

# DORMER PRAMET

## ROUND TOOL CATALOG



 **DORMER**

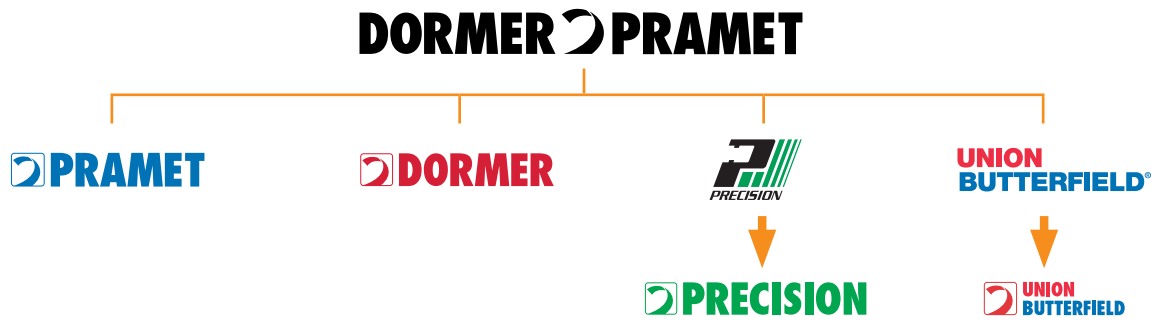
 **PRAMET**  
PRECISION

**UNION  
BUTTERFIELD®**

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## 2020 VISION: CLARITY IN BRAND ALIGNMENT



We acknowledge a unified appearance of our product logos will show that Dormer Pramet manufactures all our product brands – Precision Twist Drill, Dormer, Union Butterfield and Pramet.

In 2020, we are educating on the evolution of the Precision Twist Drill and Union Butterfield logos. Beginning in 2021, these logos will adopt the chip - our unifying symbol across the company and product brands that communicates our promise of quality manufacturing, products and logistics.

The Union Butterfield and Precision Twist Drill brands are pioneer brands for the North American marketplace. Since launching in 1885 and 1952, respectively, they represent a legacy of local support and quality tooling. Adding the chip to these logos aligns all brands visually and confirms to customers that when they add any of our tools to their shop, they add our entire team, including quality production facilities, reliable delivery and nationwide support.

## WORKPIECE MATERIAL GROUPS (WMG)

Available on our website [www.dormerpramet.com](http://www.dormerpramet.com) or by downloading our NEW Machining Calculator App.

### What is WMG?

Previous to 2019, we classified our tools according to WMG for indexable tools and AMG for round tools. We have begun to unify our technical data formats to only use WMG.

Workpiece material groups (“WMG”) are used to support easy and reliable selection of the right cutting tool and starting values for machining conditions in particular applications.

Dormer Pramet classifies workpiece materials into six different colored groups;

- **Blue:** Steel and cast steel (P-group)
- **Yellow:** Stainless steel (M-group)
- **Red:** Cast iron (K-group)
- **Green:** Non-ferrous metals (N-group)
- **Orange:** High-temperature alloys (S-group)
- **Grey:** Hardened materials (H-group)

Each of these are divided into subgroups based on their structure and/or composition. For example, P-group steel and cast steel is split into four subgroups, namely;

- P1 – **Free machining steel**
- P2 – **Plain carbon steel**
- P3 – **Alloy steel**
- P4 – **Tool steel**

A final division includes material properties, such as hardness and ultimate tensile strength. This is to provide our customers with a complete tool recommendation, including starting values for cutting speed and feed.

Speeds and feeds in the separate high performance catalogs are provided according to our new WMG groupings. The data in this catalog is still utilizing our traditional AMG groupings.

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## General Purpose

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# HYDRA DRILL

## How to Use This Chart:

- 1) Determine your Workpiece Material from the Application Material Groups (AMG) below.
- 2) Use the icons to find Product Features.
- 3) Find the Surface Feet Per Minute (SFM) and Alpha Code.

**example: 361 W**

361 = SFM

W = Alpha Code used to find your Feed Rate (IPR)

- 4) To find Cutting Feed Rate, refer to chart below.

Fn	Ø						
	1/2"	19/32"	5/8"	3/4"	1"	1.3/16"	1.1/2"
S	0.004	0.005	0.005	0.006	0.007	0.007	0.009
T	0.005	0.006	0.007	0.007	0.008	0.009	0.010
U	0.008	0.009	0.009	0.009	0.011	0.012	0.014
V	0.011	0.012	0.013	0.013	0.016	0.017	0.020
W	0.015	0.016	0.017	0.018	0.019	0.019	0.020

Application Material Groups (AMG)			Hardness HRC
1. Steel	1.1 Magnetic soft steel	12L14, 12L15	<120 HB
	1.2 Structural Steel/ case carburising steel	1005-1025, 1214, 1215, A36	<200 HB
	1.3 Plain Carbon steel	1030-1060, 1050-1060, 1144-1146	<24
	1.4 Alloy steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	<24
	1.5 Alloy steel/ Hardened and tempered steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	>24<38
	1.6 Alloy steel/ Hardened and tempered steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	>38
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2. Stainless Steel	2.1 Free machining Stainless Steel	200, 303, 416, 420F, 430F, 440	<24
	2.2 Austenitic	301, 302, 304, 316, 321, 330, CUSTOM 455, AM-350	<24
	2.3 Ferritic + Austenitic, Martensitic	318-329, 400-446, DUPLEX	<32
	2.4 Precipitation Hardened	15-5PH, Custom 450 17-4PH	<32
3. Cast Iron	3.1 Lamellar graphite	Grey, G10, Gg40, J431C, A48 CLASS 20	<150 HB
	3.2 Lamellar graphite	Grey, GG25-Gg40, J158, A48 CLASS 40-60	>150 HB<32
	3.3 Nodular graphite/ Malleable Cast Iron	A220, A436, A439, A602, Black, GGG40-GGG70	<200 HB
	3.4 Nodular graphite/ Malleable Cast Iron	Black Gts/Gtw, J434C	>200 HB<32
4. Titanium	4.1 Titanium, unalloyed	Commercially Pure	<200 HB
	4.2 Titanium, alloyed	6Al4V, 6A14V-2Sn, Monel, Monel K	<28
	4.3 Titanium, alloyed	6Al4V-4Mo, 7A14V-4Mo, 4911-4967	>28<38
5. Nickel	5.1 Nickel, unalloyed	Commercially Pure, 17644, 200, 5553	<150 HB
	5.2 Nickel, alloyed	Monel 400, Hastelloy C, Inconel 625, Waspaloy	<28
	5.3 Nickel, alloyed	Inconel 718, Nimonic 75-95, Rene 41, Inconel 825, A286	>28<38
6. Copper	6.1 Copper	Commercially Pure	<100 HB
	6.2 β-Brass, Bronze	314-340, 350-370	<200 HB
	6.3 α-Brass	Alloyed Cu + Al + Fe, Long Chipping	<200 HB
	6.4 High Strength Bronze	Ampco 18-25	<49
7. Aluminium Magnesium	7.1 Al, Mg, unalloyed	Commercially Pure	<100 HB
	7.2 Al alloyed, Si<0.5%	6061 T6, 7075, 314-340	<150 HB
	7.3 Al alloyed, Si>0.5%<10%	6061 T6, 380-390	<120 HB
	7.4 Al alloyed, Si>10% Mg alloys	Magnesium Whisker Reinforced	<120 HB
8. Synthetic Materials	8.1 Thermoplastics	Ultradid, Polystrol	---
	8.2 Thermosetting plastics	Bakelit, Pertinax	---
	8.3 Reinforced plastic materials	CFK, GFKAFK	---
9. Hard Mat.	9.1 Cermets (Metal-ceramics)	Ferrotic	<54
10. Graphite	10.1 Standard graphite		---

# Visual Index - Drills



Head Style:	R950					R960					R970					
Head Range:	15/32 - 42.00	15/32 - 42.00	15/32 - 42.00	13.5 - 42.00	15/32 - 42.00	15/32 - 30.50	15/32 - 30.50	15/32 - 30.50	15/32 - 30.50	15/32 - 30.50	15/32 - 42.00	15/32 - 42.00	15/32 - 42.00	15/32 - 42.00	15/32 - 42.00	
Body Style:	H851	H853	H855	H858	H8512	H851	H853	H855	H858	H8512	H851	H853	H855	H858	H8512	
Tool Material:	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	
Standard:																
Depth of Cut:	1.5XD	3XD	5XD	8XD	12XD	1.5XD	3XD	5XD	8XD	12XD	1.5XD	3XD	5XD	8XD	12XD	
Finish/Coating:																
Shank:	DIN 6535HA DIN 6535HE	ISO 9766 DIN 6535HE	ISO 9766 DIN 6535HE	DIN 6535HE	DIN 6535 HA	DIN 6535HA DIN 6535HE	ISO 9766 DIN 6535HE	ISO 9766 DIN 6535HE	DIN 6535HE	DIN 6535 HA	DIN 6535HA DIN 6535HE	ISO 9766 DIN 6535HE	ISO 9766 DIN 6535HE	DIN 6535HE	DIN 6535 HA	
Direction of Cut:																
Coolant:																
Range:	15/32 - 30.50	15/32 - 42.00	15/32 - 42.00	13.5 - 42.00	13.5 - 1.1/64	15/32 - 30.50	15/32 - 42.00	15/32 - 42.00	13.5 - 42.00	13.5 - 1.1/64	15/32 - 30.50	15/32 - 42.00	15/32 - 42.00	13.5 - 42.00	13.5 - 1.1/64	
Page #	21,30	21,33	21,36	21,39	21,42	24,30	24,33	24,36	24,39	24,42	27,30	27,33	27,36	27,39	27,42	ISO
1.1						397W	361W	361V	328U	289U	397W	361W	361V	328U	289U	P 1
1.2						361W	328W	328V	295U	262U	361W	328W	328V	295U	262U	P 1
1.3	361W	328W	328V	295U	262U											P 2
1.4	307W	279W	279V	246U	223U											P 3
1.5	307W	279W	279V	246U	223U											P 4
1.6	217T	197T	197T	197S	158S											H 1
1.7																H 3
1.8																H 4
2.1						217V	197V	164V	148U	157U						M 1
2.2						180T	164T	164S	131S	131S						M 3
2.3						144T	131T	131S	115S	92S						M 2
2.4	127T	115T	115T	98S	92S											S 2
3.1						433V	394V	374V	346U	315U	433V	394V	374V	346U	315U	K 1
3.2						418V	380V	354V	328U	304U	418V	380V	354V	328U	304U	K 2
3.3	318U	289U	279V	262U	231U						318U	289U	279V	262U	231U	K 3
3.4	318U	289U	279V	262U	231U						318U	289U	279V	262U	231U	K 4
4.1						163T	148T	148T	115S	118S						S 1
4.2						127T	115T	115T	98S	92S						S 2
4.3						108S	98S	98S	82S	78S						S 3
5.1						127T	115T	115T	98S	92S						S 1
5.2						108S	98S	98S	82S	78S						S 2
5.3						90S	82S	82S	66S	66S						S 3
6.1																N 3
6.2																N 4
6.3																N 3
6.4																N 4
7.1																N 1
7.2																N 1
7.3																N 1
7.4																N 2
8.1																O
8.2																O
8.3																O
9.1																H
10.1																O

# Visual Index - Drills

## Feed Rate Chart - Drills

Alpha Code	Feed in Inches per Revolution (IPR) ± 25%															Ø Diameter				
	1mm/ 1/32"	2mm/ 3/32"	3mm/ 1/8"	4mm/ 5/32"	5mm/ 3/16"	6mm/ 1/4"	8mm/ 5/16"	10mm/ 3/8"	12mm/ 1/2"	15mm/ 9/16"	16mm/ 5/8"	20mm/ 3/4"	25mm/ 1"	30mm/ 1.1/8"	40mm/ 1.5/8"	50mm/ 2"				
A	0.0004	0.0009	0.0011	0.0013	0.0014	0.0017	0.0021	0.0024	0.0027	0.0032	0.0034	0.0043	0.0049	0.0053	0.0061	0.0069				
B	0.0006	0.0011	0.0015	0.0016	0.0018	0.0021	0.0026	0.0031	0.0035	0.0041	0.0043	0.0053	0.0060	0.0065	0.0074	0.0082				
C	0.0006	0.0013	0.0017	0.0020	0.0022	0.0025	0.0031	0.0039	0.0043	0.0049	0.0051	0.0063	0.0071	0.0077	0.0087	0.0094				
D	0.0006	0.0015	0.0021	0.0024	0.0027	0.0031	0.0039	0.0047	0.0051	0.0059	0.0061	0.0074	0.0083	0.0090	0.0100	0.0108				
E	0.0007	0.0017	0.0024	0.0028	0.0031	0.0037	0.0045	0.0055	0.0059	0.0068	0.0071	0.0085	0.0094	0.0102	0.0112	0.0122				
F	0.0007	0.0020	0.0029	0.0033	0.0037	0.0043	0.0054	0.0065	0.0070	0.0080	0.0083	0.0098	0.0108	0.0116	0.0126	0.0135				
G	0.0007	0.0022	0.0033	0.0038	0.0043	0.0050	0.0063	0.0075	0.0081	0.0091	0.0094	0.0110	0.0122	0.0130	0.0140	0.0148				
H	0.0008	0.0026	0.0040	0.0046	0.0051	0.0059	0.0075	0.0090	0.0096	0.0107	0.0110	0.0126	0.0140	0.0148	0.0157	0.0165				
I	0.0008	0.0030	0.0047	0.0053	0.0059	0.0068	0.0087	0.0104	0.0110	0.0122	0.0126	0.0142	0.0157	0.0165	0.0173	0.0181				
J	0.0009	0.0033	0.0053	0.0060	0.0067	0.0078	0.0098	0.0117	0.0124	0.0137	0.0142	0.0159	0.0175	0.0183	0.0191	0.0198				
K	0.0010	0.0036	0.0059	0.0067	0.0075	0.0087	0.0110	0.0130	0.0138	0.0153	0.0157	0.0177	0.0193	0.0201	0.0209	0.0215				
L	0.0011	0.0040	0.0065	0.0073	0.0082	0.0094	0.0120	0.0142	0.0152	0.0165	0.0169	0.0191	0.0207	0.0215	0.0224	0.0231				
M	0.0012	0.0043	0.0071	0.0080	0.0089	0.0102	0.0130	0.0154	0.0165	0.0177	0.0181	0.0205	0.0220	0.0228	0.0238	0.0248				
N	0.0013	0.0047	0.0077	0.0086	0.0095	0.0110	0.0140	0.0165	0.0179	0.0189	0.0193	0.0219	0.0234	0.0242	0.0253	0.0265				
S	0.0003	0.0006	0.0008	0.0010	0.0012	0.0015	0.0020	0.0031	0.0039	0.0048	0.0051	0.0059	0.0070	0.0070	0.0090					
T	0.0006	0.0011	0.0016	0.0020	0.0024	0.0028	0.0035	0.0043	0.0051	0.0063	0.0067	0.0075	0.0080	0.0090	0.0100					
U	0.0010	0.0019	0.0028	0.0031	0.0035	0.0042	0.0055	0.0067	0.0079	0.0088	0.0091	0.0094	0.0110	0.0120	0.0140					
V	0.0015	0.0027	0.0039	0.0045	0.0051	0.0060	0.0079	0.0098	0.0110	0.0122	0.0126	0.0134	0.0160	0.0170	0.0200					
W	0.0019	0.0035	0.0051	0.0059	0.0067	0.0079	0.0102	0.0130	0.0150	0.0165	0.0169	0.0177	0.0190	0.0190	0.0200					
X	0.0022	0.0041	0.0059	0.0071	0.0083	0.0098	0.0130	0.0165	0.0189	0.0210	0.0217	0.0228								
Y	0.0027	0.0049	0.0071	0.0087	0.0102	0.0125	0.0169	0.0217	0.0276	0.0276	0.0276	0.0291								
Z	0.0037	0.0068	0.0098	0.0128	0.0157	0.0210	0.0315	0.0394	0.0433	0.0463	0.0472	0.0472								

### How To Use This Chart to Find Cutting Feed Rate (IPR):

1. Find your Alpha Code on the AMG Chart (example: 279 U : U is the Alpha Code)
2. Find the closest diameter for your cutting application on the chart to find your IPR

Application Material Groups (AMG)	Hardness HRC	ISO		
1. Steel	1.1 Magnetic soft steel	12L14, 12L15	<120 HB	P 1
	1.2 Structural Steel/ case carburising steel	1005-1025, 1214, 1215, A36	<200 HB	P 1
	1.3 Plain Carbon steel	1030-1060, 1050-1060, 1144-1146	<24	P 2
	1.4 Alloy steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	<24	P 3
	1.5 Alloy steel/ Hardened and tempered steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	>24<38	P 4
	1.6 Alloy steel/ Hardened and tempered steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	>38	H 1
	1.7 Alloy steel Hardened	A2-D2, H10-H41, L1-L6, M1-M42, T1	49-55	H 3
	1.8 Alloy steel Hardened	A2-D2, H10-H41, L1-L6, M1-M42, T1	55-63	H 4
2. Stainless Steel	2.1 Free machining Stainless Steel	200, 303, 416, 420F, 430F, 440	<24	M 1
	2.2 Austenitic	301, 302, 304, 316, 321, 330, CUSTOM 455, AM-350	<24	M 3
	2.3 Ferritic + Austenitic, Martensitic	318-329, 400-446, DUPLEX	<32	M 2
	2.4 Precipitation Hardened	15-5PH, Custom 450 17-4PH	<32	S 2
3. Cast Iron	3.1 Lamellar graphite	Grey, G10, Gg40, J431C, A48 CLASS 20	<150 HB	K 1
	3.2 Lamellar graphite	Grey, GG25-Gg40, J158, A48 CLASS 40-60	>150 HB<32	K 2
	3.3 Nodular graphite/ Malleable Cast Iron	A220, A436, A439, A602, Black, GGG40-GGG70	<200 HB	K 3
	3.4 Nodular graphite/ Malleable Cast Iron	Black Gts/Gtw, J434C	>200 HB<32	K 4
4. Titanium	4.1 Titanium, unalloyed	Commercially Pure	<200 HB	S 1
	4.2 Titanium, alloyed	6Al4V, 6Al14V-2Sn, Monel, Monel K	<28	S 2
	4.3 Titanium, alloyed	6Al4V-4Mo, 7Al14V-4Mo, 4911-4967	>28<38	S 3
5. Nickel	5.1 Nickel, unalloyed	Commercially Pure, 17644, 200, 5553	<150 HB	S 1
	5.2 Nickel, alloyed	Monel 400, Hastelloy C, Inconel 625, Waspaloy	<28	S 2
	5.3 Nickel, alloyed	Iconel 718, Nimonic 75-95, Rene 41, Iconel 825, A286	>28<38	S 3
6. Copper	6.1 Copper	Commercially Pure	<100 HB	N 3
	6.2 β-Brass, Bronze	314-340, 350-370	<200 HB	N 4
	6.3 α-Brass	Alloyed Cu + Al + Fe, Long Chipping	<200 HB	N 3
	6.4 High Strength Bronze	Ampco 18-25	<49	N 4
7. Aluminium Magnesium	7.1 Al, Mg, unalloyed	Commercially Pure	<100 HB	N 1
	7.2 Al alloyed, Si<0.5%	6061 T6, 7075, 314-340	<150 HB	N 1
	7.3 Al alloyed, Si>0.5%<10%	6061 T6, 380-390	<120 HB	N 1
	7.4 Al alloyed, Si>10% Mg alloys	Magnesium Whisker Reinforced	<120 HB	N 2
8. Synthetic Materials	8.1 Thermoplastics	Ultradid, Polystrol	---	O
	8.2 Thermosetting plastics	Bakelit, Pertinax	---	O
	8.3 Reinforced plastic materials	CFK, GFKAFK	---	O
9. Hard Mat.	9.1 Cermets (Metal-ceramics)	Ferrotic	<54	H
10. Graphite	10.1 Standard graphite		---	O

# Visual Index - Drills

Tool Material:	HM	HM	HM	HM	HM	HM	HM	HM	HM	HSS	HSS-E	HSS-E	HSS	HSS-E	HSS-E
Standard:	DIN 6539	DIN 6537 K	DIN 6537 K	DIN 6537 K	DIN 338	DIN 6537 L	DIN 6537 L	DIN 6537 L	DORNER	DIN 1897	DIN ANSI	DIN ANSI	DIN 338	DORNER	DIN ANSI
Depth of Cut:	2.5XD	3XD	3XD	3XD	4XD	5XD	5XD	5XD	8XD	2.5XD	3XD	3XD	4XD	5XD	6XD
Point Style:	130°	140°	140°	140°	130°	140°	140°	140°	140°	130°	130°	130°	130°	130°	130°
Finish/Coating:	TN	TAIN	TAIN	TAIN	TN	TAIN	TAIN	TAIN	TAIN	TN		Alorona Top	TN	TAIN Top	
Shank:		DIN 6535HA	DIN 6535HA	DIN 6535HA		DIN 6535HA	DIN 6535HA	DIN 6535HA	DIN 6535HA					DIN 6535HA	
Flute Form:	N	∞	∞	∞	N	∞	∞	∞	∞		W	W			W
Direction of Cut:	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻
Coolant Through:			⌘	⌘			⌘	⌘	⌘					⌘	
Style:	R520	R458	R457	R467	R510	R454	R453	R463	R459	A520	A920	A921	A510	A553	A900
Range:	3.00 - 16.50	3.00 - 20.00	3.00 - 20.00	3.00 - 16.00	3.00 - 14.25	3.00 - 20.00	3.00 - 20.00	3.00 - 16.00	3.00 - 16.00	3.00 - 13.00	1.00 - 20.00	2.50 - 16.00	3.00 - 14.00	5.00 - 20.00	1.00 - 20.00
Page #	45	47	47	51	54	56	56	60	63	66	69	69	73	76	78
1.1	328X	510W	510W		328W	510V	510V		443V	187M	131J	197M	187M	279L	125H
1.2	295X	440W	460W		295W	440V	460V		394V	154M	112J	171M	154M	230L	108H
1.3	295X	360W	440W		295W	360V	440V		361U	131K	105I	174J	131K	197L	85H
1.4	262X	330V	375V		262W	330V	375V		328U	105I	105I	174J	98H	148H	85H
1.5	180X	245V	295V		180V	245V	295V		262U	69G	75E	125G	69F	92F	69E
1.6	148W	164U	213U		148V	164U	213U		180T	36E	62E	98G	36D	49D	52E
1.7	115U	98U	98U		115T	98U	98U								
1.8	98T	82U	82U		98S	82U	82U								
2.1	164W	148U	246V	279G	164V	148U	246V	279G	246V	98I	49F	56F	92G	131G	49E
2.2		131T	115V	246G		131T	115V	246G	115V	52I	23F	30F	46I	62I	23E
2.3		115T	98U	197F		115T	98U	197F	98U	66G	30D	36D	62G	89G	30C
2.4		115T				115T									
3.1	295Y	295W	394W		295X	295W	394W		394W	157M	112L	174L	138K	230K	79J
3.2	295Y	295W	394W		295X	295W	394W		394W	121K	85L	138L	105J	164J	62J
3.3	213X	230V	262V		213W	230V	262V		262V	98J	85L	138L	92J	148J	62J
3.4	213X	230V	262V		213W	230V	262V		262V	85F	62J	118J	82F	138F	46I
4.1	197W	164U	180V	180V	148V	164U	180V	180V		112I	98G	157I	105G	148G	72E
4.2	148V	131U	148V	148V		131U	148V	148V		66G	59G	95I	66H	98E	49E
4.3	115U	115T	131U	131U		115T	131U	131U		13B	33C	52E	13B	26C	20C
5.1	164W			180U	164V			180U		56I	49I	79L	56I	82I	46G
5.2				148U				148U		36G	30G	46I	30E	49E	23G
5.3				131U				131U		23E	20E	33G	20E	33G	20C
6.1		328V	410W			328V	410W		410V	131E	213H		131D	230G	213G
6.2		656V	722W			656V	722W		722V	164I	216J		164I	279I	174I
6.3		656V	722W			656V	722W		722V	148K	131J	233J	148I	262I	112H
6.4		262U	328V			262U	328V		328U	66F	102G	164I	66F	115G	98G
7.1	738Z	738W	820W		738Y	738W	820W		935W	180I	246L		164G	230H	197J
7.2	738Z	738W	820W		738Y	738W	820W		935W	164M	148N		164M	328M	148N
7.3	492Y	590V	656V		492X	590V	656V		623V	121K	131N		102I	180I	131N
7.4	213Y	394V	492V		213X	394V	492V		312V	115I	118J	157J	108I	180J	92I
8.1	246Z				246X					213G	180J		213G	295G	180I
8.2	377V				377V					164G	131H		164G		131G
8.3										115F			115F		
9.1															
10.1															

# Visual Index - Drills

	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	
	DIN ANSI	DIN ANSI	DIN ANSI	DIN 1869/1	DIN 1869/2	DIN 1869/3	ANSI	ANSI	ANSI	ANSI	DIN 338	DIN 338	DIN 338	DIN 338	ANSI	
	6XD	10XD	10XD	15XD	20XD	25XD	4XD	4XD	4XD	4XD	4XD	4XD	4XD	4XD	4XD	
	130°	130°	130°	130°	130°	130°	118°	118°	118°	118°	118°	118°	118°	118°	118°	
	Alcrona Top		Alcrona Top				ST	TN	TN		ST	ST	TN	TN		
	W	W	W	W	W	W			N	N	N	N	N	N	N	
	A901	A940	A941	A976	A977	A978	R10P R15P R18P	R10 R15 R18	A012	A012S	2A	2AB	A100	A002	A002S	L10
	1.50 - 16.00	1.00 - 20.00	1.00 - 16.00	1.50 - 14.00	1.50 - 14.00	3.00 - 10.00	N97 - 11/16	N80 - 11/16	N80 - 3/4	1/16 - 1/2	0.15 - 15.00	1.00 - 17.50	0.20 - 20.00	1.00 - 16.00	2.00 - 13.00	1/32 - 1/2
	78	81	81	84	84	84	87	87	91	91	95	95	95	95	95	102
1.1	197J	125F	174G	102C	102B	102A	115H	115H	154J	154J	115H	115H	115H	154J	154J	115H
1.2	164J	108F	151G	85C	85B	85A	98H	98H	131J	131J	98H	98H	98H	131J	131J	98H
1.3	144I	72G	118G	72C	72B	72A	82F	82F	115F	115F	82F	82F	82F	115F	115F	82F
1.4	144I	72G	118G	72C	72B	72A	66F	66F	98F	98F	66F	66F	66F	98F	98F	66F
1.5	108G	56C	75D	39A	39A	39A	43E	43E	59F	59F	43E	43E	43E	59F	59F	43E
1.6	85G	39C	56D	33A	33A	33A	30D	30D	33E	33E	30D	30D	30D	33E	33E	30D
1.7																
1.8																
2.1	56E	49C	56C	39B	39B	39A	49E	49E	66F	66F	49E	49E	49E	66F	66F	49E
2.2	30E	23E	30E	23C	23B	23A	26G	26G	39G	39G	26G	26G	26G	39G	39G	26G
2.3	36C	30B	36B	26A	26A	26A	30C	30C	52C	52C	30C	30C	30C	52C	52C	30C
2.4																
3.1	190I		118I				98H	98H	131J	131J	98H	98H	98H	131J	131J	98H
3.2	154I	52I	98I	75C	75B	75A	79F	79F	98E	98E	79F	79F	79F	98E	98E	79F
3.3	112J	52I	98I	52C	52B	52A	66E	66E	92E	92E	66E	66E	66E	92E	92E	66E
3.4	92I	39H	79H	36A	36A	36A	46E	46E	85E	85E	46E	46E	46E	85E	85E	46E
4.1	115G	59E	82F	49C	49B	49A	75E	75E	75F	75F	75E	75E	75E	75F	75F	75E
4.2	79G	43C	59D	36A	36A	36A	39D	39D	43D	43D	39D	39D	39D	43D	43D	39D
4.3	33E	20C	26D	16A	16A	16A	20B	20B	23B	23B	20B	20B	20B	23B	23B	20B
5.1	72I						33G	33G	43G	43G	33G	33G	33G	43G	43G	33G
5.2	36I						20E	20E	23E	23E	20E	20E	20E	23E	23E	20E
5.3	33E						10A	10A	10A	10A	10A	10A	10A	10A	10A	10A
6.1		213F					108G	108G	164G	164G	108G	108G	108G	164G	164G	108G
6.2		230F					115I	115I	108I	108I	115I	115I	115I	108I	108I	115I
6.3	184I	112G	157H	98D	98C	98B	89H	89H	128H	128H	89H	89H	89H	128H	128H	89H
6.4	157I	98G	138H	89D	89C	89B	52G	52G	98G	98G	52G	52G	52G	98G	98G	52G
7.1		174H					108J	108J	134K	134K	108J	108J	108J	134K	134K	108J
7.2		148H					98I	98I	125J	125J	98I	98I	98I	125J	125J	98I
7.3		131H					89H	89H	108I	108I	89H	89H	89H	108I	108I	89H
7.4	157I	98G	138H	89D	89C	89B	79F	79F	108I	108I	79F	79F	79F	108I	108I	79F
8.1		180H					98J	98J	98I	98I	98J	98J	98J	98I	98I	98J
8.2		131F					92H	92H	164H	164H	92H	92H	92H	164H	164H	92H
8.3							46F	46F	115F	115F	46F	46F	46F	115F	115F	46F
9.1							10B	10B	10B	10B	10B	10B	10B	10B	10B	10B
10.1																

# Visual Index - Drills

	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS-E	HSS-E	HSS-E	HSS
	DIN 338	ANSI	ANSI	ANSI	ANSI	DIN 338	ANSI	ANSI	DIN 338	DIN 338	ANSI	DIN 338	NAS 907	ANSI
	4XD	4XD	4XD	4XD	4XD	4XD	4XD	4XD	4XD	4XD	4XD	4XD	3XD	2.5XD
	118°	135°	118°	135°	118°	135°	135°	135°	135°	135°	135°	135°	135°	118°
	ST	Purple Bronze	ST	ST		ST		TN		TN	Bronze	Bronze	Bronze	
	N				W	W					N			
	A101	HX10 HX15 HX18	R10A R15A R18A	R10B R15B R18B	R10H R18H	A108	QC21P	QC21G	QC21PM	QC21GM	R10CO R15CO R18CO	2ACO	R88CO R89CO	R40 R41 R42
	1.00 - 12.00	1/16 - 1/2	1/16 - 1/2	1/16 - 1/2	N80 - 1/2	1.00 - 16.00	1/16 - 11/16	1/16 - 1/2	1.50 - 17.50	1.50 - 13.00	N80 - 11/16	1.00 - 13.00	1/16 - 1/2	N60 - 2"
	103	105	108	111	114	114	119	119	122	122	123	123	128	130
1.1	35H	115H	115J	115J	108I	115I	98F	115F	98F	115F	115J	115J	115J	115J
1.2	30H	69H	98H	98H	92I	98I	59F	69F	59F	69F	98H	98H	98H	98J
1.3	25F	75I	89G	89G		82G	66H	75H	66H	75H	89G	89G	89G	89G
1.4	20F	69H	79F	79F		66F	59F	69F	59F	69F	79F	79F	79F	69G
1.5	13E	56F	56E	56E		43E	46D	56D	46D	56D	56E	56E	56E	46F
1.6	9D		33D	33D		30D					33D	33D	33D	33E
1.7														
1.8														
2.1	15E	105I	72E	72E		49E	89H	105H	89H	105H	72E	72E	72E	52F
2.2	8G	59H	36G	36G		30G	49F	59F	49F	59F	36G	36G	36G	30H
2.3	9C	56F	49C	49C		33D	49D	59D	49D	59D	49C	49C	49C	33D
2.4														
3.1	30H	171L	115H	115H	82F	98H	151H	171H	151H	171H	115H	115H	115H	105J
3.2	24F	89I	92D	92D	66D	79F	79H	89H	79H	89H	92D	92D	92D	89G
3.3	20E	95H	72E	72E	52C	66E	79F	95F	79F	95F	72E	72E	72E	66F
3.4	14E	59F	56E	56E	33C	46E		59D		59D	56E	56E	56E	52F
4.1	23E	95H	92F	92F	49C	82G	89H		89H		92F	92F	92F	89G
4.2	12D	75H	66D	66D		52E	49F		49F		66D	66D	66D	52E
4.3	6B		36C	36C		23B					36C	36C	36C	26C
5.1	10G	59H	49G	49G	23E	39G	49F	59H	49F	59H	49G	49G	49G	43H
5.2	6E		23E	23E		23G					23E	23E	23E	26F
5.3	3A		20B	20B		20E					20B	20B	20B	13B
6.1	33G		125H	125H	115H	108G	89I	98I	89I	98I	125H	125H	125H	118H
6.2	35I		131F	131F	118G	115I	79H	89H	79H	89H	131F	131F	131F	125J
6.3	27H		89H	89H		102H	79H	89H	79H	89H	89H	89H	89H	89I
6.4	16G		69F	69F		52G					69F	69F	69F	52H
7.1	33J		108J	108J	148J	108J	351H	400H	351H	400H	108J	108J	108J	108K
7.2	30I		98I	98I	115J	98I	325H	351H	325H	351H	98I	98I	98I	98J
7.3	27H		98H	98H	98G	89H					98H	98H	98H	98I
7.4	24F		89F	89F	95G	79F	276H	315H	276H	315H	89F	89F	89F	82I
8.1	30J				138J	98J								98K
8.2	28H				131I	92H								115I
8.3	14F				66G	46F								56G
9.1	3B		20C	20C		10B					20C	20C	20C	13C
10.1														

# Visual Index - Drills

	HSS	HSS	HSS	HSS	HSS	HSS-E	HSS-E	HSS-E	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS-E
	DIN ANSI	ANSI	DIN 1897	ANSI	ANSI	DIN 1899	ANSI	DIN 1897	ANSI	DIN 340	ANSI	ANSI	ANSI	DIN 340	DIN 340	ANSI
	2.5XD	2.5XD	2.5XD	3XD	3XD	2.5XD	2.5XD	2.5XD	6XD	6XD	6XD	6XD	6XD	6XD	6XD	6XD
	135°	135°	135°	135°	135°	118°	135°	135°	118°	118°	118°	135°	135°	135°	135°	135°
	TN	ST	ST		TN		Bronze	Bronze				TN			TN	Bronze
	N		N			N		N		N	W					
	A022	R40C R41C R42C	4ASM	QC41P	QC41G	A720	M40CO M41CO M42CO	4ASM- CO	R51 R52 R55	5ATL	R51FS	QC91P	QC91G	QC91PM	QC91GM	M51CO M52CO
	0.50 - 16.00	N60 - 1/2	1.00 - 12.50	1/16 - 11/16	1/16 - 1/2	0.15 - 1.40	N60 - 3/4	2.30 - 12.00	N80 - 1.3/4	1.00 - 31.00	1/16 - 1/2	1/16 - 11/16	1/16 - 1/2	1.50 - 17.00	1.50 - 12.50	1/16 - 1"
	133	136	139	141	141	143	144	147	148	152	154	155	155	157	157	158
1.1	115K	115J	115J	98F	115F	115A	125K	125K	89G	89G		98F	115F	98F	115F	89G
1.2	105K	98J	98J	59F	69F	98A	108H	108H	82G	82G		59F	69F	59F	69F	82G
1.3	82I	89G	89G	66H	75H	89A	98G	98G	66E	66E		66H	75H	66H	75H	66E
1.4	75H	69G	69G	59F	69F	75A	89G	89G	52E	52E		59F	69F	59F	69F	52E
1.5	52G	46F	46F	46D	56D	56A	59F	59F	30D	30D		46D	56D	46D	56D	30D
1.6	33E	33E	33E			33A	36E	36E	20B	20B						20B
1.7																
1.8																
2.1	49G	52F	52F	89H	105H	72A	72F	72F	33D	33D		89H	105H	89H	105H	33D
2.2	26I	30H	30H	49F	59F	33A	36H	36H	20F	20F		49F	59F	49F	59F	20F
2.3	30E	33D	33D	49D	59D	49A	49D	49D	13B	13B		49D	59D	49D	59D	13B
2.4																
3.1	105K	105J	105J	151H	171H	98A	112K	112K	92H	92H		151H	171H	151H	171H	92H
3.2	82I	89G	89G	79H	89H	79A	98F	98F	69E	69E		79H	89H	79H	89H	69E
3.3	66G	66F	66F	79F	95F	66A	72F	72F	49D	49D		79F	95F	79F	95F	49D
3.4	52G	52F	52F		59D	46A	56F	56F	43D	43D			59D		59D	43D
4.1	82I	89G	89G	89H		75A	98G	98G	56E	56E		89H		89H		56E
4.2	46F	52E	52E	49F		56A	59F	59F	30C	30C		49F		49F		30C
4.3	26C	26C	26C			26A	33C	33C	13A	13A						13A
5.1	43H	43H	43H	49F	59H	33A	49H	49H	26F	26F		49F	59H	49F	59H	26F
5.2	26F	26F	26F			23A	30F	30F	13D	13D						13D
5.3	13B	13B	13B			13A	20C	20C	10A	10A						10A
6.1	118H	118H	118H	89I	98I	115A	125I	125I	98E	98E	89I	89I	89I	89I	98I	98E
6.2	125K	125J	125J	79H	89H	131A	131K	131K	105H	105H		79H	89H	79H	89H	105H
6.3	89I	89I	89I	79H	89H	115A	89J	89J	89G	89G		79H	89H	79H	89H	89G
6.4	52I	52H	52H			89A	52I	52I	52E	52E						52E
7.1	131F	108K	108K	351H		115A	115K	115K	105I	105I	348H	351H	400H	351H	400H	105I
7.2	105K	98J	98J	325H		98A	108J	108J	89H	89H	325H	325H	351H	325H	351H	89H
7.3	105J	98I	98I			89A	102I	102I	89G	89G						89G
7.4	82J	82I	82I	276H		89A	98G	98G	82E	82E	276H	276H	315H	276H	315H	82E
8.1	98K	98K	98K			157A	115M	115M	115I	115I						115I
8.2	115I	115I	115I			82A	92K	92K	85G	85G						85G
8.3	56G	56G	56G				56I	56I	39E	39E						39E
9.1	13C	13C	13C				20C	20C	10A	10A						10A
10.1																

# Visual Index - Drills

	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS-E	HSS-E	HSS	HSS	HSS	HSS	HSS	HSS	
	ANSI	ANSI	BS 328	ANSI	NAS 907	NAS 907	NAS 907	NAS 907	NAS 907	NAS 907	ANSI	DIN 345	DIN 345	DIN 344	DIN 18701	DIN 18701	
	12XD	15XD	10XD	10XD	4XD	4XD	4XD	4XD	4XD	4XD	4XD	4XD	4XD	4XD	6XD	10XD	15XD
	118°	118°	118°	135°	135°	118°	135°	135°	135°	135°	118°	118°	118°	118°	118°	118°	130°
	<b>0860 1290</b>	<b>1511 1813</b>	<b>A125</b>	<b>QC0860P QC1290P</b>	<b>A243</b>	<b>A244</b>	<b>500-6 501-6 502-6</b>	<b>500-12 501-12 502-12</b>	<b>CO500-6 CO501-6</b>	<b>CO500-12 CO500-12</b>	<b>209 S209</b>	<b>5ATS</b>	<b>A530</b>	<b>A350</b>	<b>A345</b>	<b>A951</b>	
	1/8 - 3/4	3/16 - 1"	1.40 - 1"	1/8 - 1/2	3/32 - 1/4	1/8 - 1/4	N60 - 1/2	3/64 - 1/2	1/16 - 1/4	1/16 - 1/4	1/8 - 2"	5.00 - 50.00	8.50 - 40.00	5.00 - 50.00	8.00 - 50.00	10.00 - 30.00	
	<b>160</b>	<b>162</b>	<b>162</b>	<b>167</b>	<b>169</b>	<b>169</b>	<b>170</b>	<b>173</b>	<b>175</b>	<b>175</b>	<b>177</b>	<b>180</b>	<b>180</b>	<b>180</b>	<b>183</b>	<b>185</b>	
1.1	79E	79E	79E	98F							115I	115I	154I	89I	79G	89G	
1.2	72E	72E	72E	59F							98I	98I	131I	82I	72G	72G	
1.3	52C	52C	52C	66H	82F	82F	82F	82F			82F	82F	98F	66G	56E	62E	
1.4	49C	49C	49C	59F	66F	66F	66F	66F			66F	66F	89F	52F	49D	49D	
1.5	20A	20A	20A	46D	43E	43E	43E	43E			39E	39E	66E	33E	20C	26C	
1.6	16A	16A	16A		30D	30D	30D	30D	20B	20B	30D	30D	33D	20D	16B	20B	
1.7																	
1.8																	
2.1	30C	30C	30C	89H	49E	49E	49E	49E	95H	95H	49E	49E	79E	43E	39C	39C	
2.2	13E	13E	13E	49F	26G	26G	26G	26G	56F	56F	30G	30G	43G	13G	13E	20E	
2.3	26A	26A	26A	49D	30C	30C	30C	30C	56D	56D	33C	33C	66C	26C	26A	39A	
2.4									30D	30D							
3.1	72G	72G	72G	151H	98I	98I	98I	98I	161H	161H	98I	98I	118I	85I	72G	72G	
3.2	59D	59D	59D	79H	79F	79F	79F	79F	85H	85H	79E	79E	92E	66F	59D	52D	
3.3	43C	43C	43C	79F	66E	66E	66E	66E	85F	85F	66E	66E	89E	59E	43C	43C	
3.4	30C	30C	30C		46E	46E	46E	46E	56D	56D	46E	46E	72E	36E	30C	30C	
4.1	36D	36D	36D		75F	75F	75F	75F			75F	75F	105F	52F	49D	59D	
4.2	30B	30B	30B		39D	39D	39D	39D			43D	43D	59D	30D	30B	33B	
4.3	16A	16A	16A		20B	20B	20B	20B	20D	20D	23B	23B	43B	16B	16A	20A	
5.1	16E	16E	16E	49F	33G	33G	33G	33G			33G	33G	43G	26G	26E	23E	
5.2	13C	13C	13C		20E	20E	20E	20E	20B	20B	23E	23E	20E	13E	13C	16C	
5.3	10A	10A	10A		10A	10A	10A	10A	16B	16B	13A	13A	10A	10A	10A	10A	
6.1	79D	79D	79D								108F	108F	197G	108F	89D	72D	
6.2	108G	108G	108G	79H							115I	115I	180I	115I	108G	108G	
6.3	72F	72F	72F	75H	89H	89H	89H	89H			115H	115H	131G	115H	89F	72F	
6.4	52D	52D	52D		52G	52G	52G	52G			52F	52F	115E	52F	52D	52D	
7.1	79H	79H	79H	348H							85J	85J	180I	108J	108H	98H	
7.2	72G	72G	72G	325H							98I	98I	148I	82I	89G	89G	
7.3	72F	72F	72F								92H	92H	115G	89H	89F	79F	
7.4	66E	66E	66E	276H	79F	79F	79F	79F			75H	75H	92G	82H	79F	72F	
8.1	98H	98H	98H	151D							98K	98K	164J	115L	98J	98J	
8.2	85F	85F	85F	125D							92J	92J	164H	85J	98H	98H	
8.3	33D	33D	33D								46H	46H	115F	39H	33F	33F	
9.1	10A	10A	10A		10B	10B	10B	10B			10B	10B	10B	10B	10A	10A	
10.1																	



# Visual Index - Drills

	HSS	HSS-E	HSS-E	HSS	HSS	HSS	HSS	HSS	HSS-E	HSS HM	HSS HM	HM	HM	HM	HSS	HSS	
	DIN 1870/2	ANSI	DIN 345	ANSI	DORNER	ANSI	ANSI	ANSI	ANSI	PRECISION	DIN 338	PRECISION	PRECISION	PRECISION	PRECISION	PRECISION	
	20XD	4XD	4XD	5XD	4XD	4XD	4XD	1.5XD	4XD	4XD	4XD	3XD	3XD	1XD	1XD	1XD	
	130°	135°	118°		118°	118°	118°	118°	118°	118°	118°	118°	118°	90°	90°	90°	
	ST	Bronze	Bronze	ST	ST	ST	ST	ST	ST	ST	ST					TN	
	W		N		N						N						
	A952	209CO	A730	T400	A170	R56	R57	R58	R56CO	D444	A160	D33F D33W D33L	D33M	DS-90 DS-120 DS-142	SPS-90	SPSG-90	
	8.00 - 40.00	1/4 - 1.1/2	10.00 - 32.00	1/2 - 1.5/8	13.00 - 1.1/2	33/64 - 1.1/2	33/64 - 1.1/2	1" - 2"	33/64 - 1"	N32 - 1/2	4.00 - 16.00	N68 - 1/2	1.00 - 12.00	1/8 - 1/2	1/4 - 1"	1/4 - 1"	
	185	187	189	191	192	194	196	198	199	200	202	203	206	207	208	208	
1.1	89G	115J	115J	75E	115H	115H	115H	98F	115H	197E	197E	279S	279S	279S	115E	115E	
1.2	72G	98H	98H	46F	98H	98H	98H	59F	98H	197E	197E	246S	246S	246S	98E	98E	
1.3	62E	89G	89G	49F	82F	82F	82F	66H	82F	180D	180D	246S	246S	246S	89C	89C	
1.4	49D	75F	75F	49D	66E	66E	66E	59F	66E	164D	164D	230S	230S	230S	69C	69C	
1.5	26C	56E	56E	36D	43D	43D	43D	46D	43D	131C	131C	148S	148S	148S	46C	46C	
1.6	20B	33D	33D		30C	30C	30C		30C	121A	121A	148S	148S	148S	33B	33B	
1.7												98S	98S	98S			
1.8												98S	98S	98S			
2.1	39C	79E	79E	66F	49D	49D	49D	89H	49D	131B	131B	98S	98S	174S	52C	52C	
2.2	20E	36G	36G	39D	23F	23F	23F	49F	23F	115C	115C			148S	30D	30D	
2.3	39A	56C	56C	39D	23B	23B	23B	49D	23B	115A	115A				33B	33B	
2.4																	
3.1	72G	115J	115J	108E	89H	89H	89H	151H	89H	164C	164C	246T	246T	246T	105E	105E	
3.2	52D	92G	92G	59H	72E	72E	72E	79H	72E	131A	131A	246T	246T	246T	89C	89C	
3.3	43C	72E	72E	59F	62D	62D	62D	79F	62D	115A	115A	180T	180T	180T	66C	66C	
3.4	30C	56E	56E		39D	39D	39D		39D	98A	98A	180T	180T	180T	52B	52B	
4.1	59D	92G	92G	69F	56E	56E	56E	89H	56E	115A	115A			148T	89C	89C	
4.2	33B	66D	66D	36D	30C	30C	30C	49F	30C	115A	115A			115T	39B	39B	
4.3	20A	36C	36C		16A	16A	16A		16A	82A	82A			82S	23A	23A	
5.1	23E	49G	49G	49D	26F	26F	26F	49F	26F	98A	98A			148T	43D	43D	
5.2	16C	23E	23E		13D	13D	13D	23F	13D	82A	82A			98S	26C	26C	
5.3	10A	20B	20B		10A	10A	10A	13B	10A	66A	66A			66S	13A	13A	
6.1	72D	125L	125L		115F	115F	115F	108F	115F	180D	180D				902V	89D	89D
6.2	108G	131J	131J		108H	108H	108H	115H	108H	230G	230G	820V	820V	820V	108E	108E	
6.3	72F	89H	89H		89G	89G	89G	115H	89G	197C	197C	820V	820V	820V	89D	89D	
6.4	52D	69F	69F		52F	52F	52F	52F	52F	164C	164C			230T	52D	52D	
7.1	98H	108J	108J		108I	108I	108I	85I	108I	164I	164I	656V	656V	656V	108E	108E	
7.2	89G	98I	98I		98H	98H	98H	98H	98H	148H	148H	656V	656V	656V	98E	98E	
7.3	79F	98H	98H		89G	89G	89G	92H	89G	131G	131G	367V	367V	367V	98D	98D	
7.4	72F	89F	89F		72G	72G	72G	75H	72G	115F	115F	197V	197V	197V	82D	82D	
8.1	98J	115K	115K		98I	98I	98I	98I	98I			197X	197X	197X	98F	98F	
8.2	98H	92J	92J		92G	92G	92G	92I	92G	197E	197E	328V	328V	328V	115E	115E	
8.3	33F	66H	66H		46E	46E	46E	46H	46E						56D	56D	
9.1	10A	16C	16C		10A	10A	10A	10B	10A	30C	30C				39A	39A	
10.1																	

# Visual Index - Drills

	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HM	HSS	HSS	HSS	HSS
												ANSI	BS 328	ANSI	ANSI
	1XD	1XD	1XD	1XD	1XD	1XD	1XD	1XD	1XD	1XD	1XD	1XD	1XD	1XD	1XD
	SPS-120	SPSG-120	SPR-90	SPRG-90	SPR-120	SPRG-120	SPL-90	SPLG-90	SPL-120	SPLG-120	DC	76HA	A225	A217	A218
	1/4 - 1"	1/4 - 1"	1/4 - 1"	1/4 - 1"	1/4 - 1"	1/4 - 1/2	1/4 - 1"	1/4 - 1"	1/4 - 5/8	1/4 - 1/2	NO - N6	N000 - N8	3/64 - 5/16	N1 - N8	N1 - N8
	208	208	209	209	209	209	210	210	210	210	211	212	213	213	213
1.1	115E	115E	115E	115E	115E	115E	115E	115E	115E	115E	279S	115I	115I	115I	115I
1.2	98E	98E	98E	98E	98E	98E	98E	98E	98E	98E	246S	98I	98I	98I	98I
1.3	89C	89C	89C	89C	89C	89C	89C	89C	89C	89C	246S	82G	82G	82G	82G
1.4	69C	69C	69C	69C	69C	69C	69C	69C	69C	69C	230S	66F	66F	66F	66F
1.5	46C	46C	46C	46C	46C	46C	46C	46C	46C	46C	148S	43E	43E	43E	43E
1.6	33B	33B	33B	33B	33B	33B	33B	33B	33B	33B	148S	30D	30D	30D	30D
1.7											98S				
1.8											98S				
2.1	52C	52C	52C	52C	52C	52C	52C	52C	52C	52C		49E	49E	49E	49E
2.2	30D	30D	30D	30D	30D	30D	30D	30D	30D	30D		26G	26G	26G	26G
2.3	33B	33B	33B	33B	33B	33B	33B	33B	33B	33B		33C	33C	33C	33C
2.4															
3.1	105E	105E	105E	105E	105E	105E	105E	105E	105E	105E	246T	98I	98I	98I	98I
3.2	89C	89C	89C	89C	89C	89C	89C	89C	89C	89C	246T	79F	79F	79F	79F
3.3	66C	66C	66C	66C	66C	66C	66C	66C	66C	66C	180T	66E	66E	66E	66E
3.4	52B	52B	52B	52B	52B	52B	52B	52B	52B	52B	180T	46E	46E	46E	46E
4.1	89C	89C	89C	89C	89C	89C	89C	89C	89C	89C		79F	79F	79F	79F
4.2	39B	39B	39B	39B	39B	39B	39B	39B	39B	39B		43D	43D	43D	43D
4.3	23A	23A	23A	23A	23A	23A	23A	23A	23A	23A		23B	23B	23B	23B
5.1	43D	43D	43D	43D	43D	43D	43D	43D	43D	43D		33G	33G	33G	33G
5.2	26C	26C	26C	26C	26C	26C	26C	26C	26C	26C		16E	16E	16E	16E
5.3	13A	13A	13A	13A	13A	13A	13A	13A	13A	13A		13A	13A	13A	13A
6.1	89D	89D	89D	89D	89D	89D	89D	89D	89D	89D		115G	115G	115G	115G
6.2	108E	108E	108E	108E	108E	108E	108E	108E	108E	108E	820V	108I	108I	108I	108I
6.3	89D	89D	89D	89D	89D	89D	89D	89D	89D	89D	820V	89H	89H	89H	89H
6.4	52D	52D	52D	52D	52D	52D	52D	52D	52D	52D		52G	52G	52G	52G
7.1	108E	108E	108E	108E	108E	108E	108E	108E	108E	108E	656V	108J	108J	108J	108J
7.2	98E	98E	98E	98E	98E	98E	98E	98E	98E	98E	656V	98I	98I	98I	98I
7.3	98D	98D	98D	98D	98D	98D	98D	98D	98D	98D	367V	89H	89H	89H	89H
7.4	82D	82D	82D	82D	82D	82D	82D	82D	82D	82D	197V	72H	72H	72H	72H
8.1	98F	98F	98F	98F	98F	98F	98F	98F	98F	98F	197X	98J	98J	98J	98J
8.2	115E	115E	115E	115E	115E	115E	115E	115E	115E	115E	328V	92H	92H	92H	92H
8.3	56D	56D	56D	56D	56D	56D	56D	56D	56D	56D		46F	46F	46F	46F
9.1	39A	39A	39A	39A	39A	39A	39A	39A	39A	39A		10B	10B	10B	10B
10.1															

# Visual Index - Drills

	HSS-E	HSS	HSS	HSS	HSS	HSS	HSS	HSS	
	ANSI								
	1.5XD							4XD	
	A221	TS41HS TS40HS TS42HS	TS10HS TS15HS TS18HS	TS51HS TS52HS TS55HS	TS41CO TS40CO TS42CO	TS10CO TS15CO TS18CO	TS51CO TS52CO TS55CO	ATR41	Drill Sets
	N00 - N8	N50 - 3/8	N50 - 3/8	N50 - 3/8	N50 - 3/8	N50 - 3/8	N50 - 3/8	Size 1 - 4	
	214	215	215	215	219	219	219	223	224
1.1	115I	115J	115J	115J	125K	125K	125K		
1.2	98I	98J	98J	98J	108H	108H	108H		
1.3	82G	89G	89G	89G	98G	98G	98G	82F	
1.4	66F	69G	69G	69G	89G	89G	89G	66F	
1.5	43E	46F	46F	46F	59F	59F	59F	43E	
1.6	30D	33E	33E	33E	36E	36E	36E	30D	
1.7									
1.8									
2.1	49E	52F	52F	52F	72F	72F	72F	49E	
2.2	26G	30H	30H	30H	36H	36H	36H	26G	
2.3	33C	33D	33D	33D	49D	49D	49D	30C	
2.4									
3.1	98I	105J	105J	105J	112K	112K	112K	98I	
3.2	79F	89G	89G	89G	98F	98F	98F	79F	
3.3	66E	66F	66F	66F	72F	72F	72F	66E	
3.4	46E	52F	52F	52F	56F	56F	56F	46E	
4.1	79F	89G	89G	89G	98G	98G	98G	75F	
4.2	43D	52E	52E	52E	59F	59F	59F	39D	
4.3	23B	26C	26C	26C	33C	33C	33C	20B	
5.1	33G	43H	43H	43H	49H	49H	49H	33G	
5.2	16E	26F	26F	26F	30F	30F	30F	20E	
5.3	13A	13B	13B	13B	20C	20C	20C	10A	
6.1	115G	118H	118H	118H	125I	125I	125I		
6.2	108I	125J	125J	125J	131K	131K	131K		
6.3	89H	89I	89I	89I	89J	89J	89J	89H	
6.4	52G	52H	52H	52H	52I	52I	52I	52G	
7.1	108J	108K	108K	108K	115K	115K	115K		
7.2	98I	98J	98J	98J	108J	108J	108J		
7.3	89H	98I	98I	98I	102I	102I	102I		
7.4	72H	82I	82I	82I	98G	98G	98G	79F	
8.1	98J	98K	98K	98K	115M	115M	115M		
8.2	92H	115I	115I	115I	92K	92K	92K		
8.3	46F	56G	56G	56G	56I	56I	56I		
9.1	10B	13C	13C	13C	20C	20C	20C	10B	
10.1									

# List Number Index - Drills



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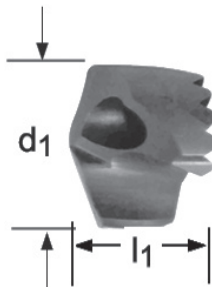
0860 .....	160	A951 .....	185	D444 .....	200	R42C .....	136
209 .....	177	A952 .....	185	DC .....	211	R453 .....	56
1290 .....	160	A976 .....	84	DS-90 .....	207	R454 .....	56
1511 .....	162	A977 .....	84	DS-120 .....	207	R457 .....	47
1813 .....	162	A978 .....	84	DS-142 .....	207	R458 .....	47
209CO .....	187	ATR41 .....	223	H851 .....	30	R459 .....	63
2A .....	95	C114COMB .....	227	H853 .....	33	R463 .....	60
2AB .....	95	C114COMBC .....	235	H855 .....	36	R467 .....	51
2ACO .....	123	C114COMBP .....	226	H858 .....	39	R51 .....	148
4ASM .....	139	C115COMB .....	227	H8512 .....	42	R510 .....	54
4ASMCO .....	147	C115COMBC .....	235	H860 .....	44	R51FS .....	154
500-12 .....	173	C115COMBP .....	226	H861 .....	44	R52 .....	148
500-6 .....	170	C13R10CO .....	234	HX10 .....	105	R520 .....	45
501-12 .....	173	C15L10 .....	231	HX15 .....	105	R55 .....	148
501-6 .....	170	C15R10 .....	224	HX18 .....	105	R56 .....	194
502-12 .....	173	C15R10CO .....	234	L10 .....	102	R56CO .....	199
502-6 .....	170	C15R10P .....	224	M40CO .....	144	R57 .....	196
5ATL .....	152	C20R18 .....	225	M41CO .....	144	R58 .....	198
5ATS .....	180	C20R18P .....	225	M42CO .....	144	R88CO .....	128
76HA .....	212	C21R10CO .....	234	M51CO .....	158	R89CO .....	128
A002 .....	95	C252A .....	228	M52CO .....	158	R950 .....	21
A012 .....	91	C252AB .....	228	QC0860P .....	167	R960 .....	24
A022 .....	133	C26M42CO .....	239	QC1290P .....	167	R970 .....	27
A088 .....	237	C26R15 .....	226	QC21G .....	119	S209 .....	177
A094 .....	229	C26R15CO .....	234	QC21GM .....	122	SPL-120 .....	210
A095 .....	230	C26R15P .....	226	QC21P .....	119	SPL-90 .....	210
A097 .....	225	C26R42 .....	236	QC21PM .....	122	SPLG-120 .....	210
A100 .....	95	C29HX10 .....	233	QC41G .....	141	SPLG-90 .....	210
A101 .....	103	C29L10 .....	231	QC41P .....	141	SPR-120 .....	209
A108 .....	114	C29M40CO .....	239	QC91G .....	155	SPR-90 .....	209
A125 .....	162	C29R10 .....	224	QC91GM .....	157	SPRG-120 .....	209
A160 .....	202	C29R10CO .....	234	QC91P .....	155	SPRG-90 .....	209
A170 .....	192	C29R10P .....	224	QC91PM .....	157	SPS-120 .....	208
A190 .....	228	C29R40 .....	236	R10 .....	87	SPS-90 .....	208
A191 .....	228	C29R40C .....	238	R10A .....	108	SPSG-120 .....	208
A217 .....	213	C29R51 .....	240	R10B .....	111	SPSG-90 .....	208
A218 .....	213	C33R56 .....	241	R10CO .....	123	T400 .....	191
A221 .....	214	C502AB .....	228	R10H .....	114	TS10HS .....	215
A225 .....	213	C60M41CO .....	239	R10P .....	87	TS15HS .....	215
A243 .....	169	C60R18 .....	225	R15 .....	87	TS18HS .....	215
A244 .....	169	C60R18CO .....	234	R15A .....	108	TS40HS .....	215
A287 .....	232	C60R18P .....	225	R15B .....	111	TS41HS .....	215
A345 .....	183	C60R41 .....	236	R15CO .....	123	TS42HS .....	215
A350 .....	180	C60R41C .....	238	R15P .....	87	TS51HS .....	215
A510 .....	73	C8R56 .....	241	R18 .....	87	TS52HS .....	215
A520 .....	66	C8R56CO .....	241	R18A .....	108	TS55HS .....	215
A530 .....	180	C8R57 .....	241	R18B .....	111	TS10CO .....	219
A553 .....	76	CO500-12 .....	175	R18CO .....	123	TS15CO .....	219
A720 .....	143	CO500-6 .....	175	R18H .....	114	TS18CO .....	219
A730 .....	189	CO501-12 .....	175	R18P .....	87	TS40CO .....	219
A900 .....	78	CO501-6 .....	175	R40 .....	130	TS41CO .....	219
A901 .....	78	D33F .....	203	R40C .....	136	TS42CO .....	219
A920 .....	69	D33L .....	203	R41 .....	130	TS51CO .....	219
A921 .....	69	D33M .....	206	R41C .....	136	TS52CO .....	219
A940 .....	81	D33W .....	203	R42 .....	130	TS55CO .....	219
A941 .....	81						

## Hydra Drill Head






### R950

1.3 1.4 1.5 1.6 2.4 3.3 3.4

Replaceable heads in tough micro-grain carbide for quick and easy tool changes. High productivity in a wide range of steels and harder materials. Superior hole accuracy and precise repeatable tolerances. Special Ti-phon coating for longer tool life.



**R950**

15/32 - 42.00

\* For more information on Hydra, see page 539

d <sub>1</sub> Øh <sub>7</sub> Inch	d <sub>1</sub> Øh <sub>7</sub> mm	d <sub>1</sub> decimal Inch	l <sub>1</sub> mm	Pack Qty	R950
15/32	11.91	0.4688	9.1	1	0010860
	12.00	0.4724	9.1	1	0010877
	12.10	0.4764	9.1	1	0037904
31/64	12.20	0.4803	9.1	1	0037911
	12.30	0.4844	9.1	1	0010884
	12.50	0.4921	9.4	1	0010907
1/2	12.60	0.4961	9.4	1	0037928
	12.70	0.5000	9.4	1	0010914
	12.80	0.5039	9.4	1	0037935
33/64	12.90	0.5079	9.4	1	0037942
	13.00	0.5118	9.7	1	0010921
	13.10	0.5156	9.7	1	0010938
17/32	13.20	0.5197	9.7	1	0037959
	13.49	0.5313	9.7	1	0010945
	13.50	0.5315	10.3	1	0010952
35/64	13.60	0.5354	10.3	1	0037966
	13.70	0.5394	10.3	1	0037973
	13.80	0.5433	10.3	1	0037980
9/16	13.89	0.5469	10.3	1	0010969
	14.00	0.5512	10.3	1	0010983
	14.10	0.5551	10.3	1	0037997
37/64	14.20	0.5591	10.3	1	0038000
	14.29	0.5625	10.3	1	0011003
	14.50	0.5709	10.3	1	0011010
19/32	14.60	0.5748	11.0	1	0038017
	14.68	0.5781	11.0	1	0011140
	14.70	0.5787	11.0	1	0038024
39/64	14.80	0.5827	11.0	1	0038031
	15.00	0.5906	11.0	1	0011201
	15.08	0.5938	11.0	1	0011218
41/64	15.10	0.5945	11.0	1	0038048
	15.20	0.5984	11.0	1	0038055
	15.24	0.6000	11.0	1	0032268

# HYDRA DRILL



d <sub>1</sub> Øh <sub>7</sub> Inch	d <sub>1</sub> Øh <sub>7</sub> mm	d <sub>1</sub> decimal Inch	l <sub>1</sub> mm	Pack Qty	R950	
39/64	15.48	0.6094	11.0	1	0011232	
	15.50	0.6102	11.0	1	0011362	
	15.60	0.6142	11.6	1	0038062	
5/8	15.70	0.6181	11.6	1	0038079	
	15.88	0.6250	11.6	1	0011379	
	16.00	0.6299	11.6	1	0011386	
	16.08	0.6331	11.6	1	0032275	
	16.10	0.6339	11.6	1	0038086	
41/64	16.20	0.6378	11.6	1	0038093	
	16.27	0.6406	11.6	1	0011393	
	16.30	0.6417	11.6	1	0032282	
	16.50	0.6496	11.6	1	0011409	
	16.60	0.6535	12.2	1	0038109	
21/32	16.67	0.6563	12.2	1	0012161	
	16.70	0.6575	12.2	1	0038116	
	17.00	0.6693	12.2	1	0012185	
43/64	17.07	0.6719	12.2	1	0012215	
	17.10	0.6732	12.2	1	0038123	
	17.20	0.6772	12.2	1	0038130	
11/16	17.46	0.6875	12.2	1	0012239	
	17.50	0.6890	12.2	1	0012253	
	17.60	0.6929	12.9	1	0032299	
45/64	17.70	0.6969	12.9	1	0038147	
	17.86	0.7031	12.9	1	0012260	
	18.00	0.7087	12.9	1	0012277	
	18.10	0.7126	12.9	1	0038154	
	18.20	0.7165	12.9	1	0038161	
23/32	18.26	0.7188	12.9	1	0012284	
	18.50	0.7283	12.9	1	0012307	
	18.60	0.7323	13.5	1	0038178	
47/64	18.65	0.7344	13.5	1	0012321	
	18.70	0.7362	13.5	1	0038185	
	18.90	0.7441	13.5	1	0038192	
	19.00	0.7480	13.5	1	0012338	
	3/4	19.05	0.7500	13.5	1	0012345
19.10		0.7520	13.5	1	0038208	
19.20		0.7559	13.5	1	0038215	
19.25		0.7579	13.5	1	0032305	
19.30		0.7598	13.5	1	0032312	
19.35		0.7618	13.5	1	0032329	
49/64	19.45	0.7656	13.5	1	0012376	
	19.50	0.7677	13.5	1	0012383	
	19.60	0.7717	14.1	1	0038222	
	19.70	0.7756	14.1	1	0038239	
25/32	19.84	0.7813	14.1	1	0012406	
	20.00	0.7874	14.1	1	0012413	
	51/64	20.24	0.7969	14.1	1	0012437
20.50		0.8071	14.1	1	0012451	
13/16		20.64	0.8125	14.8	1	0012468
	21.00	0.8268	14.8	1	0012475	
	53/64	21.03	0.8281	14.8	1	0012536
27/32		21.43	0.8438	14.8	1	0012550
		21.50	0.8465	14.8	1	0012574
55/64	21.83	0.8594	15.0	1	0012604	
	22.00	0.8661	15.0	1	0012628	
7/8	22.22	0.8750	15.0	1	0012635	
	22.50	0.8858	15.0	1	0032336	
	57/64	22.62	0.8906	15.0	1	0012642
22.70		0.8937	15.0	1	0038246	
23.00		0.9055	15.1	1	0012666	
29/32	23.02	0.9063	15.1	1	0012673	
59/64	23.42	0.9219	15.1	1	0012680	
	23.50	0.9252	15.1	1	0038253	
15/16	23.81	0.9375	15.4	1	0012703	
	24.00	0.9449	15.4	1	0012727	

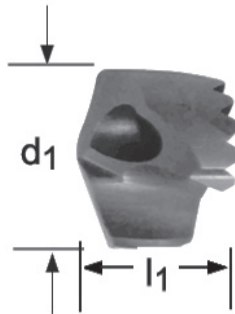
d <sub>1</sub> Øh <sub>7</sub> Inch	d <sub>1</sub> Øh <sub>7</sub> mm	d <sub>1</sub> decimal Inch	l <sub>1</sub> mm	Pack Qty	R950
61/64	24.21	0.9531	15.4	1	0012741
	24.50	0.9646	15.4	1	0038260
31/32	24.61	0.9688	15.4	1	0012772
	25.00	0.9844	15.8	1	0012819
63/64	25.00	0.9844	15.8	1	0012826
1"	25.40	1.0000	15.8	1	0012833
	25.50	1.0039	15.8	1	0038277
	25.65	1.0098	15.8	1	0032343
1.1/64	25.80	1.0156	15.8	1	0012840
	26.00	1.0236	16.4	1	0013090
1.1/32	26.19	1.0313	16.4	1	0013120
	26.50	1.0433	16.4	1	0038284
1.3/64	26.59	1.0469	16.4	1	0013229
1.1/16	26.99	1.0625	17.1	1	0013243
	27.00	1.0630	17.1	1	0013267
1.5/64	27.38	1.0781	17.1	1	0013274
	27.50	1.0827	17.1	1	0038291
1.3/32	27.78	1.0938	17.1	1	0013281
	28.00	1.1024	17.7	1	0013304
1.7/64	28.18	1.1094	17.7	1	0013311
	28.50	1.1220	17.7	1	0038307
1.1/8	28.58	1.1250	17.7	1	0013328
1.9/64	28.97	1.1406	18.3	1	0013342
	29.00	1.1417	18.3	1	0013366
1.5/32	29.37	1.1563	18.3	1	0013380
	29.50	1.1614	18.3	1	0038314
1.11/64	29.77	1.1719	18.3	1	0013427
	30.00	1.1811	19.0	1	0013434
1.3/16	30.16	1.1875	19.0	1	0013441
	30.50	1.2008	19.0	1	0013465
1.7/32	30.96	1.2188	21.0	1	46104481
	31.00	1.2205	21.0	1	46104482
1.1/4	31.75	1.2500	21.0	1	46104483
	32.00	1.2598	21.0	1	46104484
	32.50	1.2795	21.0	1	46104485
1.19/64	32.94	1.2969	21.0	1	46104486
	33.00	1.2992	21.0	1	46104487
	33.50	1.3189	21.0	1	46104488
	34.00	1.3386	23.0	1	46104489
1.11/32	34.13	1.3438	23.0	1	46104530
	34.50	1.3583	23.0	1	46104531
1.3/8	34.93	1.3750	23.0	1	46104532
	35.00	1.3780	23.0	1	46104533
	36.00	1.4173	23.0	1	46104534
1.27/64	36.12	1.4219	23.0	1	46104535
	36.50	1.4370	23.0	1	46104536
	37.00	1.4567	25.0	1	46104537
1.15/32	37.31	1.4688	25.0	1	46104538
	37.50	1.4764	25.0	1	46104539
	38.00	1.4961	25.0	1	46104540
1.1/2	38.10	1.5000	25.0	1	46104541
	38.50	1.5157	25.0	1	46104542
1.17/32	38.89	1.5313	25.0	1	46104543
	39.00	1.5354	25.0	1	46104544
	39.50	1.5551	25.0	1	46104545
1.9/16	39.69	1.5625	27.0	1	46104546
	40.00	1.5748	27.0	1	46104547
	41.00	1.6142	27.0	1	46104548
1.5/8	41.28	1.6250	27.0	1	46104549
	42.00	1.6535	27.0	1	46104550

## Hydra Drill Head

### R960

1.1 1.2 2.1 2.2 2.3 3.1 3.2 4.1 4.2 4.3 5.1 5.2 5.3

Replaceable heads in tough micro-grain carbide for quick and easy tool changes. High productivity across a wide range of stainless steel, cast iron & heat resistant materials. Superior hole accuracy and precise repeatable tolerances. Special Ti-phos coating for longer tool life.



R960



15/32 - 30.50

\* For more information on Hydra, see page 539

$d_1$ Øh <sub>7</sub> Inch	$d_1$ Øh <sub>7</sub> mm	$d_1$ decimal Inch	$l_1$ mm	Pack Qty	R960
15/32	11.91	0.4688	9.1	1	0013472
	12.00	0.4724	9.1	1	0013489
	12.10	0.4764	9.1	1	0038338
31/64	12.20	0.4803	9.1	1	0038376
	12.30	0.4844	9.1	1	0013496
	12.50	0.4921	9.4	1	0013519
1/2	12.60	0.4961	9.4	1	0038413
	12.70	0.5000	9.4	1	0013526
	12.80	0.5039	9.4	1	0038437
	12.90	0.5079	9.4	1	0038451
33/64	13.00	0.5118	9.7	1	0013533
	13.10	0.5156	9.7	1	0013540
	13.20	0.5197	9.7	1	0038468
	13.49	0.5313	9.7	1	0013557
	13.50	0.5315	10.3	1	0016022
35/64	13.60	0.5354	10.3	1	0038499
	13.70	0.5394	10.3	1	0038529
	13.80	0.5433	10.3	1	0038543
	13.89	0.5469	10.3	1	0016039
	14.00	0.5512	10.3	1	0016046
9/16	14.10	0.5551	10.3	1	0038567
	14.20	0.5591	10.3	1	0038574
	14.29	0.5625	10.3	1	0016053
	14.50	0.5709	10.3	1	0016060
37/64	14.60	0.5748	11.0	1	0038581
	14.68	0.5781	11.0	1	0016077
	14.70	0.5787	11.0	1	0039601
	14.80	0.5827	11.0	1	0039618
	15.00	0.5906	11.0	1	0016084
19/32	15.08	0.5938	11.0	1	0016091
	15.10	0.5945	11.0	1	0039625
	15.20	0.5984	11.0	1	0039632
	15.24	0.6000	11.0	1	0032350



d <sub>1</sub> Øh <sub>7</sub> Inch	d <sub>1</sub> Øh <sub>7</sub> mm	d <sub>1</sub> decimal Inch	l <sub>1</sub> mm	Pack Qty	R960
39/64	15.48	0.6094	11.0	1	0016107
	15.50	0.6102	11.0	1	0016114
	15.60	0.6142	11.6	1	0039649
5/8	15.70	0.6181	11.6	1	0039656
	15.88	0.6250	11.6	1	0016121
	16.00	0.6299	11.6	1	0016138
	16.08	0.6331	11.6	1	0032367
	16.10	0.6339	11.6	1	0039663
41/64	16.20	0.6378	11.6	1	0039670
	16.27	0.6406	11.6	1	0016145
	16.30	0.6417	11.6	1	0032374
	16.50	0.6496	11.6	1	0016152
21/32	16.60	0.6535	12.2	1	0039687
	16.67	0.6563	12.2	1	0016169
	16.70	0.6575	12.2	1	0039694
43/64	17.00	0.6693	12.2	1	0016176
	17.07	0.6719	12.2	1	0016183
	17.10	0.6732	12.2	1	0039700
11/16	17.20	0.6772	12.2	1	0039717
	17.46	0.6875	12.2	1	0016190
	17.50	0.6890	12.2	1	0016503
45/64	17.60	0.6929	12.9	1	0032381
	17.70	0.6969	12.9	1	0039724
	17.86	0.7031	12.9	1	0016640
	18.00	0.7087	12.9	1	0016664
23/32	18.10	0.7126	12.9	1	0039731
	18.20	0.7165	12.9	1	0039748
	18.26	0.7188	12.9	1	0016671
47/64	18.50	0.7283	12.9	1	0016688
	18.60	0.7323	13.5	1	0039755
	18.65	0.7344	13.5	1	0016695
	18.70	0.7362	13.5	1	0039762
	18.90	0.7441	13.5	1	0039779
3/4	19.00	0.7480	13.5	1	0016817
	19.05	0.7500	13.5	1	0016879
	19.10	0.7520	13.5	1	0039786
	19.20	0.7559	13.5	1	0039793
	19.25	0.7579	13.5	1	0032398
49/64	19.30	0.7598	13.5	1	0032404
	19.35	0.7618	13.5	1	0032411
	19.45	0.7656	13.5	1	0016886
	19.50	0.7677	13.5	1	0016947
25/32	19.60	0.7717	14.1	1	0039809
	19.70	0.7756	14.1	1	0039816
	19.84	0.7813	14.1	1	0016954
51/64	20.00	0.7874	14.1	1	0017111
	20.24	0.7969	14.1	1	0017128
13/16	20.50	0.8071	14.1	1	0017159
	20.64	0.8125	14.8	1	0017197
53/64	21.00	0.8268	14.8	1	0017166
	21.03	0.8281	14.8	1	0017203
27/32	21.43	0.8438	14.8	1	0017227
	21.50	0.8465	14.8	1	0017234
55/64	21.83	0.8594	15.0	1	0017241
	22.00	0.8661	15.0	1	0017258
7/8	22.22	0.8750	15.0	1	0017371
	22.50	0.8858	15.0	1	0032428
57/64	22.62	0.8906	15.0	1	0017401
	22.70	0.8937	15.0	1	0039823
29/32	23.00	0.9055	15.1	1	0017425
	23.02	0.9063	15.1	1	0017432
59/64	23.42	0.9219	15.1	1	0017456
	23.50	0.9252	15.1	1	0039830
15/16	23.81	0.9375	15.4	1	0017562
	24.00	0.9449	15.4	1	0017579
61/64	24.21	0.9531	15.4	1	0017586

# HYDRA DRILL



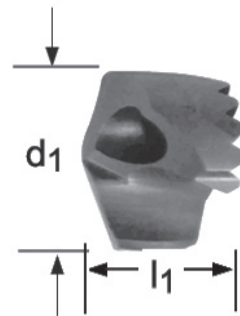
$d_1$ $\varnothing h_7$ Inch	$d_1$ $\varnothing h_7$ mm	$d_1$ decimal Inch	$l_1$ mm	Pack Qty	R960
	24.50	0.9646	15.4	1	0039847
31/32	24.61	0.9688	15.4	1	0017593
	25.00	0.9844	15.8	1	0017722
63/64	25.00	0.9844	15.8	1	0017746
1"	25.40	1.0000	15.8	1	0017753
	25.50	1.0039	15.8	1	0039854
	25.65	1.0098	15.8	1	0032435
1.1/64	25.80	1.0156	15.8	1	0018958
	26.00	1.0236	16.4	1	0018965
1.1/32	26.19	1.0312	16.4	1	0018972
	26.50	1.0433	16.4	1	0039878
1.3/64	26.59	1.0469	16.4	1	0018989
1.1/16	26.99	1.0625	17.1	1	0018996
	27.00	1.0630	17.1	1	0019009
1.5/64	27.38	1.0781	17.1	1	0019016
	27.50	1.0827	17.1	1	0039885
1.3/32	27.78	1.0938	17.1	1	0019023
	28.00	1.1024	17.7	1	0019030
1.7/64	28.18	1.1094	17.7	1	0019047
	28.50	1.1220	17.7	1	0039892
1.1/8	28.58	1.1250	17.7	1	0019054
1.9/64	28.97	1.1406	18.3	1	0019061
	29.00	1.1417	18.3	1	0019078
1.5/32	29.37	1.1563	18.3	1	0019085
	29.50	1.1614	18.3	1	0039908
1.11/64	29.77	1.1719	18.3	1	0019092
	30.00	1.1811	19.0	1	0019108
1.3/16	30.16	1.1875	19.0	1	0019115
	30.50	1.2008	19.0	1	0019122

## Hydra Drill Head

### R970

**1.2** 3.1 3.2 3.3 3.4

Replaceable heads in tough micro-grain carbide for quick and easy tool changes. Engineered for high productivity of cast iron materials. Superior hole accuracy and precise repeatable tolerances. Special Ti-phos coating for longer tool life.



**R970**

15/32 - 30.50

\* For more information on Hydra, see page 539

$d_1$ Øh <sub>7</sub> Inch	$d_1$ Øh <sub>7</sub> mm	$d_1$ decimal Inch	$l_1$ mm	Pack Qty	R970
15/32		0.4689	9.1	1	7332946
	12.0	0.4724	9.1	1	7332947
	12.1	0.4764	9.1	1	7332948
	12.2	0.4803	9.1	1	7332949
31/64		0.4844	9.1	1	7332980
	12.5	0.4921	9.4	1	7332981
	12.6	0.4961	9.4	1	7332982
1/2		0.5000	9.4	1	7332983
	12.8	0.5039	9.4	1	7332984
	12.9	0.5079	9.4	1	7332985
	13.0	0.5118	9.7	1	7332986
33/64		0.5156	9.7	1	7332987
	13.2	0.5197	9.7	1	7332988
17/32		0.5313	9.7	1	7332989
	13.5	0.5315	10.3	1	7332990
	13.6	0.5354	10.3	1	7332991
	13.7	0.5394	10.3	1	7332992
	13.8	0.5433	10.3	1	7332993
35/64		0.5469	10.3	1	7332994
	14.0	0.5512	10.3	1	7332995
	14.1	0.5551	10.3	1	7332996
	14.2	0.5591	10.3	1	7332997
9/16		0.5625	10.3	1	7332998
	14.5	0.5709	10.3	1	7332999
	14.6	0.5748	11.0	1	7333000
37/64		0.5781	11.0	1	7333001
	14.7	0.5787	11.0	1	7333002
	14.8	0.5827	11.0	1	7333003
	15.0	0.5906	11.0	1	7333004
19/32		0.5938	11.0	1	7333005
	15.1	0.5945	11.0	1	7333006
	15.2	0.5984	11.0	1	7333007

# HYDRA DRILL



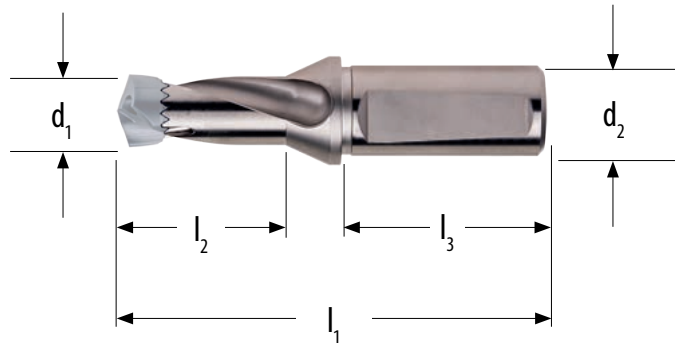
$d_1$ Øh <sub>7</sub> Inch	$d_1$ Øh <sub>7</sub> mm	$d_1$ decimal Inch	$l_1$ mm	Pack Qty	R970
	15.24	0.6000	11.0	1	7333008
39/64		0.6094	11.0	1	7333009
	15.5	0.6102	11.6	1	7333010
	15.6	0.6142	11.6	1	7333011
	15.7	0.6181	11.6	1	7333012
5/8		0.6250	11.6	1	7333013
	16.0	0.6299	11.6	1	7333014
	16.08	0.6331	11.6	1	7333015
	16.1	0.6339	11.6	1	7333016
	16.2	0.6378	11.6	1	7333017
41/64		0.6406	11.6	1	7333018
	16.3	0.6417	11.6	1	7333019
	16.5	0.6496	11.6	1	7333020
	16.6	0.6535	12.2	1	7333021
21/32		0.6563	12.2	1	7333022
	16.7	0.6575	12.2	1	7333023
	17.0	0.6693	12.2	1	7333024
43/64		0.6719	12.2	1	7333025
	17.1	0.6732	12.2	1	7333026
	17.2	0.6772	12.2	1	7333027
11/16		0.6875	12.2	1	7333028
	17.5	0.6890	12.2	1	7333029
	17.6	0.6929	12.9	1	7333030
	17.7	0.6969	12.9	1	7333031
45/64		0.7031	12.9	1	7333032
	18.0	0.7087	12.9	1	7333033
	18.1	0.7126	12.9	1	7333034
	18.2	0.7165	12.9	1	7333035
23/32		0.7188	12.9	1	7333036
	18.5	0.7283	12.9	1	7333037
	18.6	0.7323	13.5	1	7333038
47/64		0.7344	13.5	1	7333039
	18.7	0.7362	13.5	1	7333040
	18.9	0.7441	13.5	1	7333041
	19.0	0.7480	13.5	1	7333042
3/4		0.7500	13.5	1	7333043
	19.1	0.7520	13.5	1	7333044
	19.2	0.7559	13.5	1	7333045
	19.25	0.7579	13.5	1	7333046
	19.3	0.7598	13.5	1	7333047
	19.35	0.7618	13.5	1	7333048
49/64		0.7656	13.5	1	7333049
	19.5	0.7677	13.5	1	7333050
	19.6	0.7717	14.1	1	7333051
	19.7	0.7756	14.1	1	7333052
25/32		0.7813	14.1	1	7333053
	20.0	0.7874	14.1	1	7333054
51/64		0.7969	14.1	1	7333055
	20.5	0.8071	14.1	1	7333056
13/16		0.8125	14.8	1	7333057
	21.0	0.8268	14.8	1	7333058
53/64		0.8281	14.8	1	7333059
27/32		0.8438	14.8	1	7333060
	21.5	0.8465	14.8	1	7333061
55/64		0.8594	15.0	1	7333062
	22.0	0.8661	15.0	1	7333063
7/8		0.8750	15.0	1	7333064
	22.5	0.8858	15.0	1	7333065
57/64		0.8906	15.0	1	7333066
	22.7	0.8937	15.0	1	7333067
	23.0	0.9055	15.1	1	7333068
29/32		0.9063	15.1	1	7333069
59/64		0.9219	15.1	1	7333070
	23.5	0.9252	15.1	1	7333071
15/16		0.9375	15.4	1	7333072
	24.0	0.9449	15.4	1	7333073

$d_1$ Ø <sub>h7</sub> Inch	$d_1$ Ø <sub>h7</sub> mm	$d_1$ decimal Inch	$l_1$ mm	Pack Qty	R970
61/64		0.9531	15.4	1	7333074
	24.5	0.9646	15.4	1	7333075
31/32		0.9688	15.4	1	7333076
	25.0	0.9843	15.8	1	7333077
63/64		0.9844	15.8	1	7333078
1		1.0000	15.8	1	7333079
	25.5	1.0039	15.8	1	7333080
	25.65	1.0098	15.8	1	7333081
1.1/64		1.0156	15.8	1	7333082
	26.0	1.0236	16.4	1	7333083
1.1/32		1.0313	16.4	1	7333084
	26.5	1.0433	16.4	1	7333085
1.3/64		1.0469	16.4	1	7333086
1.1/16		1.0625	17.1	1	7333087
	27.0	1.0630	17.1	1	7333088
1.5/64		1.0781	17.1	1	7333089
	27.5	1.0827	17.1	1	7333090
1.3/32		1.0938	17.1	1	7333091
	28.0	1.1024	17.7	1	7333092
1.7/64		1.1094	17.7	1	7333093
	28.5	1.1220	17.7	1	7333094
1.1/8		1.1250	17.7	1	7333095
1.9/64		1.1406	18.3	1	7333096
	29.0	1.1417	18.3	1	7333097
1.5/32		1.1563	18.3	1	7333098
	29.5	1.1614	18.3	1	7333099
1.11/64		1.1719	18.3	1	7333100
	30.0	1.1811	19.0	1	7333101
1.3/16		1.1875	19.0	1	7333102
	30.5	1.2008	19.0	1	7333103
1.7/32		1.2188	21.0	1	7333104
	31.0	1.2205	21.0	1	7333105
1.1/4		1.2500	21.0	1	7333106
	32.0	1.2598	21.0	1	7333107
	32.5	1.2795	21.0	1	7333108
1.19/64		1.2968	21.0	1	7333109
	33.0	1.2992	21.0	1	7333110
	33.5	1.3189	21.0	1	7333111
	34.0	1.3386	23.0	1	7333112
1.11/32		1.3438	23.0	1	7333113
	34.5	1.3583	23.0	1	7333114
1.3/8		1.3750	23.0	1	7333115
	35.0	1.3780	23.0	1	7333116
	36.0	1.4173	23.0	1	7333117
1.27/64		1.4219	23.0	1	7333118
	36.5	1.4370	23.0	1	7333119
	37.0	1.4567	25.0	1	7333120
1.15/32		1.4688	25.0	1	7333121
	37.5	1.4764	25.0	1	7333122
	38.0	1.4961	25.0	1	7333123
1.1/2		1.5000	25.0	1	7333124
	38.5	1.5157	25.0	1	7333125
1.17/32		1.5313	25.0	1	7333126
	39.0	1.5354	25.0	1	7333127
	39.5	1.5551	25.0	1	7333128
1.9/16		1.5625	27.0	1	7333129
	40.0	1.5748	27.0	1	7333130
	41.0	1.6142	27.0	1	7333131
1.5/8		1.6250	27.0	1	7333132
	42.0	1.6535	27.0	1	7333133

## 1.5xD Hydra Bodies

### H851

Cylindrical shank with flat for multi-purpose tool holding. Allows accurate clamping for reliable use of internal coolant.



Four (4) screws and one (1) screwdriver are included with a drill body  
Apply starting values for speed and feed with a correction factor of 1.10

- \* Fractional bodies have straight shank
- \* Metric bodies have whistle notch on shank
- \* For more information on Hydra, see page 539

**H851  
Coolant  
Through**



31/64 – 30.5

Hydra Head d <sub>1</sub> Ø	Hydra Head R950 EDP#	Hydra Head R960 EDP#	Hydra Head R970 EDP#	1.5xD Hydra Body - Fractional Shank					1.5xD Hydra Body - Metric Shank				
				d <sub>2</sub> Øh <sub>6</sub> inch	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H851 EDP#	d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H851 EDP#
15/32	0010860	0013472	7332946	5/8	25.5	88.5	47.63	7833294	16.00	25.5	88.5	48.0	7833297
12.0	0010877	0013489	7332947	5/8	25.5	88.5	47.63	7833294	16.00	25.5	88.5	48.0	7833297
12.1	0037904	0038338	7332948	5/8	25.5	88.5	47.63	7833294	16.00	25.5	88.5	48.0	7833297
12.2	0037911	0038376	7332949	5/8	25.5	88.5	47.63	7833294	16.00	25.5	88.5	48.0	7833297
31/64	0010884	0013496	7332980	5/8	25.5	88.5	47.63	7833294	16.00	25.5	88.5	48.0	7833297
12.5	0010907	0013519	7332981	5/8	25.8	88.8	47.63	7833295	16.00	25.8	88.8	48.0	7833298
12.6	0037928	0038413	7332982	5/8	25.8	88.8	47.63	7833295	16.00	25.8	88.8	48.0	7833298
1/2	0010914	0013526	7332983	5/8	25.8	88.8	47.63	7833295	16.00	25.8	88.8	48.0	7833298
12.8	0037935	0038437	7332984	5/8	25.8	88.8	47.63	7833295	16.00	25.8	88.8	48.0	7833298
12.9	0037942	0038451	7332985	5/8	25.8	88.8	47.63	7833295	16.00	25.8	88.8	48.0	7833298
13.0	0010921	0013533	7332986	5/8	30.9	93.9	47.63	7833296	16.00	27.0	90.0	48.0	7833299
33/64	0010938	0013540	7332987	5/8	30.9	93.9	47.63	7833296	16.00	27.0	90.0	48.0	7833299
13.2	0037959	0038468	7332988	5/8	30.9	93.9	47.63	7833296	16.00	27.0	90.0	48.0	7833299
17/32	0010945	0013557	7332989	5/8	30.9	93.9	47.63	7833296	16.00	27.0	90.0	48.0	7833299
13.5	0010952	0016022	7332990	3/4	30.3	93.9	50.8	7833331	16.00	30.9	93.9	48.0	7833330
13.6	0037966	0038499	7332991	3/4	30.3	93.9	50.8	7833331	16.00	30.9	93.9	48.0	7833330
13.7	0037973	0038529	7332992	3/4	30.3	93.9	50.8	7833331	16.00	30.9	93.9	48.0	7833330
13.8	0037980	0038543	7332993	3/4	30.3	93.9	50.8	7833331	16.00	30.9	93.9	48.0	7833330
35/64	0010969	0016039	7332994	3/4	30.3	93.9	50.8	7833331	16.00	30.9	93.9	48.0	7833330
14.0	0010983	0016046	7332995	3/4	30.3	93.9	50.8	7833331	16.00	30.9	93.9	48.0	7833330
14.1	0037997	0038567	7332996	3/4	30.3	93.9	50.8	7833331	16.00	30.9	93.9	48.0	7833330
14.2	0038000	0038574	7332997	3/4	30.3	93.9	50.8	7833331	16.00	30.9	93.9	48.0	7833330
9/16	0011003	0016053	7332998	3/4	30.3	93.9	50.8	7833331	16.00	30.9	93.9	48.0	7833330
14.5	0011010	0016060	7332999	3/4	30.3	93.9	50.8	7833331	16.00	30.9	93.9	48.0	7833330
14.6	0038017	0038581	7333000	3/4	32.3	97.3	50.8	7833332	20.00	32.3	97.3	50.0	7833336
37/64	0011140	0016077	7333001	3/4	32.3	97.3	50.8	7833332	20.00	32.3	97.3	50.0	7833336
14.7	0038024	0039601	7333002	3/4	32.3	97.3	50.8	7833332	20.00	32.3	97.3	50.0	7833336
14.8	0038031	0039618	7333003	3/4	32.3	97.3	50.8	7833332	20.00	32.3	97.3	50.0	7833336
15.0	0011201	0016084	7333004	3/4	32.3	97.3	50.8	7833332	20.00	32.3	97.3	50.0	7833336
19/32	0011218	0016091	7333005	3/4	32.3	97.3	50.8	7833332	20.00	32.3	97.3	50.0	7833336
15.1	0038048	0039625	7333006	3/4	32.3	97.3	50.8	7833332	20.00	32.3	97.3	50.0	7833336

Hydra Head d <sub>1</sub> Ø	Hydra Head R950 EDP#	Hydra Head R960 EDP#	Hydra Head R970 EDP#	1.5xD Hydra Body - Fractional Shank					1.5xD Hydra Body - Metric Shank				
				d <sub>2</sub> Øh <sub>6</sub> inch	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H851 EDP#	d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H851 EDP#
15.2	0038055	0039632	7333007	3/4	32.3	97.3	50.8	7833332	20.00	32.3	97.3	50.0	7833336
15.24	0032268	0032350	7333008	3/4	32.3	97.3	50.8	7833332	20.00	32.3	97.3	50.0	7833336
39/64	0011232	0016107	7333009	3/4	32.3	97.3	50.8	7833332	20.00	32.3	97.3	50.0	7833336
15.5	0011362	0016114	7333010	3/4	32.3	97.3	50.8	7833332	20.00	32.3	97.3	50.0	7833336
15.6	0038062	0039649	7333011	3/4	34.9	99.9	50.8	7833333	20.00	34.9	99.9	50.0	7833337
15.7	0038079	0039656	7333012	3/4	34.9	99.9	50.8	7833333	20.00	34.9	99.9	50.0	7833337
5/8	0011379	0016121	7333013	3/4	34.9	99.9	50.8	7833333	20.00	34.9	99.9	50.0	7833337
16.0	0011386	0016138	7333014	3/4	34.9	99.9	50.8	7833333	20.00	34.9	99.9	50.0	7833337
16.08	0032275	0032367	7333015	3/4	34.9	99.9	50.8	7833333	20.00	34.9	99.9	50.0	7833337
16.1	0038086	0039663	7333016	3/4	34.9	99.9	50.8	7833333	20.00	34.9	99.9	50.0	7833337
16.2	0038093	0039670	7333017	3/4	34.9	99.9	50.8	7833333	20.00	34.9	99.9	50.0	7833337
41/64	0011393	0016145	7333018	3/4	34.9	99.9	50.8	7833333	20.00	34.9	99.9	50.0	7833337
16.3	0032282	0032374	7333019	3/4	34.9	99.9	50.8	7833333	20.00	34.9	99.9	50.0	7833337
16.5	0011409	0016152	7333020	3/4	34.9	99.9	50.8	7833333	20.00	34.9	99.9	50.0	7833337
16.6	0038109	0039687	7333021	3/4	36.4	101.4	50.8	7833334	20.00	36.4	101.4	50.0	7833338
21/32	0012161	0016169	7333022	3/4	36.4	101.4	50.8	7833334	20.00	36.4	101.4	50.0	7833338
16.7	0038116	0039694	7333023	3/4	36.4	101.4	50.8	7833334	20.00	36.4	101.4	50.0	7833338
17.0	0012185	0016176	7333024	3/4	36.4	101.4	50.8	7833334	20.00	36.4	101.4	50.0	7833338
43/64	0012215	0016183	7333025	3/4	36.4	101.4	50.8	7833334	20.00	36.4	101.4	50.0	7833338
17.1	0038123	0039700	7333026	3/4	36.4	101.4	50.8	7833334	20.00	36.4	101.4	50.0	7833338
17.2	0038130	0039717	7333027	3/4	36.4	101.4	50.8	7833334	20.00	36.4	101.4	50.0	7833338
11/16	0012239	0016190	7333028	3/4	36.4	101.4	50.8	7833334	20.00	36.4	101.4	50.0	7833338
17.5	0012253	0016503	7333029	3/4	36.4	101.4	50.8	7833334	20.00	36.4	101.4	50.0	7833338
17.6	0032299	0032381	7333030	3/4	39.0	104.0	50.8	7833335	20.00	39.0	104.0	50.0	7833339
17.7	0038147	0039724	7333031	3/4	39.0	104.0	50.8	7833335	20.00	39.0	104.0	50.0	7833339
45/64	0012260	0016640	7333032	3/4	39.0	104.0	50.8	7833335	20.00	39.0	104.0	50.0	7833339
18.0	0012277	0016664	7333033	3/4	39.0	104.0	50.8	7833335	20.00	39.0	104.0	50.0	7833339
18.1	0038154	0039731	7333034	3/4	39.0	104.0	50.8	7833335	20.00	39.0	104.0	50.0	7833339
18.2	0038161	0039748	7333035	3/4	39.0	104.0	50.8	7833335	20.00	39.0	104.0	50.0	7833339
23/32	0012284	0016671	7333036	3/4	39.0	104.0	50.8	7833335	20.00	39.0	104.0	50.0	7833339
18.5	0012307	0016688	7333037	3/4	39.0	104.0	50.8	7833335	20.00	39.0	104.0	50.0	7833339
18.6	0038178	0039755	7333038	1"	40.4	111.4	57.15	7833345	25.00	40.4	111.4	56.0	7833340
47/64	0012321	0016695	7333039	1"	40.4	111.4	57.15	7833345	25.00	40.4	111.4	56.0	7833340
18.7	0038185	0039762	7333040	1"	40.4	111.4	57.15	7833345	25.00	40.4	111.4	56.0	7833340
18.9	0038192	0039779	7333041	1"	40.4	111.4	57.15	7833345	25.00	40.4	111.4	56.0	7833340
19.0	0012338	0016817	7333042	1"	40.4	111.4	57.15	7833345	25.00	40.4	111.4	56.0	7833340
3/4	0012345	0016879	7333043	1"	40.4	111.4	57.15	7833345	25.00	40.4	111.4	56.0	7833340
19.1	0038208	0039786	7333044	1"	40.4	111.4	57.15	7833345	25.00	40.4	111.4	56.0	7833340
19.2	0038215	0039793	7333045	1"	40.4	111.4	57.15	7833345	25.00	40.4	111.4	56.0	7833340
19.25	0032305	0032398	7333046	1"	40.4	111.4	57.15	7833345	25.00	40.4	111.4	56.0	7833340
19.3	0032312	0032404	7333047	1"	40.4	111.4	57.15	7833345	25.00	40.4	111.4	56.0	7833340
19.35	0032329	0032411	7333048	1"	40.4	111.4	57.15	7833345	25.00	40.4	111.4	56.0	7833340
49/64	0012376	0016886	7333049	1"	40.4	111.4	57.15	7833345	25.00	40.4	111.4	56.0	7833340
19.5	0012383	0016947	7333050	1"	40.4	111.4	57.15	7833345	25.00	40.4	111.4	56.0	7833340
19.6	0038222	0039809	7333051	1"	43.0	114.0	57.15	7833346	25.00	43.0	114.0	56.0	7833341
19.7	0038239	0039816	7333052	1"	43.0	114.0	57.15	7833346	25.00	43.0	114.0	56.0	7833341
25/32	0012406	0016954	7333053	1"	43.0	114.0	57.15	7833346	25.00	43.0	114.0	56.0	7833341
20.0	0012413	0017111	7333054	1"	43.0	114.0	57.15	7833346	25.00	43.0	114.0	56.0	7833341
51/64	0012437	0017128	7333055	1"	43.0	114.0	57.15	7833346	25.00	43.0	114.0	56.0	7833341
20.5	0012451	0017159	7333056	1"	43.0	114.0	57.15	7833346	25.00	43.0	114.0	56.0	7833341
13/16	0012468	0017197	7333057	1"	44.5	115.5	57.15	7833347	25.00	44.5	115.5	56.0	7833342
21.0	0012475	0017166	7333058	1"	44.5	115.5	57.15	7833347	25.00	44.5	115.5	56.0	7833342
53/64	0012536	0017203	7333059	1"	44.5	115.5	57.15	7833347	25.00	44.5	115.5	56.0	7833342
27/32	0012550	0017227	7333060	1"	44.5	115.5	57.15	7833347	25.00	44.5	115.5	56.0	7833342
21.5	0012574	0017234	7333061	1"	44.5	115.5	57.15	7833347	25.00	44.5	115.5	56.0	7833342
55/64	0012604	0017241	7333062	1"	46.1	117.1	57.15	7833348	25.00	46.1	117.1	56.0	7833343
22.0	0012628	0017258	7333063	1"	46.1	117.1	57.15	7833348	25.00	46.1	117.1	56.0	7833343
7/8	0012635	0017371	7333064	1"	46.1	117.1	57.15	7833348	25.00	46.1	117.1	56.0	7833343
22.5	0032336	0032428	7333065	1"	46.1	117.1	57.15	7833348	25.00	46.1	117.1	56.0	7833343
57/64	0012642	0017401	7333066	1"	46.1	117.1	57.15	7833348	25.00	46.1	117.1	56.0	7833343
22.7	0038246	0039823	7333067	1"	46.1	117.1	57.15	7833348	25.00	46.1	117.1	56.0	7833343
23.0	0012666	0017425	7333068	1"	47.0	118.0	57.15	7833349	25.00	47.0	118.0	56.0	7833344
29/32	0012673	0017432	7333069	1"	47.0	118.0	57.15	7833349	25.00	47.0	118.0	56.0	7833344
59/64	0012680	0017456	7333070	1"	47.0	118.0	57.15	7833349	25.00	47.0	118.0	56.0	7833344
23.5	0038253	0039830	7333071	1"	47.0	118.0	57.15	7833349	25.00	47.0	118.0	56.0	7833344

# HYDRA DRILL



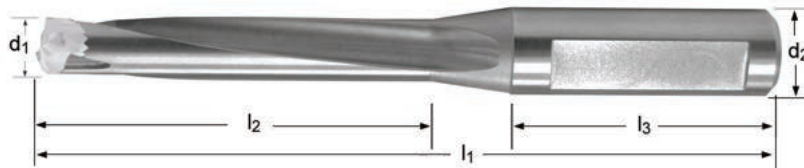
Hydra Head d <sub>1</sub> Ø	Hydra Head R950	Hydra Head R960	Hydra Head R970	1.5xD Hydra Body - Fractional Shank					1.5xD Hydra Body - Metric Shank				
	EDP#	EDP#	EDP#	d <sub>2</sub> Øh <sub>6</sub> inch	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H851 EDP#	d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H851 EDP#
15/16	0012703	0017562	7333072	1"	49.3	124.3	57.15	7833350	32.00	49.3	124.3	60.0	7833357
24.0	0012727	0017579	7333073	1"	49.3	124.3	57.15	7833350	32.00	49.3	124.3	60.0	7833357
61/64	0012741	0017586	7333074	1"	49.3	124.3	57.15	7833350	32.00	49.3	124.3	60.0	7833357
24.5	0038260	0039847	7333075	1"	49.3	124.3	57.15	7833350	32.00	49.3	124.3	60.0	7833357
31/32	0012772	0017593	7333076	1"	49.3	124.3	57.15	7833350	32.00	49.3	124.3	60.0	7833357
25.0	0012819	0017722	7333077	1.1/4	49.7	124.7	60.33	7833351	32.00	49.7	124.7	60.0	7833358
63/64	0012826	0017746	7333078	1.1/4	49.7	124.7	60.33	7833351	32.00	49.7	124.7	60.0	7833358
1	0012833	0017753	7333079	1.1/4	49.7	124.7	60.33	7833351	32.00	49.7	124.7	60.0	7833358
25.5	0038277	0039854	7333080	1.1/4	49.7	124.7	60.33	7833351	32.00	49.7	124.7	60.0	7833358
25.65	0032343	0032435	7333081	1.1/4	49.7	124.7	60.33	7833351	32.00	49.7	124.7	60.0	7833358
1.1/64	0012840	0018958	7333082	1.1/4	49.7	124.7	60.33	7833351	32.00	49.7	124.7	60.0	7833358
26.0	0013090	0018965	7333083	1.1/4	52.3	127.3	60.33	7833352	32.00	52.3	127.3	60.0	7833359
1.1/32	0013120	0018972	7333084	1.1/4	52.3	127.3	60.33	7833352	32.00	52.3	127.3	60.0	7833359
26.5	0038284	0039878	7333085	1.1/4	52.3	127.3	60.33	7833352	32.00	52.3	127.3	60.0	7833359
1.3/64	0013229	0018989	7333086	1.1/4	52.3	127.3	60.33	7833352	32.00	52.3	127.3	60.0	7833359
1.1/16	0013243	0018996	7333087	1.1/4	52.8	127.8	60.33	7833353	32.00	52.8	127.8	60.0	7833360
27.0	0013267	0019009	7333088	1.1/4	52.8	127.8	60.33	7833353	32.00	52.8	127.8	60.0	7833360
1.5/64	0013274	0019016	7333089	1.1/4	52.8	127.8	60.33	7833353	32.00	52.8	127.8	60.0	7833360
27.5	0038291	0039885	7333090	1.1/4	52.8	127.8	60.33	7833353	32.00	52.8	127.8	60.0	7833360
1.3/32	0013281	0019023	7333091	1.1/4	52.8	127.8	60.33	7833353	32.00	52.8	127.8	60.0	7833360
28.0	0013304	0019030	7333092	1.1/4	54.4	129.4	60.33	7833354	32.00	54.4	129.4	60.0	7833361
1.7/64	0013311	0019047	7333093	1.1/4	54.4	129.4	60.33	7833354	32.00	54.4	129.4	60.0	7833361
28.5	0038307	0039892	7333094	1.1/4	54.4	129.4	60.33	7833354	32.00	54.4	129.4	60.0	7833361
1.1/8	0013328	0019054	7333095	1.1/4	54.4	129.4	60.33	7833354	32.00	54.4	129.4	60.0	7833361
1.9/64	0013342	0019061	7333096	1.1/4	55.8	130.8	60.33	7833355	32.00	55.8	130.8	60.0	7833362
29.0	0013366	0019078	7333097	1.1/4	55.8	130.8	60.33	7833355	32.00	55.8	130.8	60.0	7833362
1.5/32	0013380	0019085	7333098	1.1/4	55.8	130.8	60.33	7833355	32.00	55.8	130.8	60.0	7833362
29.5	0038314	0039908	7333099	1.1/4	55.8	130.8	60.33	7833355	32.00	55.8	130.8	60.0	7833362
1.11/64	0013427	0019092	7333100	1.1/4	55.8	130.8	60.33	7833355	32.00	55.8	130.8	60.0	7833362
30.0	0013434	0019108	7333101	1.1/4	58.4	133.4	60.33	7833356	32.00	58.4	133.4	60.0	7833363
1.3/16	0013441	0019115	7333102	1.1/4	58.4	133.4	60.33	7833356	32.00	58.4	133.4	60.0	7833363
30.5	0013465	0019122	7333103	1.1/4	58.4	133.4	60.33	7833356	32.00	58.4	133.4	60.0	7833363



## 3xD Hydra Bodies

### H853

Cylindrical shank with flat for multi-purpose tool holding. Allows accurate clamping for reliable use of internal coolant.



Four (4) screws and one (1) screwdriver are included with a drill body

- \* Fractional bodies have straight flat on shank
- \* Metric bodies have whistle notch on shank
- \* For more information on Hydra, see page 539

**H853**  
Coolant Through

DIN  
6535HB  
DIN  
6535HE

3XD

HSS

140°

15/32 - 42.00

Hydra Head d <sub>1</sub> Ø	Hydra Head R950 EDP#	Hydra Head R960 EDP#	Hydra Head R970 EDP#	3xD Hydra Body - Fractional Shank					3xD Hydra Body - Metric Shank				
				d <sub>2</sub> Øh <sub>6</sub> inch	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H853 EDP#	d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H853 EDP#
15/32	0010860	0013472	7332946	5/8	44.0	105.0	48.0	0033043	16.0	44.0	105.0	48.0	0017777
12.0	0010877	0013489	7332947	5/8	44.0	105.0	48.0	0033043	16.0	44.0	105.0	48.0	0017777
12.1	0037904	0038338	7332948	5/8	44.0	105.0	48.0	0033043	16.0	44.0	105.0	48.0	0017777
12.2	0037911	0038376	7332949	5/8	44.0	105.0	48.0	0033043	16.0	44.0	105.0	48.0	0017777
31/64	0010884	0013496	7332980	5/8	44.0	105.0	48.0	0033043	16.0	44.0	105.0	48.0	0017777
12.5	0010907	0013519	7332981	5/8	44.0	105.0	48.0	0033050	16.0	44.0	105.0	48.0	0017791
12.6	0037928	0038413	7332982	5/8	44.0	105.0	48.0	0033050	16.0	44.0	105.0	48.0	0017791
1/2	0010914	0013526	7332983	5/8	44.0	105.0	48.0	0033050	16.0	44.0	105.0	48.0	0017791
12.8	0037935	0038437	7332984	5/8	44.0	105.0	48.0	0033050	16.0	44.0	105.0	48.0	0017791
12.9	0037942	0038451	7332985	5/8	44.0	105.0	48.0	0033050	16.0	44.0	105.0	48.0	0017791
13.0	0010921	0013533	7332986	5/8	47.0	110.0	48.0	0033067	16.0	47.0	110.0	48.0	0017906
33/64	0010938	0013540	7332987	5/8	47.0	110.0	48.0	0033067	16.0	47.0	110.0	48.0	0017906
13.2	0037959	0038468	7332988	5/8	47.0	110.0	48.0	0033067	16.0	47.0	110.0	48.0	0017906
17/32	0010945	0013557	7332989	5/8	47.0	110.0	48.0	0033067	16.0	47.0	110.0	48.0	0017906
13.5	0010952	0016022	7332990	3/4	52.5	116.5	48.0	0033074	16.0	52.5	116.5	48.0	0017913
13.6	0037966	0038499	7332991	3/4	52.5	116.5	48.0	0033074	16.0	52.5	116.5	48.0	0017913
13.7	0037973	0038529	7332992	3/4	52.5	116.5	48.0	0033074	16.0	52.5	116.5	48.0	0017913
13.8	0037980	0038543	7332993	3/4	52.5	116.5	48.0	0033074	16.0	52.5	116.5	48.0	0017913
35/64	0010969	0016039	7332994	3/4	52.5	116.5	48.0	0033074	16.0	52.5	116.5	48.0	0017913
14.0	0010983	0016046	7332995	3/4	52.5	116.5	48.0	0033074	16.0	52.5	116.5	48.0	0017913
14.1	0037997	0038567	7332996	3/4	52.5	116.5	48.0	0033074	16.0	52.5	116.5	48.0	0017913
14.2	0038000	0038574	7332997	3/4	52.5	116.5	48.0	0033074	16.0	52.5	116.5	48.0	0017913
9/16	0011003	0016053	7332998	3/4	52.5	116.5	48.0	0033074	16.0	52.5	116.5	48.0	0017913
14.5	0011010	0016060	7332999	3/4	52.5	116.5	48.0	0033074	16.0	52.5	116.5	48.0	0017913
14.6	0038017	0038581	7333000	3/4	55.5	126.5	50.0	0033081	20.0	55.5	126.5	50.0	0018293
37/64	0011140	0016077	7333001	3/4	55.5	126.5	50.0	0033081	20.0	55.5	126.5	50.0	0018293
14.7	0038024	0039601	7333002	3/4	55.5	126.5	50.0	0033081	20.0	55.5	126.5	50.0	0018293
14.8	0038031	0039618	7333003	3/4	55.5	126.5	50.0	0033081	20.0	55.5	126.5	50.0	0018293
15.0	0011201	0016084	7333004	3/4	55.5	126.5	50.0	0033081	20.0	55.5	126.5	50.0	0018293
19/32	0011218	0016091	7333005	3/4	55.5	126.5	50.0	0033081	20.0	55.5	126.5	50.0	0018293
15.1	0038048	0039625	7333006	3/4	55.5	126.5	50.0	0033081	20.0	55.5	126.5	50.0	0018293
15.2	0038055	0039632	7333007	3/4	55.5	126.5	50.0	0033081	20.0	55.5	126.5	50.0	0018293
15.24	0032268	0032350	7333008	3/4	55.5	126.5	50.0	0033081	20.0	55.5	126.5	50.0	0018293
39/64	0011232	0016107	7333009	3/4	55.5	126.5	50.0	0033081	20.0	55.5	126.5	50.0	0018293
15.5	0011362	0016114	7333010	3/4	55.5	126.5	50.0	0033081	20.0	55.5	126.5	50.0	0018293

# HYDRA DRILL



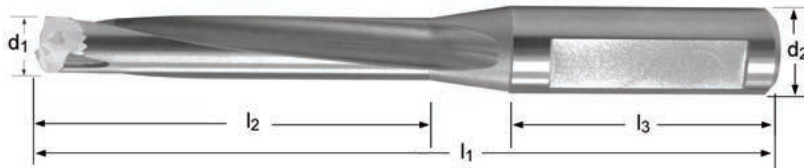
Hydra Head d <sub>1</sub> Ø	Hydra Head R950 EDP#	Hydra Head R960 EDP#	Hydra Head R970 EDP#	3xD Hydra Body - Fractional Shank					3xD Hydra Body - Metric Shank				
				d <sub>2</sub> Øh <sub>6</sub> inch	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H853 EDP#	d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H853 EDP#
15.6	0038062	0039649	7333011	3/4	59.5	131.5	50.0	0033098	20.0	59.5	131.5	50.0	0018316
15.7	0038079	0039656	7333012	3/4	59.5	131.5	50.0	0033098	20.0	59.5	131.5	50.0	0018316
5/8	0011379	0016121	7333013	3/4	59.5	131.5	50.0	0033098	20.0	59.5	131.5	50.0	0018316
16.0	0011386	0016138	7333014	3/4	59.5	131.5	50.0	0033098	20.0	59.5	131.5	50.0	0018316
16.08	0032275	0032367	7333015	3/4	59.5	131.5	50.0	0033098	20.0	59.5	131.5	50.0	0018316
16.1	0038086	0039663	7333016	3/4	59.5	131.5	50.0	0033098	20.0	59.5	131.5	50.0	0018316
16.2	0038093	0039670	7333017	3/4	59.5	131.5	50.0	0033098	20.0	59.5	131.5	50.0	0018316
41/64	0011393	0016145	7333018	3/4	59.5	131.5	50.0	0033098	20.0	59.5	131.5	50.0	0018316
16.3	0032282	0032374	7333019	3/4	59.5	131.5	50.0	0033098	20.0	59.5	131.5	50.0	0018316
16.5	0011409	0016152	7333020	3/4	59.5	131.5	50.0	0033098	20.0	59.5	131.5	50.0	0018316
16.6	0038109	0039687	7333021	3/4	62.5	136.5	50.0	0033104	20.0	62.5	136.5	50.0	0018323
21/32	0012161	0016169	7333022	3/4	62.5	136.5	50.0	0033104	20.0	62.5	136.5	50.0	0018323
16.7	0038116	0039694	7333023	3/4	62.5	136.5	50.0	0033104	20.0	62.5	136.5	50.0	0018323
17.0	0012185	0016176	7333024	3/4	62.5	136.5	50.0	0033104	20.0	62.5	136.5	50.0	0018323
43/64	0012215	0016183	7333025	3/4	62.5	136.5	50.0	0033104	20.0	62.5	136.5	50.0	0018323
17.1	0038123	0039700	7333026	3/4	62.5	136.5	50.0	0033104	20.0	62.5	136.5	50.0	0018323
17.2	0038130	0039717	7333027	3/4	62.5	136.5	50.0	0033104	20.0	62.5	136.5	50.0	0018323
11/16	0012239	0016190	7333028	3/4	62.5	136.5	50.0	0033104	20.0	62.5	136.5	50.0	0018323
17.5	0012253	0016503	7333029	3/4	62.5	136.5	50.0	0033104	20.0	62.5	136.5	50.0	0018323
17.6	0032299	0032381	7333030	3/4	66.5	141.5	50.0	0033111	20.0	66.5	141.5	50.0	0018330
17.7	0038147	0039724	7333031	3/4	66.5	141.5	50.0	0033111	20.0	66.5	141.5	50.0	0018330
45/64	0012260	0016640	7333032	3/4	66.5	141.5	50.0	0033111	20.0	66.5	141.5	50.0	0018330
18.0	0012277	0016664	7333033	3/4	66.5	141.5	50.0	0033111	20.0	66.5	141.5	50.0	0018330
18.1	0038154	0039731	7333034	3/4	66.5	141.5	50.0	0033111	20.0	66.5	141.5	50.0	0018330
18.2	0038161	0039748	7333035	3/4	66.5	141.5	50.0	0033111	20.0	66.5	141.5	50.0	0018330
23/32	0012284	0016671	7333036	3/4	66.5	141.5	50.0	0033111	20.0	66.5	141.5	50.0	0018330
18.5	0012307	0016688	7333037	3/4	66.5	141.5	50.0	0033111	20.0	66.5	141.5	50.0	0018330
18.6	0038178	0039755	7333038	1	69.5	156.5	56.0	0033128	25.0	69.5	156.5	56.0	0018347
47/64	0012321	0016695	7333039	1	69.5	156.5	56.0	0033128	25.0	69.5	156.5	56.0	0018347
18.7	0038185	0039762	7333040	1	69.5	156.5	56.0	0033128	25.0	69.5	156.5	56.0	0018347
18.9	0038192	0039779	7333041	1	69.5	156.5	56.0	0033128	25.0	69.5	156.5	56.0	0018347
19.0	0012338	0016817	7333042	1	69.5	156.5	56.0	0033128	25.0	69.5	156.5	56.0	0018347
3/4	0012345	0016879	7333043	1	69.5	156.5	56.0	0033128	25.0	69.5	156.5	56.0	0018347
19.1	0038208	0039786	7333044	1	69.5	156.5	56.0	0033128	25.0	69.5	156.5	56.0	0018347
19.2	0038215	0039793	7333045	1	69.5	156.5	56.0	0033128	25.0	69.5	156.5	56.0	0018347
19.25	0032305	0032398	7333046	1	69.5	156.5	56.0	0033128	25.0	69.5	156.5	56.0	0018347
19.3	0032312	0032404	7333047	1	69.5	156.5	56.0	0033128	25.0	69.5	156.5	56.0	0018347
19.35	0032329	0032411	7333048	1	69.5	156.5	56.0	0033128	25.0	69.5	156.5	56.0	0018347
49/64	0012376	0016886	7333049	1	69.5	156.5	56.0	0033128	25.0	69.5	156.5	56.0	0018347
19.5	0012383	0016947	7333050	1	69.5	156.5	56.0	0033128	25.0	69.5	156.5	56.0	0018347
19.6	0038222	0039809	7333051	1	73.5	156.5	56.0	0033135	25.0	73.5	156.5	56.0	0018354
19.7	0038239	0039816	7333052	1	73.5	156.5	56.0	0033135	25.0	73.5	156.5	56.0	0018354
25/32	0012406	0016954	7333053	1	73.5	156.5	56.0	0033135	25.0	73.5	156.5	56.0	0018354
20.0	0012413	0017111	7333054	1	73.5	156.5	56.0	0033135	25.0	73.5	156.5	56.0	0018354
51/64	0012437	0017128	7333055	1	73.5	156.5	56.0	0033135	25.0	73.5	156.5	56.0	0018354
20.5	0012451	0017159	7333056	1	73.5	156.5	56.0	0033135	25.0	73.5	156.5	56.0	0018354
13/16	0012468	0017197	7333057	1	76.5	156.5	56.0	0033142	25.0	76.5	156.5	56.0	0018361
21.0	0012475	0017166	7333058	1	76.5	156.5	56.0	0033142	25.0	76.5	156.5	56.0	0018361
53/64	0012536	0017203	7333059	1	76.5	156.5	56.0	0033142	25.0	76.5	156.5	56.0	0018361
27/32	0012550	0017227	7333060	1	76.5	156.5	56.0	0033142	25.0	76.5	156.5	56.0	0018361
21.5	0012574	0017234	7333061	1	76.5	156.5	56.0	0033142	25.0	76.5	156.5	56.0	0018361
55/64	0012604	0017241	7333062	1	80.1	161.5	56.0	0033159	25.0	80.1	161.5	56.0	0018378
22.0	0012628	0017258	7333063	1	80.1	161.5	56.0	0033159	25.0	80.1	161.5	56.0	0018378
7/8	0012635	0017371	7333064	1	80.1	161.5	56.0	0033159	25.0	80.1	161.5	56.0	0018378
22.5	0032336	0032428	7333065	1	80.1	161.5	56.0	0033159	25.0	80.1	161.5	56.0	0018378
57/64	0012642	0017401	7333066	1	80.1	161.5	56.0	0033159	25.0	80.1	161.5	56.0	0018378
22.7	0038246	0039823	7333067	1	80.1	161.5	56.0	0033159	25.0	80.1	161.5	56.0	0018378
23.0	0012666	0017425	7333068	1	82.5	160.5	56.0	0033166	25.0	82.5	160.5	56.0	0018385
29/32	0012673	0017432	7333069	1	82.5	160.5	56.0	0033166	25.0	82.5	160.5	56.0	0018385
59/64	0012680	0017456	7333070	1	82.5	160.5	56.0	0033166	25.0	82.5	160.5	56.0	0018385
23.5	0038253	0039830	7333071	1	82.5	160.5	56.0	0033166	25.0	82.5	160.5	56.0	0018385

Hydra Head d <sub>1</sub> Ø	Hydra Head R950 EDP#	Hydra Head R960 EDP#	Hydra Head R970 EDP#	3xD Hydra Body - Fractional Shank					3xD Hydra Body - Metric Shank				
				d <sub>2</sub> Øh <sub>6</sub> inch	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H853 EDP#	d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H853 EDP#
15/16	0012703	0017562	7333072	1	86.2	170.2	60.0	0033173	32.0	86.2	170.2	60.0	0018392
24.0	0012727	0017579	7333073	1	86.2	170.2	60.0	0033173	32.0	86.2	170.2	60.0	0018392
61/64	0012741	0017586	7333074	1	86.2	170.2	60.0	0033173	32.0	86.2	170.2	60.0	0018392
24.5	0038260	0039847	7333075	1	86.2	170.2	60.0	0033173	32.0	86.2	170.2	60.0	0018392
31/32	0012772	0017593	7333076	1	86.2	170.2	60.0	0033173	32.0	86.2	170.2	60.0	0018392
25.0	0012819	0017722	7333077	1.1/4	88.0	170.0	60.0	0033180	32.0	88.0	170.0	60.0	0018408
63/64	0012826	0017746	7333078	1.1/4	88.0	170.0	60.0	0033180	32.0	88.0	170.0	60.0	0018408
1	0012833	0017753	7333079	1.1/4	88.0	170.0	60.0	0033180	32.0	88.0	170.0	60.0	0018408
25.5	0038277	0039854	7333080	1.1/4	88.0	170.0	60.0	0033180	32.0	88.0	170.0	60.0	0018408
25.65	0032343	0032435	7333081	1.1/4	88.0	170.0	60.0	0033180	32.0	88.0	170.0	60.0	0018408
1.1/64	0012840	0018958	7333082	1.1/4	88.0	170.0	60.0	0033180	32.0	88.0	170.0	60.0	0018408
26.0	0013090	0018965	7333083	1.1/4	92.0	175.0	60.0	0033197	32.0	92.0	175.0	60.0	0018415
1.1/32	0013120	0018972	7333084	1.1/4	92.0	175.0	60.0	0033197	32.0	92.0	175.0	60.0	0018415
26.5	0038284	0039878	7333085	1.1/4	92.0	175.0	60.0	0033197	32.0	92.0	175.0	60.0	0018415
1.3/64	0013229	0018989	7333086	1.1/4	92.0	175.0	60.0	0033197	32.0	92.0	175.0	60.0	0018415
1.1/16	0013243	0018996	7333087	1.1/4	94.0	175.0	60.0	0033210	32.0	94.0	175.0	60.0	0018422
27.0	0013267	0019009	7333088	1.1/4	94.0	175.0	60.0	0033210	32.0	94.0	175.0	60.0	0018422
1.5/64	0013274	0019016	7333089	1.1/4	94.0	175.0	60.0	0033210	32.0	94.0	175.0	60.0	0018422
27.5	0038291	0039885	7333090	1.1/4	94.0	175.0	60.0	0033210	32.0	94.0	175.0	60.0	0018422
1.3/32	0013281	0019023	7333091	1.1/4	94.0	175.0	60.0	0033210	32.0	94.0	175.0	60.0	0018422
28.0	0013304	0019030	7333092	1.1/4	97.0	180.0	60.0	0033227	32.0	97.0	180.0	60.0	0018439
1.7/64	0013311	0019047	7333093	1.1/4	97.0	180.0	60.0	0033227	32.0	97.0	180.0	60.0	0018439
28.5	0038307	0039892	7333094	1.1/4	97.0	180.0	60.0	0033227	32.0	97.0	180.0	60.0	0018439
1.1/8	0013328	0019054	7333095	1.1/4	97.0	180.0	60.0	0033227	32.0	97.0	180.0	60.0	0018439
1.9/64	0013342	0019061	7333096	1.1/4	100.0	185.0	60.0	0033234	32.0	100.0	185.0	60.0	0018446
29.0	0013366	0019078	7333097	1.1/4	100.0	185.0	60.0	0033234	32.0	100.0	185.0	60.0	0018446
1.5/32	0013380	0019085	7333098	1.1/4	100.0	185.0	60.0	0033234	32.0	100.0	185.0	60.0	0018446
29.5	0038314	0039908	7333099	1.1/4	100.0	185.0	60.0	0033234	32.0	100.0	185.0	60.0	0018446
1.11/64	0013427	0019092	7333100	1.1/4	100.0	185.0	60.0	0033234	32.0	100.0	185.0	60.0	0018446
30.0	0013434	0019108	7333101	1.1/4	104.0	185.0	60.0	0033425	32.0	104.0	185.0	60.0	0018453
1.3/16	0013441	0019115	7333102	1.1/4	104.0	185.0	60.0	0033425	32.0	104.0	185.0	60.0	0018453
30.5	0013465	0019122	7333103	1.1/4	104.0	185.0	60.0	0033425	32.0	104.0	185.0	60.0	0018453
1.7/32	46104481	—	7333104	—	—	—	—	—	32.0	111.5	196.5	60.0	46111405
31.00	46104482	—	7333105	—	—	—	—	—	32.0	111.5	196.5	60.0	46111405
1.1/4	46104483	—	7333106	—	—	—	—	—	32.0	111.5	196.5	60.0	46111405
32.00	46104484	—	7333107	—	—	—	—	—	32.0	111.5	196.5	60.0	46111405
32.50	46104485	—	7333108	—	—	—	—	—	32.0	116.5	201.5	60.0	46111406
1.19/64	46104486	—	7333109	—	—	—	—	—	32.0	116.5	201.5	60.0	46111406
33.00	46104487	—	7333110	—	—	—	—	—	32.0	116.5	201.5	60.0	46111406
33.50	46104488	—	7333111	—	—	—	—	—	32.0	116.5	201.5	60.0	46111406
34.00	46104489	—	7333112	—	—	—	—	—	40.0	121.5	216.5	70.0	46111407
1.11/32	46104530	—	7333113	—	—	—	—	—	40.0	121.5	216.5	70.0	46111407
34.50	46104531	—	7333114	—	—	—	—	—	40.0	121.5	216.5	70.0	46111407
1.3/8	46104532	—	7333115	—	—	—	—	—	40.0	121.5	216.5	70.0	46111407
35.00	46104533	—	7333116	—	—	—	—	—	40.0	121.5	216.5	70.0	46111407
36.00	46104534	—	7333117	—	—	—	—	—	40.0	125.5	221.5	70.0	46111408
1.27/64	46104535	—	7333118	—	—	—	—	—	40.0	125.5	221.5	70.0	46111408
36.50	46104536	—	7333119	—	—	—	—	—	40.0	125.5	221.5	70.0	46111408
37.00	46104537	—	7333120	—	—	—	—	—	40.0	131.5	226.5	70.0	46111409
1.15/32	46104538	—	7333121	—	—	—	—	—	40.0	131.5	226.5	70.0	46111409
37.50	46104539	—	7333122	—	—	—	—	—	40.0	131.5	226.5	70.0	46111409
38.00	46104540	—	7333123	—	—	—	—	—	40.0	131.5	226.5	70.0	46111409
1.1/2	46104541	—	7333124	—	—	—	—	—	40.0	136.5	231.5	70.0	46111410
38.50	46104542	—	7333125	—	—	—	—	—	40.0	136.5	231.5	70.0	46111410
1.17/32	46104543	—	7333126	—	—	—	—	—	40.0	136.5	231.5	70.0	46111410
39.00	46104544	—	7333127	—	—	—	—	—	40.0	136.5	231.5	70.0	46111410
39.50	46104545	—	7333128	—	—	—	—	—	40.0	136.5	231.5	70.0	46111410
1.9/16	46104546	—	7333129	—	—	—	—	—	40.0	146.5	246.5	70.0	46111411
40.00	46104547	—	7333130	—	—	—	—	—	40.0	146.5	246.5	70.0	46111411
41.00	46104548	—	7333131	—	—	—	—	—	40.0	146.5	246.5	70.0	46111411
1.5/8	46104549	—	7333132	—	—	—	—	—	40.0	151.5	251.5	70.0	46111412
42.00	46104550	—	7333133	—	—	—	—	—	40.0	151.5	251.5	70.0	46111412

## 5xD Hydra Bodies

### H855

Cylindrical shank with flat for multi-purpose tool holding. Allows accurate clamping for reliable use of internal coolant.



**H855  
Coolant  
Through**

DIN  
6535HB  
DIN  
6535HE

**5XD**

**HSS**

**140°**



15/32 - 42.00

Four (4) screws and one (1) screwdriver are included with a drill body

- \* Fractional bodies have straight flat on shank
- \* Metric bodies have whistle notch on shank
- \* For more information on Hydra, see page 539

Hydra Head d <sub>1</sub> Ø	Hydra Head R950 EDP#	Hydra Head R960 EDP#	Hydra Head R970 EDP#	5xD Hydra Body - Fractional Shank					5xD Hydra Body - Metric Shank				
				d <sub>2</sub> Øh <sub>6</sub> inch	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H855 EDP#	d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H855 EDP#
15/32	0010860	0013472	7332946	5/8	69.0	130.0	48.0	0033586	16.0	69.0	130.0	48.0	0018460
12.0	0010877	0013489	7332947	5/8	69.0	130.0	48.0	0033586	16.0	69.0	130.0	48.0	0018460
12.1	0037904	0038338	7332948	5/8	69.0	130.0	48.0	0033586	16.0	69.0	130.0	48.0	0018460
12.2	0037911	0038376	7332949	5/8	69.0	130.0	48.0	0033586	16.0	69.0	130.0	48.0	0018460
31/64	0010884	0013496	7332980	5/8	69.0	130.0	48.0	0033586	16.0	69.0	130.0	48.0	0018460
12.5	0010907	0013519	7332981	5/8	69.0	130.0	48.0	0034095	16.0	69.0	130.0	48.0	0018477
12.6	0037928	0038413	7332982	5/8	69.0	130.0	48.0	0034095	16.0	69.0	130.0	48.0	0018477
1/2	0010914	0013526	7332983	5/8	69.0	130.0	48.0	0034095	16.0	69.0	130.0	48.0	0018477
12.8	0037935	0038437	7332984	5/8	69.0	130.0	48.0	0034095	16.0	69.0	130.0	48.0	0018477
12.9	0037942	0038451	7332985	5/8	69.0	130.0	48.0	0034095	16.0	69.0	130.0	48.0	0018477
13.0	0010921	0013533	7332986	5/8	74.0	140.0	48.0	0034132	16.0	74.0	140.0	48.0	0018484
33/64	0010938	0013540	7332987	5/8	74.0	140.0	48.0	0034132	16.0	74.0	140.0	48.0	0018484
13.2	0037959	0038468	7332988	5/8	74.0	140.0	48.0	0034132	16.0	74.0	140.0	48.0	0018484
17/32	0010945	0013557	7332989	5/8	74.0	140.0	48.0	0034132	16.0	74.0	140.0	48.0	0018484
13.5	0010952	0016022	7332990	3/4	81.5	146.5	48.0	0034699	16.0	81.5	146.5	48.0	0018491
13.6	0037966	0038499	7332991	3/4	81.5	146.5	48.0	0034699	16.0	81.5	146.5	48.0	0018491
13.7	0037973	0038529	7332992	3/4	81.5	146.5	48.0	0034699	16.0	81.5	146.5	48.0	0018491
13.8	0037980	0038543	7332993	3/4	81.5	146.5	48.0	0034699	16.0	81.5	146.5	48.0	0018491
35/64	0010969	0016039	7332994	3/4	81.5	146.5	48.0	0034699	16.0	81.5	146.5	48.0	0018491
14.0	0010983	0016046	7332995	3/4	81.5	146.5	48.0	0034699	16.0	81.5	146.5	48.0	0018491
14.1	0037997	0038567	7332996	3/4	81.5	146.5	48.0	0034699	16.0	81.5	146.5	48.0	0018491
14.2	0038000	0038574	7332997	3/4	81.5	146.5	48.0	0034699	16.0	81.5	146.5	48.0	0018491
9/16	0011003	0016053	7332998	3/4	81.5	146.5	48.0	0034699	16.0	81.5	146.5	48.0	0018491
14.5	0011010	0016060	7332999	3/4	81.5	146.5	48.0	0034699	16.0	81.5	146.5	48.0	0018491
14.6	0038017	0038581	7333000	3/4	86.5	156.5	50.0	0034705	20.0	86.5	156.5	50.0	0018507
37/64	0011140	0016077	7333001	3/4	86.5	156.5	50.0	0034705	20.0	86.5	156.5	50.0	0018507
14.7	0038024	0039601	7333002	3/4	86.5	156.5	50.0	0034705	20.0	86.5	156.5	50.0	0018507
14.8	0038031	0039618	7333003	3/4	86.5	156.5	50.0	0034705	20.0	86.5	156.5	50.0	0018507
15.0	0011201	0016084	7333004	3/4	86.5	156.5	50.0	0034705	20.0	86.5	156.5	50.0	0018507
19/32	0011218	0016091	7333005	3/4	86.5	156.5	50.0	0034705	20.0	86.5	156.5	50.0	0018507



# HYDRA DRILL

Hydra Head d <sub>1</sub> Ø	Hydra Head R950 EDP#	Hydra Head R960 EDP#	Hydra Head R970 EDP#	5xD Hydra Body - Fractional Shank					5xD Hydra Body - Metric Shank				
				d <sub>2</sub> Øh <sub>6</sub> inch	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H855 EDP#	d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H855 EDP#
15.1	0038048	0039625	7333006	3/4	86.5	156.5	50.0	0034705	20.0	86.5	156.5	50.0	0018507
15.2	0038055	0039632	7333007	3/4	86.5	156.5	50.0	0034705	20.0	86.5	156.5	50.0	0018507
15.24	0032268	0032350	7333008	3/4	86.5	156.5	50.0	0034705	20.0	86.5	156.5	50.0	0018507
39/64	0011232	0016107	7333009	3/4	86.5	156.5	50.0	0034705	20.0	86.5	156.5	50.0	0018507
15.5	0011362	0016114	7333010	3/4	86.5	156.5	50.0	0034705	20.0	86.5	156.5	50.0	0018507
15.6	0038062	0039649	7333011	3/4	92.5	166.5	50.0	0034712	20.0	92.5	166.5	50.0	0018514
15.7	0038079	0039656	7333012	3/4	92.5	166.5	50.0	0034712	20.0	92.5	166.5	50.0	0018514
5/8	0011379	0016121	7333013	3/4	92.5	166.5	50.0	0034712	20.0	92.5	166.5	50.0	0018514
16.0	0011386	0016138	7333014	3/4	92.5	166.5	50.0	0034712	20.0	92.5	166.5	50.0	0018514
16.08	0032275	0032367	7333015	3/4	92.5	166.5	50.0	0034712	20.0	92.5	166.5	50.0	0018514
16.1	0038086	0039663	7333016	3/4	92.5	166.5	50.0	0034712	20.0	92.5	166.5	50.0	0018514
16.2	0038093	0039670	7333017	3/4	92.5	166.5	50.0	0034712	20.0	92.5	166.5	50.0	0018514
41/64	0011393	0016145	7333018	3/4	92.5	166.5	50.0	0034712	20.0	92.5	166.5	50.0	0018514
16.3	0032282	0032374	7333019	3/4	92.5	166.5	50.0	0034712	20.0	92.5	166.5	50.0	0018514
16.5	0011409	0016152	7333020	3/4	92.5	166.5	50.0	0034712	20.0	92.5	166.5	50.0	0018514
16.6	0038109	0039687	7333021	3/4	97.5	171.5	50.0	0034736	20.0	97.5	171.5	50.0	0018521
21/32	0012161	0016169	7333022	3/4	97.5	171.5	50.0	0034736	20.0	97.5	171.5	50.0	0018521
16.7	0038116	0039694	7333023	3/4	97.5	171.5	50.0	0034736	20.0	97.5	171.5	50.0	0018521
17.0	0012185	0016176	7333024	3/4	97.5	171.5	50.0	0034736	20.0	97.5	171.5	50.0	0018521
43/64	0012215	0016183	7333025	3/4	97.5	171.5	50.0	0034736	20.0	97.5	171.5	50.0	0018521
17.1	0038123	0039700	7333026	3/4	97.5	171.5	50.0	0034736	20.0	97.5	171.5	50.0	0018521
17.2	0038130	0039717	7333027	3/4	97.5	171.5	50.0	0034736	20.0	97.5	171.5	50.0	0018521
11/16	0012239	0016190	7333028	3/4	97.5	171.5	50.0	0034736	20.0	97.5	171.5	50.0	0018521
17.5	0012253	0016503	7333029	3/4	97.5	171.5	50.0	0034736	20.0	97.5	171.5	50.0	0018521
17.6	0032299	0032381	7333030	3/4	103.5	176.5	50.0	0034743	20.0	103.5	176.5	50.0	0018538
17.7	0038147	0039724	7333031	3/4	103.5	176.5	50.0	0034743	20.0	103.5	176.5	50.0	0018538
45/64	0012260	0016640	7333032	3/4	103.5	176.5	50.0	0034743	20.0	103.5	176.5	50.0	0018538
18.0	0012277	0016664	7333033	3/4	103.5	176.5	50.0	0034743	20.0	103.5	176.5	50.0	0018538
18.1	0038154	0039731	7333034	3/4	103.5	176.5	50.0	0034743	20.0	103.5	176.5	50.0	0018538
18.2	0038161	0039748	7333035	3/4	103.5	176.5	50.0	0034743	20.0	103.5	176.5	50.0	0018538
23/32	0012284	0016671	7333036	3/4	103.5	176.5	50.0	0034743	20.0	103.5	176.5	50.0	0018538
18.5	0012307	0016688	7333037	3/4	103.5	176.5	50.0	0034743	20.0	103.5	176.5	50.0	0018538
18.6	0038178	0039755	7333038	1	108.5	191.5	56.0	0034798	25.0	108.5	191.5	56.0	0018545
47/64	0012321	0016695	7333039	1	108.5	191.5	56.0	0034798	25.0	108.5	191.5	56.0	0018545
18.7	0038185	0039762	7333040	1	108.5	191.5	56.0	0034798	25.0	108.5	191.5	56.0	0018545
18.9	0038192	0039779	7333041	1	108.5	191.5	56.0	0034798	25.0	108.5	191.5	56.0	0018545
19.0	0012338	0016817	7333042	1	108.5	191.5	56.0	0034798	25.0	108.5	191.5	56.0	0018545
3/4	0012345	0016879	7333043	1	108.5	191.5	56.0	0034798	25.0	108.5	191.5	56.0	0018545
19.1	0038208	0039786	7333044	1	108.5	191.5	56.0	0034798	25.0	108.5	191.5	56.0	0018545
19.2	0038215	0039793	7333045	1	108.5	191.5	56.0	0034798	25.0	108.5	191.5	56.0	0018545
19.25	0032305	0032398	7333046	1	108.5	191.5	56.0	0034798	25.0	108.5	191.5	56.0	0018545
19.3	0032312	0032404	7333047	1	108.5	191.5	56.0	0034798	25.0	108.5	191.5	56.0	0018545
19.35	0032329	0032411	7333048	1	108.5	191.5	56.0	0034798	25.0	108.5	191.5	56.0	0018545
49/64	0012376	0016886	7333049	1	108.5	191.5	56.0	0034798	25.0	108.5	191.5	56.0	0018545
19.5	0012383	0016947	7333050	1	108.5	191.5	56.0	0034798	25.0	108.5	191.5	56.0	0018545
19.6	0038222	0039809	7333051	1	114.5	196.5	56.0	0034804	25.0	114.5	196.5	56.0	0018552
19.7	0038239	0039816	7333052	1	114.5	196.5	56.0	0034804	25.0	114.5	196.5	56.0	0018552
25/32	0012406	0016954	7333053	1	114.5	196.5	56.0	0034804	25.0	114.5	196.5	56.0	0018552
20.0	0012413	0017111	7333054	1	114.5	196.5	56.0	0034804	25.0	114.5	196.5	56.0	0018552
51/64	0012437	0017128	7333055	1	114.5	196.5	56.0	0034804	25.0	114.5	196.5	56.0	0018552
20.5	0012451	0017159	7333056	1	114.5	196.5	56.0	0034804	25.0	114.5	196.5	56.0	0018552
13/16	0012468	0017197	7333057	1	119.5	196.5	56.0	0034811	25.0	119.5	196.5	56.0	0018569
21.0	0012475	0017166	7333058	1	119.5	196.5	56.0	0034811	25.0	119.5	196.5	56.0	0018569
53/64	0012536	0017203	7333059	1	119.5	196.5	56.0	0034811	25.0	119.5	196.5	56.0	0018569
27/32	0012550	0017227	7333060	1	119.5	196.5	56.0	0034811	25.0	119.5	196.5	56.0	0018569
21.5	0012574	0017234	7333061	1	119.5	196.5	56.0	0034811	25.0	119.5	196.5	56.0	0018569
55/64	0012604	0017241	7333062	1	125.1	201.1	56.0	0034835	25.0	125.1	201.1	56.0	0018576
22.0	0012628	0017258	7333063	1	125.1	201.1	56.0	0034835	25.0	125.1	201.1	56.0	0018576
7/8	0012635	0017371	7333064	1	125.1	201.1	56.0	0034835	25.0	125.1	201.1	56.0	0018576
22.5	0032336	0032428	7333065	1	125.1	201.1	56.0	0034835	25.0	125.1	201.1	56.0	0018576
57/64	0012642	0017401	7333066	1	125.1	201.1	56.0	0034835	25.0	125.1	201.1	56.0	0018576
22.7	0038246	0039823	7333067	1	125.1	201.1	56.0	0034835	25.0	125.1	201.1	56.0	0018576
23.0	0012666	0017425	7333068	1	129.5	210.5	56.0	0034842	25.0	129.5	210.5	56.0	0018583
29/32	0012673	0017432	7333069	1	129.5	210.5	56.0	0034842	25.0	129.5	210.5	56.0	0018583

# HYDRA DRILL

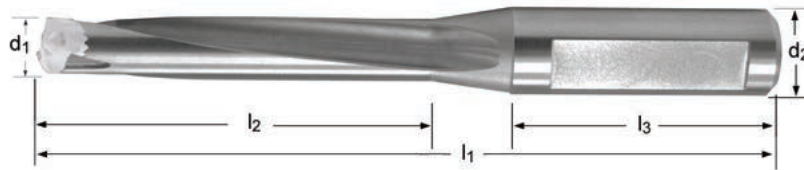


Hydra Head d <sub>1</sub> Ø	Hydra Head R950 EDP#	Hydra Head R960 EDP#	Hydra Head R970 EDP#	5xD Hydra Body - Fractional Shank					5xD Hydra Body - Metric Shank				
				d <sub>2</sub> Øh <sub>6</sub> inch	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H855 EDP#	d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H855 EDP#
59/64	0012680	0017456	7333070	1	129.5	210.5	56.0	0034842	25.0	129.5	210.5	56.0	0018583
23.5	0038253	0039830	7333071	1	129.5	210.5	56.0	0034842	25.0	129.5	210.5	56.0	0018583
15/16	0012703	0017562	7333072	1	135.2	220.2	60.0	0034859	32.0	135.2	220.2	60.0	0018590
24.0	0012727	0017579	7333073	1	135.2	220.2	60.0	0034859	32.0	135.2	220.2	60.0	0018590
61/64	0012741	0017586	7333074	1	135.2	220.2	60.0	0034859	32.0	135.2	220.2	60.0	0018590
24.5	0038260	0039847	7333075	1	135.2	220.2	60.0	0034859	32.0	135.2	220.2	60.0	0018590
31/32	0012772	0017593	7333076	1	135.2	220.2	60.0	0034859	32.0	135.2	220.2	60.0	0018590
25.0	0012819	0017722	7333077	1.1/4	140.0	225.0	60.0	0034866	32.0	140.0	225.0	60.0	0018606
63/64	0012826	0017746	7333078	1.1/4	140.0	225.0	60.0	0034866	32.0	140.0	225.0	60.0	0018606
1	0012833	0017753	7333079	1.1/4	140.0	225.0	60.0	0034866	32.0	140.0	225.0	60.0	0018606
25.5	0038277	0039854	7333080	1.1/4	140.0	225.0	60.0	0034866	32.0	140.0	225.0	60.0	0018606
25.65	0032343	0032435	7333081	1.1/4	140.0	225.0	60.0	0034866	32.0	140.0	225.0	60.0	0018606
1.1/64	0012840	0018958	7333082	1.1/4	140.0	225.0	60.0	0034866	32.0	140.0	225.0	60.0	0018606
26.0	0013090	0018965	7333083	1.1/4	146.0	230.0	60.0	0034873	32.0	146.0	230.0	60.0	0018613
1.1/32	0013120	0018972	7333084	1.1/4	146.0	230.0	60.0	0034873	32.0	146.0	230.0	60.0	0018613
26.5	0038284	0039878	7333085	1.1/4	146.0	230.0	60.0	0034873	32.0	146.0	230.0	60.0	0018613
1.3/64	0013229	0018989	7333086	1.1/4	146.0	230.0	60.0	0034873	32.0	146.0	230.0	60.0	0018613
1.1/16	0013243	0018996	7333087	1.1/4	151.0	235.0	60.0	0034897	32.0	151.0	235.0	60.0	0018620
27.0	0013267	0019009	7333088	1.1/4	151.0	235.0	60.0	0034897	32.0	151.0	235.0	60.0	0018620
1.5/64	0013274	0019016	7333089	1.1/4	151.0	235.0	60.0	0034897	32.0	151.0	235.0	60.0	0018620
27.5	0038291	0039885	7333090	1.1/4	151.0	235.0	60.0	0034897	32.0	151.0	235.0	60.0	0018620
1.3/32	0013281	0019023	7333091	1.1/4	151.0	235.0	60.0	0034897	32.0	151.0	235.0	60.0	0018620
28.0	0013304	0019030	7333092	1.1/4	157.0	240.0	60.0	0034903	32.0	157.0	240.0	60.0	0018637
1.7/64	0013311	0019047	7333093	1.1/4	157.0	240.0	60.0	0034903	32.0	157.0	240.0	60.0	0018637
28.5	0038307	0039892	7333094	1.1/4	157.0	240.0	60.0	0034903	32.0	157.0	240.0	60.0	0018637
1.1/8	0013328	0019054	7333095	1.1/4	157.0	240.0	60.0	0034903	32.0	157.0	240.0	60.0	0018637
1.9/64	0013342	0019061	7333096	1.1/4	162.0	245.0	60.0	0034934	32.0	162.0	245.0	60.0	0018644
29.0	0013366	0019078	7333097	1.1/4	162.0	245.0	60.0	0034934	32.0	162.0	245.0	60.0	0018644
1.5/32	0013380	0019085	7333098	1.1/4	162.0	245.0	60.0	0034934	32.0	162.0	245.0	60.0	0018644
29.5	0038314	0039908	7333099	1.1/4	162.0	245.0	60.0	0034934	32.0	162.0	245.0	60.0	0018644
1.11/64	0013427	0019092	7333100	1.1/4	162.0	245.0	60.0	0034934	32.0	162.0	245.0	60.0	0018644
30.0	0013434	0019108	7333101	1.1/4	167.0	255.0	60.0	0034965	32.0	167.0	255.0	60.0	0018651
1.3/16	0013441	0019115	7333102	1.1/4	167.0	255.0	60.0	0034965	32.0	167.0	255.0	60.0	0018651
30.5	0013465	0019122	7333103	1.1/4	167.0	255.0	60.0	0034965	32.0	167.0	255.0	60.0	0018651
1.7/32	46104481	—	7333104	—	—	—	—	—	32.0	176.5	261.5	60.0	46111413
31.00	46104482	—	7333105	—	—	—	—	—	32.0	176.5	261.5	60.0	46111413
1.1/4	46104483	—	7333106	—	—	—	—	—	32.0	176.5	261.5	60.0	46111413
32.00	46104484	—	7333107	—	—	—	—	—	32.0	176.5	261.5	60.0	46111413
32.50	46104485	—	7333108	—	—	—	—	—	32.0	186.5	271.5	60.0	46111414
1.19/64	46104486	—	7333109	—	—	—	—	—	32.0	186.5	271.5	60.0	46111414
33.00	46104487	—	7333110	—	—	—	—	—	32.0	186.5	271.5	60.0	46111414
33.50	46104488	—	7333111	—	—	—	—	—	32.0	186.5	271.5	60.0	46111414
34.00	46104489	—	7333112	—	—	—	—	—	40.0	196.5	291.5	70.0	46111415
1.11/32	46104530	—	7333113	—	—	—	—	—	40.0	196.5	291.5	70.0	46111415
34.50	46104531	—	7333114	—	—	—	—	—	40.0	196.5	291.5	70.0	46111415
1.3/8	46104532	—	7333115	—	—	—	—	—	40.0	196.5	291.5	70.0	46111415
35.00	46104533	—	7333116	—	—	—	—	—	40.0	196.5	291.5	70.0	46111415
36.00	46104534	—	7333117	—	—	—	—	—	40.0	201.5	296.5	70.0	46111416
1.27/64	46104535	—	7333118	—	—	—	—	—	40.0	201.5	296.5	70.0	46111416
36.50	46104536	—	7333119	—	—	—	—	—	40.0	201.5	296.5	70.0	46111416
37.00	46104537	—	7333120	—	—	—	—	—	40.0	211.5	306.5	70.0	46111417
1.15/32	46104538	—	7333121	—	—	—	—	—	40.0	211.5	306.5	70.0	46111417
37.50	46104539	—	7333122	—	—	—	—	—	40.0	211.5	306.5	70.0	46111417
38.00	46104540	—	7333123	—	—	—	—	—	40.0	211.5	306.5	70.0	46111417
1.1/2	46104541	—	7333124	—	—	—	—	—	40.0	211.5	316.5	70.0	46111418
38.50	46104542	—	7333125	—	—	—	—	—	40.0	211.5	316.5	70.0	46111418
1.17/32	46104543	—	7333126	—	—	—	—	—	40.0	211.5	316.5	70.0	46111418
39.00	46104544	—	7333127	—	—	—	—	—	40.0	211.5	316.5	70.0	46111418
39.50	46104545	—	7333128	—	—	—	—	—	40.0	211.5	316.5	70.0	46111418
1.9/16	46104546	—	7333129	—	—	—	—	—	40.0	226.5	325.5	70.0	46111419
40.00	46104547	—	7333130	—	—	—	—	—	40.0	226.5	325.5	70.0	46111419
41.00	46104548	—	7333131	—	—	—	—	—	40.0	226.5	325.5	70.0	46111419
1.5/8	46104549	—	7333132	—	—	—	—	—	40.0	236.5	336.5	70.0	46111420
42.00	46104550	—	7333133	—	—	—	—	—	40.0	236.5	336.5	70.0	46111420

## 8xD Hydra Bodies

### H858

Cylindrical shank with flat for multi-purpose tool holding. Allows accurate clamping for reliable use of internal coolant.



**H858 Coolant Through**

DIN 6535HB  
DIN 6535HE

**8XD**

**HSS**

**140°**

13.50 - 42.00

Four (4) screws and one (1) screwdriver are included with a drill body

- \* Metric bodies have whistle notch on shank
- \* For more information on Hydra, see page 539

Hydra Head d <sub>1</sub> Ø	Hydra Head R950 EDP#	Hydra Head R960 EDP#	Hydra Head R970 EDP#	8xD Hydra Body - Metric Shank					8xD Hydra Body - Metric Shank				
				d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H858 EDP#	d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H858 EDP#
13.5	0010952	0016022	7332990	—	—	—	—	—	16.0	124.5	191.5	48.0	0018668
13.6	0037966	0038499	7332991	—	—	—	—	—	16.0	124.5	191.5	48.0	0018668
13.7	0037973	0038529	7332992	—	—	—	—	—	16.0	124.5	191.5	48.0	0018668
13.8	0037980	0038543	7332993	—	—	—	—	—	16.0	124.5	191.5	48.0	0018668
35/64	0010969	0016039	7332994	—	—	—	—	—	16.0	124.5	191.5	48.0	0018668
14.0	0010983	0016046	7332995	—	—	—	—	—	16.0	124.5	191.5	48.0	0018668
14.1	0037997	0038567	7332996	—	—	—	—	—	16.0	124.5	191.5	48.0	0018668
14.2	0038000	0038574	7332997	—	—	—	—	—	16.0	124.5	191.5	48.0	0018668
9/16	0011003	0016053	7332998	—	—	—	—	—	16.0	124.5	191.5	48.0	0018668
14.5	0011010	0016060	7332999	—	—	—	—	—	16.0	124.5	191.5	48.0	0018668
14.6	0038017	0038581	7333000	—	—	—	—	—	20.0	133.5	201.5	50.0	0018675
37/64	0011140	0016077	7333001	—	—	—	—	—	20.0	133.5	201.5	50.0	0018675
14.7	0038024	0039601	7333002	—	—	—	—	—	20.0	133.5	201.5	50.0	0018675
14.8	0038031	0039618	7333003	—	—	—	—	—	20.0	133.5	201.5	50.0	0018675
15.0	0011201	0016084	7333004	—	—	—	—	—	20.0	133.5	201.5	50.0	0018675
19/32	0011218	0016091	7333005	—	—	—	—	—	20.0	133.5	201.5	50.0	0018675
15.1	0038048	0039625	7333006	—	—	—	—	—	20.0	133.5	201.5	50.0	0018675
15.2	0038055	0039632	7333007	—	—	—	—	—	20.0	133.5	201.5	50.0	0018675
15.24	0032268	0032350	7333008	—	—	—	—	—	20.0	133.5	201.5	50.0	0018675
39/64	0011232	0016107	7333009	—	—	—	—	—	20.0	133.5	201.5	50.0	0018675
15.5	0011362	0016114	7333010	—	—	—	—	—	20.0	133.5	201.5	50.0	0018675
15.6	0038062	0039649	7333011	—	—	—	—	—	20.0	141.5	211.5	50.0	0018682
15.7	0038079	0039656	7333012	—	—	—	—	—	20.0	141.5	211.5	50.0	0018682
5/8	0011379	0016121	7333013	—	—	—	—	—	20.0	141.5	211.5	50.0	0018682
16.0	0011386	0016138	7333014	—	—	—	—	—	20.0	141.5	211.5	50.0	0018682
16.08	0032275	0032367	7333015	—	—	—	—	—	20.0	141.5	211.5	50.0	0018682
16.1	0038086	0039663	7333016	—	—	—	—	—	20.0	141.5	211.5	50.0	0018682
16.2	0038093	0039670	7333017	—	—	—	—	—	20.0	141.5	211.5	50.0	0018682
41/64	0011393	0016145	7333018	—	—	—	—	—	20.0	141.5	211.5	50.0	0018682
16.3	0032282	0032374	7333019	—	—	—	—	—	20.0	141.5	211.5	50.0	0018682

# HYDRA DRILL



Hydra Head d <sub>1</sub> Ø	Hydra Head R950 EDP#	Hydra Head R960 EDP#	Hydra Head R970 EDP#	8xD Hydra Body - Metric Shank					8xD Hydra Body - Metric Shank				
				d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H858 EDP#	d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H858 EDP#
16.5	0011409	0016152	7333020	—	—	—	—	—	20.0	141.5	211.5	50.0	0018682
16.6	0038109	0039687	7333021	—	—	—	—	—	20.0	150.5	221.5	50.0	0018699
21/32	0012161	0016169	7333022	—	—	—	—	—	20.0	150.5	221.5	50.0	0018699
16.7	0038116	0039694	7333023	—	—	—	—	—	20.0	150.5	221.5	50.0	0018699
17.0	0012185	0016176	7333024	—	—	—	—	—	20.0	150.5	221.5	50.0	0018699
43/64	0012215	0016183	7333025	—	—	—	—	—	20.0	150.5	221.5	50.0	0018699
17.1	0038123	0039700	7333026	—	—	—	—	—	20.0	150.5	221.5	50.0	0018699
17.2	0038130	0039717	7333027	—	—	—	—	—	20.0	150.5	221.5	50.0	0018699
11/16	0012239	0016190	7333028	—	—	—	—	—	20.0	150.5	221.5	50.0	0018699
17.5	0012253	0016503	7333029	—	—	—	—	—	20.0	150.5	221.5	50.0	0018699
17.6	0032299	0032381	7333030	—	—	—	—	—	20.0	158.5	226.5	50.0	0018705
17.7	0038147	0039724	7333031	—	—	—	—	—	20.0	158.5	226.5	50.0	0018705
45/64	0012260	0016640	7333032	—	—	—	—	—	20.0	158.5	226.5	50.0	0018705
18.0	0012277	0016664	7333033	—	—	—	—	—	20.0	158.5	226.5	50.0	0018705
18.1	0038154	0039731	7333034	—	—	—	—	—	20.0	158.5	226.5	50.0	0018705
18.2	0038161	0039748	7333035	—	—	—	—	—	20.0	158.5	226.5	50.0	0018705
23/32	0012284	0016671	7333036	—	—	—	—	—	20.0	158.5	226.5	50.0	0018705
18.5	0012307	0016688	7333037	—	—	—	—	—	20.0	158.5	226.5	50.0	0018705
18.6	0038178	0039755	7333038	—	—	—	—	—	25.0	167.5	251.5	56.0	0018712
47/64	0012321	0016695	7333039	—	—	—	—	—	25.0	167.5	251.5	56.0	0018712
18.7	0038185	0039762	7333040	—	—	—	—	—	25.0	167.5	251.5	56.0	0018712
18.9	0038192	0039779	7333041	—	—	—	—	—	25.0	167.5	251.5	56.0	0018712
19.0	0012338	0016817	7333042	—	—	—	—	—	25.0	167.5	251.5	56.0	0018712
3/4	0012345	0016879	7333043	—	—	—	—	—	25.0	167.5	251.5	56.0	0018712
19.1	0038208	0039786	7333044	—	—	—	—	—	25.0	167.5	251.5	56.0	0018712
19.2	0038215	0039793	7333045	—	—	—	—	—	25.0	167.5	251.5	56.0	0018712
19.25	0032305	0032398	7333046	—	—	—	—	—	25.0	167.5	251.5	56.0	0018712
19.3	0032312	0032404	7333047	—	—	—	—	—	25.0	167.5	251.5	56.0	0018712
19.35	0032329	0032411	7333048	—	—	—	—	—	25.0	167.5	251.5	56.0	0018712
49/64	0012376	0016886	7333049	—	—	—	—	—	25.0	167.5	251.5	56.0	0018712
19.5	0012383	0016947	7333050	—	—	—	—	—	25.0	167.5	251.5	56.0	0018712
19.6	0038222	0039809	7333051	—	—	—	—	—	25.0	175.5	264.5	56.0	0018729
19.7	0038239	0039816	7333052	—	—	—	—	—	25.0	175.5	264.5	56.0	0018729
25/32	0012406	0016954	7333053	—	—	—	—	—	25.0	175.5	264.5	56.0	0018729
20.0	0012413	0017111	7333054	—	—	—	—	—	25.0	175.5	264.5	56.0	0018729
51/64	0012437	0017128	7333055	—	—	—	—	—	25.0	175.5	264.5	56.0	0018729
20.5	0012451	0017159	7333056	—	—	—	—	—	25.0	175.5	264.5	56.0	0018729
13/16	0012468	0017197	7333057	—	—	—	—	—	25.0	184.5	266.5	56.0	0018736
21.0	0012475	0017166	7333058	—	—	—	—	—	25.0	184.5	266.5	56.0	0018736
53/64	0012536	0017203	7333059	—	—	—	—	—	25.0	184.5	266.5	56.0	0018736
27/32	0012550	0017227	7333060	—	—	—	—	—	25.0	184.5	266.5	56.0	0018736
21.5	0012574	0017234	7333061	—	—	—	—	—	25.0	184.5	266.5	56.0	0018736
55/64	0012604	0017241	7333062	—	—	—	—	—	25.0	192.1	271.1	56.0	0018743
22.0	0012628	0017258	7333063	—	—	—	—	—	25.0	192.1	271.1	56.0	0018743
7/8	0012635	0017371	7333064	—	—	—	—	—	25.0	192.1	271.1	56.0	0018743
22.5	0032336	0032428	7333065	—	—	—	—	—	25.0	192.1	271.1	56.0	0018743
57/64	0012642	0017401	7333066	—	—	—	—	—	25.0	192.1	271.1	56.0	0018743
22.7	0038246	0039823	7333067	—	—	—	—	—	25.0	192.1	271.1	56.0	0018743
23.0	0012666	0017425	7333068	—	—	—	—	—	25.0	200.5	280.5	56.0	0018750
29/32	0012673	0017432	7333069	—	—	—	—	—	25.0	200.5	280.5	56.0	0018750
59/64	0012680	0017456	7333070	—	—	—	—	—	25.0	200.5	280.5	56.0	0018750
23.5	0038253	0039830	7333071	—	—	—	—	—	25.0	200.5	280.5	56.0	0018750
15/16	0012703	0017562	7333072	—	—	—	—	—	32.0	208.2	295.2	60.0	0018767
24.0	0012727	0017579	7333073	—	—	—	—	—	32.0	208.2	295.2	60.0	0018767
61/64	0012741	0017586	7333074	—	—	—	—	—	32.0	208.2	295.2	60.0	0018767
24.5	0038260	0039847	7333075	—	—	—	—	—	32.0	208.2	295.2	60.0	0018767
31/32	0012772	0017593	7333076	—	—	—	—	—	32.0	208.2	295.2	60.0	0018767
25.0	0012819	0017722	7333077	—	—	—	—	—	32.0	217.0	300.0	60.0	0018774
63/64	0012826	0017746	7333078	—	—	—	—	—	32.0	217.0	300.0	60.0	0018774
1	0012833	0017753	7333079	—	—	—	—	—	32.0	217.0	300.0	60.0	0018774
25.5	0038277	0039854	7333080	—	—	—	—	—	32.0	217.0	300.0	60.0	0018774
25.65	0032343	0032435	7333081	—	—	—	—	—	32.0	217.0	300.0	60.0	0018774
1.1/64	0012840	0018958	7333082	—	—	—	—	—	32.0	217.0	300.0	60.0	0018774
26.0	0013090	0018965	7333083	—	—	—	—	—	32.0	225.0	310.0	60.0	0018781
1.1/32	0013120	0018972	7333084	—	—	—	—	—	32.0	225.0	310.0	60.0	0018781

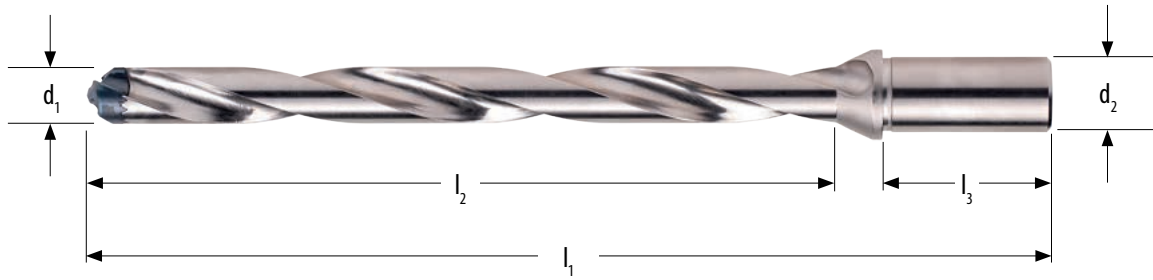


Hydra Head d <sub>1</sub> Ø	Hydra Head R950 EDP#	Hydra Head R960 EDP#	Hydra Head R970 EDP#	8xD Hydra Body - Metric Shank					8xD Hydra Body - Metric Shank				
				d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H858 EDP#	d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H858 EDP#
26.5	0038284	0039878	7333085	—	—	—	—	—	32.0	225.0	310.0	60.0	0018781
1.3/64	0013229	0018989	7333086	—	—	—	—	—	32.0	225.0	310.0	60.0	0018781
1.1/16	0013243	0018996	7333087	—	—	—	—	—	32.0	234.0	320.0	60.0	0018798
27.0	0013267	0019009	7333088	—	—	—	—	—	32.0	234.0	320.0	60.0	0018798
1.5/64	0013274	0019016	7333089	—	—	—	—	—	32.0	234.0	320.0	60.0	0018798
27.5	0038291	0039885	7333090	—	—	—	—	—	32.0	234.0	320.0	60.0	0018798
1.3/32	0013281	0019023	7333091	—	—	—	—	—	32.0	234.0	320.0	60.0	0018798
28.0	0013304	0019030	7333092	—	—	—	—	—	32.0	242.0	325.0	60.0	0018804
1.7/64	0013311	0019047	7333093	—	—	—	—	—	32.0	242.0	325.0	60.0	0018804
28.5	0038307	0039892	7333094	—	—	—	—	—	32.0	242.0	325.0	60.0	0018804
1.1/8	0013328	0019054	7333095	—	—	—	—	—	32.0	242.0	325.0	60.0	0018804
1.9/64	0013342	0019061	7333096	—	—	—	—	—	32.0	251.0	335.0	60.0	0018811
29.0	0013366	0019078	7333097	—	—	—	—	—	32.0	251.0	335.0	60.0	0018811
1.5/32	0013380	0019085	7333098	—	—	—	—	—	32.0	251.0	335.0	60.0	0018811
29.5	0038314	0039908	7333099	—	—	—	—	—	32.0	251.0	335.0	60.0	0018811
1.11/64	0013427	0019092	7333100	—	—	—	—	—	32.0	251.0	335.0	60.0	0018811
30.0	0013434	0019108	7333101	—	—	—	—	—	32.0	259.0	345.0	60.0	0018828
1.3/16	0013441	0019115	7333102	—	—	—	—	—	32.0	259.0	345.0	60.0	0018828
30.5	0013465	0019122	7333103	—	—	—	—	—	32.0	259.0	345.0	60.0	0018828
1.7/32	46104481	—	7333104	—	—	—	—	—	32.0	271.5	356.5	60.0	46111421
31.00	46104482	—	7333105	—	—	—	—	—	32.0	271.5	356.5	60.0	46111421
1.1/4	46104483	—	7333106	—	—	—	—	—	32.0	271.5	356.5	60.0	46111421
32.00	46104484	—	7333107	—	—	—	—	—	32.0	271.5	356.5	60.0	46111421
32.50	46104485	—	7333108	—	—	—	—	—	40.0	286.5	371.5	60.0	46111422
1.19/64	46104486	—	7333109	—	—	—	—	—	40.0	286.5	371.5	60.0	46111422
33.00	46104487	—	7333110	—	—	—	—	—	40.0	286.5	371.5	60.0	46111422
33.50	46104488	—	7333111	—	—	—	—	—	40.0	286.5	371.5	60.0	46111422
34.00	46104489	—	7333112	—	—	—	—	—	40.0	301.5	396.5	70.0	46111423
1.11/32	46104530	—	7333113	—	—	—	—	—	40.0	301.5	396.5	70.0	46111423
34.50	46104531	—	7333114	—	—	—	—	—	40.0	301.5	396.5	70.0	46111423
1.3/8	46104532	—	7333115	—	—	—	—	—	40.0	301.5	396.5	70.0	46111423
35.00	46104533	—	7333116	—	—	—	—	—	40.0	301.5	396.5	70.0	46111423
36.00	46104534	—	7333117	—	—	—	—	—	40.0	311.5	406.5	70.0	46111424
1.27/64	46104535	—	7333118	—	—	—	—	—	40.0	311.5	406.5	70.0	46111424
36.50	46104536	—	7333119	—	—	—	—	—	40.0	311.5	406.5	70.0	46111424
37.00	46104537	—	7333120	—	—	—	—	—	40.0	326.5	421.5	70.0	46111425
1.15/32	46104538	—	7333121	—	—	—	—	—	40.0	326.5	421.5	70.0	46111425
37.50	46104539	—	7333122	—	—	—	—	—	40.0	326.5	421.5	70.0	46111425
38.00	46104540	—	7333123	—	—	—	—	—	40.0	326.5	421.5	70.0	46111425
1.1/2	46104541	—	7333124	—	—	—	—	—	40.0	336.5	431.5	70.0	46111426
38.50	46104542	—	7333125	—	—	—	—	—	40.0	336.5	431.5	70.0	46111426
1.17/32	46104543	—	7333126	—	—	—	—	—	40.0	336.5	431.5	70.0	46111426
39.00	46104544	—	7333127	—	—	—	—	—	40.0	336.5	431.5	70.0	46111426
39.50	46104545	—	7333128	—	—	—	—	—	40.0	336.5	431.5	70.0	46111426
1.9/16	46104546	—	7333129	—	—	—	—	—	40.0	351.5	451.5	70.0	46111427
40.00	46104547	—	7333130	—	—	—	—	—	40.0	351.5	451.5	70.0	46111427
41.00	46104548	—	7333131	—	—	—	—	—	40.0	351.5	451.5	70.0	46111427
1.5/8	46104549	—	7333132	—	—	—	—	—	40.0	361.5	461.5	70.0	46111428
42.00	46104550	—	7333133	—	—	—	—	—	40.0	361.5	461.5	70.0	46111428

## 12xD Hydra Bodies

### H8512

Metric body, Cylindrical shank



**H851**  
Coolant  
Through



12XD

HSS

140°



**NEW**

Four (4) screws and one (1) screwdriver are included with a drill body  
Apply starting values for speed and feed with a correction factor of **0.80**

\* For more information on Hydra, see page 539

13.5 – 1.1/64

Hydra Head d <sub>1</sub> Ø	Hydra Head R950 EDP#	Hydra Head R960 EDP#	Hydra Head R970 EDP#	12xD Hydra Body - Fractional Shank					12xD Hydra Body - Metric Shank				
				d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H8512 EDP#	d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H8512 EDP#
13.5	0010952	0016022	7332990	—	—	—	—	—	16.00	168.0	236.0	48.0	7833364
13.6	0037966	0038499	7332991	—	—	—	—	—	16.00	168.0	236.0	48.0	7833364
13.7	0037973	0038529	7332992	—	—	—	—	—	16.00	168.0	236.0	48.0	7833364
13.8	0037980	0038543	7332993	—	—	—	—	—	16.00	168.0	236.0	48.0	7833364
35/64	0010969	0016039	7332994	—	—	—	—	—	16.00	168.0	236.0	48.0	7833364
14.0	0010983	0016046	7332995	—	—	—	—	—	16.00	168.0	236.0	48.0	7833364
14.1	0037997	0038567	7332996	—	—	—	—	—	16.00	168.0	236.0	48.0	7833364
14.2	0038000	0038574	7332997	—	—	—	—	—	16.00	168.0	236.0	48.0	7833364
9/16	0011003	0016053	7332998	—	—	—	—	—	16.00	168.0	236.0	48.0	7833364
14.5	0011010	0016060	7332999	—	—	—	—	—	16.00	168.0	236.0	48.0	7833364
14.6	0038017	0038581	7333000	—	—	—	—	—	20.00	180.0	250.3	50.0	7833365
37/64	0011140	0016077	7333001	—	—	—	—	—	20.00	180.0	250.3	50.0	7833365
14.7	0038024	0039601	7333002	—	—	—	—	—	20.00	180.0	250.3	50.0	7833365
14.8	0038031	0039618	7333003	—	—	—	—	—	20.00	180.0	250.3	50.0	7833365
15.0	0011201	0016084	7333004	—	—	—	—	—	20.00	180.0	250.3	50.0	7833365
19/32	0011218	0016091	7333005	—	—	—	—	—	20.00	180.0	250.3	50.0	7833365
15.1	0038048	0039625	7333006	—	—	—	—	—	20.00	180.0	250.3	50.0	7833365
15.2	0038055	0039632	7333007	—	—	—	—	—	20.00	180.0	250.3	50.0	7833365
15.24	0032268	0032350	7333008	—	—	—	—	—	20.00	180.0	250.3	50.0	7833365
39/64	0011232	0016107	7333009	—	—	—	—	—	20.00	180.0	250.3	50.0	7833365
15.5	0011362	0016114	7333010	—	—	—	—	—	20.00	180.0	250.3	50.0	7833365
15.6	0038062	0039649	7333011	—	—	—	—	—	20.00	192.0	262.6	50.0	7833366
15.7	0038079	0039656	7333012	—	—	—	—	—	20.00	192.0	262.6	50.0	7833366
5/8	0011379	0016121	7333013	—	—	—	—	—	20.00	192.0	262.6	50.0	7833366
16.0	0011386	0016138	7333014	—	—	—	—	—	20.00	192.0	262.6	50.0	7833366
16.08	0032275	0032367	7333015	—	—	—	—	—	20.00	192.0	262.6	50.0	7833366
16.1	0038086	0039663	7333016	—	—	—	—	—	20.00	192.0	262.6	50.0	7833366
16.2	0038093	0039670	7333017	—	—	—	—	—	20.00	192.0	262.6	50.0	7833366
41/64	0011393	0016145	7333018	—	—	—	—	—	20.00	192.0	262.6	50.0	7833366
16.3	0032282	0032374	7333019	—	—	—	—	—	20.00	192.0	262.6	50.0	7833366
16.5	0011409	0016152	7333020	—	—	—	—	—	20.00	192.0	262.6	50.0	7833366

Hydra Head d <sub>1</sub> Ø	Hydra Head R950 EDP#	Hydra Head R960 EDP#	Hydra Head R970 EDP#	12xD Hydra Body - Fractional Shank					12xD Hydra Body - Metric Shank				
				d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H8512 EDP#	d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	H8512 EDP#
16.6	0038109	0039687	7333021	—	—	—	—	—	20.00	204.0	275.0	50.0	7833367
21/32	0012161	0016169	7333022	—	—	—	—	—	20.00	204.0	275.0	50.0	7833367
16.7	0038116	0039694	7333023	—	—	—	—	—	20.00	204.0	275.0	50.0	7833367
17.0	0012185	0016176	7333024	—	—	—	—	—	20.00	204.0	275.0	50.0	7833367
43/64	0012215	0016183	7333025	—	—	—	—	—	20.00	204.0	275.0	50.0	7833367
17.1	0038123	0039700	7333026	—	—	—	—	—	20.00	204.0	275.0	50.0	7833367
17.2	0038130	0039717	7333027	—	—	—	—	—	20.00	204.0	275.0	50.0	7833367
11/16	0012239	0016190	7333028	—	—	—	—	—	20.00	204.0	275.0	50.0	7833367
17.5	0012253	0016503	7333029	—	—	—	—	—	20.00	204.0	275.0	50.0	7833367
17.6	0032299	0032381	7333030	—	—	—	—	—	20.00	216.0	287.2	50.0	7833368
17.7	0038147	0039724	7333031	—	—	—	—	—	20.00	216.0	287.2	50.0	7833368
45/64	0012260	0016640	7333032	—	—	—	—	—	20.00	216.0	287.2	50.0	7833368
18.0	0012277	0016664	7333033	—	—	—	—	—	20.00	216.0	287.2	50.0	7833368
18.1	0038154	0039731	7333034	—	—	—	—	—	20.00	216.0	287.2	50.0	7833368
18.2	0038161	0039748	7333035	—	—	—	—	—	20.00	216.0	287.2	50.0	7833368
23/32	0012284	0016671	7333036	—	—	—	—	—	20.00	216.0	287.2	50.0	7833368
18.5	0012307	0016688	7333037	—	—	—	—	—	20.00	216.0	287.2	50.0	7833368
18.6	0038178	0039755	7333038	—	—	—	—	—	25.00	228.0	305.6	56.0	7833369
47/64	0012321	0016695	7333039	—	—	—	—	—	25.00	228.0	305.6	56.0	7833369
18.7	0038185	0039762	7333040	—	—	—	—	—	25.00	228.0	305.6	56.0	7833369
18.9	0038192	0039779	7333041	—	—	—	—	—	25.00	228.0	305.6	56.0	7833369
19.0	0012338	0016817	7333042	—	—	—	—	—	25.00	228.0	305.6	56.0	7833369
3/4	0012345	0016879	7333043	—	—	—	—	—	25.00	228.0	305.6	56.0	7833369
19.1	0038208	0039786	7333044	—	—	—	—	—	25.00	228.0	305.6	56.0	7833369
19.2	0038215	0039793	7333045	—	—	—	—	—	25.00	228.0	305.6	56.0	7833369
19.25	0032305	0032398	7333046	—	—	—	—	—	25.00	228.0	305.6	56.0	7833369
19.3	0032312	0032404	7333047	—	—	—	—	—	25.00	228.0	305.6	56.0	7833369
19.35	0032329	0032411	7333048	—	—	—	—	—	25.00	228.0	305.6	56.0	7833369
49/64	0012376	0016886	7333049	—	—	—	—	—	25.00	228.0	305.6	56.0	7833369
19.5	0012383	0016947	7333050	—	—	—	—	—	25.00	228.0	305.6	56.0	7833369
19.6	0038222	0039809	7333051	—	—	—	—	—	25.00	240.0	317.8	56.0	7833370
19.7	0038239	0039816	7333052	—	—	—	—	—	25.00	240.0	317.8	56.0	7833370
25/32	0012406	0016954	7333053	—	—	—	—	—	25.00	240.0	317.8	56.0	7833370
20.0	0012413	0017111	7333054	—	—	—	—	—	25.00	240.0	317.8	56.0	7833370
51/64	0012437	0017128	7333055	—	—	—	—	—	25.00	240.0	317.8	56.0	7833370
20.5	0012451	0017159	7333056	—	—	—	—	—	25.00	240.0	317.8	56.0	7833370
13/16	0012468	0017197	7333057	—	—	—	—	—	25.00	252.0	330.1	56.0	7833371
21.0	0012475	0017166	7333058	—	—	—	—	—	25.00	252.0	330.1	56.0	7833371
53/64	0012536	0017203	7333059	—	—	—	—	—	25.00	252.0	330.1	56.0	7833371
27/32	0012550	0017227	7333060	—	—	—	—	—	25.00	252.0	330.1	56.0	7833371
21.5	0012574	0017234	7333061	—	—	—	—	—	25.00	252.0	330.1	56.0	7833371
55/64	0012604	0017241	7333062	—	—	—	—	—	25.00	264.0	343.0	56.0	7833372
22.0	0012628	0017258	7333063	—	—	—	—	—	25.00	264.0	343.0	56.0	7833372
7/8	0012635	0017371	7333064	—	—	—	—	—	25.00	264.0	343.0	56.0	7833372
22.5	0032336	0032428	7333065	—	—	—	—	—	25.00	264.0	343.0	56.0	7833372
57/64	0012642	0017401	7333066	—	—	—	—	—	25.00	264.0	343.0	56.0	7833372
22.7	0038246	0039823	7333067	—	—	—	—	—	25.00	264.0	343.0	56.0	7833372
23.0	0012666	0017425	7333068	—	—	—	—	—	25.00	276.0	354.8	56.0	7833373
29/32	0012673	0017432	7333069	—	—	—	—	—	25.00	276.0	354.8	56.0	7833373
59/64	0012680	0017456	7333070	—	—	—	—	—	25.00	276.0	354.8	56.0	7833373
23.5	0038253	0039830	7333071	—	—	—	—	—	25.00	276.0	354.8	56.0	7833373
15/16	0012703	0017562	7333072	—	—	—	—	—	32.00	288.0	371.7	60.0	7833374
24.0	0012727	0017579	7333073	—	—	—	—	—	32.00	288.0	371.7	60.0	7833374
61/64	0012741	0017586	7333074	—	—	—	—	—	32.00	288.0	371.7	60.0	7833374
24.5	0038260	0039847	7333075	—	—	—	—	—	32.00	288.0	371.7	60.0	7833374
31/32	0012772	0017593	7333076	—	—	—	—	—	32.00	288.0	371.7	60.0	7833374
25.0	0012819	0017722	7333077	—	—	—	—	—	32.00	300.0	383.8	60.0	7833375
63/64	0012826	0017746	7333078	—	—	—	—	—	32.00	300.0	383.8	60.0	7833375
1	0012833	0017753	7333079	—	—	—	—	—	32.00	300.0	383.8	60.0	7833375
25.5	0038277	0039854	7333080	—	—	—	—	—	32.00	300.0	383.8	60.0	7833375
25.65	0032343	0032435	7333081	—	—	—	—	—	32.00	300.0	383.8	60.0	7833375
1.1/64	0012840	0018958	7333082	—	—	—	—	—	32.00	300.0	383.8	60.0	7833375

# HYDRA DRILL ACCESSORIES



## Screws & Screw Driver

### H860

Set of 2 Hydra Screws

### H861

Hydra Drill Screw Driver



NOTE: Four (4) screws and one (1) screwdriver are included with a drill body



\* For more information on Hydra, see page 539

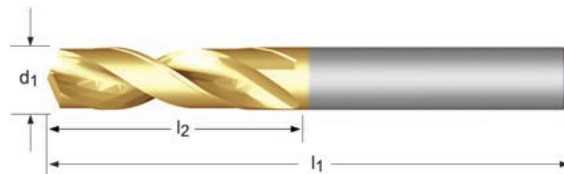
H860	H861	For Hydra Head Range	Pack Qty	H860	H861
H860N1	H861N1	15/32 - 15.5	1	0018835	0018897
H860N2	H861N2	15.6 - 18.5	1	0018842	0018903
H860N3	H861N3	18.6 - 21.5	1	0018859	0018910
H860N4	H861N3	55/64 - 31/32	1	0018866	0018910
H860N5	H861N4	25.0 - 1.3/32	1	0018873	0018927
H860N6	H861N5	28.0 - 33.5	1	0018880	0018934
H860N7	H861N6	34.0 - 42.0	1	46111949	46260354

## Multi-Application, Screw Machine Length, Parallel Shank

### R520

- 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 2.1 3.1 3.2 3.3 3.4 4.1 4.2  
4.3 5.1 7.1 7.2 7.3 7.4 8.1 8.2

Heavy-Duty design. Self centering Split Point for easier penetration. TiN coating increases wear resistance and improves tool life.



# CDX

**R520**

DIN  
**6539**

**2.5XD**

**HM**

**130°**

3.00 - 16.50

$d_1$ Øh <sub>7</sub> Inch	$d_1$ Øh <sub>7</sub> mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	<b>R520</b>
	3.00	0.1181	16	46	1	0116067
	3.10	0.1220	18	49	1	0116074
1/8	3.18	0.1250	18	49	1	0210666
	3.20	0.1260	18	49	1	0116081
	3.30	0.1299	18	49	1	0116098
	3.40	0.1339	20	52	1	0116104
	3.50	0.1378	20	52	1	0116111
	3.60	0.1417	20	52	1	0116128
	3.70	0.1457	20	52	1	0116135
	3.80	0.1496	22	55	1	0116142
	3.90	0.1535	22	55	1	0116159
	4.00	0.1575	22	55	1	0116166
	4.10	0.1614	22	55	1	0116173
	4.20	0.1654	22	55	1	0116180
	4.30	0.1693	24	58	1	0116197
	4.40	0.1732	24	58	1	0116203
	4.50	0.1772	24	58	1	0116210
	4.60	0.1811	24	58	1	0116227
	4.70	0.1850	24	58	1	0116234
	4.80	0.1890	26	62	1	0116241
	4.90	0.1929	26	62	1	0116258
	5.00	0.1969	26	62	1	0116265
	5.10	0.2008	26	62	1	0116272
	5.20	0.2047	26	62	1	0116289
	5.30	0.2087	26	62	1	0116296
	5.40	0.2126	28	66	1	0116302
	5.50	0.2165	28	66	1	0116319
	5.60	0.2205	28	66	1	0116326
	5.70	0.2244	28	66	1	0116333
	5.80	0.2283	28	66	1	0116340
	5.90	0.2323	28	66	1	0116357
	6.00	0.2362	28	66	1	0116364
	6.10	0.2402	31	70	1	0116371

# CDX SOLID CARBIDE DRILL



$d_1$ Øh <sub>7</sub> Inch	$d_1$ Øh <sub>7</sub> mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	R520
	6.20	0.2441	31	70	1	0116388
	6.30	0.2480	31	70	1	0116395
1/4	6.35	0.2500	31	70	1	0210741
	6.40	0.2520	31	70	1	0116401
	6.50	0.2559	31	70	1	0116418
	6.60	0.2598	31	70	1	0346402
	6.70	0.2638	31	70	1	0346419
	6.80	0.2677	34	74	1	0116425
	6.90	0.2717	34	74	1	0116432
	7.00	0.2756	34	74	1	0116449
	7.10	0.2795	34	74	1	0346426
	7.20	0.2835	34	74	1	0346433
	7.30	0.2874	34	74	1	0116456
	7.40	0.2913	34	74	1	0116463
	7.50	0.2953	34	74	1	0116470
	7.60	0.2992	37	79	1	0346440
	7.70	0.3031	37	79	1	0346457
	7.80	0.3071	37	79	1	0116487
	7.90	0.3110	37	79	1	0346464
5/16	7.94	0.3125	37	79	1	0210789
	8.00	0.3150	37	79	1	0116494
	8.10	0.3189	37	79	1	0346471
	8.20	0.3228	37	79	1	0346488
	8.30	0.3268	37	79	1	0346495
	8.40	0.3307	37	79	1	0346501
	8.50	0.3346	37	79	1	0116500
	8.60	0.3386	40	84	1	0346518
	8.70	0.3425	40	84	1	0216866
	8.80	0.3465	40	84	1	0346525
	8.90	0.3504	40	84	1	0346532
	9.00	0.3543	40	84	1	0116517
	9.10	0.3583	40	84	1	0346549
	9.20	0.3622	40	84	1	0116524
	9.30	0.3661	40	84	1	0116531
	9.40	0.3701	40	84	1	0216873
	9.50	0.3740	40	84	1	0116548
3/8	9.52	0.3750	43	89	1	0210826
	9.60	0.3780	43	89	1	0346556
	9.70	0.3819	43	89	1	0346563
	9.80	0.3858	43	89	1	0346570
	9.90	0.3898	43	89	1	0346587
	10.00	0.3937	43	89	1	0115923
	10.10	0.3976	43	89	1	0346778
	10.20	0.4016	43	89	1	0115930
	10.30	0.4055	43	89	1	0216880
	10.40	0.4094	43	89	1	0115947
	10.50	0.4134	43	89	1	0115954
	11.00	0.4331	47	95	1	0115961
7/16	11.11	0.4375	47	95	1	0210864
	11.20	0.4409	47	95	1	0216897
	11.50	0.4528	47	95	1	0115978
	12.00	0.4724	51	102	1	0115985
	12.50	0.4921	51	102	1	0115992
1/2	12.70	0.5000	51	102	1	0210901
	13.00	0.5118	51	102	1	0116005
	13.50	0.5315	54	107	1	0216903
	14.00	0.5512	54	107	1	0116012
	14.20	0.5591	56	111	1	0216910
	14.25	0.5610	56	111	1	0216927
	14.50	0.5709	56	111	1	0116029
	15.00	0.5906	56	111	1	0116036
	15.10	0.5945	58	115	1	0216934
5/8	15.88	0.6250	58	115	1	0210925
	16.00	0.6299	58	115	1	0116043
	16.50	0.6496	60	119	1	0116050

## Multi-Application, Short Length, Reinforced Shank

### R458

1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 2.1 2.2 2.3 2.4 3.1 3.2 3.3  
3.4 4.1 4.2 4.3 6.1 6.2 6.3 6.4 7.1 7.2 7.3 7.4

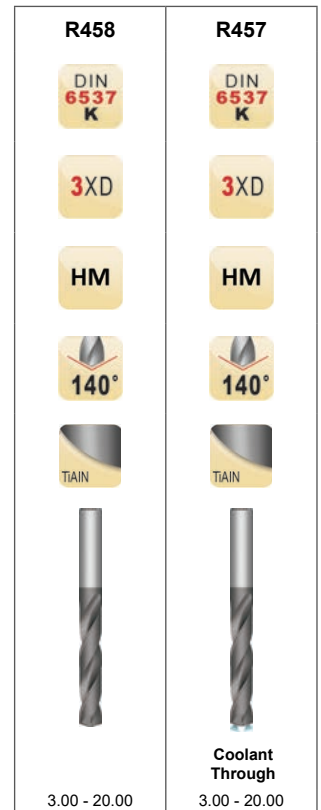
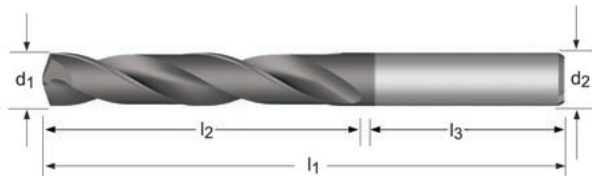
Self centering 4-facet split point and CTW flute construction for enhanced penetration rate. TiAlN coating increases wear resistance and improves tool life at high RPM.

### R457

1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 2.1 2.2 2.3 3.1 3.2 3.3 3.4  
4.1 4.2 4.3 6.1 6.2 6.3 6.4 7.1 7.2 7.3 7.4

Coolant through clears chips away from the cutting edge. Self centering 4-facet split point for enhanced penetration rates. TiAlN coating increases surface hardness and improves tool life at high RPM.

### High productivity in a wide range of materials



d <sub>1</sub> Ø "/Nr.	d <sub>1</sub> Ø <sub>m7</sub> mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	d <sub>2</sub> Ø <sub>h6</sub> mm	Pack Qty	R458	R457
	3.00	0.1181	20	62	36	6	1	0615324	0614884
	3.10	0.1220	20	62	36	6	1	0626443	0626115
1/8	3.18	0.1252	20	62	36	6	1	0624845	0624432
	3.20	0.1260	20	62	36	6	1	0626450	0626122
30	3.26	0.1283	20	62	36	6	1	0042267	0041833
	3.30	0.1299	20	62	36	6	1	0615331	0614891
	3.40	0.1339	20	62	36	6	1	0615348	0614907
29	3.45	0.1358	20	62	36	6	1	0042274	0041840
	3.50	0.1378	20	62	36	6	1	0615355	0614914
28	3.57	0.1406	20	62	36	6	1	0042281	0041857
9/64	3.57	0.1406	20	62	36	6	1	0625224	0624814
	3.60	0.1417	20	62	36	6	1	0626467	0626139
27	3.66	0.1441	20	62	36	6	1	0042298	0041864
	3.70	0.1457	20	62	36	6	1	0626474	0626146
26	3.73	0.1469	24	66	36	6	1	0626481	0041871
25	3.80	0.1496	24	66	36	6	1	0626498	0041888
24	3.86	0.1520	24	66	36	6	1	0042328	0041895
	3.90	0.1535	24	66	36	6	1	0626504	0626160
23	3.91	0.1539	24	66	36	6	1	0042335	0041901
5/32	3.97	0.1563	24	66	36	6	1	0625163	0624753
22	3.99	0.1571	24	66	36	6	1	0042342	0041918
	4.00	0.1575	24	66	36	6	1	0615362	0614921
21	4.04	0.1591	24	66	36	6	1	0042359	0041925
	4.05	0.1594	24	66	36	6	1	—	0626177
20	4.09	0.1610	24	66	36	6	1	0042366	0041932
	4.10	0.1614	24	66	36	6	1	0626511	0626184
	4.20	0.1654	24	66	36	6	1	0615379	0614938
19	4.22	0.1661	24	66	36	6	1	0042373	0041949
	4.30	0.1693	24	66	36	6	1	0615386	0614945
18	4.31	0.1697	24	66	36	6	1	0042380	0041956
11/64	4.37	0.1720	24	66	36	6	1	0624876	0624463
17	4.39	0.1728	24	66	36	6	1	0042397	0041963
	4.40	0.1732	24	66	36	6	1	0135013	0134832

# FORCE X SOLID CARBIDE DRILL



d <sub>1</sub> Ø "/Nr.	d <sub>1</sub> Øm <sub>7</sub> mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	d <sub>2</sub> Øh <sub>6</sub> mm	Pack Qty	R458	R457
16	4.50	0.1772	24	66	36	6	1	0615393	0041970
15	4.57	0.1799	24	66	36	6	1	0042410	0041987
	4.60	0.1811	24	66	36	6	1	0626528	0626191
14	4.62	0.1819	24	66	36	6	1	0042427	0041994
	4.70	0.1850	24	66	36	6	1	0135020	0626207
13	4.70	0.1850	24	66	36	6	1	0042434	0042007
3/16	4.76	0.1875	28	66	36	6	1	0625033	0624623
12	4.80	0.1890	28	66	36	6	1	0135037	0042014
11	4.85	0.1909	28	66	36	6	1	0042458	0042021
	4.90	0.1929	28	66	36	6	1	0135044	0622070
10	4.92	0.1937	28	66	36	6	1	0042465	0042038
9	4.98	0.1961	28	66	36	6	1	0042472	0042045
	5.00	0.1969	28	66	36	6	1	0615409	0614969
	5.05	0.1988	28	66	36	6	1	—	0626214
8	5.06	0.1992	28	66	36	6	1	0042489	0042052
	5.10	0.2008	28	66	36	6	1	0615416	0614976
7	5.11	0.2012	28	66	36	6	1	0042496	0042069
13/64	5.16	0.2031	28	66	36	6	1	0624890	0624487
6	5.18	0.2039	28	66	36	6	1	0042502	0042076
	5.20	0.2047	28	66	36	6	1	0135051	0134856
5	5.22	0.2055	28	66	36	6	1	0042519	0042083
	5.30	0.2087	28	66	36	6	1	7361260	7361237
4	5.31	0.2091	28	66	36	6	1	0042526	0042090
	5.40	0.2126	28	66	36	6	1	7361261	7361238
3	5.41	0.2130	28	66	36	6	1	0042533	0042106
	5.50	0.2165	28	66	36	6	1	0615423	0614983
7/32	5.56	0.2189	28	66	36	6	1	0625194	0624784
	5.60	0.2205	28	66	36	6	1	0626535	0626221
2	5.61	0.2209	28	66	36	6	1	0042540	0042113
	5.70	0.2244	28	66	36	6	1	0626542	0626238
1	5.79	0.2280	28	66	36	6	1	0042557	0042120
	5.80	0.2283	28	66	36	6	1	0626559	0626245
	5.90	0.2323	28	66	36	6	1	7361262	7361239
A	5.94	0.2339	28	66	36	6	1	0042564	0042137
15/64	5.95	0.2343	28	66	36	6	1	0624913	0624500
	6.00	0.2362	28	66	36	6	1	0615430	0614990
B	6.03	0.2374	34	79	36	8	1	7361263	7361240
	6.05	0.2382	34	79	36	8	1	—	0626252
	6.10	0.2402	34	79	36	8	1	0626566	0626269
C	6.15	0.2421	34	79	36	8	1	7361264	7361241
	6.20	0.2441	34	79	36	8	1	0135068	0134863
D	6.25	0.2461	34	79	36	8	1	0042571	0042144
	6.30	0.2480	34	79	36	8	1	0626573	0626276
1/4	6.35	0.2500	34	79	36	8	1	0624838	0624425
E	6.35	0.2500	34	79	36	8	1	7361265	7361242
	6.40	0.2520	34	79	36	8	1	0135075	0134870
	6.50	0.2559	34	79	36	8	1	0615447	0615003
F	6.53	0.2571	34	79	36	8	1	7361266	7361243
	6.60	0.2598	34	79	36	8	1	0626580	0626283
G	6.63	0.2610	34	79	36	8	1	7361267	7361244
	6.70	0.2638	34	79	36	8	1	0135082	0134887
17/64	6.75	0.2657	34	79	36	8	1	0624937	0624524
H	6.76	0.2661	34	79	36	8	1	0042588	0042151
	6.80	0.2677	34	79	36	8	1	0615454	0615010
	6.90	0.2717	34	79	36	8	1	0615461	0615027
I	6.91	0.2720	34	79	36	8	1	7361268	7361245
	7.00	0.2756	34	79	36	8	1	0615478	0615034
J	7.04	0.2772	41	79	36	8	1	7361269	7361246
	7.10	0.2795	41	79	36	8	1	0626597	0626290
K	7.14	0.2811	41	79	36	8	1	7361270	7361247
9/32	7.14	0.2811	41	79	36	8	1	0625217	0624807
	7.20	0.2835	41	79	36	8	1	7361271	7361248
	7.30	0.2874	41	79	36	8	1	0626603	0626306
L	7.37	0.2902	41	79	36	8	1	0042595	0042168
	7.40	0.2913	41	79	36	8	1	0615485	0615041
M	7.49	0.2949	41	79	36	8	1	0042601	0042175



d <sub>1</sub> Ø "/Nr.	d <sub>1</sub> Øm <sub>7</sub> mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	d <sub>2</sub> Øh <sub>6</sub> mm	Pack Qty	R458	R457
	7.50	0.2953	41	79	36	8	1	0615492	0615058
19/64	7.54	0.2969	41	79	36	8	1	0624951	0624548
	7.60	0.2992	41	79	36	8	1	0626610	0626313
N	7.67	0.3020	41	79	36	8	1	0042618	0042182
	7.70	0.3031	41	79	36	8	1	0135099	0134894
	7.80	0.3071	41	79	36	8	1	0626627	0626320
	7.90	0.3110	41	79	36	8	1	0135105	0134900
5/16	7.94	0.3126	41	79	36	8	1	0625156	0624746
	8.00	0.3150	41	79	36	8	1	0615508	0615065
O	8.03	0.3161	47	89	40	10	1	0042625	0042199
	8.05	0.3169	47	89	40	10	1	—	0626337
	8.10	0.3189	47	89	40	10	1	0626634	0626689
	8.20	0.3228	47	89	40	10	1	0135112	0134917
P	8.20	0.3228	47	89	40	10	1	7361272	7361249
	8.30	0.3268	47	89	40	10	1	7361273	7361250
21/64	8.33	0.3280	47	89	40	10	1	0624975	0624562
	8.40	0.3307	47	89	40	10	1	0135129	0134924
Q	8.43	0.3319	47	89	40	10	1	0042632	0042205
	8.50	0.3346	47	89	40	10	1	0615515	0615072
	8.60	0.3386	47	89	40	10	1	0615522	0615089
R	8.61	0.3390	47	89	40	10	1	7361274	7361251
	8.70	0.3425	47	89	40	10	1	0615539	0615096
11/32	8.73	0.3437	47	89	40	10	1	0624869	0624456
	8.80	0.3465	47	89	40	10	1	0626641	0626344
S	8.84	0.3480	47	89	40	10	1	7361275	7361252
	8.90	0.3504	47	89	40	10	1	7361276	0134931
	9.00	0.3543	47	89	40	10	1	0615546	0615102
T	9.09	0.3579	47	89	40	10	1	0042649	0042212
	9.10	0.3583	47	89	40	10	1	0626658	0626351
23/64	9.13	0.3594	47	89	40	10	1	0624999	0624586
	9.20	0.3622	47	89	40	10	1	7361277	7361253
	9.30	0.3661	47	89	40	10	1	0615553	0615119
U	9.35	0.3681	47	89	40	10	1	0042656	0042229
	9.40	0.3701	47	89	40	10	1	0135136	0134948
	9.50	0.3740	47	89	40	10	1	0615560	0615126
3/8	9.52	0.3748	47	89	40	10	1	0625057	0624647
V	9.58	0.3772	47	89	40	10	1	7361278	7361254
	9.60	0.3780	47	89	40	10	1	0626665	0626368
	9.70	0.3819	47	89	40	10	1	0135143	0629062
	9.80	0.3858	47	89	40	10	1	0626672	0626375
W	9.80	0.3858	47	89	40	10	1	7361279	7361255
	9.90	0.3898	47	89	40	10	1	0135150	0134955
25/64	9.92	0.3906	47	89	40	10	1	0625002	0624593
	10.00	0.3937	47	89	40	10	1	0615133	0614693
	10.05	0.3957	55	102	45	12	1	—	0625958
X	10.08	0.3969	55	102	45	12	1	0042663	0042236
	10.10	0.3976	55	102	45	12	1	0626382	0625965
	10.20	0.4016	55	102	45	12	1	0615140	0614709
Y	10.26	0.4039	55	102	45	12	1	0042670	0042243
	10.30	0.4055	55	102	45	12	1	0615157	0614716
13/32	10.32	0.4063	55	102	45	12	1	0624883	0624470
	10.40	0.4094	55	102	45	12	1	0615164	0614723
Z	10.49	0.4130	55	102	45	12	1	0042687	0042250
	10.50	0.4134	55	102	45	12	1	0615171	0614730
	10.60	0.4173	55	102	45	12	1	0626399	0625972
	10.70	0.4213	55	102	45	12	1	7361280	—
27/64	10.72	0.4220	55	102	45	12	1	0625019	0624609
	10.80	0.4252	55	102	45	12	1	0042694	7361256
	10.90	0.4291	55	102	45	12	1	7361281	—
	11.00	0.4331	55	102	45	12	1	0615188	0614747
	11.10	0.4370	55	102	45	12	1	7361282	—
7/16	11.11	0.4374	55	102	45	12	1	0625187	0624777
	11.20	0.4409	55	102	45	12	1	0615195	0614754
	11.30	0.4449	55	102	45	12	1	7361283	7361257

# FORCE X SOLID CARBIDE DRILL



$d_1$ $\emptyset$ "Nr.	$d_1$ $\emptyset m_7$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	$l_3$ mm	$d_2$ $\emptyset h_6$ mm	Pack Qty	R458	R457
	11.40	0.4488	55	102	45	12	1	0135167	0134962
	11.50	0.4528	55	102	45	12	1	0615201	0614761
29/64	11.51	0.4531	55	102	45	12	1	0625026	0624616
	11.60	0.4567	55	102	45	12	1	0135174	0134979
	11.70	0.4606	55	102	45	12	1	7361284	—
	11.80	0.4646	55	102	45	12	1	0626405	0625989
	11.90	0.4685	55	102	45	12	1	7361285	—
15/32	11.91	0.4689	55	102	45	12	1	0624906	0624494
	12.00	0.4724	55	102	45	12	1	0615218	0614778
	12.05	0.4744	60	107	45	14	1	—	0625996
	12.10	0.4764	60	107	45	14	1	0626412	0626009
	12.20	0.4803	60	107	45	14	1	0615225	0614785
31/64	12.30	0.4843	60	107	45	14	1	0625064	0624654
	12.50	0.4921	60	107	45	14	1	0615232	0614792
	12.70	0.5000	60	107	45	14	1	0626429	0626016
1/2	12.70	0.5000	60	107	45	14	1	0624821	0624418
	12.80	0.5039	60	107	45	14	1	0135181	0134986
	13.00	0.5118	60	107	45	14	1	0615249	0614808
33/64	13.10	0.5157	60	107	45	14	1	0625071	0624661
	13.30	0.5236	60	107	45	14	1	7361286	7361258
17/32	13.49	0.5311	60	107	45	14	1	0624920	0624517
	13.50	0.5315	60	107	45	14	1	0615256	0614815
	13.80	0.5433	60	107	45	14	1	0135198	0134993
35/64	13.89	0.5469	60	107	45	14	1	0625088	0624678
	14.00	0.5512	60	107	45	14	1	0615263	0614822
	14.25	0.5610	65	115	48	16	1	0615270	0614839
9/16	14.29	0.5626	65	115	48	16	1	0625200	0624791
	14.50	0.5709	65	115	48	16	1	0615287	0614846
37/64	14.68	0.5780	65	115	48	16	1	0625095	0624685
	14.80	0.5827	65	115	48	16	1	0622032	0135006
	15.00	0.5906	65	115	48	16	1	0615294	0614853
19/32	15.08	0.5937	65	115	48	16	1	0624944	0624531
	15.10	0.5945	65	115	48	16	1	0626436	0626023
	15.30	0.6024	65	115	48	16	1	7361287	7361259
39/64	15.48	0.6094	65	115	48	16	1	0625101	0624692
	15.50	0.6102	65	115	48	16	1	0615300	0614860
	15.80	0.6220	65	115	48	16	1	0135204	0622049
5/8	15.88	0.6252	65	115	48	16	1	0625170	0624760
	16.00	0.6299	65	115	48	16	1	0615317	0614877
41/64	16.27	0.6406	73	123	48	18	1	0625118	0624708
	16.50	0.6496	73	123	48	18	1	0135211	0626030
21/32	16.67	0.6563	73	123	48	18	1	0624968	0624555
	17.00	0.6693	73	123	48	18	1	0135228	0626047
43/64	17.07	0.6720	73	123	48	18	1	0625125	0624715
11/16	17.46	0.6874	73	123	48	18	1	0624852	0624449
	17.50	0.6890	73	123	48	18	1	0135235	0626054
	17.80	0.7008	73	123	48	18	1	0135273	—
45/64	17.86	0.7031	73	123	48	18	1	0625132	0624722
	18.00	0.7087	73	123	48	18	1	0135280	0626061
23/32	18.26	0.7189	79	131	50	20	1	0624982	0624579
	18.50	0.7283	79	131	50	20	1	0135297	0626078
47/64	18.65	0.7343	79	131	50	20	1	0625149	0624739
	18.80	0.7402	79	131	50	20	1	—	0622056
	19.00	0.7480	79	131	50	20	1	0135327	0626085
3/4	19.05	0.7500	79	131	50	20	1	0625040	0624630
	19.50	0.7677	79	131	50	20	1	0135334	0626092
	19.80	0.7795	79	131	50	20	1	0135341	0622063
	20.00	0.7874	79	131	50	20	1	0135358	0626108

## Multi-Application, Short Length, Reinforced Shank

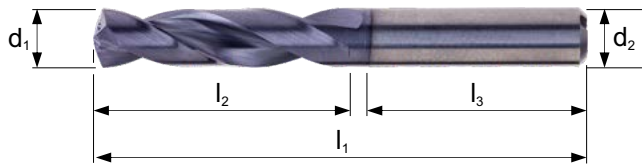
### R467

2.1 2.2 2.3 2.4 4.1 4.2 4.3

5.1 5.2 5.3

Self-centering 4-facet split point and CTW flute construction for enhanced penetration rate specifically designed for Stainless Steel (ISO-M) materials. TiAlN coating increases wear resistance and improves tool life. Coolant through combined with an advanced point geometry prevents premature wear of the cutting edges. Length designed for 3 x Diameter drilling depths.

### High productivity in a wide range of materials



**R467**

**DIN 6537 K**

**3XD**

**HM**

**140°**

**TiAlN**



**Coolant Through**  
3.00 - 16.00

$d_1$ Ø " / Nr.	$d_1$ Ø <sub>m7</sub> mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	$l_3$ mm	$d_2$ Ø <sub>h6</sub> mm	Pack Qty	R467
	3.00	0.1181	20	62	36	6	1	7625100
	3.10	0.1220	20	62	36	6	1	7625101
1/8	3.18	0.1250	20	62	36	6	1	7625102
	3.20	0.1260	20	62	36	6	1	7625103
	3.30	0.1299	20	62	36	6	1	7625104
	3.40	0.1339	20	62	36	6	1	7625105
29	3.45	0.1360	20	62	36	6	1	7625106
	3.50	0.1378	20	62	36	6	1	7625107
9/64	3.57	0.1406	20	62	36	6	1	7625108
	3.60	0.1417	20	62	36	6	1	7625109
	3.70	0.1457	20	62	36	6	1	7625110
	3.80	0.1496	24	66	36	6	1	7625111
	3.90	0.1535	24	66	36	6	1	7625112
5/32	3.97	0.1563	24	66	36	6	1	7625113
	4.00	0.1575	24	66	36	6	1	7625114
	4.05	0.1594	24	66	36	6	1	7625115
	4.10	0.1614	24	66	36	6	1	7625116
	4.20	0.1654	24	66	36	6	1	7625117
	4.30	0.1693	24	66	36	6	1	7625118
11/64	4.37	0.1719	24	66	36	6	1	7625119
	4.40	0.1732	24	66	36	6	1	7625120
	4.50	0.1772	24	66	36	6	1	7625121
	4.60	0.1811	24	66	36	6	1	7625122
	4.70	0.1850	24	66	36	6	1	7625123
3/16	4.76	0.1875	28	66	36	6	1	7625124
	4.80	0.1890	28	66	36	6	1	7625125
	4.90	0.1929	28	66	36	6	1	7625126
	5.00	0.1969	28	66	36	6	1	7625127
	5.05	0.1988	28	66	36	6	1	7625128
	5.10	0.2008	28	66	36	6	1	7625129
7	5.11	0.2010	28	66	36	6	1	7625130
13/64	5.16	0.2031	28	66	36	6	1	7625131
	5.20	0.2047	28	66	36	6	1	7625132

# FORCE M SOLID CARBIDE DRILL



$d_1$ Ø "/Nr.	$d_1$ Ø <sub>m7</sub> mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	$l_3$ mm	$d_2$ Ø <sub>h6</sub> mm	Pack Qty	R467
5	5.22	0.2055	28	66	36	6	1	7625133
	5.30	0.2087	28	66	36	6	1	7625134
	5.40	0.2126	28	66	36	6	1	7625135
	5.50	0.2165	28	66	36	6	1	7625136
7/32	5.56	0.2188	28	66	36	6	1	7625137
	5.60	0.2205	28	66	36	6	1	7625138
	5.70	0.2244	28	66	36	6	1	7625139
	5.80	0.2283	28	66	36	6	1	7625140
15/64	5.90	0.2323	28	66	36	6	1	7625141
	5.95	0.2344	28	66	36	6	1	7625142
	6.00	0.2362	28	66	36	6	1	7625143
	6.05	0.2382	34	79	36	8	1	7625144
	6.10	0.2402	34	79	36	8	1	7625145
	6.20	0.2441	34	79	36	8	1	7625146
1/4	6.30	0.2480	34	79	36	8	1	7625147
	6.35	0.2500	34	79	36	8	1	7625148
	6.40	0.2520	34	79	36	8	1	7625149
	6.50	0.2559	34	79	36	8	1	7625150
	6.60	0.2598	34	79	36	8	1	7625151
17/64	6.70	0.2638	34	79	36	8	1	7625152
	6.75	0.2656	34	79	36	8	1	7625153
	6.80	0.2677	34	79	36	8	1	7625154
	6.90	0.2717	34	79	36	8	1	7625155
	7.00	0.2756	34	79	36	8	1	7625156
9/32	7.10	0.2795	41	79	36	8	1	7625157
	7.14	0.2813	41	79	36	8	1	7625158
	7.20	0.2835	41	79	36	8	1	7625159
	7.30	0.2874	41	79	36	8	1	7625160
	7.40	0.2913	41	79	36	8	1	7625161
19/64	7.50	0.2953	41	79	36	8	1	7625162
	7.54	0.2969	41	79	36	8	1	7625163
	7.60	0.2992	41	79	36	8	1	7625164
	7.70	0.3031	41	79	36	8	1	7625165
	7.80	0.3071	41	79	36	8	1	7625166
5/16	7.90	0.3110	41	79	36	8	1	7625167
	7.94	0.3125	41	79	36	8	1	7625168
	8.00	0.3150	41	79	36	8	1	7625169
	8.05	0.3169	47	89	40	10	1	7625170
	8.10	0.3189	47	89	40	10	1	7625171
21/64	8.20	0.3228	47	89	40	10	1	7625172
	8.30	0.3268	47	89	40	10	1	7625173
	8.33	0.3281	47	89	40	10	1	7625174
	8.40	0.3307	47	89	40	10	1	7625175
	8.50	0.3346	47	89	40	10	1	7625176
11/32	8.60	0.3386	47	89	40	10	1	7625177
	8.70	0.3425	47	89	40	10	1	7625178
	8.73	0.3438	47	89	40	10	1	7625179
	8.80	0.3465	47	89	40	10	1	7625180
	8.90	0.3504	47	89	40	10	1	7625181
23/64	9.00	0.3543	47	89	40	10	1	7625182
	9.10	0.3583	47	89	40	10	1	7625183
	9.13	0.3594	47	89	40	10	1	7625184
	9.20	0.3622	47	89	40	10	1	7625185
	9.30	0.3661	47	89	40	10	1	7625186
3/8	9.40	0.3701	47	89	40	10	1	7625187
	9.50	0.3740	47	89	40	10	1	7625188
	9.53	0.3750	47	89	40	10	1	7625189
	9.60	0.3780	47	89	40	10	1	7625190
	9.70	0.3819	47	89	40	10	1	7625191
25/64	9.80	0.3858	47	89	40	10	1	7625192
	9.90	0.3898	47	89	40	10	1	7625193
	9.92	0.3906	47	89	40	10	1	7625194
	10.00	0.3937	47	89	40	10	1	7625195
	10.05	0.3957	55	102	45	12	1	7625196
10.10	0.3976	55	102	45	12	1	7625197	
	10.20	0.4016	55	102	45	12	1	7625198

$d_1$ Ø "/Nr.	$d_1$ Ø <sub>m7</sub> mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	$l_3$ mm	$d_2$ Ø <sub>h6</sub> mm	Pack Qty	R467
	10.30	0.4055	55	102	45	12	1	7625199
13/32	10.32	0.4063	55	102	45	12	1	7625200
	10.40	0.4094	55	102	45	12	1	7625201
	10.50	0.4134	55	102	45	12	1	7625202
	10.60	0.4173	55	102	45	12	1	7625203
27/64	10.72	0.4219	55	102	45	12	1	7625204
	10.80	0.4252	55	102	45	12	1	7625205
	10.90	0.4291	55	102	45	12	1	7625206
	11.00	0.4331	55	102	45	12	1	7625207
7/16	11.11	0.4375	55	102	45	12	1	7625208
	11.20	0.4409	55	102	45	12	1	7625209
	11.30	0.4449	55	102	45	12	1	7625210
	11.40	0.4488	55	102	45	12	1	7625211
	11.50	0.4528	55	102	45	12	1	7625212
29/64	11.51	0.4531	55	102	45	12	1	7625213
	11.60	0.4567	55	102	45	12	1	7625214
	11.80	0.4646	55	102	45	12	1	7625215
15/32	11.91	0.4688	55	102	45	12	1	7625216
	12.00	0.4724	55	102	45	12	1	7625217
	12.05	0.4744	60	107	45	14	1	7625218
	12.10	0.4764	60	107	45	14	1	7625219
	12.20	0.4803	60	107	45	14	1	7625220
31/64	12.30	0.4844	60	107	45	14	1	7625221
	12.50	0.4921	60	107	45	14	1	7625222
1/2	12.70	0.5000	60	107	45	14	1	7625223
	12.70	0.5000	60	107	45	14	1	7625224
	12.80	0.5039	60	107	45	14	1	7625225
	13.00	0.5118	60	107	45	14	1	7625226
33/64	13.10	0.5156	60	107	45	14	1	7625227
	13.30	0.5236	60	107	45	14	1	7625228
17/32	13.49	0.5313	60	107	45	14	1	7625229
	13.50	0.5315	60	107	45	14	1	7625230
	13.80	0.5433	60	107	45	14	1	7625231
35/64	13.89	0.5469	60	107	45	14	1	7625232
	14.00	0.5512	60	107	45	14	1	7625233
	14.25	0.5610	65	115	48	16	1	7625234
9/16	14.29	0.5625	65	115	48	16	1	7625235
	14.50	0.5709	65	115	48	16	1	7625236
37/64	14.68	0.5781	65	115	48	16	1	7625237
	14.80	0.5827	65	115	48	16	1	7625238
	15.00	0.5906	65	115	48	16	1	7625239
19/32	15.08	0.5938	65	115	48	16	1	7625240
	15.10	0.5945	65	115	48	16	1	7625241
	15.30	0.6024	65	115	48	16	1	7625242
39/64	15.48	0.6094	65	115	48	16	1	7625243
	15.50	0.6102	65	115	48	16	1	7625244
	15.80	0.6220	65	115	48	16	1	7625245
5/8	15.88	0.6250	65	115	48	16	1	7625246
	16.00	0.6299	65	115	48	16	1	7625247

# CDX SOLID CARBIDE DRILL



## Multi-Application, Jobber Length, Parallel Shank

### R510

- 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 2.1 3.1 3.2 3.3 3.4 4.1 5.1  
7.1 7.2 7.3 7.4 8.1 8.2

Heavy-Duty design. Self centering Split Point for easier penetration.  
TiN coating increases wear resistance and improves tool life.

# CDX

R510

DIN  
338

4XD

HM

130°



3.00 - 14.25



$d_1$ Øh <sub>7</sub> Inch	$d_1$ Øh <sub>7</sub> mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	R510
	3.00	0.1181	33	61	1	0115657
1/8	3.18	0.1250	36	65	1	0380802
	3.20	0.1260	36	65	1	0148990
	3.30	0.1299	36	65	1	0115664
	3.40	0.1339	39	70	1	0115671
	3.50	0.1378	39	70	1	0115688
	3.70	0.1457	39	70	1	0216781
	3.90	0.1535	43	75	1	0345245
	4.00	0.1575	43	75	1	0115695
	4.10	0.1614	43	75	1	0115701
	4.20	0.1654	43	75	1	0115718
	4.30	0.1693	47	80	1	0115725
	4.50	0.1772	47	80	1	0115732
	4.60	0.1811	47	80	1	0216798
	4.70	0.1850	47	80	1	0216804
3/16	4.76	0.1875	52	86	1	0380949
	4.90	0.1929	52	86	1	0115749
	5.00	0.1969	52	86	1	0115756
	5.10	0.2008	52	86	1	0115763
	5.50	0.2165	57	93	1	0115770
	5.60	0.2205	57	93	1	0216811
	5.70	0.2244	57	93	1	0216828
	6.00	0.2362	57	93	1	0115787
1/4	6.35	0.2500	63	101	1	0381038
	6.50	0.2559	63	101	1	0115794
	6.60	0.2598	63	101	1	0345252
	6.80	0.2677	69	109	1	0115800
	6.90	0.2717	69	109	1	0115817
	7.00	0.2756	69	109	1	0115824
	7.30	0.2874	69	109	1	0115831
	7.40	0.2913	69	109	1	0115848
	7.50	0.2953	69	109	1	0115855
	7.80	0.3071	75	117	1	0345269

$d_1$ $\varnothing h_7$ Inch	$d_1$ $\varnothing h_7$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	R510
5/16	7.90	0.3110	75	117	1	0345276
	7.94	0.3125	75	117	1	0380963
	8.00	0.3150	75	117	1	0115862
	8.50	0.3346	75	117	1	0115879
	8.70	0.3425	81	125	1	0149003
	8.80	0.3465	81	125	1	0345283
	9.00	0.3543	81	125	1	0115886
	9.20	0.3622	81	125	1	0115893
	9.30	0.3661	81	125	1	0115909
	9.40	0.3701	81	125	1	0216835
3/8	9.50	0.3740	81	125	1	0115916
	9.52	0.3750	87	133	1	0381045
	9.90	0.3898	87	133	1	0345290
	10.00	0.3937	87	133	1	0115558
	10.20	0.4016	87	133	1	0115565
	10.30	0.4055	87	133	1	0216842
	10.40	0.4094	87	133	1	0115572
	10.50	0.4134	87	133	1	0115589
	10.80	0.4252	94	142	1	0345306
	11.00	0.4331	94	142	1	0115596
7/16	11.11	0.4375	94	142	1	0380987
	11.20	0.4409	94	142	1	0216859
	11.50	0.4528	94	142	1	0115602
	12.00	0.4724	101	151	1	0115619
1/2	12.70	0.5000	101	151	1	0381021
	13.00	0.5118	101	151	1	0115626
	14.00	0.5512	108	160	1	0115633
	14.25	0.5610	114	169	1	0115640

# FORCE X SOLID CARBIDE DRILL



## Multi-Application, Standard Length, Reinforced Shank

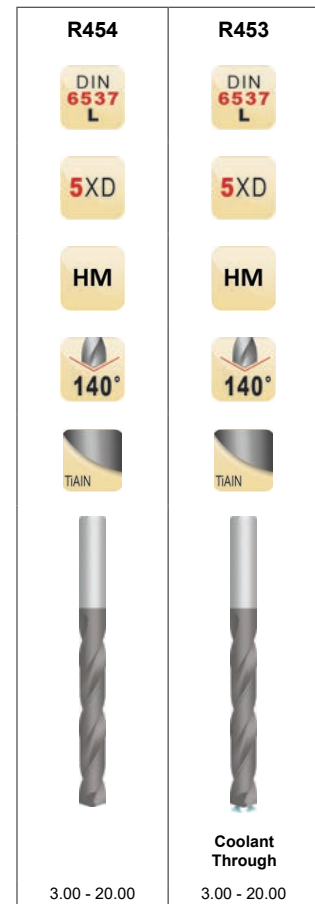
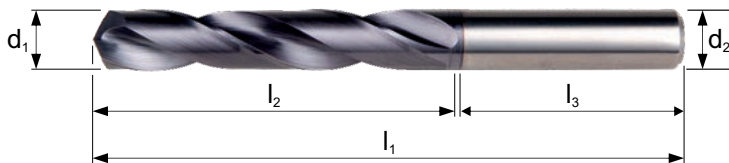
**R454** Self centering 4-facet split point and CTW flute construction for enhanced penetration rate. TiAlN coating increases wear resistance, improves tool life at high RPM.

- 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 2.1 2.2 2.3 2.4 3.1 3.2 3.3  
3.4 4.1 4.2 4.3 6.1 6.2 6.3 6.4 7.1 7.2 7.3 7.4

**R453** Coolant through clears chips away from the cutting edge. Self centering 4-facet split point and CTW flute construction for enhanced penetration rates. TiAlN coating increases surface hardness, improves tool life at high RPM.

- 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 2.1 2.2 2.3 2.4 3.1 3.2 3.3  
3.4 4.1 4.2 4.3 6.1 6.2 6.3 6.4 7.1 7.2 7.3 7.4

### High productivity in a wide range of materials



d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø <sub>m7</sub> mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	d <sub>2</sub> Ø <sub>h6</sub> mm	Pack Qty	R454	R453
	3.00	0.1181	28	66	36	6	1	0614433	0614051
	3.10	0.1220	28	66	36	6	1	0625712	0625385
1/8	3.18	0.1252	28	66	36	6	1	0624029	0623619
	3.20	0.1260	28	66	36	6	1	0625729	0625392
30	3.26	0.1283	28	66	36	6	1	0041406	0040393
	3.30	0.1299	28	66	36	6	1	0614440	0616147
	3.40	0.1339	28	66	36	6	1	0614457	0614068
29	3.45	0.1358	28	66	36	6	1	0041413	0040409
	3.50	0.1378	28	66	36	6	1	0614464	0614075
28	3.57	0.1406	28	66	36	6	1	0041420	0040416
9/64	3.57	0.1406	28	66	36	6	1	0624401	0623992
	3.60	0.1417	28	66	36	6	1	0625736	0625408
27	3.66	0.1441	28	66	36	6	1	0041437	0040423
	3.70	0.1457	28	66	36	6	1	0625743	0625415
26	3.73	0.1469	36	74	36	6	1	0041444	0040430
25	3.80	0.1496	36	74	36	6	1	0625750	0625422
24	3.86	0.1520	36	74	36	6	1	0041468	0040454
	3.90	0.1535	36	74	36	6	1	0625767	0628911
23	3.91	0.1539	36	74	36	6	1	0041475	0040461
5/32	3.97	0.1563	36	74	36	6	1	0624340	0623930
22	3.99	0.1571	36	74	36	6	1	0041482	0040478
	4.00	0.1575	36	74	36	6	1	0614471	0614082
21	4.04	0.1591	36	74	36	6	1	0041499	0040485
	4.05	0.1594	36	74	36	6	1	—	0625439
20	4.09	0.1610	36	74	36	6	1	0041505	0040492
	4.10	0.1614	36	74	36	6	1	0625774	0625446
	4.20	0.1654	36	74	36	6	1	0614488	0616154
19	4.22	0.1661	36	74	36	6	1	0041512	0040508
	4.30	0.1693	36	74	36	6	1	0614495	0614099
18	4.31	0.1697	36	74	36	6	1	0041529	0040515
11/64	4.37	0.1720	36	74	36	6	1	0624050	0623640
17	4.39	0.1728	36	74	36	6	1	0041536	0040522
	4.40	0.1732	36	74	36	6	1	0134450	0134191



d <sub>1</sub> Ø Inch	d <sub>1</sub> Øm <sub>7</sub> mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	d <sub>2</sub> Øh <sub>6</sub> mm	Pack Qty	R454	R453
	4.50	0.1772	36	74	36	6	1	0614501	0614105
16	4.50	0.1772	36	74	36	6	1	0041543	0040539
15	4.57	0.1799	36	74	36	6	1	0041550	0040546
	4.60	0.1811	36	74	36	6	1	0625781	0625453
14	4.62	0.1819	36	74	36	6	1	0041567	0040553
13	4.70	0.1850	36	74	36	6	1	0625798	0625460
3/16	4.76	0.1874	44	82	36	6	1	0624210	0623800
12	4.80	0.1890	44	82	36	6	1	0134467	0134207
11	4.85	0.1909	44	82	36	6	1	0041598	0040584
	4.90	0.1929	44	82	36	6	1	0134474	0134214
10	4.92	0.1937	44	82	36	6	1	0041604	0040591
9	4.98	0.1961	44	82	36	6	1	0041611	0040607
	5.00	0.1969	44	82	36	6	1	0614518	0614112
	5.05	0.1988	44	82	36	6	1	—	0625477
8	5.06	0.1992	44	82	36	6	1	0041628	0040614
	5.10	0.2008	44	82	36	6	1	0614525	0614129
7	5.11	0.2012	44	82	36	6	1	0041635	0040621
13/64	5.16	0.2031	44	82	36	6	1	0624074	0623664
6	5.18	0.2039	44	82	36	6	1	0041642	0040638
	5.20	0.2047	44	82	36	6	1	0134481	0134221
5	5.22	0.2055	44	82	36	6	1	0041659	0040645
	5.30	0.2087	44	82	36	6	1	—	7361201
4	5.31	0.2091	44	82	36	6	1	0041666	0040652
	5.40	0.2126	44	82	36	6	1	—	7361202
3	5.41	0.2130	44	82	36	6	1	0041673	0040669
	5.50	0.2165	44	82	36	6	1	0614532	0614136
7/32	5.56	0.2189	44	82	36	6	1	0624371	0623961
	5.60	0.2205	44	82	36	6	1	0625804	0625484
2	5.61	0.2209	44	82	36	6	1	0041680	0040676
	5.70	0.2244	44	82	36	6	1	0625811	0625491
1	5.79	0.2280	44	82	36	6	1	0041697	0040683
	5.80	0.2283	44	82	36	6	1	0625828	0625507
	5.90	0.2323	44	82	36	6	1	—	7361203
A	5.94	0.2339	44	82	36	6	1	0041703	0040690
15/64	5.95	0.2343	44	82	36	6	1	0624098	0623688
	6.00	0.2362	44	82	36	6	1	0614549	0614143
B	6.03	0.2374	53	91	36	8	1	7361224	7361204
	6.05	0.2382	53	91	36	8	1	—	0625514
	6.10	0.2402	53	91	36	8	1	0625835	0625521
C	6.15	0.2421	53	91	36	8	1	7361225	7361205
	6.20	0.2441	53	91	36	8	1	0134498	0134238
D	6.25	0.2461	53	91	36	8	1	0041710	0040706
	6.30	0.2480	53	91	36	8	1	0625842	0625538
1/4	6.35	0.2500	53	91	36	8	1	0624012	0623602
E	6.35	0.2500	53	91	36	8	1	7361226	7361206
	6.40	0.2520	53	91	36	8	1	0134504	0134245
	6.50	0.2559	53	91	36	8	1	0614556	0614150
F	6.53	0.2571	53	91	36	8	1	7361227	7361207
	6.60	0.2598	53	91	36	8	1	0625859	0625545
G	6.63	0.2610	53	91	36	8	1	7361228	7361208
	6.70	0.2638	53	91	36	8	1	0614563	0134252
17/64	6.75	0.2657	53	91	36	8	1	0624111	0623701
H	6.76	0.2661	53	91	36	8	1	0041727	0041291
	6.80	0.2677	53	91	36	8	1	0614570	0616116
	6.90	0.2717	53	91	36	8	1	0614587	0614167
I	6.91	0.2720	53	91	36	8	1	7361229	7361209
	7.00	0.2756	53	91	36	8	1	0614594	0614174
J	7.04	0.2772	53	91	36	8	1	7361230	7361210
	7.10	0.2795	53	91	36	8	1	0625866	0625552
K	7.14	0.2811	53	91	36	8	1	7361231	7361211
9/32	7.14	0.2811	53	91	36	8	1	0624395	0623985
	7.20	0.2835	53	91	36	8	1	—	7361212
	7.30	0.2874	53	91	36	8	1	0625873	0625569
L	7.37	0.2902	53	91	36	8	1	0041734	0041307
	7.40	0.2913	53	91	36	8	1	0614600	0616161

# FORCE X SOLID CARBIDE DRILL



d <sub>1</sub> Ø Inch	d <sub>1</sub> Øm <sub>7</sub> mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	d <sub>2</sub> Øh <sub>6</sub> mm	Pack Qty	R454	R453
M	7.49	0.2949	53	91	36	8	1	0041741	0041314
	7.50	0.2953	53	91	36	8	1	0614617	0614181
19/64	7.54	0.2969	53	91	36	8	1	0624135	0623725
	7.60	0.2992	53	91	36	8	1	0625880	0625576
N	7.67	0.3020	53	91	36	8	1	0041758	0041321
	7.70	0.3031	53	91	36	8	1	0134511	0134306
	7.80	0.3071	53	91	36	8	1	0625897	0625583
	7.90	0.3110	53	91	36	8	1	0134528	0134313
	7.94	0.3126	53	91	36	8	1	0624333	0623923
5/16	8.00	0.3150	53	91	36	8	1	0614624	0614198
	8.03	0.3161	61	103	40	10	1	0041765	0041338
O	8.05	0.3169	61	103	40	10	1	—	0625590
	8.10	0.3189	61	103	40	10	1	0625903	0625606
	8.20	0.3228	61	103	40	10	1	0134535	0134320
	8.20	0.3228	61	103	40	10	1	7361232	7361213
P	8.30	0.3268	61	103	40	10	1	—	7361214
	8.33	0.3280	61	103	40	10	1	0624159	0623749
21/64	8.40	0.3307	61	103	40	10	1	0134542	0134337
	8.43	0.3319	61	103	40	10	1	0041772	0041345
Q	8.50	0.3346	61	103	40	10	1	0614631	0614204
	8.60	0.3386	61	103	40	10	1	0614648	0616178
	8.61	0.3390	61	103	40	10	1	7361233	7361215
R	8.70	0.3425	61	103	40	10	1	0614655	0614211
	8.73	0.3437	61	103	40	10	1	0624043	0623633
11/32	8.80	0.3465	61	103	40	10	1	0625910	0625613
	8.84	0.3480	61	103	40	10	1	7361234	7361216
S	8.90	0.3504	61	103	40	10	1	0134559	0134344
	9.00	0.3543	61	103	40	10	1	0614662	0614228
T	9.09	0.3579	61	103	40	10	1	0041789	0041352
	9.10	0.3583	61	103	40	10	1	0625927	0625620
23/64	9.13	0.3594	61	103	40	10	1	0624173	0623763
	9.20	0.3622	61	103	40	10	1	—	7361217
	9.30	0.3661	61	103	40	10	1	0614679	0616123
	9.35	0.3681	61	103	40	10	1	0041796	0041369
U	9.40	0.3701	61	103	40	10	1	0134566	0134351
	9.50	0.3740	61	103	40	10	1	0614686	0614235
	3/8	9.52	0.3748	61	103	40	10	1	0624234
V	9.58	0.3772	61	103	40	10	1	7361235	7361218
	9.60	0.3780	61	103	40	10	1	0625934	0625637
	9.70	0.3819	61	103	40	10	1	0134573	0629055
	9.80	0.3858	61	103	40	10	1	0625941	0625644
W	9.80	0.3858	61	103	40	10	1	7361236	7361219
	9.90	0.3898	61	103	40	10	1	0134580	0134368
	25/64	9.92	0.3906	61	103	40	10	1	0624180
X	10.00	0.3937	61	103	40	10	1	0614242	0613870
	10.05	0.3957	70	118	45	12	1	—	0625231
	10.08	0.3969	70	118	45	12	1	0041802	0041376
Y	10.10	0.3976	70	118	45	12	1	0625651	0625248
	10.20	0.4016	70	118	45	12	1	0614259	0613887
	10.26	0.4039	70	118	45	12	1	0041819	0041383
	10.30	0.4055	70	118	45	12	1	0614266	0613894
13/32	10.32	0.4063	70	118	45	12	1	0624067	0623657
	10.40	0.4094	70	118	45	12	1	0614273	0616130
Z	10.49	0.4130	70	118	45	12	1	0041826	0041390
	10.50	0.4134	70	118	45	12	1	0614280	0613900
	10.60	0.4173	70	118	45	12	1	0625668	0625255
27/64	10.72	0.4220	70	118	45	12	1	0624197	0623787
	10.80	0.4252	70	118	45	12	1	—	7361220
	11.00	0.4331	70	118	45	12	1	0614297	0613917
	7/16	11.11	0.4374	70	118	45	12	1	0624364
7/16	11.20	0.4409	70	118	45	12	1	0614303	0613924
	11.30	0.4449	70	118	45	12	1	—	7361221
	11.40	0.4488	70	118	45	12	1	0134597	0134375
	11.50	0.4528	70	118	45	12	1	0614310	0613931

d <sub>1</sub> Ø Inch	d <sub>1</sub> Øm <sub>7</sub> mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	d <sub>2</sub> Øh <sub>6</sub> mm	Pack Qty	R454	R453
29/64	11.51	0.4531	70	118	45	12	1	0624203	0623794
	11.60	0.4567	70	118	45	12	1	0134603	0134382
	11.80	0.4646	70	118	45	12	1	0625675	0625262
15/32	11.91	0.4689	70	118	45	12	1	0624081	0623671
	12.00	0.4724	70	118	45	12	1	0614327	0613948
	12.05	0.4744	76	124	45	14	1	—	0625279
	12.10	0.4764	76	124	45	14	1	0625682	—
	12.20	0.4803	76	124	45	14	1	0614334	0613955
	12.30	0.4843	76	124	45	14	1	0624241	0623831
31/64	12.50	0.4921	76	124	45	14	1	0614341	0613962
	12.70	0.5000	76	124	45	14	1	0625699	0625286
	12.80	0.5039	76	124	45	14	1	0624005	0623596
1/2	12.80	0.5039	76	124	45	14	1	0134610	0134399
	13.00	0.5118	76	124	45	14	1	0614358	0613979
	13.10	0.5157	76	124	45	14	1	0624258	0623848
33/64	13.30	0.5236	76	124	45	14	1	—	7361222
	13.49	0.5311	76	124	45	14	1	0624104	0623695
	13.50	0.5315	76	124	45	14	1	0614365	0613986
	13.80	0.5433	76	124	45	14	1	0134627	0134405
	13.89	0.5469	76	124	45	14	1	0624265	0623855
	14.00	0.5512	76	124	45	14	1	0614372	0613993
9/16	14.25	0.5610	82	133	48	16	1	0614389	0614006
	14.29	0.5626	82	133	48	16	1	0624388	0623978
	14.50	0.5709	82	133	48	16	1	0614396	0614013
37/64	14.68	0.5780	82	133	48	16	1	0624272	0623862
	14.80	0.5827	82	133	48	16	1	0134634	0134412
	15.00	0.5906	82	133	48	16	1	0614402	0614020
19/32	15.08	0.5937	82	133	48	16	1	0624128	0623718
	15.10	0.5945	82	133	48	16	1	0625705	0625293
	15.30	0.6024	82	133	48	16	1	—	7361223
39/64	15.48	0.6094	82	133	48	16	1	0624289	0623879
	15.50	0.6102	82	133	48	16	1	0614419	0614037
	15.80	0.6220	82	133	48	16	1	0134641	0134429
5/8	15.88	0.6252	82	133	48	16	1	0624357	0623947
	16.00	0.6299	82	133	48	16	1	0614426	0614044
41/64	16.27	0.6406	91	143	48	18	1	0624296	0623886
	16.50	0.6496	91	143	48	18	1	0134658	0625309
21/32	16.67	0.6563	91	143	48	18	1	0624142	0623732
	17.00	0.6693	91	143	48	18	1	0134665	0625316
43/64	17.07	0.6720	91	143	48	18	1	0624302	0623893
11/16	17.46	0.6874	91	143	48	18	1	0624036	0623626
	17.50	0.6890	91	143	48	18	1	0134672	0625323
	17.80	0.7008	91	143	48	18	1	0134689	0134436
45/64	17.86	0.7031	91	143	48	18	1	0624319	0623909
	18.00	0.7087	91	143	48	18	1	0134696	0625330
23/32	18.26	0.7189	99	153	50	20	1	0624166	0623756
	18.50	0.7283	99	153	50	20	1	0134702	0625347
47/64	18.65	0.7343	99	153	50	20	1	0624326	0623916
	19.00	0.7480	99	153	50	20	1	0134719	0625354
3/4	19.05	0.7500	99	153	50	20	1	0624227	0623817
	19.50	0.7677	99	153	50	20	1	0134726	0625361
	19.80	0.7795	99	153	50	20	1	0134733	0134443
	20.00	0.7874	99	153	50	20	1	0134740	0625378

# FORCE M SOLID CARBIDE DRILL



## Multi-Application, Standard Length, Reinforced Shank

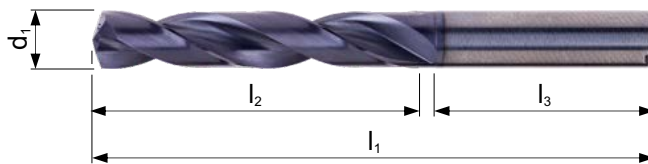
R463

2.1 2.2 2.3 2.4 4.1 4.2 4.3

5.1 5.2 5.3

Self-centering 4-facet split point and CTW flute construction for enhanced penetration rate specifically designed for Stainless Steel (ISO-M) materials. TiAlN coating increases wear resistance and improves tool life. Coolant through combined with an advanced point geometry prevents premature wear of the cutting edges. Length designed for 5 x Diameter drilling depths.

### High productivity in a wide range of materials



R463

DIN 6537 L

5XD

HM

140°

TiAlN



Coolant Through

3.00 - 16.00

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø <sub>m7</sub> mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	d <sub>2</sub> Ø <sub>h6</sub> mm	Pack Qty	R463
	3.00	0.1181	28	66	36	6	1	7624913
	3.10	0.1220	28	66	36	6	1	7624914
1/8	3.18	0.1250	28	66	36	6	1	7624915
	3.20	0.1260	28	66	36	6	1	7624916
	3.30	0.1299	28	66	36	6	1	7624917
	3.40	0.1339	28	66	36	6	1	7624918
29	3.45	0.1360	28	66	36	6	1	7624919
	3.50	0.1378	28	66	36	6	1	7624960
9/64	3.57	0.1406	28	66	36	6	1	7624961
	3.60	0.1417	28	66	36	6	1	7624962
	3.70	0.1457	28	66	36	6	1	7624963
	3.80	0.1496	36	74	36	6	1	7624964
	3.90	0.1535	36	74	36	6	1	7624965
5/32	3.97	0.1563	36	74	36	6	1	7624966
	4.00	0.1575	36	74	36	6	1	7624967
	4.05	0.1594	36	74	36	6	1	7624968
	4.10	0.1614	36	74	36	6	1	7624969
	4.20	0.1654	36	74	36	6	1	7624970
	4.30	0.1693	36	74	36	6	1	7624971
11/64	4.37	0.1719	36	74	36	6	1	7624972
	4.40	0.1732	36	74	36	6	1	7624973
	4.50	0.1772	36	74	36	6	1	7624974
	4.60	0.1811	36	74	36	6	1	7624975
	4.70	0.1850	36	74	36	6	1	7624976
3/16	4.76	0.1875	44	82	36	6	1	7624977
	4.80	0.1890	44	82	36	6	1	7624978
	4.90	0.1929	44	82	36	6	1	7624979
	5.00	0.1969	44	82	36	6	1	7624980
	5.05	0.1988	44	82	36	6	1	7624981
	5.10	0.2008	44	82	36	6	1	7624982
7	5.11	0.2010	44	82	36	6	1	7624983
13/64	5.16	0.2031	44	82	36	6	1	7624984
	5.20	0.2047	44	82	36	6	1	7624985

d <sub>1</sub> Ø Inch	d <sub>1</sub> Øm <sub>7</sub> mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	d <sub>2</sub> Øh <sub>6</sub> mm	Pack Qty	R463
5	5.22	0.2055	44	82	36	6	1	7624986
	5.30	0.2087	44	82	36	6	1	7624987
	5.40	0.2126	44	82	36	6	1	7624988
	5.50	0.2165	44	82	36	6	1	7624989
7/32	5.56	0.2188	44	82	36	6	1	7624990
	5.60	0.2205	44	82	36	6	1	7624991
	5.70	0.2244	44	82	36	6	1	7624992
	5.80	0.2283	44	82	36	6	1	7624993
	5.90	0.2323	44	82	36	6	1	7624994
15/64	5.95	0.2344	44	82	36	6	1	7624995
	6.00	0.2362	44	82	36	6	1	7624996
	6.05	0.2382	53	91	36	8	1	7624997
	6.10	0.2402	53	91	36	8	1	7624998
	6.20	0.2441	53	91	36	8	1	7624999
1/4	6.30	0.2480	53	91	36	8	1	7625000
	6.35	0.2500	53	91	36	8	1	7625001
	6.40	0.2520	53	91	36	8	1	7625002
	6.50	0.2559	53	91	36	8	1	7625003
	6.60	0.2598	53	91	36	8	1	7625004
17/64	6.70	0.2638	53	91	36	8	1	7625005
	6.75	0.2656	53	91	36	8	1	7625006
	6.80	0.2677	53	91	36	8	1	7625007
	6.90	0.2717	53	91	36	8	1	7625008
	7.00	0.2756	53	91	36	8	1	7625009
9/32	7.10	0.2795	53	91	36	8	1	7625010
	7.14	0.2813	53	91	36	8	1	7625011
	7.20	0.2835	53	91	36	8	1	7625012
	7.30	0.2874	53	91	36	8	1	7625013
	7.40	0.2913	53	91	36	8	1	7625014
19/64	7.50	0.2953	53	91	36	8	1	7625015
	7.54	0.2969	53	91	36	8	1	7625016
	7.60	0.2992	53	91	36	8	1	7625017
	7.70	0.3031	53	91	36	8	1	7625018
	7.80	0.3071	53	91	36	8	1	7625019
5/16	7.90	0.3110	53	91	36	8	1	7625020
	7.94	0.3125	53	91	36	8	1	7625021
	8.00	0.3150	53	91	36	8	1	7625022
	8.05	0.3169	61	103	40	10	1	7625023
	8.10	0.3189	61	103	40	10	1	7625024
21/64	8.20	0.3228	61	103	40	10	1	7625025
	8.30	0.3268	61	103	40	10	1	7625026
	8.33	0.3281	61	103	40	10	1	7625027
	8.40	0.3307	61	103	40	10	1	7625028
	8.50	0.3346	61	103	40	10	1	7625029
11/32	8.60	0.3386	61	103	40	10	1	7625030
	8.70	0.3425	61	103	40	10	1	7625031
	8.73	0.3438	61	103	40	10	1	7625032
	8.80	0.3465	61	103	40	10	1	7625033
	8.90	0.3504	61	103	40	10	1	7625034
23/64	9.00	0.3543	61	103	40	10	1	7625035
	9.10	0.3583	61	103	40	10	1	7625036
	9.13	0.3594	61	103	40	10	1	7625037
	9.20	0.3622	61	103	40	10	1	7625038
	9.30	0.3661	61	103	40	10	1	7625039
3/8	9.40	0.3701	61	103	40	10	1	7625040
	9.50	0.3740	61	103	40	10	1	7625041
	9.53	0.3750	61	103	40	10	1	7625042
	9.60	0.3780	61	103	40	10	1	7625043
	9.70	0.3819	61	103	40	10	1	7625044
25/64	9.80	0.3858	61	103	40	10	1	7625045
	9.90	0.3898	61	103	40	10	1	7625046
	9.92	0.3906	61	103	40	10	1	7625047
	10.00	0.3937	61	103	40	10	1	7625048
	10.05	0.3957	70	118	45	12	1	7625049
	10.10	0.3976	70	118	45	12	1	7625050

# FORCE M SOLID CARBIDE DRILL



$d_1$ $\varnothing$ Inch	$d_1$ $\varnothing m_7$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	$l_3$ mm	$d_2$ $\varnothing h_6$ mm	Pack Qty	R463
	10.20	0.4016	70	118	45	12	1	7625051
	10.30	0.4055	70	118	45	12	1	7625052
13/32	10.32	0.4063	70	118	45	12	1	7625053
	10.40	0.4094	70	118	45	12	1	7625054
	10.50	0.4134	70	118	45	12	1	7625055
	10.60	0.4173	70	118	45	12	1	7625056
27/64	10.72	0.4219	70	118	45	12	1	7625057
	10.80	0.4252	70	118	45	12	1	7625058
	10.90	0.4291	70	118	45	12	1	7625059
	11.00	0.4331	70	118	45	12	1	7625060
7/16	11.11	0.4375	70	118	45	12	1	7625061
	11.20	0.4409	70	118	45	12	1	7625062
	11.30	0.4449	70	118	45	12	1	7625063
	11.40	0.4488	70	118	45	12	1	7625064
	11.50	0.4528	70	118	45	12	1	7625065
29/64	11.51	0.4531	70	118	45	12	1	7625066
	11.60	0.4567	70	118	45	12	1	7625067
	11.80	0.4646	70	118	45	12	1	7625068
15/32	11.91	0.4688	70	118	45	12	1	7625069
	12.00	0.4724	70	118	45	12	1	7625070
	12.05	0.4744	76	124	45	14	1	7625071
	12.20	0.4803	76	124	45	14	1	7625072
31/64	12.30	0.4844	76	124	45	14	1	7625073
	12.50	0.4921	76	124	45	14	1	7625074
1/2	12.70	0.5000	76	124	45	14	1	7625075
	12.70	0.5000	76	124	45	14	1	7625076
	12.80	0.5039	76	124	45	14	1	7625077
	13.00	0.5118	76	124	45	14	1	7625078
33/64	13.10	0.5156	76	124	45	14	1	7625079
	13.30	0.5236	76	124	45	14	1	7625080
17/32	13.49	0.5313	76	124	45	14	1	7625081
	13.50	0.5315	76	124	45	14	1	7625082
	13.80	0.5433	76	124	45	14	1	7625083
35/64	13.89	0.5469	76	124	45	14	1	7625084
	14.00	0.5512	76	124	45	14	1	7625085
	14.25	0.5610	82	133	48	16	1	7625086
9/16	14.29	0.5625	82	133	48	16	1	7625087
	14.50	0.5709	82	133	48	16	1	7625088
37/64	14.68	0.5781	82	133	48	16	1	7625089
	14.80	0.5827	82	133	48	16	1	7625090
	15.00	0.5906	82	133	48	16	1	7625091
19/32	15.08	0.5938	82	133	48	16	1	7625092
	15.10	0.5945	82	133	48	16	1	7625093
	15.30	0.6024	82	133	48	16	1	7625094
39/64	15.48	0.6094	82	133	48	16	1	7625095
	15.50	0.6102	82	133	48	16	1	7625096
	15.80	0.6220	82	133	48	16	1	7625097
5/8	15.88	0.6250	82	133	48	16	1	7625098
	16.00	0.6299	82	133	48	16	1	7625099

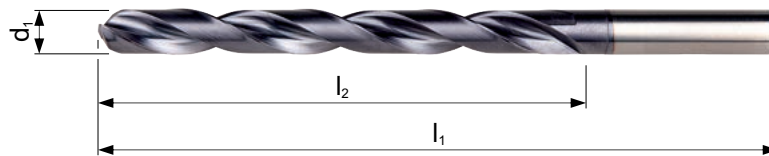
## Multi-Application, 8xD, Reinforced Shank

**R459** Coolant through clears chips away from the cutting edge. Self centering 4-flute split point and CTW flute construction for enhanced penetration rates. TiAlN coating increases surface hardness, improves tool life at high RPM.

1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4

6.1 6.2 6.3 6.4 7.1 7.2 7.3 7.4

### High productivity in a wide range of materials



R459



Coolant Through

3.00 - 16.00

d <sub>1</sub> Øm <sub>7</sub> Inch	d <sub>1</sub> Øm <sub>7</sub> mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	d <sub>2</sub> Øh <sub>6</sub> mm	Pack Qty	R459
	3.00	0.1181	37	79	36	6	1	46718973
	3.10	0.1220	37	79	36	6	1	46718974
1/8	3.18	0.1252	37	79	36	6	1	46718975
	3.20	0.1260	37	79	36	6	1	46718976
	3.30	0.1299	37	79	36	6	1	46718977
	3.40	0.1339	37	79	36	6	1	46718978
	3.50	0.1378	37	79	36	6	1	46718979
9/64	3.57	0.1406	37	79	36	6	1	46718990
	3.60	0.1417	37	79	36	6	1	46718991
	3.70	0.1457	37	79	36	6	1	46718992
	3.80	0.1496	48	90	36	6	1	46718993
	3.90	0.1535	48	90	36	6	1	46718994
5/32	3.97	0.1563	48	90	36	6	1	46718995
	4.00	0.1575	48	90	36	6	1	46718996
	4.10	0.1614	48	90	36	6	1	46718997
	4.20	0.1654	48	90	36	6	1	46718998
	4.30	0.1693	48	90	36	6	1	46718999
11/64	4.37	0.1720	48	90	36	6	1	46719000
	4.40	0.1732	48	90	36	6	1	46719001
	4.50	0.1772	48	90	36	6	1	46719002
	4.60	0.1811	48	90	36	6	1	46719003
	4.70	0.1850	62	104	36	6	1	46719004
3/16	4.76	0.1874	62	104	36	6	1	46719005
	4.80	0.1890	62	104	36	6	1	46719006
	4.90	0.1929	62	104	36	6	1	46719007
	5.00	0.1969	62	104	36	6	1	46719008
	5.10	0.2008	62	104	36	6	1	46719009
13/64	5.16	0.2031	62	104	36	6	1	46719010
	5.20	0.2047	62	104	36	6	1	46719011
	5.30	0.2087	62	104	36	6	1	46719012
	5.40	0.2126	62	104	36	6	1	46719013
	5.50	0.2165	62	104	36	6	1	46719014

# FORCE X SOLID CARBIDE DRILL



$d_1$ $\varnothing m_7$ Inch	$d_1$ $\varnothing m_7$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	$l_3$ mm	$d_2$ $\varnothing h_6$ mm	Pack Qty	R459
7/32	5.56	0.2189	62	104	36	6	1	46719015
	5.60	0.2205	62	104	36	6	1	46719016
	5.70	0.2244	62	104	36	6	1	46719017
	5.80	0.2283	62	104	36	6	1	46719018
	5.90	0.2323	62	104	36	6	1	46719019
15/64	5.95	0.2343	62	104	36	6	1	46719020
	6.00	0.2362	62	104	36	6	1	46719021
	6.10	0.2402	84	126	36	8	1	46719022
	6.20	0.2441	84	126	36	8	1	46719023
	6.30	0.2480	84	126	36	8	1	46719024
1/4	6.35	0.2500	84	126	36	8	1	46719025
	6.40	0.2520	84	126	36	8	1	46719026
	6.50	0.2559	84	126	36	8	1	46719027
	6.60	0.2598	84	126	36	8	1	46719028
	6.70	0.2638	84	126	36	8	1	46719029
17/64	6.75	0.2657	84	126	36	8	1	46719030
	6.80	0.2677	84	126	36	8	1	46719031
	6.90	0.2717	84	126	36	8	1	46719032
	7.00	0.2756	84	126	36	8	1	46719033
	7.10	0.2795	84	126	36	8	1	46719034
9/32	7.14	0.2811	84	126	36	8	1	46719035
	7.20	0.2835	84	126	36	8	1	46719036
	7.30	0.2874	84	126	36	8	1	46719037
	7.40	0.2913	84	126	36	8	1	46719038
	7.50	0.2953	84	126	36	8	1	46719039
19/64	7.54	0.2969	84	126	36	8	1	46719040
	7.60	0.2992	84	126	36	8	1	46719041
	7.70	0.3031	84	126	36	8	1	46719042
	7.80	0.3071	84	126	36	8	1	46719043
	7.90	0.3110	84	126	36	8	1	46719044
5/16	7.94	0.3126	84	126	36	8	1	46719045
	8.00	0.3150	84	126	36	8	1	46719046
	8.10	0.3189	106	152	40	10	1	46719047
	8.20	0.3228	106	152	40	10	1	46719048
	8.30	0.3268	106	152	40	10	1	46719049
21/64	8.33	0.3280	106	152	40	10	1	46719050
	8.40	0.3307	106	152	40	10	1	46719051
	8.50	0.3346	106	152	40	10	1	46719052
	8.60	0.3386	106	152	40	10	1	46719053
	8.70	0.3425	106	152	40	10	1	46719054
11/32	8.73	0.3437	106	152	40	10	1	46719055
	8.80	0.3465	106	152	40	10	1	46719056
	8.90	0.3504	106	152	40	10	1	46719057
	9.00	0.3543	106	152	40	10	1	46719058
	9.10	0.3583	106	152	40	10	1	46719059
23/64	9.13	0.3594	106	152	40	10	1	46719060
	9.20	0.3622	106	152	40	10	1	46719061
	9.30	0.3661	106	152	40	10	1	46719062
	9.40	0.3701	106	152	40	10	1	46719063
	9.50	0.3740	106	152	40	10	1	46719064
3/8	9.53	0.3748	106	152	40	10	1	46719065
	9.60	0.3780	106	152	40	10	1	46719066
	9.70	0.3819	106	152	40	10	1	46719067
	9.80	0.3858	106	152	40	10	1	46719068
	9.90	0.3898	106	152	40	10	1	46719069
25/64	9.92	0.3906	106	152	40	10	1	46719070
	10.00	0.3937	106	152	40	10	1	46719071
	10.20	0.4016	128	180	45	12	1	46719072
	10.30	0.4055	128	180	45	12	1	46719073
13/32	10.32	0.4063	128	180	45	12	1	46719074
	10.40	0.4094	128	180	45	12	1	46719075
	10.50	0.4134	128	180	45	12	1	46719076
27/64	10.72	0.4220	128	180	45	12	1	46719077
	10.80	0.4252	128	180	45	12	1	46719078



$d_1$ $\varnothing m_7$ Inch	$d_1$ $\varnothing m_7$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	$l_3$ mm	$d_2$ $\varnothing h_6$ mm	Pack Qty	R459
	11.00	0.4331	128	180	45	12	1	46719079
7/16	11.11	0.4374	128	180	45	12	1	46719080
	11.20	0.4409	128	180	45	12	1	46719081
	11.30	0.4449	128	180	45	12	1	46719082
	11.50	0.4528	128	180	45	12	1	46719083
29/64	11.51	0.4531	128	180	45	12	1	46719084
	11.80	0.4646	128	180	45	12	1	46719085
15/32	11.91	0.4689	128	180	45	12	1	46719086
	12.00	0.4724	128	180	45	12	1	46719087
	12.20	0.4803	151	202	48	14	1	46719088
31/64	12.30	0.4843	151	202	48	14	1	46719089
	12.50	0.4921	151	202	48	14	1	46719090
1/2	12.70	0.5000	151	202	48	14	1	46719091
	12.80	0.5039	151	202	48	14	1	46719092
	13.00	0.5118	151	202	48	14	1	46719093
33/64	13.10	0.5157	151	202	48	14	1	46719094
17/32	13.49	0.5311	151	202	48	14	1	46719095
	13.50	0.5315	151	202	48	14	1	46719096
35/64	13.89	0.5469	151	202	48	14	1	46719097
	14.00	0.5512	151	202	48	14	1	46719098
	14.25	0.5610	172	227	48	16	1	46719099
9/16	14.29	0.5626	172	227	48	16	1	46719100
	14.50	0.5709	172	227	48	16	1	46719101
37/64	14.68	0.5780	172	227	48	16	1	46719102
	15.00	0.5906	172	227	48	16	1	46719103
19/32	15.08	0.5937	172	227	48	16	1	46719104
	15.10	0.5945	172	227	48	16	1	46719105
39/64	15.48	0.6094	172	227	48	16	1	46719106
	15.50	0.6102	172	227	48	16	1	46719107
5/8	15.88	0.6252	172	227	48	16	1	46719108
	16.00	0.6299	172	227	48	16	1	46719109

# ADX SCREW MACHINE DRILL



## Multi-Application, Screw Machine Length

### A520

1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4 4.1 4.2  
4.3 5.1 5.2 5.3 6.1 6.2 6.3 6.4 7.1 7.2 7.3 7.4 8.1 8.2 8.3

Low thrust design. Notched point improves chip formation for enhanced penetration rate. TiN coating increases wear resistance and improves tool life.

# ADX

A520

DIN  
1897

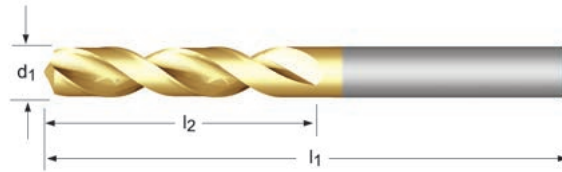
2.5XD

HSS

130°



3.00 - 13.00



$d_1$ Øh <sub>8</sub> Inch	$d_1$ Øh <sub>8</sub> mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A520
	3.00	0.1181	16	46	1	0038901
	3.10	0.1220	18	49	1	0038918
1/8	3.18	0.1250	18	49	1	0171264
	3.20	0.1260	18	49	1	0038925
	3.30	0.1299	18	49	1	0038932
	3.40	0.1339	20	52	1	0038949
	3.50	0.1378	20	52	1	0038956
9/64	3.57	0.1406	20	52	1	0171271
	3.60	0.1417	20	52	1	0038963
	3.70	0.1457	20	52	1	0038970
	3.80	0.1496	22	55	1	0038987
	3.90	0.1535	22	55	1	0038994
5/32	3.97	0.1563	22	55	1	0171288
	4.00	0.1575	22	55	1	0039007
	4.10	0.1614	22	55	1	0039014
	4.20	0.1654	22	55	1	0039021
	4.30	0.1693	24	58	1	0039038
11/64	4.37	0.1719	24	58	1	0171295
	4.40	0.1732	24	58	1	0039045
	4.50	0.1772	24	58	1	0039052
	4.60	0.1811	24	58	1	0039069
	4.70	0.1850	24	58	1	0039076
3/16	4.76	0.1875	26	62	1	0171301
	4.80	0.1890	26	62	1	0039083
	4.90	0.1929	26	62	1	0039090
	5.00	0.1969	26	62	1	0039106
	5.10	0.2008	26	62	1	0039113
13/64	5.16	0.2031	26	62	1	0171318
	5.20	0.2047	26	62	1	0039120
	5.30	0.2087	26	62	1	0039137
	5.40	0.2126	28	66	1	0039144
	5.50	0.2165	28	66	1	0039151
7/32	5.56	0.2188	28	66	1	0171325

$d_1$ $\varnothing_{h_8}$ Inch	$d_1$ $\varnothing_{h_8}$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A520
	5.60	0.2205	28	66	1	0039168
	5.70	0.2244	28	66	1	0039175
	5.80	0.2283	28	66	1	0039182
	5.90	0.2323	28	66	1	0039199
15/64	5.95	0.2344	28	66	1	0171332
	6.00	0.2362	28	66	1	0039205
	6.10	0.2402	31	70	1	0039212
	6.20	0.2441	31	70	1	0039229
	6.30	0.2480	31	70	1	0039236
1/4	6.35	0.2500	31	70	1	0171349
	6.40	0.2520	31	70	1	0039243
	6.50	0.2559	31	70	1	0039250
	6.60	0.2598	31	70	1	0039267
	6.70	0.2638	31	70	1	0039274
17/64	6.75	0.2656	34	74	1	0171356
	6.80	0.2677	34	74	1	0039281
	6.90	0.2717	34	74	1	0039298
	7.00	0.2756	34	74	1	0039304
	7.10	0.2795	34	74	1	0039311
9/32	7.14	0.2812	34	74	1	0171363
	7.20	0.2835	34	74	1	0039328
	7.30	0.2874	34	74	1	0039335
	7.40	0.2913	34	74	1	0039342
	7.50	0.2953	34	74	1	0039359
19/64	7.54	0.2969	37	79	1	0171370
	7.60	0.2992	37	79	1	0039366
	7.70	0.3031	37	79	1	0039373
	7.80	0.3071	37	79	1	0039380
	7.90	0.3110	37	79	1	0039397
5/16	7.94	0.3125	37	79	1	0171387
	8.00	0.3150	37	79	1	0039403
	8.10	0.3189	37	79	1	0039410
	8.20	0.3228	37	79	1	0039427
	8.30	0.3268	37	79	1	0039434
21/64	8.33	0.3281	37	79	1	0171394
	8.40	0.3307	37	79	1	0039441
	8.50	0.3346	37	79	1	0039458
	8.60	0.3386	40	84	1	0039465
	8.70	0.3425	40	84	1	0039472
11/32	8.73	0.3437	40	84	1	0171400
	8.80	0.3465	40	84	1	0039489
	8.90	0.3504	40	84	1	0039496
	9.00	0.3543	40	84	1	0039502
	9.10	0.3583	40	84	1	0039519
23/64	9.13	0.3594	40	84	1	0171417
	9.20	0.3622	40	84	1	0039526
	9.30	0.3661	40	84	1	0039533
	9.40	0.3701	40	84	1	0039540
	9.50	0.3740	40	84	1	0039557
3/8	9.52	0.3750	43	89	1	0171424
	9.60	0.3780	43	89	1	0039564
	9.70	0.3819	43	89	1	0039571
	9.80	0.3858	43	89	1	0039588
	9.90	0.3898	43	89	1	0039595
25/64	9.92	0.3906	43	89	1	0171431
	10.00	0.3937	43	89	1	0038598
	10.10	0.3976	43	89	1	0038604
	10.20	0.4016	43	89	1	0038611
	10.30	0.4055	43	89	1	0038628
13/32	10.32	0.4063	43	89	1	0171448
	10.40	0.4094	43	89	1	0038635
	10.50	0.4134	43	89	1	0038642
	10.60	0.4173	43	89	1	0038659
	10.70	0.4213	47	95	1	0038666
27/64	10.72	0.4219	47	95	1	0171455
	10.80	0.4252	47	95	1	0038673

# ADX SCREW MACHINE DRILL



$d_1$ $\varnothing_{h_8}$ Inch	$d_1$ $\varnothing_{h_8}$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A520
	10.90	0.4291	47	95	1	0038680
	11.00	0.4331	47	95	1	0038697
	11.10	0.4370	47	95	1	0038703
7/16	11.11	0.4375	47	95	1	0171462
	11.20	0.4409	47	95	1	0038710
	11.30	0.4449	47	95	1	0038727
	11.40	0.4488	47	95	1	0038734
	11.50	0.4528	47	95	1	0038741
29/64	11.51	0.4531	47	95	1	0171479
	11.60	0.4567	47	95	1	0038758
	11.70	0.4606	47	95	1	0038765
	11.80	0.4646	47	95	1	0038772
	11.90	0.4685	51	102	1	0038789
15/32	11.91	0.4688	51	102	1	0171486
	12.00	0.4724	51	102	1	0038796
	12.10	0.4764	51	102	1	0038802
	12.20	0.4803	51	102	1	0038819
	12.30	0.4843	51	102	1	0038826
31/64	12.30	0.4843	51	102	1	0171493
	12.40	0.4882	51	102	1	0038833
	12.50	0.4921	51	102	1	0038840
	12.60	0.4961	51	102	1	0038857
	12.70	0.5000	51	102	1	0038864
1/2	12.70	0.5000	51	102	1	0171509
	12.80	0.5039	51	102	1	0038871
	12.90	0.5079	51	102	1	0038888
	13.00	0.5118	51	102	1	0038895

## Multi-Application, Premium Cobalt Screw Machine Length - Parabolic Flute for Advanced Chip Removal

### A920

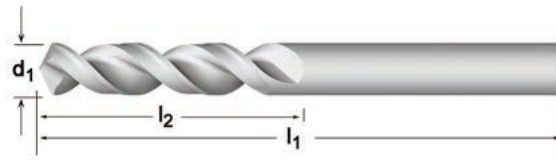
- 1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4 4.1 4.2  
4.3 5.1 5.2 5.3 6.1 6.2 6.3 6.4 7.1 7.2 7.3 7.4 8.1 8.2

Heavy-Duty parabolic flute design allows greater drilling depths in one pass. Notched point improves chip formation. Premium cobalt base material increases wear resistance. Bright finish improves chip flow in soft or non-ferrous materials.

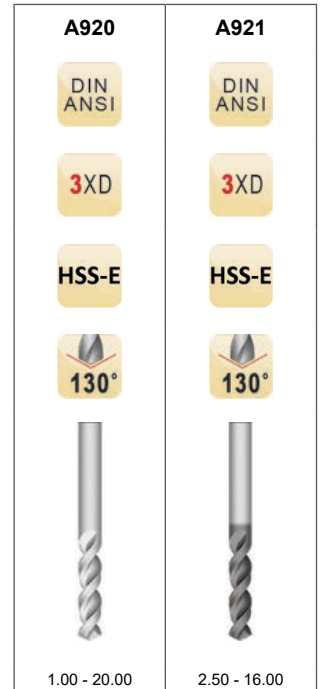
### A921

- 1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4 4.1 4.2  
4.3 5.1 5.2 5.3 6.3 6.4 7.4

Heavy-Duty parabolic flute design allows greater drilling depths in one pass. Notched Point improves chip formation. Premium cobalt base material combined with AlCrN-Top coating increases lubricity and wear resistance which improves tool life.



# PFX



$d_1$ $\varnothing_{h_8}$ Inch	$d_1$ $\varnothing_{h_8}$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A920	A921
	1.00	0.0394	6	26	1	0050217	—
	1.10	0.0433	7	28	1	0050262	—
3/64	1.19	0.0469	13	35	1	0211427	—
	1.20	0.0472	8	30	1	0050309	—
	1.25	0.0492	8	30	1	0211434	—
	1.30	0.0512	8	30	1	0050316	—
	1.35	0.0531	9	32	1	0211458	—
	1.40	0.0551	9	32	1	0050323	—
	1.50	0.0591	9	32	1	0050347	—
	1.55	0.0610	10	34	1	0211489	—
1/16	1.59	0.0625	16	41	1	0050644	—
	1.60	0.0630	10	34	1	0050668	—
	1.70	0.0669	10	34	1	0050675	—
	1.75	0.0689	11	36	1	0211502	—
	1.80	0.0709	11	36	1	0050682	—
	1.90	0.0748	11	36	1	0050699	—
5/64	1.98	0.0781	17	43	1	0050705	—
	2.00	0.0787	12	38	1	0050712	—
	2.10	0.0827	12	38	1	0050729	—
	2.15	0.0846	13	40	1	0211571	—
	2.20	0.0866	13	40	1	0050743	—
	2.30	0.0906	13	40	1	0050750	—
	2.35	0.0925	14	43	1	0211601	—
3/32	2.38	0.0937	19	41	1	0050767	—
	2.40	0.0945	14	43	1	0050781	—
	2.50	0.0984	14	43	1	0050804	0052488
	2.60	0.1024	14	43	1	0050811	0052495
	2.70	0.1063	16	46	1	0050828	0212509
7/64	2.78	0.1094	21	46	1	0050835	0212523
	2.80	0.1102	16	46	1	0050842	—
	2.90	0.1142	16	46	1	0050859	0212561
	3.00	0.1181	16	46	1	0050866	0052501
	3.10	0.1220	18	49	1	0050873	0052518

# PFX SCREW MACHINE DRILL



$d_1$ $\varnothing h_8$ Inch	$d_1$ $\varnothing h_8$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A920	A921
1/8	3.18	0.1250	22	48	1	0050880	0212592
	3.20	0.1260	18	49	1	0050897	0052525
	3.30	0.1299	18	49	1	0050903	0052532
	3.40	0.1339	20	52	1	0050910	0052549
	3.50	0.1378	20	52	1	0050927	0052556
9/64	3.57	0.1406	24	49	1	0050934	0212622
	3.60	0.1417	20	52	1	0050941	0052563
	3.70	0.1457	20	52	1	0050958	0052570
	3.80	0.1496	22	55	1	0050965	0052587
	3.90	0.1535	22	55	1	0050972	0052594
5/32	3.97	0.1563	25	52	1	0050989	0212677
	4.00	0.1575	22	55	1	0051009	0052600
	4.10	0.1614	22	55	1	0051016	0052617
	4.20	0.1654	22	55	1	0051023	0052624
	4.30	0.1693	24	58	1	0051030	0052631
11/64	4.37	0.1719	27	54	1	0051047	0286012
	4.40	0.1732	24	58	1	0051054	0052648
	4.50	0.1772	24	58	1	0051061	0052655
	4.60	0.1811	24	58	1	0051078	0052662
	4.70	0.1850	24	58	1	0051085	0052679
3/16	4.76	0.1875	29	56	1	0051092	0335635
	4.80	0.1890	26	62	1	0051108	0052686
	4.90	0.1929	26	62	1	0051115	0052693
	5.00	0.1969	26	62	1	0051122	0052709
	5.10	0.2008	26	62	1	0051139	0052716
13/64	5.16	0.2031	30	57	1	0051146	0441336
	5.20	0.2047	26	62	1	0051153	0052723
	5.30	0.2087	26	62	1	0051160	0052730
	5.40	0.2126	28	66	1	0051177	0052747
	5.50	0.2165	28	66	1	0051191	0052754
7/32	5.56	0.2188	32	60	1	0051207	0632956
	5.60	0.2205	28	66	1	0051214	0052761
	5.70	0.2244	28	66	1	0051221	0052778
	5.80	0.2283	28	66	1	0051238	0052785
	5.90	0.2323	28	66	1	0051245	0052792
15/64	5.95	0.2344	33	62	1	0051269	0632994
	6.00	0.2362	28	66	1	0051276	0052808
	6.10	0.2402	31	70	1	0051283	0052815
	6.20	0.2441	31	70	1	0051290	0052822
	6.30	0.2480	31	70	1	0051306	0052839
1/4	6.35	0.2500	35	64	1	0051313	0633038
	6.40	0.2520	31	70	1	0051320	0052846
	6.50	0.2559	31	70	1	0051337	0052853
	6.60	0.2598	31	70	1	0051344	0052860
	6.70	0.2638	31	70	1	0051351	0052877
17/64	6.75	0.2656	37	67	1	0051368	0633069
	6.80	0.2677	34	74	1	0051375	0052884
	6.90	0.2717	34	74	1	0051382	0052891
	7.00	0.2756	34	74	1	0051429	0052907
	7.10	0.2795	34	74	1	0051436	0052914
9/32	7.14	0.2812	38	68	1	0051443	0633106
	7.20	0.2835	34	74	1	0051450	0052921
	7.30	0.2874	34	74	1	0051467	0052938
	7.40	0.2913	34	74	1	0051474	0052945
	7.50	0.2953	34	74	1	0051481	0052952
19/64	7.54	0.2969	40	70	1	0051498	0633137
	7.60	0.2992	37	79	1	0051504	0052969
	7.70	0.3031	37	79	1	0051511	0052976
	7.80	0.3071	37	79	1	0051528	0053089
	7.90	0.3110	37	79	1	0051535	0053096
5/16	7.94	0.3125	41	71	1	0051542	0633151
	8.00	0.3150	37	79	1	0051566	0053102
	8.10	0.3189	37	79	1	0051580	0053119
	8.20	0.3228	37	79	1	0051603	0053133
	8.30	0.3268	37	79	1	0051610	0053157
21/64	8.33	0.3281	43	75	1	0051627	0633175

$d_1$ $\varnothing h_8$ Inch	$d_1$ $\varnothing h_8$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A920	A921
	8.40	0.3307	37	79	1	0051634	0053249
	8.50	0.3346	37	79	1	0051658	0053256
	8.60	0.3386	40	84	1	0051665	0053263
	8.70	0.3425	40	84	1	0051672	0053270
11/32	8.73	0.3437	43	76	1	0051689	0633205
	8.80	0.3465	40	84	1	0051702	0053287
	8.90	0.3504	40	84	1	0051719	0053294
	9.00	0.3543	40	84	1	0051726	0053300
	9.10	0.3583	40	84	1	0051733	0053317
23/64	9.13	0.3594	44	78	1	0051740	0633236
	9.20	0.3622	40	84	1	0051757	0053324
	9.30	0.3661	40	84	1	0051764	0053331
	9.40	0.3701	40	84	1	0051771	0053348
	9.50	0.3740	40	84	1	0051788	0053355
3/8	9.52	0.3750	46	79	1	0051795	0633250
	9.60	0.3780	43	89	1	0051801	0053362
	9.70	0.3819	43	89	1	0051818	0053379
	9.80	0.3858	43	89	1	0051825	0053386
	9.90	0.3898	43	89	1	0051832	0053393
25/64	9.92	0.3906	48	83	1	0051849	0633274
	10.00	0.3937	43	89	1	0051856	0053409
	10.20	0.4016	43	89	1	0051863	0053416
	10.30	0.4055	43	89	1	0051870	0053423
13/32	10.32	0.4063	49	84	1	0051887	0633304
	10.50	0.4134	43	89	1	0051900	0053447
27/64	10.72	0.4219	51	86	1	0051917	0633328
	10.80	0.4252	47	95	1	0051924	0053454
	11.00	0.4331	47	95	1	0051931	0053461
7/16	11.11	0.4375	52	87	1	0051948	0633342
	11.50	0.4528	47	95	1	0051962	0053485
29/64	11.51	0.4531	54	90	1	0051979	0633366
	11.80	0.4646	47	95	1	0051986	0053492
15/32	11.91	0.4688	54	92	1	0051993	0633373
	12.00	0.4724	51	102	1	0052006	0053508
	12.20	0.4803	51	102	1	0052013	—
31/64	12.30	0.4843	56	94	1	0052020	0633380
	12.50	0.4921	51	102	1	0052037	0053522
1/2	12.70	0.5000	57	95	1	0052044	0633397
	13.00	0.5118	51	102	1	0052068	0053546
33/64	13.10	0.5156	60	98	1	0212257	0633410
	13.50	0.5315	54	107	1	0052075	0053553
35/64	13.89	0.5469	64	102	1	0212264	0633427
	14.00	0.5512	54	107	1	0052082	0053560
9/16	14.29	0.5625	64	102	1	0212271	0633434
	14.50	0.5709	56	111	1	0052099	0053577
37/64	14.68	0.5781	67	105	1	0212288	0633441
	14.75	0.5807	56	111	1	0212295	0633458
	15.00	0.5906	56	111	1	0052105	0053584
19/32	15.08	0.5937	67	105	1	0212301	0633465
39/64	15.48	0.6094	70	108	1	0212318	0633472
	15.50	0.6102	58	115	1	0052112	0053591
5/8	15.88	0.6250	70	108	1	0212325	0633489
	16.00	0.6299	58	115	1	0052129	0053607
41/64	16.27	0.6406	73	114	1	0212332	—
	16.50	0.6496	60	119	1	0212349	—
21/32	16.67	0.6563	73	114	1	0212356	—
	16.75	0.6594	60	119	1	0212363	—
	17.00	0.6693	60	119	1	0052136	—
43/64	17.07	0.6719	73	117	1	0212370	—
11/16	17.46	0.6875	73	117	1	0212387	—
	17.50	0.6890	62	123	1	0052143	—
45/64	17.86	0.7031	76	121	1	0212394	—
	18.00	0.7087	62	123	1	0052457	—
23/32	18.26	0.7188	76	121	1	0212400	—
	18.50	0.7283	64	127	1	0212417	—
47/64	18.65	0.7344	79	127	1	0212424	—

# PFX SCREW MACHINE DRILL



$d_1$ $\varnothing h_8$ Inch	$d_1$ $\varnothing h_8$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A920	A921
	19.00	0.7480	64	127	1	0052464	—
3/4	19.05	0.7500	79	127	1	0212431	—
49/64	19.45	0.7656	83	130	1	0212448	—
	19.50	0.7677	66	131	1	0212455	—
25/32	19.84	0.7813	83	130	1	0212462	—
	20.00	0.7874	66	131	1	0052471	—



## Multi-Application, Jobber Length

### A510

- 1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4 4.1 4.2  
4.3 5.1 5.2 5.3 6.1 6.2 6.3 6.4 7.1 7.2 7.3 7.4 8.1 8.2 8.3

Low thrust design. Notched point improves chip formation for enhanced penetration rate. TiN coating increases wear resistance and improves tool life.

# ADX


**A510**

**DIN 338**

**4XD**

**HSS**

**130°**



3.00 - 14.00



$d_1$ Ø <sub>h8</sub> Inch	$d_1$ Ø <sub>h8</sub> mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	<b>A510</b>
	3.00	0.1181	33	61	1	0036495
	3.10	0.1220	36	65	1	0036501
1/8	3.18	0.1250	36	65	1	0168974
	3.20	0.1260	36	65	1	0036518
	3.30	0.1299	36	65	1	0036525
	3.40	0.1339	39	70	1	0036532
	3.50	0.1378	39	70	1	0036549
9/64	3.57	0.1406	39	70	1	0168981
	3.60	0.1417	39	70	1	0036556
	3.70	0.1457	39	70	1	0036563
	3.80	0.1496	43	75	1	0036570
	3.90	0.1535	43	75	1	0036587
5/32	3.97	0.1563	43	75	1	0168998
	4.00	0.1575	43	75	1	0036594
	4.10	0.1614	43	75	1	0036600
	4.20	0.1654	43	75	1	0036617
	4.30	0.1693	47	80	1	0036624
11/64	4.37	0.1719	47	80	1	0169001
	4.40	0.1732	47	80	1	0036631
	4.50	0.1772	47	80	1	0036648
	4.60	0.1811	47	80	1	0036655
	4.70	0.1850	47	80	1	0036662
3/16	4.76	0.1875	52	86	1	0169018
	4.80	0.1890	52	86	1	0036679
	4.90	0.1929	52	86	1	0036686
	5.00	0.1969	52	86	1	0036693
	5.10	0.2008	52	86	1	0036709
13/64	5.16	0.2031	52	86	1	0169025
	5.20	0.2047	52	86	1	0036716
	5.30	0.2087	52	86	1	0036723
	5.40	0.2126	57	93	1	0036730
	5.50	0.2165	57	93	1	0036747
7/32	5.56	0.2188	57	93	1	0169032

# ADX JOBBER LENGTH DRILL



$d_1$ $\varnothing h_8$ Inch	$d_1$ $\varnothing h_8$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A510
	5.60	0.2205	57	93	1	0036754
	5.70	0.2244	57	93	1	0036761
	5.80	0.2283	57	93	1	0036778
	5.90	0.2323	57	93	1	0036785
15/64	5.95	0.2344	57	93	1	0169049
	6.00	0.2362	57	93	1	0036792
	6.10	0.2402	63	101	1	0036808
	6.20	0.2441	63	101	1	0036815
	6.30	0.2480	63	101	1	0036822
1/4	6.35	0.2500	63	101	1	0169056
	6.40	0.2520	63	101	1	0036839
	6.50	0.2559	63	101	1	0036846
	6.60	0.2598	63	101	1	0036853
	6.70	0.2638	63	101	1	0036860
17/64	6.75	0.2656	69	109	1	0169063
	6.80	0.2677	69	109	1	0036877
	6.90	0.2717	69	109	1	0036884
	7.00	0.2756	69	109	1	0036891
	7.10	0.2795	69	109	1	0036907
9/32	7.14	0.2812	69	109	1	0169070
	7.20	0.2835	69	109	1	0036914
	7.30	0.2874	69	109	1	0036921
	7.40	0.2913	69	109	1	0036938
	7.50	0.2953	69	109	1	0036945
19/64	7.54	0.2969	75	117	1	0169087
	7.60	0.2992	75	117	1	0036952
	7.70	0.3031	75	117	1	0036969
	7.80	0.3071	75	117	1	0036976
	7.90	0.3110	75	117	1	0036983
5/16	7.94	0.3125	75	117	1	0169094
	8.00	0.3150	75	117	1	0036990
	8.10	0.3189	75	117	1	0037003
	8.20	0.3228	75	117	1	0037010
	8.30	0.3268	75	117	1	0037027
21/64	8.33	0.3281	75	117	1	0169100
	8.40	0.3307	75	117	1	0037034
	8.50	0.3346	75	117	1	0037041
	8.60	0.3386	81	125	1	0037058
	8.70	0.3425	81	125	1	0037065
11/32	8.73	0.3437	81	125	1	0169117
	8.80	0.3465	81	125	1	0037072
	8.90	0.3504	81	125	1	0037089
	9.00	0.3543	81	125	1	0037096
	9.10	0.3583	81	125	1	0037102
23/64	9.13	0.3594	81	125	1	0169124
	9.20	0.3622	81	125	1	0037119
	9.30	0.3661	81	125	1	0037126
	9.40	0.3701	81	125	1	0037133
	9.50	0.3740	81	125	1	0037140
3/8	9.52	0.3750	87	133	1	0169131
	9.60	0.3780	87	133	1	0037157
	9.70	0.3819	87	133	1	0037164
	9.80	0.3858	87	133	1	0037171
	9.90	0.3898	87	133	1	0037188
25/64	9.92	0.3906	87	133	1	0169148
	10.00	0.3937	87	133	1	0036174
	10.10	0.3976	87	133	1	0036181
	10.20	0.4016	87	133	1	0036198
	10.30	0.4055	87	133	1	0036204
13/32	10.32	0.4063	87	133	1	0169155
	10.40	0.4094	87	133	1	0036211
	10.50	0.4134	87	133	1	0036228
	10.60	0.4173	87	133	1	0036235
	10.70	0.4213	94	142	1	0036242
27/64	10.72	0.4219	94	142	1	0169162
	10.80	0.4252	94	142	1	0036259

$d_1$ $\varnothing_{h_8}$ Inch	$d_1$ $\varnothing_{h_8}$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A510
	10.90	0.4291	94	142	1	0036266
	11.00	0.4331	94	142	1	0036273
	11.10	0.4370	94	142	1	0036280
7/16	11.11	0.4375	94	142	1	0169179
	11.20	0.4409	94	142	1	0036297
	11.30	0.4449	94	142	1	0036303
	11.40	0.4488	94	142	1	0036310
	11.50	0.4528	94	142	1	0036327
29/64	11.51	0.4531	94	142	1	0169186
	11.60	0.4567	94	142	1	0036334
	11.70	0.4606	94	142	1	0036341
	11.80	0.4646	94	142	1	0036358
	11.90	0.4685	101	151	1	0036365
15/32	11.91	0.4688	101	151	1	0169193
	12.00	0.4724	101	151	1	0036372
	12.10	0.4764	101	151	1	0036389
	12.20	0.4803	101	151	1	0036396
	12.30	0.4843	101	151	1	0036402
31/64	12.30	0.4843	101	151	1	0169209
	12.40	0.4882	101	151	1	0036419
	12.50	0.4921	101	151	1	0036426
	12.60	0.4961	101	151	1	0036433
	12.70	0.5000	101	151	1	0036440
1/2	12.70	0.5000	101	151	1	0169216
	12.80	0.5039	101	151	1	0036457
	12.90	0.5079	101	151	1	0036464
	13.00	0.5118	101	151	1	0036471
	14.00	0.5512	108	160	1	0036488

# ADX STANDARD LENGTH DRILL



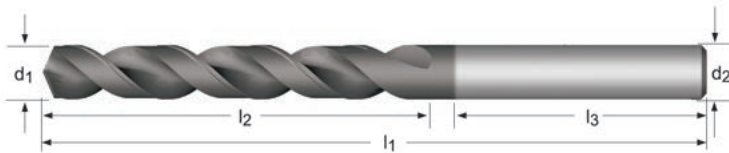
Multi-Application, Premium Cobalt Coolant Feed w/ Reinforced Shank

# ADX






A553

- 1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4 4.1 4.2  
4.3 5.1 5.2 5.3 6.1 6.2 6.3 6.4 7.1 7.2 7.3 7.4 8.1

Notched point improves chip formation. Low thrust design. Cobalt base material & TiAlN-Top coating increases wear resistance and improves tool life.



A553

5.00 - 20.00

d <sub>1</sub> Øh <sub>8</sub> mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	d <sub>2</sub> Øh <sub>6</sub> mm	Pack Qty	A553
5.00	0.1969	36	79	36	6	1	0391204
5.20	0.2047	38	79	36	6	1	0391228
5.50	0.2165	40	79	36	6	1	0391242
6.00	0.2362	43	79	36	6	1	0391280
6.30	0.2480	46	87	36	8	1	0391297
6.50	0.2559	47	87	36	8	1	0391303
6.80	0.2677	48	87	36	8	1	0391327
6.90	0.2717	48	87	36	8	1	0391334
7.00	0.2756	48	87	36	8	1	0391341
7.40	0.2913	54	94	36	8	1	0391365
7.50	0.2953	54	94	36	8	1	0391372
8.00	0.3150	58	94	36	8	1	0391402
8.50	0.3346	75	130	40	10	1	0391419
8.70	0.3425	75	130	40	10	1	0391426
9.00	0.3543	75	130	40	10	1	0391433
9.50	0.3740	75	130	40	10	1	0391457
10.00	0.3937	75	130	40	10	1	0390795
10.20	0.4016	87	150	45	12	1	0390801
10.30	0.4055	87	150	45	12	1	0390818
10.50	0.4134	87	150	45	12	1	0390825
11.00	0.4330	94	150	45	12	1	0390849
11.30	0.4449	94	150	45	12	1	0390856
11.50	0.4528	94	150	45	12	1	0390863
12.00	0.4724	94	150	45	12	1	0390870
12.50	0.4921	101	160	45	14	1	0390887
13.00	0.5118	101	160	45	14	1	0390894
13.50	0.5315	101	160	45	14	1	0390924
14.00	0.5512	101	160	45	14	1	0390948
14.25	0.5610	108	170	48	16	1	0390955
14.50	0.5709	108	170	48	16	1	0390962
15.00	0.5906	108	170	48	16	1	0390986
15.25	0.6004	108	170	48	16	1	0391006
15.50	0.6102	108	170	48	16	1	0391013

$d_1$ $\varnothing h_8$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	$l_3$ mm	$d_2$ $\varnothing h_6$ mm	Pack Qty	A553
16.00	0.6299	108	170	48	16	1	0391037
16.50	0.6496	125	190	48	18	1	0391051
17.00	0.6693	125	190	48	18	1	0391075
17.50	0.6890	130	190	48	18	1	0391099
17.75	0.6988	130	190	48	18	1	0391105
18.00	0.7087	130	190	48	18	1	0391112
19.00	0.7480	135	200	50	20	1	0391150
19.25	0.7579	140	200	50	20	1	0391167
20.00	0.7874	140	200	50	20	1	0391198

# PFX JOBBER LENGTH DRILL



## Premium Cobalt Jobber Length - Parabolic Flute for Advanced Chip Removal

### A900

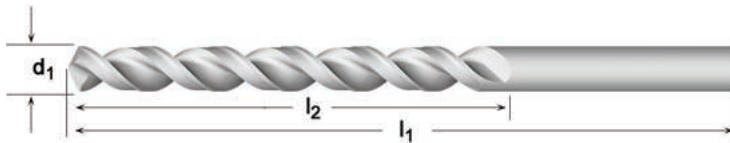
1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4 4.1 4.2  
4.3 5.1 5.2 5.3 6.1 6.2 6.3 6.4 7.1 7.2 7.3 7.4 8.1 8.2

Heavy-Duty parabolic flute design allows greater drilling depths in one pass. Notched Point improves chip formation. Premium cobalt base material increases wear resistance. Bright finish improves chip flow in soft or non-ferrous materials.

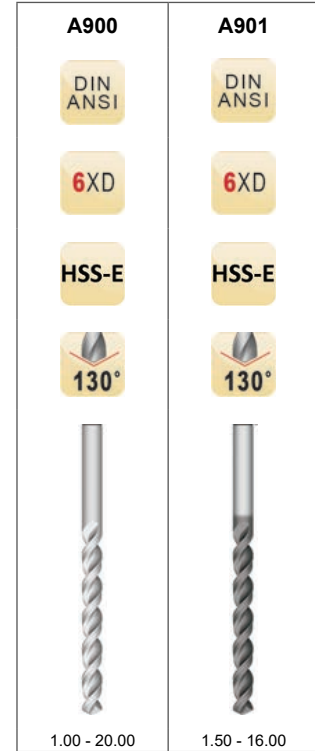
### A901

1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4 4.1 4.2  
4.3 5.1 5.2 5.3 6.3 6.4 7.4

Heavy-Duty parabolic flute design allows greater drilling depths in one pass. Notched point improves chip formation. Premium Cobalt base material combined with AlCrN-Top coating increases lubricity and wear resistance which improves tool life.



## PFX



$d_1$ Ø <sub>h8</sub> Inch	$d_1$ Ø <sub>h8</sub> mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A900	A901
	1.00	0.0394	12	34	1	0046289	—
	1.10	0.0433	14	36	1	0046296	—
3/64	1.19	0.0469	19	44	1	0633540	—
	1.20	0.0472	16	38	1	0046302	—
	1.25	0.0492	16	36	1	0633557	—
	1.30	0.0512	16	38	1	0046319	—
	1.40	0.0551	18	40	1	0046326	—
	1.50	0.0591	18	40	1	0046333	0047781
	1.55	0.0610	20	43	1	0633601	0634547
1/16	1.59	0.0625	22	48	1	0046340	0634554
	1.60	0.0630	20	43	1	0046357	0634561
	1.70	0.0669	20	43	1	0046364	—
	1.75	0.0689	22	46	1	0633625	0634592
	1.80	0.0709	22	46	1	0046371	0634615
	1.90	0.0748	22	46	1	0046388	0634639
5/64	1.98	0.0781	25	51	1	0046395	0634653
	2.00	0.0787	24	49	1	0046401	0047798
	2.10	0.0827	24	49	1	0046418	0634691
	2.15	0.0846	27	53	1	0633694	0634707
	2.20	0.0866	27	53	1	0046425	—
	2.30	0.0906	27	53	1	0046432	—
3/32	2.38	0.0937	32	57	1	0046449	0634752
	2.40	0.0945	30	57	1	0046456	0634769
	2.50	0.0984	30	57	1	0046463	0047804
	2.60	0.1024	30	57	1	0046470	0047811
	2.70	0.1063	33	61	1	0046487	0634820
7/64	2.78	0.1094	38	67	1	0046494	0634844
	2.80	0.1102	33	61	1	0046500	—
	2.90	0.1142	33	61	1	0046517	0634882
	3.00	0.1181	33	61	1	0046524	0047828
	3.10	0.1220	36	65	1	0046531	0047835
1/8	3.18	0.1250	41	70	1	0046548	0634912
	3.20	0.1260	36	65	1	0046555	0047842
	3.30	0.1299	36	65	1	0046562	0047859

d <sub>1</sub> Øh <sub>8</sub> Inch	d <sub>1</sub> Øh <sub>8</sub> mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	Pack Qty	A900	A901
	3.40	0.1339	39	70	1	0046579	0047866
	3.50	0.1378	39	70	1	0046586	0047873
9/64	3.57	0.1406	44	73	1	0046593	0634943
	3.60	0.1417	39	70	1	0046609	0047880
	3.70	0.1457	39	70	1	0046616	0047897
	3.80	0.1496	43	75	1	0046623	0047903
	3.90	0.1535	43	75	1	0046630	0047910
5/32	3.97	0.1563	51	79	1	0046647	0634998
	4.00	0.1575	43	75	1	0046654	0047927
	4.10	0.1614	43	75	1	0046661	0047934
	4.20	0.1654	43	75	1	0046678	0047941
	4.30	0.1693	47	80	1	0046685	0047958
11/64	4.37	0.1719	54	83	1	0046692	0635056
	4.40	0.1732	47	80	1	0046708	0047965
	4.50	0.1772	47	80	1	0046715	0047972
	4.60	0.1811	47	80	1	0046722	0047989
	4.70	0.1850	47	80	1	0046739	0047996
3/16	4.76	0.1875	59	89	1	0046746	0635094
	4.80	0.1890	52	86	1	0046753	0048009
	4.90	0.1929	52	86	1	0046760	0048016
	5.00	0.1969	52	86	1	0046777	0048023
	5.10	0.2008	52	86	1	0046784	0048030
13/64	5.16	0.2031	62	92	1	0046807	0635155
	5.20	0.2047	52	86	1	0046814	0048047
	5.30	0.2087	52	86	1	0046821	0048054
	5.40	0.2126	57	93	1	0046838	0048061
	5.50	0.2165	57	93	1	0046845	0048078
7/32	5.56	0.2188	64	95	1	0046852	0635209
	5.60	0.2205	57	93	1	0046869	0048085
	5.70	0.2244	57	93	1	0046876	0048092
	5.80	0.2283	57	93	1	0046883	0048108
	5.90	0.2323	57	93	1	0046890	0048115
15/64	5.95	0.2344	67	98	1	0046906	0635247
	6.00	0.2362	57	93	1	0046913	0048122
	6.10	0.2402	63	101	1	0046920	0048139
	6.20	0.2441	63	101	1	0046937	0048146
	6.30	0.2480	63	101	1	0046944	0048153
1/4	6.35	0.2500	70	102	1	0046951	0635285
	6.40	0.2520	63	101	1	0046968	0048160
	6.50	0.2559	63	101	1	0046975	0048177
	6.60	0.2598	63	101	1	0046999	0048184
	6.70	0.2638	63	101	1	0047002	0048191
17/64	6.75	0.2656	73	105	1	0047019	0635315
	6.80	0.2677	69	109	1	0047026	0048207
	6.90	0.2717	69	109	1	0047033	0048214
	7.00	0.2756	69	109	1	0047057	0048221
	7.10	0.2795	69	109	1	0047064	0048238
9/32	7.14	0.2812	75	108	1	0047071	0635353
	7.20	0.2835	69	109	1	0047088	0048245
	7.30	0.2874	69	109	1	0047095	0048252
	7.40	0.2913	69	109	1	0047101	0048269
	7.50	0.2953	69	109	1	0047118	0048276
19/64	7.54	0.2969	78	111	1	0047125	0635384
	7.60	0.2992	75	117	1	0047132	0048283
	7.70	0.3031	75	117	1	0047149	0048290
	7.80	0.3071	75	117	1	0047156	0048306
	7.90	0.3110	75	117	1	0047163	0048313
5/16	7.94	0.3125	81	114	1	0047170	0635407
	8.00	0.3150	75	117	1	0047187	0048320
	8.10	0.3189	75	117	1	0047194	0048337
	8.20	0.3228	75	117	1	0047200	0048344
	8.30	0.3268	75	117	1	0047217	0048351
21/64	8.33	0.3280	84	117	1	0047224	0635421
	8.40	0.3307	75	117	1	0047231	0048368
	8.50	0.3346	75	117	1	0047255	0048375
	8.60	0.3386	81	125	1	0047262	0048382

# PFX JOBBER LENGTH DRILL



$d_1$ $\varnothing h_8$ Inch	$d_1$ $\varnothing h_8$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A900	A901
	8.70	0.3425	81	125	1	0047286	0048399
11/32	8.73	0.3437	87	121	1	0047293	0635452
	8.80	0.3465	81	125	1	0047309	0048405
	8.90	0.3504	81	125	1	0047316	0048412
	9.00	0.3543	81	125	1	0047323	0048429
	9.10	0.3583	81	125	1	0047330	0048436
23/64	9.13	0.3594	89	124	1	0047347	0635483
	9.20	0.3622	81	125	1	0047354	0048443
	9.30	0.3661	81	125	1	0047361	0048450
	9.40	0.3701	81	125	1	0047378	0048467
	9.50	0.3740	81	125	1	0047385	0048474
3/8	9.52	0.3750	92	127	1	0047392	0635506
	9.60	0.3780	87	133	1	0047408	0048481
	9.70	0.3819	87	133	1	0047415	0048498
	9.80	0.3858	87	133	1	0047422	0048504
	9.90	0.3898	87	133	1	0047439	0048627
25/64	9.92	0.3906	95	130	1	0047446	0635520
	10.00	0.3937	87	133	1	0047453	0048641
	10.20	0.4016	87	133	1	0047460	0048863
	10.30	0.4055	87	133	1	0047477	0048870
13/32	10.32	0.4063	98	133	1	0047484	0635551
	10.40	0.4094	87	133	1	0047491	0048955
	10.50	0.4134	87	133	1	0047507	0049013
27/64	10.72	0.4219	100	137	1	0047514	0635575
	10.80	0.4252	94	142	1	0047521	0049198
	11.00	0.4331	94	142	1	0047538	0049235
7/16	11.11	0.4375	103	140	1	0047545	0635599
	11.50	0.4528	94	142	1	0047569	0049280
29/64	11.51	0.4531	106	143	1	0047576	0635612
	11.80	0.4646	94	142	1	0047583	0049297
15/32	11.91	0.4688	110	146	1	0047590	0635629
	12.00	0.4724	101	151	1	0047606	0049303
31/64	12.30	0.4843	111	149	1	0047620	0635636
	12.50	0.4921	101	151	1	0047637	0049594
1/2	12.70	0.5000	101	151	1	0047644	46073789
	13.00	0.5118	101	151	1	0047668	0049655
33/64	13.10	0.5156	122	168	1	0634318	0635650
	13.50	0.5315	108	160	1	0047675	0049662
35/64	13.89	0.5469	122	168	1	0634325	0635667
	14.00	0.5512	108	160	1	0047682	0049686
9/16	14.29	0.5625	122	168	1	0634332	0635674
	14.50	0.5709	114	169	1	0047699	0049709
37/64	14.68	0.5781	122	168	1	0634349	0635681
	15.00	0.5906	114	169	1	0047705	0049723
19/32	15.08	0.5937	132	181	1	0634363	0635704
39/64	15.48	0.6094	132	181	1	0634370	0635711
	15.50	0.6102	120	178	1	0047712	0050132
5/8	15.88	0.6250	132	181	1	0634387	0635728
	16.00	0.6299	120	178	1	0047729	0050170
41/64	16.27	0.6406	132	181	1	0634394	—
	16.50	0.6496	125	184	1	0634400	—
21/32	16.67	0.6562	132	181	1	0634417	—
	17.00	0.6693	125	184	1	0047736	—
43/64	17.07	0.6719	143	194	1	0634431	—
11/16	17.46	0.6875	143	194	1	0634448	—
	17.50	0.6890	130	191	1	0047743	—
45/64	17.86	0.7031	130	191	1	0634455	—
	18.00	0.7087	130	191	1	0047750	—
23/32	18.26	0.7187	130	191	1	0634462	—
	18.50	0.7283	135	198	1	0634479	—
47/64	18.65	0.7344	135	198	1	0634486	—
	19.00	0.7480	135	198	1	0047767	—
3/4	19.05	0.7500	135	198	1	0634493	—
49/64	19.45	0.7656	135	198	1	0634509	—
	19.50	0.7677	140	205	1	0634516	—
25/32	19.84	0.7812	140	205	1	0634523	—
	20.00	0.7874	140	205	1	0047774	—



Premium Cobalt, Taper Length - Parabolic Flute for Advanced Chip Removal

## A940

- 1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.2 3.3 3.4 4.1 4.2 4.3  
6.1 6.2 6.3 6.4 7.1 7.2 7.3 7.4 8.1 8.2

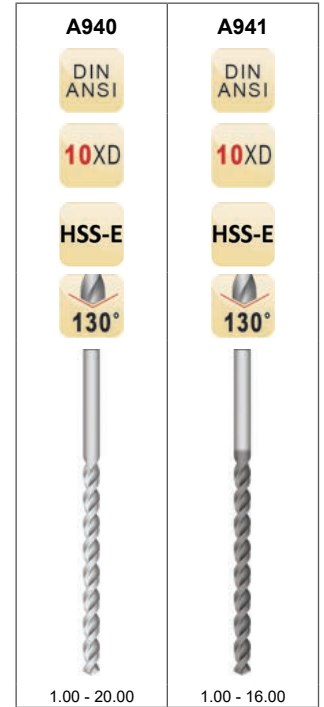
Heavy-Duty parabolic flute design allows greater drilling depths in one pass. Notched point improves chip formation. Premium cobalt material increases wear resistance. Bright finish improves chip flow in soft or non-ferrous materials.

## A941

- 1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4 4.1 4.2  
4.3 6.3 6.4 7.4

Heavy-Duty parabolic flute design allows greater drilling depths in one pass. Notched point improves chip formation. Premium cobalt base material combined with AlCrN-Top Coating increases lubricity and wear resistance which improves tool life.

# PFX



$d_1$ Øh <sub>8</sub> Inch	$d_1$ Øh <sub>8</sub> mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A940	A941
	1.00	0.0394	33	56	1	0053614	0059371
	1.10	0.0433	37	60	1	0053621	—
3/64	1.19	0.0469	29	57	1	0635735	0635803
	1.20	0.0472	41	65	1	0053638	—
	1.30	0.0512	41	65	1	0053645	—
	1.40	0.0551	45	70	1	0053751	—
	1.50	0.0591	45	70	1	0053768	0059388
1/16	1.59	0.0625	44	76	1	0053775	0635810
	1.60	0.0630	50	76	1	0054253	—
	1.70	0.0669	50	76	1	0054260	—
	1.80	0.0709	53	80	1	0054383	—
	1.90	0.0748	53	80	1	0054390	—
5/64	1.98	0.0781	51	95	1	0054406	0635827
	2.00	0.0787	56	85	1	0054604	0059401
	2.10	0.0827	56	85	1	0054611	—
	2.20	0.0866	59	90	1	0054628	—
	2.30	0.0906	59	90	1	0054710	—
3/32	2.38	0.0937	57	108	1	0054727	0635834
	2.40	0.0945	62	95	1	0054734	—
	2.50	0.0984	62	95	1	0054789	0059418
	2.60	0.1024	62	95	1	0054796	—
	2.70	0.1063	66	100	1	0054802	—
7/64	2.78	0.1094	64	117	1	0054833	0635841
	2.80	0.1102	66	100	1	0054840	—
	2.90	0.1142	66	100	1	0054857	—
	3.00	0.1181	66	100	1	0054871	0059432
	3.10	0.1220	69	106	1	0055465	0059449
1/8	3.18	0.1250	70	130	1	0055472	0635858
	3.20	0.1260	69	106	1	0055533	0059463
	3.30	0.1299	69	106	1	0055540	0059654
	3.40	0.1339	73	112	1	0055588	0059661
	3.50	0.1378	73	112	1	0055595	0059838
9/64	3.57	0.1406	76	137	1	0055618	0635865

# PFX TAPER LENGTH DRILL



$d_1$ $\varnothing h_8$ Inch	$d_1$ $\varnothing h_8$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A940	A941
	3.60	0.1417	73	112	1	0055625	0059944
	3.70	0.1457	73	112	1	0055632	0059968
	3.80	0.1496	78	119	1	0056011	0059982
	3.90	0.1535	78	119	1	0056028	0060216
5/32	3.97	0.1563	76	137	1	0056165	0635872
	4.00	0.1575	78	119	1	0056172	0060223
	4.10	0.1614	78	119	1	0056226	0060315
	4.20	0.1654	78	119	1	0056233	0060322
	4.30	0.1693	82	126	1	0056257	0060377
11/64	4.37	0.1719	86	146	1	0056264	0635889
	4.40	0.1732	82	126	1	0056271	0060384
	4.50	0.1772	82	126	1	0056288	0060414
	4.60	0.1811	82	126	1	0056295	0060421
	4.70	0.1850	82	126	1	0056301	0060445
3/16	4.76	0.1875	86	146	1	0056318	0635896
	4.80	0.1890	87	132	1	0056561	0060452
	4.90	0.1929	87	132	1	0056615	0060476
	5.00	0.1969	87	132	1	0056646	0060490
	5.10	0.2008	87	132	1	0056820	0060513
13/64	5.16	0.2031	92	152	1	0056882	0635902
	5.20	0.2047	87	132	1	0056974	0060605
	5.30	0.2087	87	132	1	0057001	0060612
	5.40	0.2126	91	139	1	0057056	0060674
	5.50	0.2165	91	139	1	0057780	0060681
7/32	5.56	0.2188	92	152	1	0057797	0635919
	5.60	0.2205	91	139	1	0057810	0060728
	5.70	0.2244	91	139	1	0057827	0060735
	5.80	0.2283	91	139	1	0057834	0060766
	5.90	0.2323	91	139	1	0057841	0060773
15/64	5.95	0.2344	95	156	1	0057858	0635926
	6.00	0.2362	91	139	1	0057865	0060797
	6.10	0.2402	97	148	1	0057872	0060889
	6.20	0.2441	97	148	1	0058145	0060940
	6.30	0.2480	97	148	1	0058152	0060995
1/4	6.35	0.2500	95	156	1	0058169	0635933
	6.40	0.2520	97	148	1	0058176	0061022
	6.50	0.2559	97	148	1	0058183	0061046
	6.60	0.2598	97	148	1	0058190	0061053
	6.70	0.2638	97	148	1	0058206	0061091
17/64	6.75	0.2656	98	159	1	0058213	0635940
	6.80	0.2677	102	156	1	0058220	0061107
	6.90	0.2717	102	156	1	0058237	0061114
	7.00	0.2756	102	156	1	0058244	0061121
	7.10	0.2795	102	156	1	0058251	0061138
9/32	7.14	0.2812	98	159	1	0058268	0635957
	7.20	0.2835	102	156	1	0058275	0061145
	7.30	0.2874	102	156	1	0058282	0061152
	7.40	0.2913	102	156	1	0058299	0061169
	7.50	0.2953	102	156	1	0058305	0061176
19/64	7.54	0.2969	102	162	1	0058312	0635964
	7.60	0.2992	109	165	1	0058343	0061183
	7.70	0.3031	109	165	1	0058350	0061190
	7.80	0.3071	109	165	1	0058374	0061206
	7.90	0.3110	109	165	1	0058381	0061213
5/16	7.94	0.3125	102	162	1	0058398	0635971
	8.00	0.3150	109	165	1	0058404	0061220
	8.10	0.3189	109	165	1	0058411	0061237
	8.20	0.3228	109	165	1	0058435	0061244
	8.30	0.3268	109	165	1	0058442	0061251
21/64	8.33	0.3281	105	165	1	0058473	0635988
	8.40	0.3307	109	165	1	0058503	0061268
	8.50	0.3346	109	165	1	0058510	0061275
	8.60	0.3386	115	175	1	0058558	0061282
	8.70	0.3425	115	175	1	0058572	0061299
11/32	8.73	0.3438	105	165	1	0058589	0635995
	8.80	0.3465	115	175	1	0058596	0061305

d <sub>1</sub> Øh <sub>8</sub> Inch	d <sub>1</sub> Øh <sub>8</sub> mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	Pack Qty	A940	A941
	8.90	0.3504	115	175	1	0058602	0061312
	9.00	0.3543	115	175	1	0058626	0061329
	9.10	0.3583	115	175	1	0058633	0061336
23/64	9.13	0.3594	108	171	1	0058640	00636008
	9.20	0.3622	115	175	1	0058657	0061343
	9.30	0.3661	115	175	1	0058664	0061350
	9.40	0.3701	115	175	1	0058671	0061367
	9.50	0.3740	115	175	1	0058688	0061374
3/8	9.52	0.3750	108	171	1	0058695	00636015
	9.60	0.3780	121	184	1	0058701 <sup>1)</sup>	0061381 <sup>1)</sup>
	9.70	0.3819	121	184	1	0058718 <sup>1)</sup>	0061398 <sup>1)</sup>
	9.80	0.3858	121	184	1	0058725 <sup>1)</sup>	0061404 <sup>1)</sup>
	9.90	0.3898	121	184	1	0058732 <sup>1)</sup>	0061411 <sup>1)</sup>
25/64	9.92	0.3906	111	178	1	0058749 <sup>1)</sup>	00636022 <sup>1)</sup>
	10.00	0.3937	121	184	1	0058756 <sup>1)</sup>	0061428 <sup>1)</sup>
	10.20	0.4016	121	184	1	0058763 <sup>1)</sup>	0061435 <sup>1)</sup>
	10.30	0.4055	121	184	1	0058770 <sup>1)</sup>	0061442 <sup>1)</sup>
13/32	10.32	0.4063	111	178	1	0058787 <sup>1)</sup>	00636039 <sup>1)</sup>
	10.50	0.4134	121	184	1	0058800 <sup>1)</sup>	0061466 <sup>1)</sup>
27/64	10.72	0.4219	117	184	1	0058817 <sup>1)</sup>	00636046 <sup>1)</sup>
	11.00	0.4331	128	195	1	0058831 <sup>1)</sup>	0061480 <sup>1)</sup>
7/16	11.11	0.4375	117	184	1	0058855 <sup>1)</sup>	00636053 <sup>1)</sup>
	11.20	0.4409	128	195	1	0058862 <sup>1)</sup>	0061497 <sup>1)</sup>
	11.50	0.4528	128	195	1	0058886 <sup>1)</sup>	0061633 <sup>1)</sup>
29/64	11.51	0.4531	121	190	1	0058893 <sup>1)</sup>	00636060 <sup>1)</sup>
	11.80	0.4646	128	195	1	0058909 <sup>1)</sup>	0061657 <sup>1)</sup>
15/32	11.91	0.4688	121	190	1	0058916 <sup>1)</sup>	00636077 <sup>1)</sup>
	12.00	0.4724	134	205	1	0058923 <sup>1)</sup>	0061688 <sup>1)</sup>
	12.20	0.4803	134	205	1	0058930 <sup>1)</sup>	0061718 <sup>1)</sup>
31/64	12.30	0.4843	121	197	1	0058978 <sup>1)</sup>	00636084 <sup>1)</sup>
	12.50	0.4921	134	205	1	0058985 <sup>1)</sup>	0061749 <sup>1)</sup>
1/2	12.70	0.5000	121	197	1	0058992 <sup>1)</sup>	00636091 <sup>1)</sup>
	13.00	0.5118	134	205	1	0059012 <sup>1)</sup>	0061817 <sup>1)</sup>
33/64	13.10	0.5156	121	203	1	0059043 <sup>1)</sup>	00636107 <sup>1)</sup>
17/32	13.49	0.5311	121	203	1	0059050 <sup>1)</sup>	—
	13.50	0.5315	140	214	1	0059067 <sup>1)</sup>	0061848 <sup>1)</sup>
35/64	13.89	0.5469	124	210	1	0635742 <sup>1)</sup>	00636114 <sup>1)</sup>
	14.00	0.5512	140	214	1	0059081 <sup>1)</sup>	0061862 <sup>1)</sup>
9/16	14.29	0.5625	124	210	1	0059111 <sup>1)</sup>	00636121 <sup>1)</sup>
	14.50	0.5709	144	220	1	0059128 <sup>1)</sup>	0061886 <sup>1)</sup>
37/64	14.68	0.5781	124	222	1	0059166 <sup>1)</sup>	00636138 <sup>1)</sup>
	15.00	0.5906	144	220	1	0059180 <sup>1)</sup>	0061909 <sup>1)</sup>
19/32	15.08	0.5937	124	222	1	0059203 <sup>1)</sup>	00636145 <sup>1)</sup>
39/64	15.48	0.6094	124	222	1	0635759 <sup>1)</sup>	00636152 <sup>1)</sup>
	15.50	0.6102	149	227	1	0059210 <sup>1)</sup>	0061916 <sup>1)</sup>
5/8	15.88	0.6250	124	222	1	0059227 <sup>1)</sup>	00636169 <sup>1)</sup>
	16.00	0.6299	149	227	1	0059234 <sup>1)</sup>	0061930 <sup>1)</sup>
41/64	16.27	0.6406	130	229	1	0635766 <sup>1)</sup>	—
	16.50	0.6496	154	235	1	0059241 <sup>1)</sup>	—
21/32	16.67	0.6563	130	229	1	0059258 <sup>1)</sup>	—
	17.00	0.6693	154	235	1	0059265 <sup>1)</sup>	—
43/64	17.07	0.6719	137	235	1	0635773 <sup>1)</sup>	—
11/16	17.46	0.6875	137	235	1	0059272 <sup>1)</sup>	—
	17.50	0.6890	158	241	1	0059289 <sup>1)</sup>	—
45/64	17.86	0.7031	143	241	1	0059296 <sup>1)</sup>	—
	18.00	0.7087	158	241	1	0059302 <sup>1)</sup>	—
23/32	18.26	0.7188	143	241	1	0059326 <sup>1)</sup>	—
47/64	18.65	0.7344	149	248	1	0059333 <sup>1)</sup>	—
	19.00	0.7480	162	247	1	0059340 <sup>1)</sup>	—
3/4	19.05	0.7500	149	248	1	0059357 <sup>1)</sup>	—
49/64	19.45	0.7656	152	251	1	0635780 <sup>1)</sup>	—
25/32	19.84	0.7812	152	251	1	0635797 <sup>1)</sup>	—
	20.00	0.7874	166	254	1	0059364 <sup>1)</sup>	—

<sup>1)</sup> <10xD

# PFX EXTRA LENGTH DRILL



## PFX Premium Cobalt, Extra Length - Parabolic Flute for Advanced Chip Removal

A976

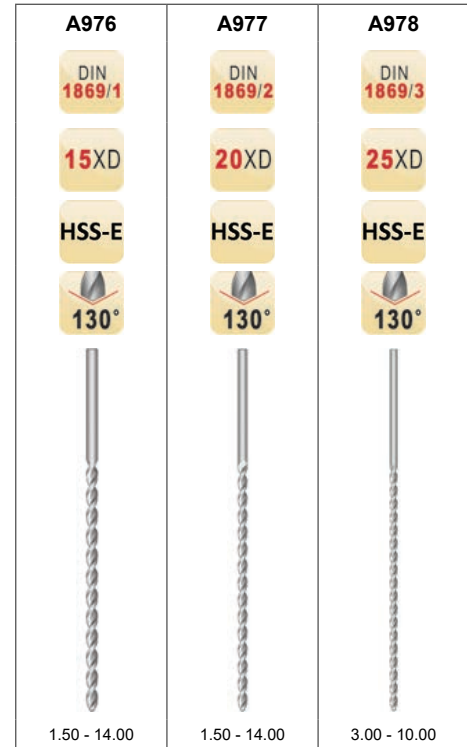
A977

A978

- 1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.2 3.3 3.4 4.1 4.2 4.3  
6.3 6.4 7.4

Heavy-Duty parabolic flute design allows greater drilling depths in one pass. Notched point improves chip formation. Premium cobalt base material increases wear resistance. Bright finish improves chip flow in soft or non-ferrous materials.

# PFX



$d_1$ $\varnothing_{h_8}$ Inch	$d_1$ $\varnothing_{h_8}$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A976	A977	A978
	1.50	0.0591	100	150	1	—	0347386 <sup>1)</sup>	—
	1.50	0.0591	75	115	1	0347362	—	—
1/16	1.59	0.0625	100	150	1	—	0347393 <sup>1)</sup>	—
	2.00	0.0787	110	160	1	—	0347409 <sup>1)</sup>	—
	2.00	0.0787	85	125	1	0148501	—	—
	2.10	0.0827	85	125	1	0279724	—	—
	2.20	0.0866	90	135	1	0148518	—	—
	2.30	0.0906	90	135	1	0279717	—	—
3/32	2.38	0.0937	115	170	1	—	0347416 <sup>1)</sup>	—
	2.40	0.0945	95	140	1	0279731	—	—
	2.50	0.0984	95	140	1	0148525	—	—
	2.60	0.1024	95	140	1	0279748	—	—
	2.70	0.1063	100	150	1	0279755	—	—
	2.80	0.1102	100	150	1	0279762	—	—
	2.90	0.1142	100	150	1	0279779	—	—
	3.00	0.1181	100	150	1	0148532	—	—
	3.00	0.1181	130	190	1	—	0148709	—
	3.00	0.1181	160	240	1	—	—	0347324 <sup>1)</sup>
	3.10	0.1220	105	155	1	0279786	—	—
1/8	3.18	0.1250	105	155	1	0347072	—	—
1/8	3.18	0.1250	135	200	1	—	0347218	—
	3.20	0.1260	105	155	1	0279793	—	—
	3.30	0.1299	105	155	1	0148549	—	—
	3.40	0.1339	115	165	1	0279809	—	—
	3.50	0.1378	115	165	1	0148556	—	—
	3.50	0.1378	145	210	1	—	0148716	—
	3.50	0.1378	180	265	1	—	—	0148853
	3.60	0.1417	115	165	1	0279816	—	—
	3.70	0.1457	115	165	1	0148563	—	—

<sup>1)</sup> Dormer Standard

$d_1$ $\varnothing_{h_8}$ Inch	$d_1$ $\varnothing_{h_8}$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A976	A977	A978
	3.80	0.1496	120	175	1	0279823	—	—
	3.90	0.1535	120	175	1	0279830	—	—
5/32	3.97	0.1563	120	175	1	0347089	—	—
	4.00	0.1575	120	175	1	0148570	—	—
	4.00	0.1575	150	220	1	—	0148723	—
	4.00	0.1575	190	280	1	—	—	0148860
	4.10	0.1614	120	175	1	0279847	—	—
	4.20	0.1654	120	175	1	0279854	—	—
	4.30	0.1693	125	185	1	0279861	—	—
	4.40	0.1732	125	185	1	0279878	—	—
	4.50	0.1772	125	185	1	0148587	—	—
	4.50	0.1772	160	235	1	—	0148730	—
	4.50	0.1772	200	295	1	—	—	0148877
	4.60	0.1811	125	185	1	0279885	—	—
	4.70	0.1850	125	185	1	0279892	—	—
3/16	4.76	0.1875	135	195	1	0347935	—	—
3/16	4.76	0.1875	170	245	1	—	0347225	—
	4.80	0.1890	135	195	1	0279908	—	—
	4.90	0.1929	135	195	1	0279915	—	—
	5.00	0.1969	135	195	1	0148594	—	—
	5.00	0.1969	170	245	1	—	0148747	—
	5.00	0.1969	210	315	1	—	—	0148884
	5.10	0.2008	135	195	1	0279922	—	—
	5.20	0.2047	135	195	1	0279939	—	—
	5.30	0.2087	135	195	1	0279946	—	—
	5.40	0.2126	140	205	1	0279953	—	—
	5.50	0.2165	140	205	1	0148600	—	—
	5.50	0.2165	180	260	1	—	0148754	—
	5.50	0.2165	225	330	1	—	—	0148891
	5.60	0.2205	140	205	1	0279960	—	—
	5.70	0.2244	140	205	1	0279977	—	—
	5.80	0.2283	140	205	1	0279984	—	—
	5.90	0.2323	140	205	1	0279991	—	—
	6.00	0.2362	140	205	1	0148617	—	—
	6.00	0.2362	180	260	1	—	0148761	—
	6.00	0.2362	225	330	1	—	—	0148907
	6.10	0.2402	150	215	1	0280003	—	—
	6.20	0.2441	150	215	1	0280010	—	—
	6.30	0.2480	150	215	1	0280027	—	—
1/4	6.35	0.2500	150	215	1	0347096	—	—
1/4	6.35	0.2500	190	275	1	—	0347232	—
1/4	6.35	0.2500	235	350	1	—	—	0347331
	6.40	0.2520	150	215	1	0280034	—	—
	6.50	0.2559	150	215	1	0148624	—	—
	6.50	0.2559	190	275	1	—	0148778	—
	6.50	0.2559	235	350	1	—	—	0148914
	6.60	0.2598	150	215	1	0280041	—	—
	6.70	0.2638	150	215	1	0280058	—	—
	6.80	0.2677	155	225	1	0280065	—	—
	6.90	0.2717	155	225	1	0280072	—	—
	7.00	0.2756	155	225	1	0148631	—	—
	7.00	0.2756	200	290	1	—	0148785	—
	7.00	0.2756	250	370	1	—	—	0148921
	7.50	0.2953	155	225	1	0148648	—	—
	7.50	0.2953	200	290	1	—	0148792	—
	7.50	0.2953	250	370	1	—	—	0148938
5/16	7.94	0.3125	165	240	1	0347102	—	—
	8.00	0.3150	165	240	1	0148655	—	—
	8.00	0.3150	210	305	1	—	0148808	—
	8.00	0.3150	265	390	1	—	—	0148945
	8.50	0.3346	165	240	1	0148662	—	—
	8.50	0.3346	210	305	1	—	0148815	—
	8.50	0.3346	265	390	1	—	—	0148952
11/32	8.73	0.3437	175	250	1	0347119	—	—
11/32	8.73	0.3437	220	320	1	—	0347249	—
	9.00	0.3543	175	250	1	0148679	—	—

# PFX EXTRA LENGTH DRILL



$d_1$ $\varnothing h_8$ Inch	$d_1$ $\varnothing h_8$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A976	A977	A978
	9.00	0.3543	220	320	1	—	0148822	—
	9.00	0.3543	280	410	1	—	—	0148969
	9.50	0.3740	175	250	1	0148686	—	—
	9.50	0.3740	220	320	1	—	0148839	—
	9.50	0.3740	280	410	1	—	—	0148976
3/8	9.52	0.3750	185	265	1	0347126	—	—
	10.00	0.3937	185	265	1	0148693	—	—
	10.00	0.3937	235	340	1	—	0148846	—
	10.00	0.3937	295	430	1	—	—	0148983
	10.50	0.4134	185	265	1	0347133	—	—
	10.50	0.4134	235	340	1	—	0347256	—
	11.00	0.4331	195	280	1	0347140	—	—
	11.00	0.4331	250	365	1	—	0347263	—
7/16	11.11	0.4375	195	280	1	0347379	—	—
	11.50	0.4528	195	280	1	0347157	—	—
	11.50	0.4528	250	365	1	—	0347270	—
	12.00	0.4724	205	295	1	0347164	—	—
	12.00	0.4724	260	375	1	—	0347287	—
	12.50	0.4921	205	295	1	0347171	—	—
	12.50	0.4921	260	375	1	—	0347294	—
1/2	12.70	0.5000	205	295	1	0347188	—	—
	13.00	0.5118	205	295	1	0347195	—	—
	13.00	0.5118	260	375	1	—	0347300	—
	14.00	0.5512	215	310	1	0347201	—	—
	14.00	0.5512	270	390	1	—	0347317 <sup>1)</sup>	—



# JOBBER DRILL

## General Purpose Jobber Length

\* Sets Available on pgs. 224--227

**R10P** - Fractional Sizes

**R15P** - Letter Sizes

**R18P** - Wire Gauge Sizes

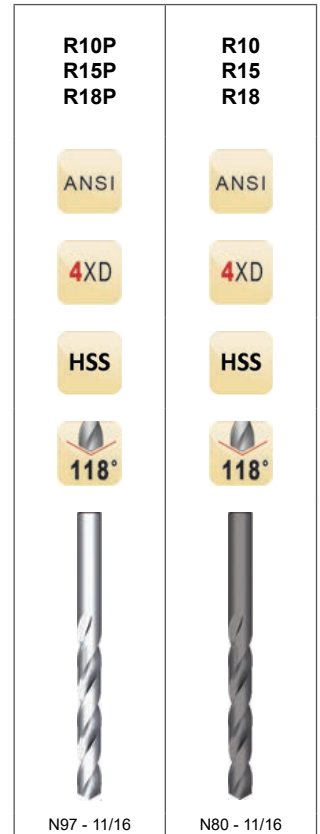
Bright Finish improves chip flow in soft or non-ferrous materials

**R10** - Fractional Sizes

**R15** - Letter Sizes

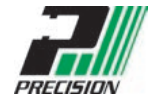
**R18** - Wire Gauge Sizes

Steam Oxide reduces wear and chip welding in harder ferrous materials for increased wear resistance and lubricity.



$d_1$ Ø Inch	$d_1$ Ø Nr.	$d_1$ Ø letter	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	<b>R10P</b> <b>R15P</b> <b>R18P</b>	<b>R10</b> <b>R15</b> <b>R18</b>
	97		0.0059	1/16	3/4	12	018697	—
	96		0.0063	1/16	3/4	12	018696	—
	95		0.0067	1/16	3/4	12	018695	—
	94		0.0071	1/16	3/4	12	018694	—
	93		0.0075	1/16	3/4	12	018693	—
	92		0.0079	1/16	3/4	12	018692	—
	91		0.0083	5/64	3/4	12	018691	—
	90		0.0087	5/64	3/4	12	018690	—
	89		0.0091	5/64	3/4	12	018689	—
	88		0.0095	5/64	3/4	12	018688	—
	87		0.0100	5/64	3/4	12	018687	—
	86		0.0105	3/32	3/4	12	018686	—
	85		0.0110	3/32	3/4	12	018685	—
	84		0.0115	3/32	3/4	12	018684	—
	83		0.0120	3/32	3/4	12	018683	—
	82		0.0125	3/32	3/4	12	018682	—
	81		0.0130	3/32	3/4	12	018681	—
	80		0.0135	1/8	3/4	12	018680	018080
	79		0.0145	1/8	3/4	12	018679	018079
1/64			0.0156	3/16	3/4	12	010601	010001
	78		0.0160	3/16	7/8	12	018678	018078
	77		0.0180	3/16	7/8	12	018677	018077
	76		0.0200	3/16	7/8	12	018676	018076
	75		0.0210	1/4	1"	12	018675	018075
	74		0.0225	1/4	1"	12	018674	018074
	73		0.0240	5/16	1.1/8	12	018673	018073
	72		0.0250	5/16	1.1/8	12	018672	018072
	71		0.0260	3/8	1.1/4	12	018671	018071
	70		0.0280	3/8	1.1/4	12	018670	018070
	69		0.0292	1/2	1.3/8	12	018669	018069

# JOBBER DRILL



d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	R10P R15P R18P	R10 R15 R18
1/32	68		0.0310	1/2	1.3/8	12	018668	018068
			0.0313	1/2	1.3/8	12	010602	010002
	67		0.0320	1/2	1.3/8	12	018667	018067
	66		0.0330	1/2	1.3/8	12	018666	018066
	65		0.0350	5/8	1.1/2	12	018665	018065
	64		0.0360	5/8	1.1/2	12	018664	018064
	63		0.0370	5/8	1.1/2	12	018663	018063
	62		0.0380	5/8	1.1/2	12	018662	018062
	61		0.0390	11/16	1.5/8	12	018661	018061
	60		0.0400	11/16	1.5/8	12	018660	018060
	59		0.0410	11/16	1.5/8	12	018659	018059
	58		0.0420	11/16	1.5/8	12	018658	018058
3/64	57		0.0430	3/4	1.3/4	12	018657	018057
	56		0.0465	3/4	1.3/4	12	018656	018056
			0.0469	3/4	1.3/4	12	010603	010003
	55		0.0520	7/8	1.7/8	12	018655	018055
	54		0.0550	7/8	1.7/8	12	018654	018054
	53		0.0595	7/8	1.7/8	12	018653	018053
1/16			0.0625	7/8	1.7/8	12	010604	010004
	52		0.0635	7/8	1.7/8	12	018652	018052
	51		0.0670	1"	2"	12	018651	018051
	50		0.0700	1"	2"	12	018650	018050
	49		0.0730	1"	2"	12	018649	018049
	48		0.0760	1"	2"	12	018648	018048
5/64			0.0781	1"	2"	12	010605	010005
	47		0.0785	1"	2"	12	018647	018047
	46		0.0810	1.1/8	2.1/8	12	018646	018046
	45		0.0820	1.1/8	2.1/8	12	018645	018045
	44		0.0860	1.1/8	2.1/8	12	018644	018044
	43		0.0890	1.1/4	2.1/4	12	018643	018043
	42		0.0935	1.1/4	2.1/4	12	018642	018042
			0.0938	1.1/4	2.1/4	12	010606	010006
3/32	41		0.0960	1.3/8	2.3/8	12	018641	018041
	40		0.0980	1.3/8	2.3/8	12	018640	018040
	39		0.0995	1.3/8	2.3/8	12	018639	018039
	38		0.1015	1.7/16	2.1/2	12	018638	018038
	37		0.1040	1.7/16	2.1/2	12	018637	018037
	36		0.1065	1.7/16	2.1/2	12	018636	018036
7/64			0.1094	1.1/2	2.5/8	12	010607	010007
	35		0.1100	1.1/2	2.5/8	12	018635	018035
	34		0.1110	1.1/2	2.5/8	12	018634	018034
	33		0.1130	1.1/2	2.5/8	12	018633	018033
	32		0.1160	1.5/8	2.3/4	12	018632	018032
	31		0.1200	1.5/8	2.3/4	12	018631	018031
1/8			0.1250	1.5/8	2.3/4	12	010608	010008
	30		0.1285	1.5/8	2.3/4	12	018630	018030
	29		0.1360	1.3/4	2.7/8	12	018629	018029
	28		0.1405	1.3/4	2.7/8	12	018628	018028
9/64			0.1406	1.3/4	2.7/8	12	010609	010009
	27		0.1440	1.7/8	3"	12	018627	018027
	26		0.1470	1.7/8	3"	12	018626	018026
	25		0.1495	1.7/8	3"	12	018625	018025
	24		0.1520	2"	3.1/8	12	018624	018024
	23		0.1540	2"	3.1/8	12	018623	018023
5/32			0.1563	2"	3.1/8	12	010610	010010
	22		0.1570	2"	3.1/8	12	018622	018022
	21		0.1590	2.1/8	3.1/4	12	018621	018021
	20		0.1610	2.1/8	3.1/4	12	018620	018020
	19		0.1660	2.1/8	3.1/4	12	018619	018019
	18		0.1695	2.1/8	3.1/4	12	018618	018018
11/64			0.1719	2.1/8	3.1/4	12	010611	010011
	17		0.1730	2.3/16	3.3/8	12	018617	018017
	16		0.1770	2.3/16	3.3/8	12	018616	018016





# JOBBER DRILL

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	R10P R15P R18P	R10 R15 R18
	15		0.1800	2.3/16	3.3/8	12	018615	018015
	14		0.1820	2.3/16	3.3/8	12	018614	018014
	13		0.1850	2.5/16	3.1/2	12	018613	018013
3/16			0.1875	2.5/16	3.1/2	12	010612	010012
	12		0.1890	2.5/16	3.1/2	12	018612	018012
	11		0.1910	2.5/16	3.1/2	12	018611	018011
	10		0.1935	2.7/16	3.5/8	12	018610	018010
	9		0.1960	2.7/16	3.5/8	12	018609	018009
	8		0.1990	2.7/16	3.5/8	12	018608	018008
	7		0.2010	2.7/16	3.5/8	12	018607	018007
13/64			0.2031	2.7/16	3.5/8	12	010613	010013
	6		0.2040	2.1/2	3.3/4	12	018606	018006
	5		0.2055	2.1/2	3.3/4	12	018605	018005
	4		0.2090	2.1/2	3.3/4	12	018604	018004
	3		0.2130	2.1/2	3.3/4	12	018603	018003
7/32			0.2188	2.1/2	3.3/4	12	010614	010014
	2		0.2210	2.5/8	3.7/8	12	018602	018002
	1		0.2280	2.5/8	3.7/8	12	018601	018001
		A	0.2340	2.5/8	3.7/8	12	015601	015001
15/64			0.2344	2.5/8	3.7/8	12	010615	010015
		B	0.2380	2.3/4	4"	12	015602	015002
		C	0.2421	2.3/4	4"	12	015603	015003
		D	0.2461	2.3/4	4"	12	015604	015004
		E	0.2500	2.3/4	4"	12	015605	015005
1/4			0.2500	2.3/4	4"	12	010616	010016
		F	0.2571	2.7/8	4.1/8	12	015606	015006
		G	0.2610	2.7/8	4.1/8	12	015607	015007
17/64			0.2656	2.7/8	4.1/8	12	010617	010017
		H	0.2661	2.7/8	4.1/8	12	015608	015008
		I	0.2720	2.7/8	4.1/8	12	015609	015009
		J	0.2772	2.7/8	4.1/8	12	015610	015010
		K	0.2811	2.15/16	4.1/4	12	015611	015011
9/32			0.2813	2.15/16	4.1/4	12	010618	010018
		L	0.2902	2.15/16	4.1/4	12	015612	015012
		M	0.2949	3.1/16	4.3/8	12	015613	015013
19/64			0.2969	3.1/16	4.3/8	12	010619	010019
		N	0.3020	3.1/16	4.3/8	12	015614	015014
5/16			0.3125	3.3/16	4.1/2	6	010620	010020
		O	0.3161	3.3/16	4.1/2	6	015615	015015
		P	0.3228	3.5/16	4.5/8	6	015616	015016
21/64			0.3281	3.5/16	4.5/8	6	010621	010021
		Q	0.3319	3.7/16	4.3/4	6	015617	015017
		R	0.3390	3.7/16	4.3/4	6	015618	015018
11/32			0.3437	3.7/16	4.3/4	6	010622	010022
		S	0.3480	3.1/2	4.7/8	6	015619	015019
		T	0.3580	3.1/2	4.7/8	6	015620	015020
23/64			0.3594	3.1/2	4.7/8	6	010623	010023
		U	0.3680	3.5/8	5"	6	015621	015021
3/8			0.3750	3.5/8	5"	6	010624	010024
		V	0.3772	3.5/8	5"	6	015622	015022
		W	0.3858	3.3/4	5.1/8	6	015623	015023
25/64			0.3906	3.3/4	5.1/8	6	010625	010025
		X	0.3969	3.3/4	5.1/8	6	015624	015024
		Y	0.4039	3.7/8	5.1/4	6	015625	015025
13/32			0.4063	3.7/8	5.1/4	6	010626	010026
		Z	0.4130	3.7/8	5.1/4	6	015626	015026
27/64			0.4219	3.15/16	5.3/8	6	010627	010027
7/16			0.4375	4.1/16	5.1/2	6	010628	010028
29/64			0.4531	4.3/16	5.5/8	6	010629	010029
15/32			0.4687	4.5/16	5.3/4	6	010630	010030
31/64			0.4844	4.3/8	5.7/8	6	010631	010031
1/2			0.5000	4.1/2	6"	6	010632	010032
33/64			0.5156	4.13/16	6.5/8	1	010633	010033

# JOBBER DRILL



$d_1$ Ø Inch	$d_1$ Ø Nr.	$d_1$ Ø letter	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	R10P R15P R18P	R10 R15 R18
17/32			0.5313	4.13/16	6.5/8	1	010634	010034
35/64			0.5469	4.13/16	6.5/8	1	010635	010035
9/16			0.5625	4.13/16	6.5/8	1	010636	010036
37/64			0.5781	4.13/16	6.5/8	1	010637	010037
19/32			0.5937	5.3/16	7.1/8	1	010638	010038
39/64			0.6094	5.3/16	7.1/8	1	010639	010039
5/8			0.6250	5.3/16	7.1/8	1	010640	010040
41/64			0.6406	5.3/16	7.1/8	1	010641	010041
21/32			0.6563	5.3/16	7.1/8	1	010642	010042
43/64			0.6719	5.5/8	7.5/8	1	010643	010043
11/16			0.6875	5.5/8	7.5/8	1	010644	010044

## General Purpose Jobber Length, Fractional

\* Sets Available on pg. 225

### A012

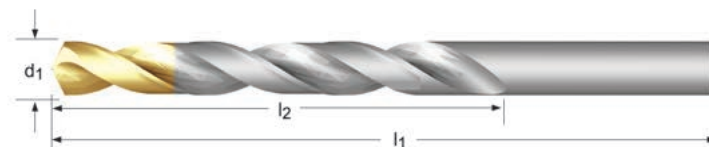
Low thrust design self centering Split Point for easier penetration.  
TiN Coated Tip increases surface hardness and improves tool life.

### A012S

Select A012 sizes available in a pouch pack.

1/16 thru 3/16 2 per pack

13/64 thru 1/2 1 per pack



\* Bright / No split point Below N46

$d_1$ Ø Inch	$d_1$ Ø Nr.	$d_1$ Ø letter	$d_1$ Ø mm	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	A012	A012S
	80		0.34	0.0135	1/8	3/4	10	0574256 *	—
	79		0.37	0.0145	1/8	3/4	10	0574249 *	—
1/64			0.40	0.0156	3/16	3/4	10	0573952 *	—
	78		0.41	0.0160	3/16	7/8	10	0574232 *	—
	77		0.46	0.0180	3/16	7/8	10	0574225 *	—
	76		0.51	0.0200	3/16	7/8	10	0574218 *	—
	75		0.53	0.0210	1/4	1"	10	0574201 *	—
	74		0.57	0.0225	1/4	1"	10	0574195 *	—
	73		0.61	0.0240	5/16	1.1/8	10	0574188 *	—
	72		0.64	0.0250	5/16	1.1/8	10	0574171 *	—
	71		0.66	0.0260	3/8	1.1/4	10	0574164 *	—
	70		0.71	0.0280	3/8	1.1/4	10	0574157 *	—
	69		0.742	0.0292	1/2	1.3/8	10	0574140 *	—
	68		0.79	0.0310	1/2	1.3/8	10	0574133 *	—
1/32			0.79	0.0313	1/2	1.3/8	10	0573969 *	—
	67		0.81	0.0320	1/2	1.3/8	10	0574126 *	—
	66		0.84	0.0330	1/2	1.3/8	10	0574119 *	—
	65		0.89	0.0350	5/8	1.1/2	10	0574102 *	—
	64		0.91	0.0360	5/8	1.1/2	10	0574096 *	—
	63		0.94	0.0370	5/8	1.1/2	10	0574089 *	—
	62		0.97	0.0380	5/8	1.1/2	10	0574072 *	—
	61		0.99	0.0390	11/16	1.5/8	10	0574065 *	—
	60		1.02	0.0400	11/16	1.5/8	10	0574058 *	—
	59		1.04	0.0410	11/16	1.5/8	10	0574041 *	—
	58		1.07	0.0420	11/16	1.5/8	10	0574034 *	—
	57		1.09	0.0430	3/4	1.3/4	10	0574027 *	—
	56		1.18	0.0465	3/4	1.3/4	10	0574010 *	—
3/64			1.19	0.0469	3/4	1.3/4	10	0573976 *	—
	55		1.32	0.0520	7/8	1.7/8	10	0574003 *	—
	54		1.40	0.0550	7/8	1.7/8	10	0573990 *	—
	53		1.51	0.0595	7/8	1.7/8	10	0573983 *	—
1/16			1.59	0.0625	7/8	1.7/8	2	—	46524892 *

# JOBBER DRILL



d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> Ø mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	A012	A012S
1/16			1.59	0.0625	7/8	1.7/8	10	0578636 *	—
	52		1.61	0.0635	7/8	1.7/8	10	0578704 *	—
	51		1.70	0.0669	1"	2"	10	0578698 *	—
	50		1.78	0.0700	1"	2"	10	0578681 *	—
	49		1.85	0.0730	1"	2"	10	0578674 *	—
	48		1.93	0.0760	1"	2"	10	0578667 *	—
5/64			1.98	0.0781	1"	2"	2	—	46524893 *
5/64			1.98	0.0781	1"	2"	10	0578643 *	—
	47		1.99	0.0785	1"	2"	10	0578650 *	—
	46		2.06	0.0810	1.1/8	2.1/8	10	0571705	—
	45		2.08	0.0820	1.1/8	2.1/8	10	0571699	—
	44		2.18	0.0860	1.1/8	2.1/8	10	0571682	—
	43		2.26	0.0890	1.1/4	2.1/4	10	0571675	—
	42		2.38	0.0935	1.1/4	2.1/4	10	0571668	—
3/32			2.38	0.0938	1.1/4	2.1/4	2	—	46524894
3/32			2.38	0.0938	1.1/4	2.1/4	10	0572061	—
	41		2.44	0.0960	1.3/8	2.3/8	10	0571651	—
	40		2.49	0.0980	1.3/8	2.3/8	10	0571644	—
	39		2.53	0.0995	1.3/8	2.3/8	10	0571620	—
	38		2.58	0.1015	1.7/16	2.1/2	10	0571613	—
	37		2.64	0.1040	1.7/16	2.1/2	10	0571606	—
	36		2.71	0.1065	1.7/16	2.1/2	10	0571590	—
7/64			2.78	0.1094	1.1/2	2.5/8	2	—	46524895
7/64			2.78	0.1094	1.1/2	2.5/8	10	0572184	—
	35		2.79	0.1100	1.1/2	2.5/8	10	0571583	—
	34		2.82	0.1110	1.1/2	2.5/8	10	0571576	—
	33		2.87	0.1130	1.1/2	2.5/8	10	0571569	—
	32		2.95	0.1160	1.5/8	2.3/4	10	0571552	—
	31		3.05	0.1200	1.5/8	2.3/4	10	0571545	—
1/8			3.18	0.1250	1.5/8	2.3/4	2	—	46524896
1/8			3.18	0.1250	1.5/8	2.3/4	10	0571897	—
	30		3.26	0.1285	1.5/8	2.3/4	10	0571538	—
	29		3.45	0.1360	1.3/4	2.7/8	10	0571514	—
	28		3.57	0.1405	1.3/4	2.7/8	10	0571507	—
9/64			3.57	0.1405	1.3/4	2.7/8	2	—	46524897
9/64			3.57	0.1406	1.3/4	2.7/8	10	0572214	—
	27		3.66	0.1440	1.7/8	3"	10	0571491	—
	26		3.73	0.1470	1.7/8	3"	10	0571484	—
	25		3.80	0.1495	1.7/8	3"	10	0571477	—
	24		3.86	0.1520	2"	3.1/8	10	0571460	—
	23		3.91	0.1540	2"	3.1/8	10	0571453	—
5/32	5/32		3.97	0.1563	2"	3.1/8	2	—	46524898
5/32			3.97	0.1563	2"	3.1/8	10	0572146	—
	22		3.99	0.1570	2"	3.1/8	10	0571446	—
	21		4.04	0.1590	2.1/8	3.1/4	10	0571439	—
	20		4.09	0.1610	2.1/8	3.1/4	10	0571422	—
	19		4.22	0.1660	2.1/8	3.1/4	10	0571408	—
	18		4.31	0.1695	2.1/8	3.1/4	10	0571392	—
11/64			4.37	0.1719	2.1/8	3.1/4	2	—	46524899
11/64			4.37	0.1719	2.1/8	3.1/4	10	0571910	—
	17		4.39	0.1730	2.3/16	3.3/8	10	0571385	—
	16		4.50	0.1770	2.3/16	3.3/8	10	0571378	—
	15		4.57	0.1800	2.3/16	3.3/8	10	0571361	—
	14		4.62	0.1820	2.3/16	3.3/8	10	0571354	—
	13		4.70	0.1850	2.5/16	3.1/2	10	0571347	—
3/16			4.76	0.1875	2.5/16	3.1/2	2	—	46524900
3/16			4.76	0.1875	2.5/16	3.1/2	10	0572054	—
	12		4.80	0.1890	2.5/16	3.1/2	10	0571330	—
	11		4.85	0.1910	2.5/16	3.1/2	10	0571323	—
	10		4.92	0.1935	2.7/16	3.5/8	10	0571316	—
	9		4.98	0.1960	2.7/16	3.5/8	10	0571750	—
	8		5.06	0.1990	2.7/16	3.5/8	10	0571743	—
	7		5.11	0.2010	2.7/16	3.5/8	10	0571736	—
13/64			5.16	0.2031	2.7/16	3.5/8	1	—	46524901
13/64			5.16	0.2031	2.7/16	3.5/8	10	0571934	—

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> Ø mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	A012	A012S
	6		5.18	0.2040	2.1/2	3.3/4	10	0571729	—
	5		5.22	0.2055	2.1/2	3.3/4	10	0571712	—
	4		5.31	0.2090	2.1/2	3.3/4	10	0571637	—
	3		5.41	0.2130	2.1/2	3.3/4	10	0571521	—
7/32			5.56	0.2188	2.1/2	3.3/4	1	—	46524902
7/32			5.56	0.2188	2.1/2	3.3/4	10	0572177	—
	2		5.61	0.2210	2.5/8	3.7/8	10	0571415	—
	1		5.79	0.2280	2.5/8	3.7/8	10	0571309	—
		A	5.94	0.2340	2.5/8	3.7/8	10	0571163	—
15/64			5.95	0.2344	2.5/8	3.7/8	1	—	46524903
15/64			5.95	0.2344	2.5/8	3.7/8	10	0571958	—
		B	6.03	0.2380	2.3/4	4"	10	0571170	—
		C	6.15	0.2420	2.3/4	4"	10	0571187	—
		D	6.25	0.2460	2.3/4	4"	10	0571194	—
1/4			6.35	0.2500	2.3/4	4"	1	—	46524904
1/4			6.35	0.2500	2.3/4	4"	10	0571125	—
		E	6.35	0.2500	2.3/4	4"	10	0571200	—
		F	6.53	0.2570	2.7/8	4.1/8	10	0571217	—
		G	6.63	0.2610	2.7/8	4.1/8	10	0571224	—
17/64			6.75	0.2656	2.7/8	4.1/8	1	—	46524905
17/64			6.75	0.2656	2.7/8	4.1/8	10	0571972	—
		H	6.76	0.2660	2.7/8	4.1/8	10	0571231	—
		I	6.91	0.2720	2.7/8	4.1/8	10	0571248	—
		J	7.04	0.2770	2.7/8	4.1/8	10	0571255	—
		K	7.14	0.2810	2.15/16	4.1/4	10	0571262	—
9/32			7.14	0.2813	2.15/16	4.1/4	1	—	46524906
9/32			7.14	0.2813	2.15/16	4.1/4	10	0572207	—
		L	7.37	0.2900	2.15/16	4.1/4	10	0571279	—
		M	7.49	0.2950	3.1/16	4.3/8	10	0571286	—
19/64			7.54	0.2968	3.1/16	4.3/8	1	—	46524907
19/64			7.54	0.2968	3.1/16	4.3/8	10	0571996	—
		N	7.67	0.3020	3.1/16	4.3/8	10	0571293	—
5/16			7.94	0.3125	3.3/16	4.1/2	1	—	46524908
5/16			7.94	0.3125	3.3/16	4.1/2	10	0572139	—
		O	8.03	0.3160	3.3/16	4.1/2	10	0571767	—
		P	8.20	0.3230	3.5/16	4.5/8	10	0571774	—
21/64			8.33	0.3281	3.5/16	4.5/8	1	—	46524909
21/64			8.33	0.3281	3.5/16	4.5/8	10	0572009	—
		Q	8.43	0.3320	3.7/16	4.3/4	10	0571781	—
		R	8.61	0.3390	3.7/16	4.3/4	10	0571798	—
11/32			8.73	0.3437	3.7/16	4.3/4	1	—	46524910
11/32			8.73	0.3437	3.7/16	4.3/4	10	0571903	—
		S	8.84	0.3480	3.1/2	4.7/8	10	0571804	—
		T	9.09	0.3580	3.1/2	4.7/8	10	0571811	—
23/64			9.13	0.3594	3.1/2	4.7/8	1	—	46524911
23/64			9.13	0.3594	3.1/2	4.7/8	10	0572016	—
		U	9.35	0.3680	3.5/8	5"	10	0571828	—
3/8			9.52	0.3750	3.5/8	5"	1	—	46524912
3/8			9.52	0.3750	3.5/8	5"	10	0572078	—
		V	9.58	0.3770	3.5/8	5"	10	0571835	—
		W	9.80	0.3860	3.3/4	5.1/8	10	0571842	—
25/64			9.92	0.3906	3.3/4	5.1/8	1	—	46524913
25/64			9.92	0.3906	3.3/4	5.1/8	10	0572023	—
		X	10.08	0.3970	3.3/4	5.1/8	5	0571859	—
		Y	10.26	0.4040	3.7/8	5.1/4	5	0571866	—
13/32			10.32	0.4063	3.7/8	5.1/4	1	—	46524914
13/32			10.32	0.4063	3.7/8	5.1/4	5	0571927	—
		Z	10.49	0.4130	3.7/8	5.1/4	5	0571873	—
27/64			10.72	0.4219	3.15/16	5.3/8	1	—	46524915
27/64			10.72	0.4219	3.15/16	5.3/8	5	0572030	—
7/16			11.11	0.4375	4.1/16	5.1/2	1	—	46524916
7/16			11.11	0.4375	4.1/16	5.1/2	5	0572160	—
29/64			11.51	0.4531	4.3/16	5.5/8	1	—	46524917
29/64			11.51	0.4531	4.3/16	5.5/8	5	0572047	—
15/32			11.91	0.4687	4.5/16	5.3/4	1	—	46524918
15/32			11.91	0.4687	4.5/16	5.3/4	5	0571941	—

# JOBBER DRILL



d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> Ø mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	A012	A012S
31/64			12.30	0.4844	4.3/8	5.7/8	1	—	46524919
31/64			12.30	0.4844	4.3/8	5.7/8	5	0572085	—
1/2			12.70	0.5000	4.1/2	6"	1	—	46524920
1/2			12.70	0.5000	4.1/2	6"	5	0571880	—
33/64			13.10	0.5156	4.13/16	6.5/8	1	0572092	—
17/32			13.49	0.5313	4.13/16	6.5/8	1	0571965	—
35/64			13.89	0.5469	4.13/16	6.5/8	1	0572108	—
9/16			14.29	0.5625	4.13/16	6.5/8	1	0572191	—
37/64			14.68	0.5781	4.13/16	6.5/8	1	0572115	—
19/32			15.08	0.5937	5.3/16	7.1/8	1	0571989	—
39/64			15.48	0.6094	5.3/16	7.1/8	1	0572122	—
5/8			15.88	0.6250	5.3/16	7.1/8	1	0572153	—
21/32			16.67	0.6563	5.3/16	7.1/8	1	0578728	—
11/16			17.46	0.6875	5.5/8	7.5/8	1	0578711	—
45/64			17.86	0.7031	5.5/8	7.5/8	1	0578742	—
23/32			18.26	0.7188	5.5/8	7.5/8	1	0578735	—
47/64			18.65	0.7344	6"	8"	1	0578766	—
3/4			19.05	0.7500	6"	8"	1	0578759	—

**General Purpose Jobber Length, DIN Standard**

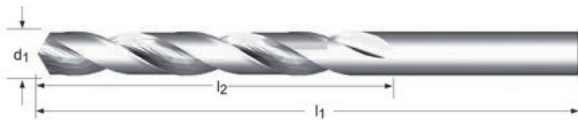
\* Sets Available on pg. 228-230

**2A** Bright Finish improves chip flow in soft or non-ferrous materials

**2AB** Steam Oxide for increased wear resistance & lubricity.  
**A100**

**A002** Low thrust design self centering Split Point for easier penetration. TiN Coated Tip increases wear resistance and improves tool life.  
**A002S**

- \* Bright Below 2mm
- \* No split point below 2mm



2A	2AB	A100	A002	A002S
DIN 338	DIN 338	DIN 338	DIN 338	DIN 338
4XD	4XD	4XD	4XD	4XD
HSS	HSS	HSS	HSS	HSS
118°	118°	118°	118°	118°
0.15 - 15.00	1.00 - 17.50	0.20 - 20.00	1.00 - 16.00	1.00 - 16.00

d <sub>1</sub> Øh <sub>8</sub> mm	d <sub>1</sub> Øh <sub>8</sub> "/Nr./letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	2A	2AB	A100	A002	A002S
0.15		0.0059	1.5	19	016215	—	—	—	—
0.16		0.0063	1.5	19	016216	—	—	—	—
0.17		0.0067	1.5	19	016217	—	—	—	—
0.18		0.0070	1.5	19	016218	—	—	—	—
0.19		0.0075	1.5	19	016219	—	—	—	—
0.20		0.0078	2.5	19	016002	—	0000021	—	—
0.21		0.0083	2.5	19	016221	—	—	—	—
0.22		0.0087	2.5	19	016222	—	—	—	—
0.23		0.0091	2.5	19	016223	—	—	—	—
0.24		0.0094	2.5	19	016224	—	—	—	—
0.25		0.0098	3	19	016225	—	0000038	—	—
0.26		0.0102	3	19	016226	—	—	—	—
0.27		0.0106	3	19	016227	—	—	—	—
0.28		0.0110	3	19	016228	—	—	—	—
0.29		0.0114	3	19	016229	—	—	—	—
0.30		0.0118	3	19	016003	—	0000045	—	—
0.32		0.0126	4	19	016232	—	0000052	—	—
	80	0.0135	4	19	—	—	0029480	—	—
0.34		0.0134	4	19	016234	—	—	—	—
0.35		0.0138	4	19	016235	—	0000069	—	—
0.36		0.0142	4	19	016236	—	—	—	—
	79	0.0145	4	19	—	—	0029466	—	—
0.38		0.0150	4	19	016238	—	0000076	—	—
	1/64	0.0156	5	20	—	—	0001219	—	—
0.40		0.0157	5	20	016004	—	0000083	—	—
	78	0.0160	5	20	—	—	0029459	—	—
0.42		0.0165	5	20	016242	—	0000090	—	—
0.44		0.0173	5	20	016244	—	—	—	—
0.45		0.0177	5	20	016245	—	0000106	—	—
	77	0.0180	5	20	—	—	0029442	—	—

Package quantities: **2A and 2AB:** 0.15mm - 7.90mm = 12; 8.00mm - 12.50mm = 6; 12.70mm and above = 1  
**A100 and A002:** 0.20mm - 10.00mm = 10; X - 13.00mm = 5; 33/64 and above = 1  
**A002S:** 0.20mm - 5.00mm = 2; 13/64 - 13.00mm = 1

d <sub>1</sub> Øh <sub>8</sub> mm	d <sub>1</sub> Øh <sub>8</sub> "/Nr./letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	2A	2AB	A100	A002	A002S
0.46		0.0181	5	20	016246	—	—	—	—
0.48		0.0189	5	20	016248	—	0000113	—	—
0.50		0.0197	6	22	016005	—	0000120	—	—
	76	0.0200	6	22	—	—	0029435	—	—
0.52		0.0205	6	22	—	—	0000137	—	—
	75	0.0210	6	22	—	—	0029428	—	—
0.55		0.0217	7	24	016250	—	0000144	—	—
	74	0.0225	7	24	—	—	0029411	—	—
0.58		0.0228	7	24	—	—	0000151	—	—
0.60		0.0236	7	24	016006	—	0000168	—	—
	73	0.0240	8	26	—	—	0029404	—	—
0.62		0.0244	8	26	—	—	0000175	—	—
	72	0.0250	8	26	—	—	0029398	—	—
0.65		0.0256	8	26	016251	—	0000182	—	—
	71	0.0260	8	26	—	—	0029381	—	—
0.68		0.0268	9	28	—	—	0000199	—	—
0.70		0.0276	9	28	016007	—	0000205	—	—
	70	0.0280	9	28	—	—	0029374	—	—
0.72		0.0283	9	28	—	—	0000212	—	—
	69	0.0292	9	28	—	—	0029350	—	—
0.75		0.0295	9	28	016252	—	0000229	—	—
0.78		0.0307	10	30	—	—	0000236	—	—
	68	0.0310	10	30	—	—	0029343	—	—
	1/32	0.0313	10	30	—	—	0001059	—	—
0.80		0.0315	10	30	016008	—	0000243	—	—
	67	0.0320	10	30	—	—	0029336	—	—
0.82		0.0323	10	30	—	—	0000250	—	—
	66	0.0330	10	30	—	—	0029329	—	—
0.85		0.0335	10	30	016253	—	0000267	—	—
0.88		0.0346	11	32	—	—	0000274	—	—
	65	0.0350	11	32	—	—	0029312	—	—
0.90		0.0354	11	32	016009	—	0000281	—	—
	64	0.0360	11	32	—	—	0029305	—	—
0.92		0.0362	11	32	—	—	0000298	—	—
	63	0.0370	11	32	—	—	0029299	—	—
0.95		0.0374	11	32	016254	—	0000304	—	—
	62	0.0380	12	34	—	—	0029282	—	—
0.98		0.0386	12	34	—	—	0000311	—	—
	61	0.0390	12	34	—	—	0029275	—	—
1.00		0.0394	12	34	016010	029010	0000328	0376782	—
	60	0.0400	12	34	—	—	0029268	—	—
	59	0.0410	12	34	—	—	0029244	—	—
1.05		0.0413	12	34	—	—	0000335	—	—
	58	0.0420	14	36	—	—	0029237	—	—
	57	0.0430	14	36	—	—	0029220	—	—
1.10		0.0433	14	36	016011	029011	0000342	0376799	—
1.15		0.0453	14	36	016256	029256	0000359	—	—
	56	0.0465	14	36	—	—	0029213	—	—
	3/64	0.0469	16	38	—	—	0001783	0376928	—
1.20		0.0472	16	38	016012	029012	0000366	0376805	—
1.25		0.0492	16	38	016257	029257	0000373	—	—
1.30		0.0512	16	38	016013	029013	0000380	0376812	—
	55	0.0520	16	38	—	—	0029206	—	—
1.35		0.0531	18	40	016258	029258	0000397	—	—
	54	0.0550	18	40	—	—	0029190	—	—
1.40		0.0551	18	40	016014	029014	0000403	0376829	—
1.45		0.0571	18	40	016259	029259	0000410	—	—
1.50		0.0591	18	40	016015	029015	0000427	0376836	—
	53	0.0595	20	43	—	—	0029183	—	—
1.55		0.0610	20	43	016260	029260	0000434	—	—
	1/16	0.0625	20	43	—	—	0000786	0376881	—
1.60		0.0630	20	43	016016	029016	0000441	0376843	—

Package quantities: **2A and 2AB:** 0.15mm - 7.90mm = **12**; 8.00mm - 12.50mm = **6**; 12.70mm and above = **1**  
**A100 and A002:** 0.20mm - 10.00mm = **10**; X - 13.00mm = **5**; 33/64 and above = **1**  
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d <sub>1</sub> Øh <sub>8</sub> mm	d <sub>1</sub> Øh <sub>8</sub> "/Nr./letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	2A	2AB	A100	A002	A002S
1.65	52	0.0635	20	43	—	—	0029176	—	—
1.70		0.0650	20	43	016261	—	0000458	—	—
1.75		0.0669	20	43	016017	029017	0000465	0376850	—
	51	0.0670	22	46	—	—	0029169	—	—
1.80		0.0689	22	46	016262	029262	0000472	—	—
1.85		0.0700	22	46	—	—	0029152	—	—
	50	0.0709	22	46	016018	029018	0000489	0376867	—
1.90		0.0728	22	46	—	—	0000496	—	—
	49	0.0730	22	46	—	—	0029138	—	—
1.95		0.0748	22	46	016019	029019	0000502	0376874	—
	48	0.0760	24	49	—	—	0029121	—	—
	5/64	0.0768	24	49	46790303	029264	0000519	—	—
	47	0.0781	24	49	—	—	0002100	0376935	—
2.00		0.0785	24	49	—	—	0029114	—	—
2.05		0.0787	24	49	016020	029020	0001332	0376041	46524831
		0.0807	24	49	—	—	0001349	—	—
	46	0.0810	24	49	—	—	0029107	—	—
	45	0.0820	24	49	—	—	0029091	—	—
2.10		0.0827	24	49	016021	029021	0001356	0376058	—
2.15		0.0846	27	53	016266	—	0001363	—	—
	44	0.0860	27	53	—	—	0029084	—	—
2.20		0.0866	27	53	016022	029022	0001370	0376898	—
2.25		0.0886	27	53	016267	—	0001387	—	—
	43	0.0890	27	53	—	—	0029077	—	—
2.30		0.0906	27	53	016023	029023	0001394	0376904	—
2.35		0.0925	27	53	016268	029268	0001400	—	—
	42	0.0935	30	57	—	—	0029060	—	—
	3/32	0.0937	30	57	—	—	0001752	0376119	—
2.40		0.0945	30	57	016024	029024	0001417	0376911	—
	41	0.0960	30	57	—	—	0029053	—	—
2.45		0.0965	30	57	—	—	0001424	—	—
	40	0.0980	30	57	—	—	0029046	—	—
2.50		0.0984	30	57	016025	029025	0001431	0376065	46524832
	39	0.0995	30	57	—	—	0029022	—	—
2.55		0.1004	30	57	—	—	001448	—	—
	38	0.1015	30	57	—	—	0029015	—	—
2.60		0.1024	30	57	016026	029026	0001455	0376072	—
	37	0.1040	30	57	—	—	0029008	—	—
2.65		0.1043	30	57	—	—	0001462	—	—
2.70		0.1063	33	61	016027	029027	0001479	0376089	—
	36	0.1065	33	61	—	—	0028995	—	—
2.75		0.1083	33	61	016270	—	0001486	—	—
	7/64	0.1093	33	61	—	—	0002384	0376126	—
	35	0.1100	33	61	—	—	0028988	—	—
2.82		0.1102	33	61	—	—	0001493	0376096	—
	34	0.1110	33	61	—	—	0028971	—	—
2.85		0.1122	33	61	—	—	0001509	—	—
	33	0.1130	33	61	—	—	0028964	—	—
2.90		0.1142	33	61	016029	029029	0001516	0376102	—
	32	0.1160	33	61	—	—	0028957	—	—
2.95		0.1161	33	61	—	—	0001523	—	—
3.00		0.1181	33	61	016030	029030	0001608	0350577	46524833
	31	0.1200	36	65	—	—	0028940	—	—
3.10		0.1220	36	65	016031	029031	0001615	0350584	—
3.15		0.1240	36	65	—	—	0001622	—	—
	1/8	0.1250	36	65	—	—	0001264	0350591	46524834
3.20		0.1260	36	65	016032	029032	0001639	0350607	46524835
3.25		0.1280	36	65	016271	029271	0001646	0605356	—
	30	0.1285	36	65	—	—	0028933	—	—
3.30		0.1299	36	65	016033	029033	0001653	0350614	46524836
3.40		0.1339	39	70	016034	029034	0001660	0350621	—
	29	0.1360	39	70	—	—	0028919	—	—

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d <sub>1</sub> Øh <sub>8</sub> mm	d <sub>1</sub> Øh <sub>8</sub> "/Nr./letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	2A	2AB	A100	A002	A002S
3.50		0.1378	39	70	016035	029035	0001677	0350638	46524837
	28	0.1405	39	70	—	—	0028902	—	—
	9/64	0.1406	39	70	—	—	0002650	0350645	—
3.60		0.1417	39	70	016036	029036	0001684	0350652	—
	27	0.1440	39	70	—	—	0028896	—	—
3.70		0.1457	39	70	016037	029037	0001691	0350669	—
	26	0.1470	39	70	—	—	0028889	—	—
3.75		0.1476	39	70	—	—	0001707	—	—
	25	0.1495	43	75	—	—	0028872	—	—
3.80		0.1496	43	75	—	—	0001714	0350676	—
	24	0.1520	43	75	—	—	0028865	—	—
3.90		0.1535	43	75	—	—	0001721	0350683	—
	23	0.1540	43	75	—	—	0028858	—	—
	5/32	0.1562	43	75	—	—	0002094	0350690	46524838
	22	0.1570	43	75	—	—	0028841	—	—
4.00		0.1575	43	75	016040	029040	0001820	0350706	46524839
	21	0.1590	43	75	—	—	0028834	—	—
	20	0.1610	43	75	—	—	0028827	—	—
4.10		0.1614	43	75	016041	029041	0001837	0350713	46524860
4.20		0.1654	43	75	016042	029042	0001844	0350720	46524861
	19	0.1660	43	75	—	—	0028803	—	—
4.25		0.1673	43	75	—	—	0001851	—	—
4.30		0.1693	47	80	—	—	0001868	0350737	—
4.30		0.1693	47	80	016043	029043	0001868	0350737	—
	18	0.1695	47	80	—	—	0028797	—	—
	11/64	0.1719	47	80	—	—	0000793	0350744	—
	17	0.1730	47	80	—	—	0028780	—	—
4.40		0.1732	47	80	016044	029044	0001875	0350751	—
	16	0.1770	47	80	—	—	0028773	—	—
4.50		0.1772	47	80	016045	029045	0001882	0350768	46524862
	15	0.1800	47	80	—	—	0028766	—	—
4.60		0.1811	47	80	016046	029046	0001899	0350775	—
	14	0.1820	47	80	—	—	0028759	—	—
4.70		0.1850	47	80	—	—	0001905	0350782	—
	13	0.1850	47	80	—	—	0028742	—	—
4.75		0.1870	47	80	—	—	0001912	—	—
	3/16	0.1875	52	86	—	—	0001738	0350799	46524863
	12	0.1890	52	86	—	—	0028735	—	—
4.80		0.1890	52	86	016048	029048	0001929	0350805	—
	11	0.1910	52	86	—	—	0028728	—	—
4.90		0.1929	52	86	—	—	0001936	0350812	—
	10	0.1935	52	86	—	—	0028711	—	—
	9	0.1960	52	86	—	—	0029497	—	—
5.00		0.1968	52	86	016050	029050	0001967	0350829	46524864
	8	0.1990	52	86	—	—	0029473	—	—
5.10		0.2008	52	86	016051	029051	0001974	0350836	—
	7	0.2010	52	86	—	—	0029367	—	—
	13/64	0.2031	52	86	—	—	0001073	0350843	46524865
	6	0.2040	52	86	—	—	0029251	—	—
5.20		0.2047	52	86	016052	029052	0001981	0350850	—
	5	0.2055	52	86	—	—	0029145	—	—
5.25		0.2067	52	86	—	—	0001998	—	—
5.30		0.2087	52	86	016053	029053	0002001	0350867	—
	4	0.2090	57	93	—	—	0029039	—	—
5.40		0.2126	57	93	016054	029054	0002018	0350874	—
	3	0.2130	57	93	—	—	0028926	—	—
5.50		0.2165	57	93	016055	029055	0002025	0350881	46524866
	7/32	0.2187	57	93	—	—	0002377	0350898	46524867
5.60		0.2205	57	93	016056	029056	0002032	0350904	—
	2	0.2210	57	93	—	—	0028810	—	—
5.70		0.2244	57	93	016057	029057	0002049	0350911	—
5.75		0.2264	57	93	016276	029276	0002056	—	—

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d <sub>1</sub> Øh <sub>8</sub> mm	d <sub>1</sub> Øh <sub>8</sub> "/Nr./letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	2A	2AB	A100	A002	A002S
	1	0.2280	57	93	—	—	0028704	—	—
5.80		0.2283	57	93	016058	029058	0002063	0350928	—
5.90		0.2323	57	93	—	—	0002070	0350935	—
	A	0.2340	57	93	—	—	0028568	—	—
	15/64	0.2344	57	93	—	—	0001189	0350942	—
6.00		0.2362	57	93	016060	029060	0002124	0350959	46524868
	B	0.2380	63	101	—	—	0028575	—	—
6.10		0.2402	63	101	016061	029061	0002131	0350966	—
	C	0.2420	63	101	—	—	0028582	—	—
6.20		0.2441	63	101	016062	029062	0002148	0350973	—
	D	0.2460	63	101	—	—	0028599	—	—
6.25		0.2461	63	101	—	—	0002155	—	—
6.30		0.2480	63	101	016063	029063	0002162	0350980	—
	1/4	0.2500	63	101	—	—	0001080	0350997	46524869
	E	0.2500	63	101	—	—	0028605	—	—
6.40		0.2520	63	101	016064	029064	0002179	0351000	—
6.50		0.2559	63	101	016065	029065	0002186	0351017	46524870
	F	0.2570	63	101	—	—	0028612	—	—
6.60		0.2598	63	101	016066	029066	0002193	0351024	—
	G	0.2610	63	101	—	—	0028629	—	—
6.70		0.2638	63	101	016067	029067	0002209	0351031	—
	17/64	0.2656	69	109	—	—	0001257	0351048	46524871
6.75		0.2657	69	109	016278	029278	0002216	—	—
	H	0.2660	69	109	—	—	0028636	—	—
6.80		0.2677	69	109	016068	029068	0002223	0351055	46524872
6.90		0.2717	69	109	—	—	0002230	0351062	—
	I	0.2720	69	109	—	—	0028643	—	—
7.00		0.2756	69	109	016070	029070	0002247	0351079	46524873
	J	0.2770	69	109	—	—	0028650	—	—
7.10		0.2795	69	109	—	—	0002254	0351086	—
	K	0.2810	69	109	—	—	0028667	—	—
	9/32	0.2812	69	109	—	—	0002643	0351093	—
7.20		0.2835	69	109	016072	029072	0002261	0351109	—
7.25		0.2854	69	109	016279	029279	0002278	—	—
7.30		0.2874	69	109	016073	029073	0002285	0351116	—
	L	0.2900	69	109	—	—	0028674	—	—
7.40		0.2913	69	109	016074	029074	0002292	0351123	—
	M	0.2950	69	109	—	—	0028681	—	—
7.50		0.2953	69	109	016075	029075	0002308	0351130	46524874
	19/64	0.2968	75	117	—	—	0001325	0351147	—
7.60		0.2992	75	117	016076	029076	0002315	0351154	—
	N	0.3020	75	117	—	—	0028698	—	—
7.70		0.3031	75	117	—	—	0002322	0351161	—
7.75		0.3051	75	117	—	—	0002339	—	—
7.80		0.3071	75	117	016078	029078	0002346	0351178	—
7.85		0.3091	75	117	—	029281	—	—	—
7.90		0.3110	75	117	016079	029079	0002353	0351185	—
	5/16	0.3125	75	117	—	—	0002087	0351192	46524875
8.00		0.3150	75	117	016080	029080	0002391	0351208	46524876
	O	0.3160	75	117	—	—	0029503	—	—
8.10		0.3189	75	117	016081	029081	0002407	0351215	—
	P	0.3230	75	117	—	—	0029510	—	—
8.20		0.3228	75	117	016082	029082	0002414	0351222	46524877
8.25		0.3248	75	117	016282	029282	0002421	—	—
8.30		0.3268	75	117	—	—	0002438	0351239	—
	21/64	0.3281	75	117	—	—	0001554	0351246	—
8.40		0.3307	75	117	016084	029084	0002445	0351253	—
	Q	0.3320	75	117	—	—	0029527	—	—
8.50		0.3346	75	117	016085	029085	0002452	0351260	46524878
8.60		0.3386	81	125	016086	029086	0002469	0351277	—
	R	0.3390	81	125	—	—	0029534	—	—
8.70		0.3425	81	125	016087	029087	0002476	—	—
	11/32	0.3437	81	125	—	—	0000779	0351291	—

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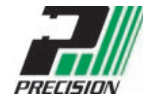
d <sub>1</sub> Øh <sub>8</sub> mm	d <sub>1</sub> Øh <sub>8</sub> "/Nr./letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	2A	2AB	A100	A002	A002S
8.75		0.3445	81	125	016283	029283	0002483	—	—
8.80		0.3465	81	125	016088	029088	0002490	0351307	—
	S	0.3480	81	125	—	—	0029541	—	—
8.90		0.3504	81	125	016089	029089	0002506	0351314	—
9.00		0.3543	81	125	016090	029090	0002513	0351321	46524879
	T	0.3580	81	125	—	—	0029558	—	—
9.10		0.3583	81	125	—	—	0002520	0351338	—
	23/64	0.3594	81	125	—	—	0001561	0351345	—
9.20		0.3622	81	125	—	—	0002537	0351352	—
9.25		0.3642	81	125	—	—	0002544	—	—
9.30		0.3661	81	125	016093	029093	0002551	0351369	—
	U	0.3680	81	125	—	—	0029565	—	—
9.40		0.3701	81	125	016094	029094	0002568	0351376	—
9.50		0.3740	81	125	016095	029095	0002575	0351383	46524880
	3/8	0.3750	87	133	—	—	0001806	0351390	46524881
	V	0.3770	87	133	—	—	0029572	—	—
9.60		0.3780	87	133	016096	029096	0002582	0351406	—
9.70		0.3819	87	133	016097	029097	0002599	0351413	—
9.75		0.3839	87	133	—	—	0002605	—	—
9.80		0.3858	87	133	016098	029098	0002612	0351420	—
	W	0.3860	87	133	—	—	0029589	—	—
9.90		0.3898	87	133	016099	029099	0002629	0351437	—
	25/64	0.3906	87	133	—	—	0001578	0351444	—
10.00		0.3937	87	133	016100	029100	0000526	0351451	46524882
	X	0.3970	87	133	—	—	0029596	—	—
10.10		0.3976	87	133	—	—	0000533	0351468	—
10.20		0.4016	87	133	016102	029102	0000540	0351475	46524883
10.25		0.4035	87	133	—	—	0000557	—	—
	Y	0.4040	87	133	—	—	0029602	—	—
10.30		0.4055	87	133	016103	029103	0000564	0351482	—
	13/32	0.4062	87	133	—	—	0001066	0351499	—
10.40		0.4094	87	133	—	—	0000571	0351505	—
	Z	0.4130	87	133	—	—	0029619	—	—
10.50		0.4134	87	133	016105	029105	0000588	0351512	46524884
10.60		0.4173	87	133	016106	—	0000595	0351529	—
10.70		0.4213	94	142	—	—	0000601	0351536	—
	27/64	0.4219	94	142	—	—	0001585	0351543	—
10.75		0.4232	94	142	—	—	0000618	—	—
10.80		0.4252	94	142	016108	029108	0000625	0351550	—
10.90		0.4291	94	142	016109	029109	0000632	0351567	—
11.00		0.4331	94	142	016110	029110	0000649	0351574	46524885
11.10		0.4370	94	142	—	—	0000656	0351581	—
	7/16	0.4375	94	142	—	—	0002360	0351598	—
11.20		0.4409	94	142	016112	029112	0000663	0351604	—
11.25		0.4429	94	142	—	—	0000670	—	—
11.30		0.4449	94	142	016113	029113	0000687	0351611	—
11.40		0.4488	94	142	016114	029114	0000694	0351628	—
11.50		0.4528	94	142	016115	029115	0000700	0351635	46524886
	29/64	0.4531	94	142	—	—	0001592	0351642	—
11.60		0.4567	94	142	—	—	0000717	0351659	—
11.70		0.4606	94	142	016117	029117	0000724	0351666	—
11.75		0.4626	94	142	—	—	0000731	—	—
11.80		0.4646	94	142	016118	029118	0000748	0351673	—
11.90		0.4685	101	151	—	—	0000755	0351680	—
	15/32	0.4687	101	151	—	—	0001172	0351697	—
12.00		0.4724	101	151	016120	029120	0000816	0351703	46524887
12.10		0.4764	101	151	016121	029121	0000823	0351710	—
12.20		0.4803	101	151	016122	029122	0000830	0351727	—
12.25		0.4823	101	151	—	—	0000847	—	—
12.30		0.4843	101	151	—	—	0000854	0351734	—
	31/64	0.4843	101	151	—	—	0001745	0351741	—
12.40		0.4882	101	151	—	—	0000861	0351758	—

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**A100 and A002:** 0.20mm - 10.00mm = **10**; X - 13.00mm = **5**; 33/64 and above = **1**  
**A002S:** 0.20mm - 5.00mm = **2**; 13/64 - 13.00mm = **1**

d <sub>1</sub> Øh <sub>8</sub> mm	d <sub>1</sub> Øh <sub>8</sub> "/Nr./letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	2A	2AB	A100	A002	A002S
12.50		0.4921	101	151	016125	029125	0000878	0351765	46524888
12.60		0.4961	101	151	—	—	0000885	0351772	—
	1/2	0.5000	101	151	—	—	0000809	0351789	46524889
12.70		0.5000	101	151	—	029127	0000892	0351796	—
12.75		0.5020	101	151	—	—	0000908	—	—
12.80		0.5039	101	151	016128	029128	0000915	0351802	—
12.90		0.5079	101	151	—	029129	0000922	0351819	—
13.00		0.5118	101	151	016130	029130	0000939	0351826	46524890
	33/64	0.5156	101	151	—	—	0001769	0385333	—
13.10		0.5157	101	151	—	—	0000946	0385180	—
13.20		0.5197	101	151	—	—	0000953	0385524	—
13.25		0.5217	108	160	—	—	0000960	0385579	—
13.30		0.5236	108	160	—	—	0000977	0385197	—
13.40		0.5276	108	160	—	—	0000984	0385531	—
	17/32	0.5313	108	160	—	—	0001240	0385319	—
13.50		0.5315	108	160	034135	016135	0000991	0385548	—
13.60		0.5354	108	160	—	—	0001004	0385203	—
13.70		0.5394	108	160	—	—	0001011	0385210	—
13.75		0.5413	108	160	—	—	0001028	0385586	—
13.80		0.5433	108	160	—	—	0001035	0385227	—
	35/64	0.5469	108	160	—	—	0001776	0385340	—
13.90		0.5472	108	160	—	—	0001042	0385494	—
14.00		0.5512	108	160	034140	016140	0001097	0384497	—
14.25		0.5610	114	169	—	—	0001103	0385234	—
	9/16	0.5625	114	169	—	—	0002636	0385388	—
14.50		0.5709	114	169	034145	016145	0001110	0385241	—
	37/64	0.5781	114	169	—	—	0001790	0385357	—
14.75		0.5807	114	169	—	—	0001127	0385258	—
15.00		0.5906	114	169	034150	016150	0001134	0385265	—
	19/32	0.5937	120	178	—	—	0001318	0385326	—
15.25		0.6004	120	178	—	—	0001141	0385272	—
	39/64	0.6094	120	178	—	—	0001813	0385364	—
15.50		0.6102	120	178	—	016155	0001158	0385289	—
15.75		0.6201	120	178	—	—	0001165	0385296	—
	5/8	0.6250	120	178	—	—	0002117	0385371	—
16.00		0.6299	120	178	—	016160	0001196	0385302	—
	41/64	0.6406	125	184	—	—	0001943	—	—
16.50		0.6496	125	184	—	016165	0001202	—	—
	21/32	0.6562	125	184	—	—	0001547	—	—
17.00		0.6693	125	184	—	016170	0001226	—	—
	43/64	0.6719	130	191	—	—	0001950	—	—
	11/16	0.6875	130	191	—	—	0000762	—	—
17.50		0.6890	130	191	—	016175	0001233	—	—
18.00		0.7087	130	191	—	—	0001271	—	—
18.50		0.7283	135	198	—	—	0001288	—	—
19.00		0.7480	135	198	—	—	0001295	—	—
19.50		0.7677	140	205	—	—	0001301	—	—
20.00		0.7874	140	205	—	—	0001530	—	—

Package quantities: **2A and 2AB:** 0.15mm - 7.90mm = **12**; 8.00mm - 12.50mm = **6**; 12.70mm and above = **1**  
**A100 and A002:** 0.20mm - 10.00mm = **10**; X - 13.00mm = **5**; 33/64 and above = **1**  
**A002S:** 0.20mm - 5.00mm = **2**; 13/64 - 13.00mm = **1**

# JOBBER DRILL



## General Purpose Jobber Length - Left Hand

\* Sets Available on pg. 231

**L10** Left hand helix for use in machines where spindle is counter-clockwise & can be used to remove broken parts without damaging threaded holes. Bright Finish improves chip flow in soft or non-ferrous materials



L10

ANSI

4XD

HSS

118°

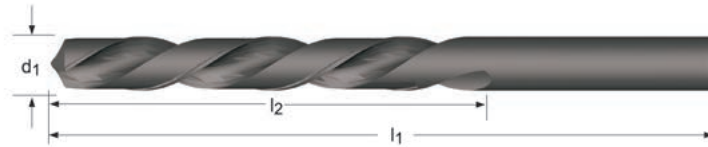


1/32 - 1/2

$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	L10
1/32	0.0313	1/2	1.3/8	12	010902
3/64	0.0469	3/4	1.3/4	12	010903
1/16	0.0625	7/8	1.7/8	12	010904
5/64	0.0781	1"	2"	12	010905
3/32	0.0938	1.1/4	2.1/4	12	010906
7/64	0.1094	1.1/2	2.5/8	12	010907
1/8	0.1250	1.5/8	2.3/4	12	010908
9/64	0.1406	1.3/4	2.7/8	12	010909
5/32	0.1563	2"	3.1/8	12	010910
11/64	0.1719	2.1/8	3.1/4	12	010911
3/16	0.1875	2.5/16	3.1/2	12	010912
13/64	0.2031	2.7/16	3.5/8	12	010913
7/32	0.2188	2.1/2	3.3/4	12	010914
15/64	0.2344	2.5/8	3.7/8	12	010915
1/4	0.2500	2.3/4	4"	12	010916
17/64	0.2656	2.7/8	4.1/8	12	010917
9/32	0.2813	2.15/16	4.1/4	12	010918
19/64	0.2969	3.1/16	4.3/8	12	010919
5/16	0.3125	3.3/16	4.1/2	6	010920
21/64	0.3281	3.5/16	4.5/8	6	010921
11/32	0.3437	3.7/16	4.3/4	6	010922
23/64	0.3594	3.1/2	4.7/8	6	010923
3/8	0.3750	3.5/8	5"	6	010924
25/64	0.3906	3.3/4	5.1/8	6	010925
13/32	0.4063	3.7/8	5.1/4	6	010926
27/64	0.4219	3.15/16	5.3/8	6	010927
7/16	0.4375	4.1/16	5.1/2	6	010928
29/64	0.4531	4.3/16	5.5/8	6	010929
15/32	0.4687	4.5/16	5.3/4	6	010930
31/64	0.4844	4.3/8	5.7/8	6	010931
1/2	0.5000	4.1/2	6"	6	010932

## General Purpose Jobber Length - Left Hand

**A101** Left hand helix for use in machines where spindle is counter-clockwise & can be used to remove broken parts without damaging threaded holes.



**A101**

**DIN 338**

**4XD**

**HSS**

**118°**



1.00 - 12.00

$d_1$ $\varnothing_{h_8}$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	<b>A101</b>
1.00	0.0394	12	34	0002667
1.10	0.0433	14	36	0002674
1.20	0.0472	16	38	0002681
1.25	0.0492	16	38	0002698
1.30	0.0512	16	38	0002704
1.40	0.0551	18	40	0002711
1.50	0.0591	18	40	0002728
1.60	0.0630	20	43	0002735
1.70	0.0669	20	43	0002742
1.80	0.0709	22	46	0002766
1.90	0.0748	22	46	0002773
2.00	0.0787	24	49	0002803
2.10	0.0827	24	49	0002810
2.20	0.0866	27	53	0002827
2.30	0.0906	27	53	0002834
2.40	0.0945	30	57	0002841
2.50	0.0984	30	57	0002858
2.60	0.1024	30	57	0002865
2.70	0.1063	33	61	0002872
2.80	0.1102	33	61	0002889
2.90	0.1142	33	61	0002896
3.00	0.1181	33	61	0002902
3.20	0.1260	36	65	0002919
3.30	0.1299	36	65	0002926
3.50	0.1378	39	70	0002933
3.80	0.1496	43	75	0002940
4.00	0.1575	43	75	0002957
4.20	0.1654	43	75	0002964
4.50	0.1772	47	80	0002971
4.80	0.1890	52	86	0002988
5.00	0.1969	52	86	0002995
5.10	0.2008	52	86	0003008
5.20	0.2047	52	86	0003015

# JOBBER DRILL



$d_1$ $\varnothing h_8$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	A101
5.50	0.2165	57	93	0003022
6.00	0.2362	57	93	0003039
6.50	0.2559	63	101	0003046
7.00	0.2756	69	109	0003053
7.50	0.2953	69	109	0003060
8.00	0.3150	75	117	0003077
8.50	0.3346	75	117	0003084
9.00	0.3543	81	125	0003091
10.00	0.3937	87	133	0002780
11.00	0.4331	94	142	0149027
12.00	0.4724	101	151	0002797





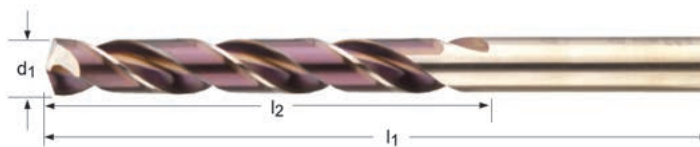
# JOBBER DRILL

## Heavy Duty Jobber Length (HX Series)

\* HX10 set available on pg. 233

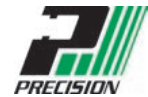
- HX10** - Fractional Sizes
- HX18** - Wire Gauge Sizes
- HX15** - Letter Sizes

Low thrust design self centering Split Point for easier penetration. Stronger and more Rigid. Unique surface treatment for improved wear resistance in hard ferrous alloys.



$d_1$ Ø Inch	$d_1$ Ø Nr.	$d_1$ Ø letter	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	HX10	HX18	HX15
1/16			0.0625	7/8	1.7/8	12	022004	—	—
	52		0.0635	7/8	1.7/8	12	—	022152	—
	51		0.0670	1"	2"	12	—	022151	—
	50		0.0700	1"	2"	12	—	022150	—
	49		0.0730	1"	2"	12	—	022149	—
	48		0.0760	1"	2"	12	—	022148	—
5/64			0.0781	1"	2"	12	022005	—	—
	47		0.0785	1"	2"	12	—	022147	—
	46		0.0810	1.1/8	2.1/8	12	—	022146	—
	45		0.0820	1.1/8	2.1/8	12	—	022145	—
	44		0.0860	1.1/8	2.1/8	12	—	022144	—
	43		0.0890	1.1/4	2.1/4	12	—	022143	—
	42		0.0935	1.1/4	2.1/4	12	—	022142	—
3/32			0.0938	1.1/4	2.1/4	12	022006	—	—
	41		0.0960	1.3/8	2.3/8	12	—	022141	—
	40		0.0980	1.3/8	2.3/8	12	—	022140	—
	39		0.0995	1.3/8	2.3/8	12	—	022139	—
	38		0.1015	1.7/16	2.1/2	12	—	022138	—
	37		0.1040	1.7/16	2.1/2	12	—	022137	—
	36		0.1065	1.7/16	2.1/2	12	—	022136	—
7/64			0.1094	1.1/2	2.5/8	12	022007	—	—
	35		0.1100	1.1/2	2.5/8	12	—	022135	—
	34		0.1110	1.1/2	2.5/8	12	—	022134	—
	33		0.1130	1.1/2	2.5/8	12	—	022133	—
	32		0.1160	1.5/8	2.3/4	12	—	022132	—
	31		0.1200	1.5/8	2.3/4	12	—	022131	—
1/8			0.1250	1.5/8	2.3/4	12	022008	—	—
	30		0.1285	1.5/8	2.3/4	12	—	022130	—
	29		0.1360	1.3/4	2.7/8	12	—	022129	—
	28		0.1405	1.3/4	2.7/8	12	—	022128	—
9/64			0.1406	1.3/4	2.7/8	12	022009	—	—
	27		0.1440	1.7/8	3"	12	—	022127	—
	26		0.1470	1.7/8	3"	12	—	022126	—

# JOBBER DRILL



d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	HX10	HX18	HX15
	25		0.1495	1.7/8	3"	12	—	022125	—
	24		0.1520	2"	3.1/8	12	—	022124	—
	23		0.1540	2"	3.1/8	12	—	022123	—
5/32			0.1563	2"	3.1/8	12	022010	—	—
	22		0.1570	2"	3.1/8	12	—	022122	—
	21		0.1590	2.1/8	3.1/4	12	—	022121	—
	20		0.1610	2.1/8	3.1/4	12	—	022120	—
	19		0.1660	2.1/8	3.1/4	12	—	022119	—
	18		0.1695	2.1/8	3.1/4	12	—	022118	—
11/64			0.1719	2.1/8	3.1/4	12	022011	—	—
	17		0.1730	2.3/16	3.3/8	12	—	022117	—
	16		0.1770	2.3/16	3.3/8	12	—	022116	—
	15		0.1800	2.3/16	3.3/8	12	—	022115	—
	14		0.1820	2.3/16	3.3/8	12	—	022114	—
	13		0.1850	2.5/16	3.1/2	12	—	022113	—
3/16			0.1875	2.5/16	3.1/2	12	022012	—	—
	12		0.1890	2.5/16	3.1/2	12	—	022112	—
	11		0.1910	2.5/16	3.1/2	12	—	022111	—
	10		0.1935	2.7/16	3.5/8	12	—	022110	—
	9		0.1960	2.7/16	3.5/8	12	—	022109	—
	8		0.1990	2.7/16	3.5/8	12	—	022108	—
	7		0.2010	2.7/16	3.5/8	12	—	022107	—
13/64			0.2031	2.7/16	3.5/8	12	022013	—	—
	6		0.2040	2.1/2	3.3/4	12	—	022106	—
	5		0.2055	2.1/2	3.3/4	12	—	022105	—
	4		0.2090	2.1/2	3.3/4	12	—	022104	—
	3		0.2130	2.1/2	3.3/4	12	—	022103	—
7/32			0.2188	2.1/2	3.3/4	12	022014	—	—
	2		0.2210	2.5/8	3.7/8	12	—	022102	—
	1		0.2280	2.5/8	3.7/8	12	—	022101	—
		A	0.2340	2.5/8	3.7/8	12	—	—	022201
15/64			0.2344	2.5/8	3.7/8	12	022015	—	—
		B	0.2374	2.3/4	4"	12	—	—	022202
		C	0.2421	2.3/4	4"	12	—	—	022203
		D	0.2461	2.3/4	4"	12	—	—	022204
		E	0.2500	2.3/4	4"	12	—	—	022205
1/4			0.2500	2.3/4	4"	12	022016	—	—
		F	0.2571	2.7/8	4.1/8	12	—	—	022206
		G	0.2610	2.7/8	4.1/8	12	—	—	022207
17/64			0.2656	2.7/8	4.1/8	12	0022017	—	—
		H	0.2661	2.7/8	4.1/8	12	—	—	022208
		I	0.2720	2.7/8	4.1/8	12	—	—	022209
		J	0.2772	2.7/8	4.1/8	12	—	—	022210
		K	0.2811	2.15/16	4.1/4	12	—	—	022211
9/32			0.2813	2.15/16	4.1/4	12	022018	—	—
		L	0.2902	2.15/16	4.1/4	12	—	—	022212
		M	0.2949	3.1/16	4.3/8	12	—	—	022213
19/64			0.2969	3.1/16	4.3/8	12	022019	—	—
		N	0.3020	3.1/16	4.3/8	12	—	—	022214
5/16			0.3125	3.3/16	4.1/2	6	022020	—	—
		O	0.3161	3.3/16	4.1/2	6	—	—	022215
		P	0.3228	3.5/16	4.5/8	6	—	—	022216
21/64			0.3281	3.5/16	4.5/8	6	022021	—	—
		Q	0.3319	3.7/16	4.3/4	6	—	—	022217
		R	0.3390	3.7/16	4.3/4	6	—	—	022218
11/32			0.3437	3.7/16	4.3/4	6	022022	—	—
		S	0.3480	3.1/2	4.7/8	6	—	—	022219
		T	0.3580	3.1/2	4.7/8	6	—	—	022220
23/64			0.3594	3.1/2	4.7/8	6	022023	—	—
		U	0.3680	3.5/8	5"	6	—	—	022221
3/8			0.3750	3.5/8	5"	6	022024	—	—
		V	0.3772	3.5/8	5"	6	—	—	022222
		W	0.3858	3.3/4	5.1/8	6	—	—	022223
25/64			0.3906	3.3/4	5.1/8	6	022025	—	—
		X	0.3969	3.3/4	5.1/8	6	—	—	022224
		Y	0.4039	3.7/8	5.1/4	6	—	—	022225



# JOBBER DRILL

$d_1$ Ø Inch	$d_1$ Ø Nr.	$d_1$ Ø letter	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	HX10	HX18	HX15
13/32			0.4063	3.7/8	5.1/4	6	022026	—	—
		Z	0.4130	3.7/8	5.1/4	6	—	—	022226
27/64			0.4219	3.15/16	5.3/8	6	022027	—	—
7/16			0.4375	4.1/16	5.1/2	6	022028	—	—
29/64			0.4531	4.3/16	5.5/8	6	022029	—	—
15/32			0.4687	4.5/16	5.3/4	6	022030	—	—
31/64			0.4844	4.3/8	5.7/8	6	022031	—	—
1/2			0.5000	4.1/2	6"	6	022032	—	—

# JOBBER DRILL



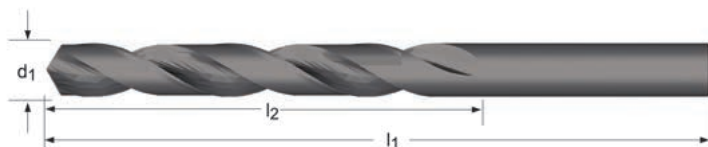
## General Purpose Jobber Length (NAS 907 Type A)

**R10A** - Fractional Sizes

**R18A** - Wire Gauge Sizes

**R15A** - Letter Sizes

Low thrust design self centering Split Point for easier penetration.  
Steam oxide surface treatment for increased wear resistance & lubricity



R10A	R18A	R15A
ANSI	ANSI	ANSI
4XD	4XD	4XD
HSS	HSS	HSS
118°	118°	118°
1/16 - 1/2	N52 - N1	A - Z

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	R10A	R18A	R15A
1/16			0.0625	7/8	1.7/8	12	010104	—	—
	52		0.0635	7/8	1.7/8	12	—	018152	—
	51		0.0670	1"	2"	12	—	018151	—
	50		0.0700	1"	2"	12	—	018150	—
	49		0.0730	1"	2"	12	—	018149	—
	48		0.0760	1"	2"	12	—	018148	—
5/64			0.0781	1"	2"	12	010105	—	—
	47		0.0785	1"	2"	12	—	018147	—
	46		0.0810	1.1/8	2.1/8	12	—	018146	—
	45		0.0820	1.1/8	2.1/8	12	—	018145	—
	44		0.0860	1.1/8	2.1/8	12	—	018144	—
	43		0.0890	1.1/4	2.1/4	12	—	018143	—
	42		0.0935	1.1/4	2.1/4	12	—	018142	—
3/32			0.0938	1.1/4	2.1/4	12	010106	—	—
	41		0.0960	1.3/8	2.3/8	12	—	018141	—
	40		0.0980	1.3/8	2.3/8	12	—	018140	—
	39		0.0995	1.3/8	2.3/8	12	—	018139	—
	38		0.1015	1.7/16	2.1/2	12	—	018138	—
	37		0.1040	1.7/16	2.1/2	12	—	018137	—
	36		0.1065	1.7/16	2.1/2	12	—	018136	—
7/64			0.1094	1.1/2	2.5/8	12	010107	—	—
	35		0.1100	1.1/2	2.5/8	12	—	018135	—
	34		0.1110	1.1/2	2.5/8	12	—	018134	—
	33		0.1130	1.1/2	2.5/8	12	—	018133	—
	32		0.1160	1.5/8	2.3/4	12	—	018132	—
	31		0.1200	1.5/8	2.3/4	12	—	018131	—
1/8			0.1250	1.5/8	2.3/4	12	010108	—	—
	30		0.1285	1.5/8	2.3/4	12	—	018130	—
	29		0.1360	1.3/4	2.7/8	12	—	018129	—
	28		0.1405	1.3/4	2.7/8	12	—	018128	—
9/64			0.1406	1.3/4	2.7/8	12	010109	—	—
	27		0.1440	1.7/8	3"	12	—	018127	—



# JOBBER DRILL

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	R10A	R18A	R15A
	26		0.1470	1.7/8	3"	12	—	018126	—
	25		0.1495	1.7/8	3"	12	—	018125	—
	24		0.1520	2"	3.1/8	12	—	018124	—
	23		0.1540	2"	3.1/8	12	—	018123	—
5/32			0.1563	2"	3.1/8	12	010110	—	—
	22		0.1570	2"	3.1/8	12	—	018122	—
	21		0.1590	2.1/8	3.1/4	12	—	018121	—
	20		0.1610	2.1/8	3.1/4	12	—	018120	—
	19		0.1660	2.1/8	3.1/4	12	—	018119	—
	18		0.1695	2.1/8	3.1/4	12	—	018118	—
11/64			0.1719	2.1/8	3.1/4	12	010111	—	—
	17		0.1730	2.3/16	3.3/8	12	—	018117	—
	16		0.1770	2.3/16	3.3/8	12	—	018116	—
	15		0.1800	2.3/16	3.3/8	12	—	018115	—
	14		0.1820	2.3/16	3.3/8	12	—	018114	—
	13		0.1850	2.5/16	3.1/2	12	—	018113	—
3/16			0.1875	2.5/16	3.1/2	12	010112	—	—
	12		0.1890	2.5/16	3.1/2	12	—	018112	—
	11		0.1910	2.5/16	3.1/2	12	—	018111	—
	10		0.1935	2.7/16	3.5/8	12	—	018110	—
	9		0.1960	2.7/16	3.5/8	12	—	018109	—
	8		0.1990	2.7/16	3.5/8	12	—	018108	—
	7		0.2010	2.7/16	3.5/8	12	—	018107	—
13/64			0.2031	2.7/16	3.5/8	12	010113	—	—
	6		0.2040	2.1/2	3.3/4	12	—	018106	—
	5		0.2055	2.1/2	3.3/4	12	—	018105	—
	4		0.2090	2.1/2	3.3/4	12	—	018104	—
	3		0.2130	2.1/2	3.3/4	12	—	018103	—
7/32			0.2188	2.1/2	3.3/4	12	010114	—	—
	2		0.2210	2.5/8	3.7/8	12	—	018102	—
	1		0.2280	2.5/8	3.7/8	12	—	018101	—
		A	0.2340	2.5/8	3.7/8	12	—	—	015101
15/64			0.2344	2.5/8	3.7/8	12	010115	—	—
		B	0.2374	2.3/4	4"	12	—	—	015102
		C	0.2421	2.3/4	4"	12	—	—	015103
		D	0.2461	2.3/4	4"	12	—	—	015104
		E	0.2500	2.3/4	4"	12	—	—	015105
1/4			0.2500	2.3/4	4"	12	010116	—	—
		F	0.2571	2.7/8	4.1/8	12	—	—	015106
		G	0.2610	2.7/8	4.1/8	12	—	—	015107
17/64			0.2656	2.7/8	4.1/8	12	010117	—	—
		H	0.2661	2.7/8	4.1/8	12	—	—	015108
		I	0.2720	2.7/8	4.1/8	12	—	—	015109
		J	0.2772	2.7/8	4.1/8	12	—	—	015110
		K	0.2811	2.15/16	4.1/4	12	—	—	015111
9/32			0.2813	2.15/16	4.1/4	12	010118	—	—
		L	0.2902	2.15/16	4.1/4	12	—	—	015112
		M	0.2949	3.1/16	4.3/8	12	—	—	015113
19/64			0.2969	3.1/16	4.3/8	12	010119	—	—
		N	0.3020	3.1/16	4.3/8	12	—	—	015114
5/16			0.3125	3.3/16	4.1/2	6	010120	—	—
		O	0.3161	3.3/16	4.1/2	6	—	—	015115
		P	0.3228	3.5/16	4.5/8	6	—	—	015116
21/64			0.3281	3.5/16	4.5/8	6	010121	—	—
		Q	0.3319	3.7/16	4.3/4	6	—	—	015117
		R	0.3390	3.7/16	4.3/4	6	—	—	015118
11/32			0.3437	3.7/16	4.3/4	6	010122	—	—
		S	0.3480	3.1/2	4.7/8	6	—	—	015119
		T	0.3580	3.1/2	4.7/8	6	—	—	015120
23/64			0.3594	3.1/2	4.7/8	6	010123	—	—
		U	0.3680	3.5/8	5"	6	—	—	015121
3/8			0.3750	3.5/8	5"	6	010124	—	—
		V	0.3772	3.5/8	5"	6	—	—	015122
		W	0.3858	3.3/4	5.1/8	6	—	—	015123
25/64			0.3906	3.3/4	5.1/8	6	0010125	—	—

# JOBBER DRILL



$d_1$ Ø Inch	$d_1$ Ø Nr.	$d_1$ Ø letter	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	R10A	R18A	R15A
		X	0.3969	3.3/4	5.1/8	6	—	—	015124
		Y	0.4039	3.7/8	5.1/4	6	—	—	015125
13/32			0.4063	3.7/8	5.1/4	6	010126	—	—
		Z	0.4130	3.7/8	5.1/4	6	—	—	015126
27/64			0.4219	3.15/16	5.3/8	6	010127	—	—
7/16			0.4375	4.1/16	5.1/2	6	010128	—	—
29/64			0.4531	4.3/16	5.5/8	6	010129	—	—
15/32			0.4687	4.5/16	5.3/4	6	010130	—	—
31/64			0.4844	4.3/8	5.7/8	6	010131	—	—
1/2			0.5000	4.1/2	6"	6	010132	—	—



# JOBBER DRILL

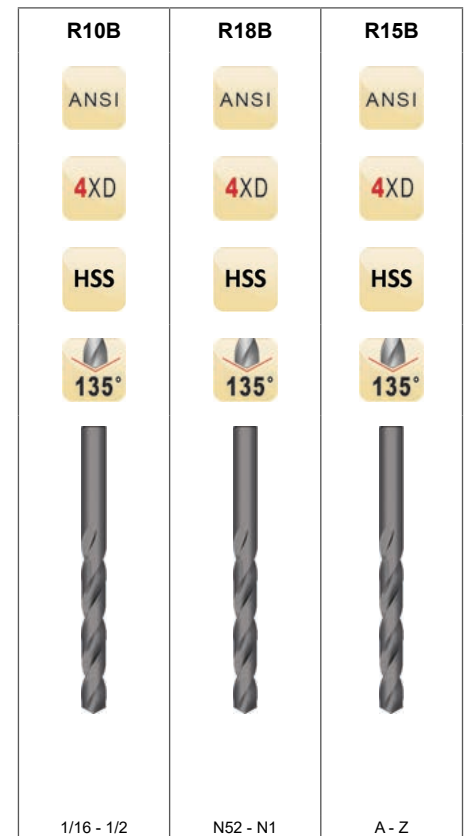
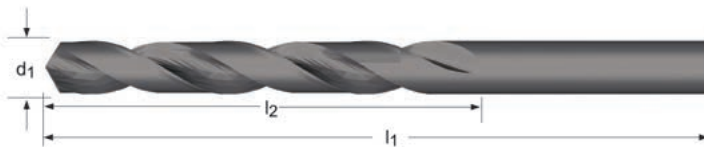
## Heavy Duty Jobber Length (NAS 907 Type B)

**R10B** - Fractional Sizes

**R18B** - Wire Gauge Sizes

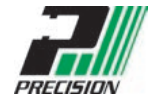
**R15B** - Letter Sizes

Low thrust design self centering Split Point for easier penetration. Steam Oxide surface treatment for increased wear resistance & lubricity. Recommended for tougher ferrous materials.



$d_1$ Ø Inch	$d_1$ Ø Nr.	$d_1$ Ø letter	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	R10B	R18B	R15B
1/16			0.0625	7/8	1.7/8	12	010204	—	—
	52		0.0635	7/8	1.7/8	12	—	018252	—
	51		0.0670	1"	2"	12	—	018251	—
	50		0.0700	1"	2"	12	—	018250	—
	49		0.0730	1"	2"	12	—	018249	—
	48		0.0760	1"	2"	12	—	018248	—
5/64			0.0781	1"	2"	12	010205	—	—
	47		0.0785	1"	2"	12	—	018247	—
	46		0.0810	1.1/8	2.1/8	12	—	018246	—
	45		0.0820	1.1/8	2.1/8	12	—	018245	—
	44		0.0860	1.1/8	2.1/8	12	—	018244	—
	43		0.0890	1.1/4	2.1/4	12	—	018243	—
	42		0.0935	1.1/4	2.1/4	12	—	018242	—
3/32			0.0938	1.1/4	2.1/4	12	010206	—	—
	41		0.0960	1.3/8	2.3/8	12	—	018241	—
	40		0.0980	1.3/8	2.3/8	12	—	018240	—
	39		0.0995	1.3/8	2.3/8	12	—	018239	—
	38		0.1015	1.7/16	2.1/2	12	—	018238	—
	37		0.1040	1.7/16	2.1/2	12	—	018237	—
	36		0.1065	1.7/16	2.1/2	12	—	018236	—
7/64			0.1094	1.1/2	2.5/8	12	010207	—	—
	35		0.1100	1.1/2	2.5/8	12	—	018235	—
	34		0.1110	1.1/2	2.5/8	12	—	018234	—
	33		0.1130	1.1/2	2.5/8	12	—	018233	—
	32		0.1160	1.5/8	2.3/4	12	—	018232	—
	31		0.1200	1.5/8	2.3/4	12	—	018231	—
1/8			0.1250	1.5/8	2.3/4	12	010208	—	—
	30		0.1285	1.5/8	2.3/4	12	—	018230	—
	29		0.1360	1.3/4	2.7/8	12	—	018229	—
	28		0.1405	1.3/4	2.7/8	12	—	018228	—
9/64			0.1406	1.3/4	2.7/8	12	010209	—	—
	27		0.1440	1.7/8	3"	12	—	018227	—

# JOBBER DRILL



d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	R10B	R18B	R15B
	26		0.1470	1.7/8	3"	12	—	018226	—
	25		0.1495	1.7/8	3"	12	—	018225	—
	24		0.1520	2"	3.1/8	12	—	018224	—
	23		0.1540	2"	3.1/8	12	—	018223	—
5/32			0.1563	2"	3.1/8	12	010210	—	—
	22		0.1570	2"	3.1/8	12	—	018222	—
	21		0.1590	2.1/8	3.1/4	12	—	018221	—
	20		0.1610	2.1/8	3.1/4	12	—	018220	—
	19		0.1660	2.1/8	3.1/4	12	—	018219	—
	18		0.1695	2.1/8	3.1/4	12	—	018218	—
11/64			0.1719	2.1/8	3.1/4	12	010211	—	—
	17		0.1730	2.3/16	3.3/8	12	—	018217	—
	16		0.1770	2.3/16	3.3/8	12	—	018216	—
	15		0.1800	2.3/16	3.3/8	12	—	018215	—
	14		0.1820	2.3/16	3.3/8	12	—	018214	—
	13		0.1850	2.5/16	3.1/2	12	—	018213	—
3/16			0.1875	2.5/16	3.1/2	12	010212	—	—
	12		0.1890	2.5/16	3.1/2	12	—	018212	—
	11		0.1910	2.5/16	3.1/2	12	—	018211	—
	10		0.1935	2.7/16	3.5/8	12	—	018210	—
	9		0.1960	2.7/16	3.5/8	12	—	018209	—
	8		0.1990	2.7/16	3.5/8	12	—	018208	—
	7		0.2010	2.7/16	3.5/8	12	—	018207	—
13/64			0.2031	2.7/16	3.5/8	12	010213	—	—
	6		0.2040	2.1/2	3.3/4	12	—	018206	—
	5		0.2055	2.1/2	3.3/4	12	—	018205	—
	4		0.2090	2.1/2	3.3/4	12	—	018204	—
	3		0.2130	2.1/2	3.3/4	12	—	018203	—
7/32			0.2188	2.1/2	3.3/4	12	010214	—	—
	2		0.2210	2.5/8	3.7/8	12	—	018202	—
	1		0.2280	2.5/8	3.7/8	12	—	018201	—
		A	0.2340	2.5/8	3.7/8	12	—	—	015201
15/64			0.2344	2.5/8	3.7/8	12	010215	—	—
		B	0.2380	2.3/4	4"	12	—	—	015202
		C	0.2421	2.3/4	4"	12	—	—	015203
		D	0.2461	2.3/4	4"	12	—	—	015204
		E	0.2500	2.3/4	4"	12	—	—	015205
1/4			0.2500	2.3/4	4"	12	010216	—	—
		F	0.2571	2.7/8	4.1/8	12	—	—	015206
		G	0.2610	2.7/8	4.1/8	12	—	—	015207
17/64			0.2656	2.7/8	4.1/8	12	010217	—	—
		H	0.2661	2.7/8	4.1/8	12	—	—	015208
		I	0.2720	2.7/8	4.1/8	12	—	—	015209
		J	0.2772	2.7/8	4.1/8	12	—	—	015210
		K	0.2811	2.15/16	4.1/4	12	—	—	015211
9/32			0.2813	2.15/16	4.1/4	12	010218	—	—
		L	0.2902	2.15/16	4.1/4	12	—	—	015212
		M	0.2949	3.1/16	4.3/8	12	—	—	015213
19/64			0.2969	3.1/16	4.3/8	12	010219	—	—
		N	0.3020	3.1/16	4.3/8	12	—	—	015214
5/16			0.3125	3.3/16	4.1/2	6	010220	—	—
		O	0.3161	3.3/16	4.1/2	6	—	—	015215
		P	0.3228	3.5/16	4.5/8	6	—	—	015216
21/64			0.3281	3.5/16	4.5/8	6	010221	—	—
		Q	0.3319	3.7/16	4.3/4	6	—	—	015217
		R	0.3390	3.7/16	4.3/4	6	—	—	015218
11/32			0.3437	3.7/16	4.3/4	6	010222	—	—
		S	0.3480	3.1/2	4.7/8	6	—	—	015219
		T	0.3580	3.1/2	4.7/8	6	—	—	015220
23/64			0.3594	3.1/2	4.7/8	6	010223	—	—
		U	0.3680	3.5/8	5"	6	—	—	015221
3/8			0.3750	3.5/8	5"	6	010224	—	—
		V	0.3772	3.5/8	5"	6	—	—	015222
		W	0.3858	3.3/4	5.1/8	6	—	—	015223
25/64			0.3906	3.3/4	5.1/8	6	010225	—	—
		X	0.3969	3.3/4	5.1/8	6	—	—	015224





# JOBBER DRILL

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	R10B	R18B	R15B
		Y	0.4039	3.7/8	5.1/4	6	—	—	015225
13/32			0.4063	3.7/8	5.1/4	6	010226	—	—
		Z	0.4130	3.7/8	5.1/4	6	—	—	015226
27/64			0.4219	3.15/16	5.3/8	6	010227	—	—
7/16			0.4375	4.1/16	5.1/2	6	010228	—	—
29/64			0.4531	4.3/16	5.5/8	6	010229	—	—
15/32			0.4687	4.5/16	5.3/4	6	010230	—	—
31/64			0.4844	4.3/8	5.7/8	6	010231	—	—
1/2			0.5000	4.1/2	6"	6	010232	—	—

## High Helix Jobber Length

\* Sets Available on pg. 232

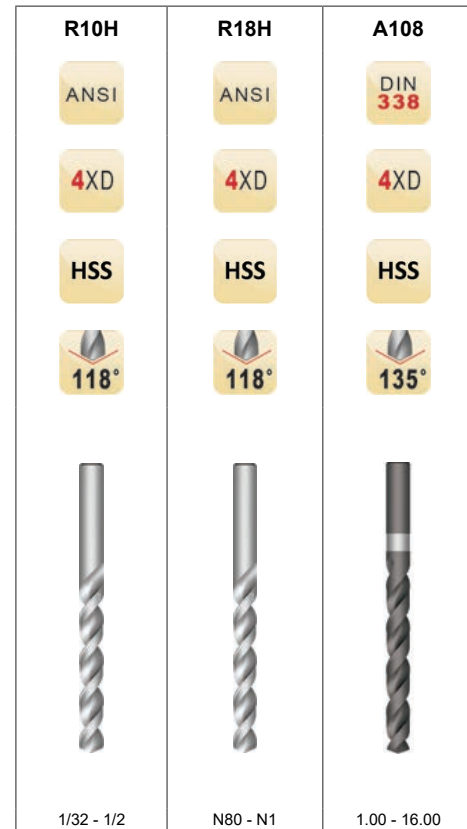
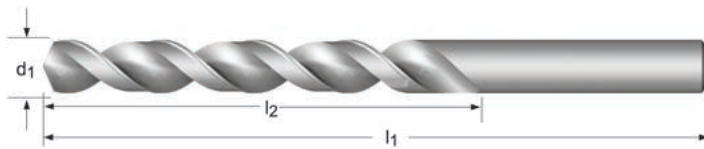
**R10H** - Fractional Sizes

**R18H** - Wire Gauge Sizes

High Helix and Bright Finish for better chip flow in soft or non-ferrous materials.

**A108** - Fractional & Metric Sizes

Low thrust design self centering Split Point for easier penetration. Steam Oxide for increased wear resistance & lubricity. Fast spiral for stainless.



$d_1$ Ø Inch	$d_1$ Ø Nr.	$d_1$ Ø mm	$d_1$ decimal Inch	$l_2$ Inch	$l_2$ mm	$l_1$ Inch	$l_1$ mm	Pack Qty	R10H	R18H	A108
	80		0.0135	1/8		3/4		12	—	018580	—
	79		0.0145	1/8		3/4		12	—	018579	—
	78		0.0160	3/16		7/8		12	—	018578	—
	77		0.0180	3/16		7/8		12	—	018577	—
	76		0.0200	3/16		7/8		12	—	018576	—
	75		0.0210	1/4		1"		12	—	018575	—
	74		0.0225	1/4		1"		12	—	018574	—
	73		0.0240	5/16		1.1/8		12	—	018573	—
	72		0.0250	5/16		1.1/8		12	—	018572	—
	71		0.0260	3/8		1.1/4		12	—	018571	—
	70		0.0280	3/8		1.1/4		12	—	018570	—
	69		0.0292	1/2		1.3/8		12	—	018569	—
	68		0.0310	1/2		1.3/8		12	—	018568	—
1/32			0.0313	1/2		1.3/8		12	010502	—	—
	67		0.0320	1/2		1.3/8		12	—	018567	—
	66		0.0330	1/2		1.3/8		12	—	018566	—
	65		0.0350	5/8		1.1/2		12	—	018565	—
	64		0.0360	5/8		1.1/2		12	—	018564	—
	63		0.0370	5/8		1.1/2		12	—	018563	—
	62		0.0380	5/8		1.1/2		12	—	018562	—
	61		0.0390	11/16		1.5/8		12	—	018561	—
		1.00	0.0394		12		34	10	—	—	0007549
	60		0.0400	11/16		1.5/8		12	—	018560	—
	59		0.0410	11/16		1.5/8		12	—	018559	—
	58		0.0420	11/16		1.5/8		12	—	018558	—
	57		0.0430	3/4		1.3/4		12	—	018557	—
		1.10	0.0433		14		36	10	—	—	0007556
	56		0.0465	3/4		1.3/4		12	—	018556	—
3/64			0.0469	3/4		1.3/4		12	010503	—	—
		1.20	0.0472		16		38	10	—	—	0007563
		1.30	0.0512		16		38	10	—	—	0007570
	55		0.0520	7/8		1.7/8		12	—	018555	—
	54		0.0550	7/8		1.7/8		12	—	018554	—

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>2</sub> mm	l <sub>1</sub> Inch	l <sub>1</sub> mm	Pack Qty	R10H	R18H	A108
		1.40	0.0551		18		40	10	—	—	0007587
		1.50	0.0591		18		40	10	—	—	0007594
	53		0.0595	7/8		1.7/8		12	—	018553	—
1/16			0.0625	7/8		1.7/8		12	010504	—	—
1/16			0.0625		20		43	10	—	—	0007723
		1.60	0.0630		20		43	10	—	—	0007600
	52		0.0635	7/8		1.7/8		12	—	018552	—
		1.70	0.0669		20		43	10	—	—	0007617
	51		0.0670	1"		2"		12	—	018551	—
	50		0.0700	1"		2"		12	—	018550	—
		1.80	0.0709		22		46	10	—	—	0007624
	49		0.0730	1"		2"		12	—	018549	—
		1.90	0.0748		22		46	10	—	—	0007631
	48		0.0760	1"		2"		12	—	018548	—
5/64			0.0781	1"		2"		12	010505	—	—
5/64			0.0781		24		49	10	—	—	0008478
	47		0.0785	1"		2"		12	—	018547	—
		2.00	0.0787		24		49	10	—	—	0007969
	46		0.0810	1.1/8		2.1/8		12	—	018546	—
	45		0.0820	1.1/8		2.1/8		12	—	018545	—
		2.10	0.0827		24		49	10	—	—	0007976
	44		0.0860	1.1/8		2.1/8		12	—	018544	—
		2.20	0.0866		27		53	10	—	—	0007983
	43		0.0890	1.1/4		2.1/4		12	—	018543	—
		2.30	0.0906		27		53	10	—	—	0007990
	42		0.0935	1.1/4		2.1/4		12	—	018542	—
3/32			0.0938	1.1/4		2.1/4		12	010506	—	—
3/32			0.0938		30		57	10	—	—	0008232
		2.40	0.0945		30		57	10	—	—	0008003
	41		0.0960	1.3/8		2.3/8		12	—	018541	—
	40		0.0980	1.3/8		2.3/8		12	—	018540	—
		2.50	0.0984		30		57	10	—	—	0008010
	39		0.0995	1.3/8		2.3/8		12	—	018539	—
	38		0.1015	1.7/16		2.1/2		12	—	018538	—
		2.60	0.1024		30		57	10	—	—	0008027
	37		0.1040	1.7/16		2.1/2		12	—	018537	—
		2.70	0.1063		33		61	10	—	—	0008034
	36		0.1065	1.7/16		2.1/2		12	—	018536	—
7/64			0.1094	1.1/2		2.5/8		12	010507	—	—
7/64			0.1094		33		61	10	—	—	0008706
	35		0.1100	1.1/2		2.5/8		12	—	018535	—
		2.80	0.1102		33		61	10	—	—	0008041
	34		0.1110	1.1/2		2.5/8		12	—	018534	—
	33		0.1130	1.1/2		2.5/8		12	—	018533	—
		2.90	0.1142		33		61	10	—	—	0008058
	32		0.1160	1.5/8		2.3/4		12	—	018532	—
		3.00	0.1181		33		61	10	—	—	0008119
	31		0.1200	1.5/8		2.3/4		12	—	018531	—
		3.10	0.1220		36		65	10	—	—	0008126
1/8			0.1250	1.5/8		2.3/4		12	010508	—	—
1/8			0.1250		36		65	10	—	—	0007945
		3.20	0.1260		36		65	10	—	—	0008133
	30		0.1285	1.5/8		2.3/4		12	—	018530	—
		3.30	0.1299		36		65	10	—	—	0008140
		3.40	0.1339		39		70	10	—	—	0008157
	29		0.1360	1.3/4		2.7/8		12	—	018529	—
		3.50	0.1378		39		70	10	—	—	0008164
	28		0.1405	1.3/4		2.7/8		12	—	018528	—
9/64			0.1406	1.3/4		2.7/8		12	010509	—	—
9/64			0.1406		39		70	10	—	—	0008928
		3.60	0.1417		39		70	10	—	—	0008171
	27		0.1440	1.7/8		3"		12	—	018527	—
		3.70	0.1457		39		70	10	—	—	0008188
	26		0.1470	1.7/8		3"		12	—	018526	—
	25		0.1495	1.7/8		3"		12	—	018525	—
		3.80	0.1496		43		75	10	—	—	0008195

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>2</sub> mm	l <sub>1</sub> Inch	l <sub>1</sub> mm	Pack Qty	R10H	R18H	A108
	24		0.1520	2"		3.1/8		12	—	018524	—
		3.90	0.1535		43		75	10	—	—	0008201
	23		0.1540	2"		3.1/8		12	—	018523	—
5/32			0.1563	2"		3.1/8		12	010510	—	—
5/32			0.1563		43		75	10	—	—	0008461
	22		0.1570	2"		3.1/8		12	—	018522	—
		4.00	0.1575		43		75	10	—	—	0008256
	21		0.1590	2.1/8		3.1/4		12	—	018521	—
	20		0.1610	2.1/8		3.1/4		12	—	018520	—
		4.10	0.1614		43		75	10	—	—	0008263
		4.20	0.1654		43		75	10	—	—	0008270
	19		0.1660	2.1/8		3.1/4		12	—	018519	—
		4.30	0.1693		47		80	10	—	—	0008287
	18		0.1695	2.1/8		3.1/4		12	—	018518	—
11/64			0.1719	2.1/8		3.1/4		12	010511	—	—
11/64			0.1719		47		80	10	—	—	0007730
	17		0.1730	2.3/16		3.3/8		12	—	018517	—
		4.40	0.1732		47		80	10	—	—	0008294
	16		0.1770	2.3/16		3.3/8		12	—	018516	—
		4.50	0.1772		47		80	10	—	—	0008300
	15		0.1800	2.3/16		3.3/8		12	—	018515	—
		4.60	0.1811		47		80	10	—	—	0008317
	14		0.1820	2.3/16		3.3/8		12	—	018514	—
	13		0.1850	2.5/16		3.1/2		12	—	018513	—
		4.70	0.1850		47		80	10	—	—	0008324
3/16			0.1875	2.5/16		3.1/2		12	010512	—	—
3/16			0.1875		52		86	10	—	—	0008218
	12		0.1890	2.5/16		3.1/2		12	—	018512	—
		4.80	0.1890		52		86	10	—	—	0008331
	11		0.1910	2.5/16		3.1/2		12	—	018511	—
		4.90	0.1929		52		86	10	—	—	0008348
	10		0.1935	2.7/16		3.5/8		12	—	018510	—
	10		0.1935		52		86	10	—	—	46305901
	9		0.1960	2.7/16		3.5/8		12	—	018509	—
		5.00	0.1969		52		86	10	—	—	0008355
	8		0.1990	2.7/16		3.5/8		12	—	018508	—
		5.10	0.2008		52		86	10	—	—	0008362
	7		0.2010	2.7/16		3.5/8		12	—	018507	—
13/64			0.2031	2.7/16		3.5/8		12	010513	—	—
13/64			0.2031		52		86	10	—	—	0007839
	6		0.2040	2.1/2		3.3/4		12	—	018506	—
		5.20	0.2047		52		86	10	—	—	0008379
	5		0.2055	2.1/2		3.3/4		12	—	018505	—
		5.30	0.2087		52		86	10	—	—	0008386
	4		0.2090	2.1/2		3.3/4		12	—	018504	—
		5.40	0.2126		57		93	10	—	—	0008393
	3		0.2130	2.1/2		3.3/4		12	—	018503	—
		5.50	0.2165		57		93	10	—	—	0008409
7/32			0.2188	2.1/2		3.3/4		12	010514	—	—
7/32			0.2188					10	—	—	0008690
		5.60	0.2205		57		93	10	—	—	0008416
	2		0.2210	2.5/8		3.7/8		12	—	018502	—
		5.70	0.2244		57		93	10	—	—	0008423
	1		0.2280	2.5/8		3.7/8		12	—	018501	—
		5.80	0.2283		57		93	10	—	—	0008430
		5.90	0.2323		57		93	10	—	—	0008447
15/64			0.2344	2.5/8		3.7/8		12	010515	—	—
15/64			0.2344		57		93	10	—	—	46305902
		6.00	0.2362		57		93	10	—	—	0008485
		6.10	0.2402		63		101	10	—	—	0008492
		6.20	0.2441		63		101	10	—	—	0008508
		6.30	0.2480		63		101	10	—	—	0008515
1/4			0.2500	2.3/4		4"		12	010516	—	—
1/4			0.2500		63		101	10	—	—	0007846
		6.40	0.2520		63		101	10	—	—	0008522

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>2</sub> mm	l <sub>1</sub> Inch	l <sub>1</sub> mm	Pack Qty	R10H	R18H	A108
		6.50	0.2559		63		101	10	—	—	0008539
		6.60	0.2598		63		101	10	—	—	0008546
		6.70	0.2638		63		101	10	—	—	0008553
17/64			0.2656	2.7/8		4.1/8		12	010517	—	—
17/64			0.2656		69		109	10	—	—	46305903
		6.80	0.2677		69		109	10	—	—	0008560
		6.90	0.2717		69		109	10	—	—	0008577
		7.00	0.2756		69		109	10	—	—	0008584
		7.10	0.2795		69		109	10	—	—	0008591
9/32			0.2813	2.15/16		4.1/4		12	010518	—	—
9/32			0.2813		69		109	10	—	—	0008911
		7.20	0.2835		69		109	10	—	—	0008607
		7.30	0.2874		69		109	10	—	—	0008614
		7.40	0.2913		69		109	10	—	—	0008621
		7.50	0.2953		69		109	10	—	—	0008638
19/64			0.2969	3.1/16		4.3/8		12	010519	—	—
19/64			0.2969		75		117	10	—	—	46305904
		7.60	0.2992		75		117	10	—	—	0008645
		7.70	0.3031		75		117	10	—	—	0008652
		7.80	0.3071		75		117	10	—	—	0008669
		7.90	0.3110		75		117	10	—	—	0008676
5/16			0.3125	3.3/16		4.1/2		6	010520	—	—
5/16			0.3125		75		117	10	—	—	0008454
		8.00	0.3150		75		117	10	—	—	0008713
		8.10	0.3189		75		117	10	—	—	0008720
		8.20	0.3228		75		117	10	—	—	0008737
		8.30	0.3268		75		117	10	—	—	0008744
21/64			0.3281	3.5/16		4.5/8		6	010521	—	—
21/64			0.3281		75		117	10	—	—	46305905
		8.40	0.3307		75		117	10	—	—	0008751
		8.50	0.3346		75		117	10	—	—	0008768
		8.60	0.3386		81		125	10	—	—	0008775
		8.70	0.3425		81		125	10	—	—	0008782
11/32			0.3437	3.7/16		4.3/4		6	010522	—	—
11/32			0.3437		81		125	10	—	—	0007716
		8.80	0.3465		81		125	10	—	—	0008799
		8.90	0.3504		81		125	10	—	—	0008805
		9.00	0.3543		81		125	10	—	—	0008812
		9.10	0.3583		81		125	10	—	—	0008829
23/64			0.3594	3.1/2		4.7/8		6	010523	—	—
23/64			0.3594		81		125	10	—	—	46305906
		9.20	0.3622		81		125	10	—	—	0008836
		9.30	0.3661		81		125	10	—	—	0008843
		9.40	0.3701		81		125	10	—	—	0008850
		9.50	0.3740		81		125	10	—	—	0008867
3/8			0.3750	3.5/8		5"		6	010524	—	—
3/8			0.3750		87		133	10	—	—	0008249
		9.60	0.3780		87		133	10	—	—	0008874
		9.70	0.3819		87		133	10	—	—	0008881
		9.80	0.3858		87		133	10	—	—	0008898
		9.90	0.3898		87		133	10	—	—	0008904
25/64			0.3906	3.3/4		5.1/8		6	010525	—	—
25/64			0.3906		87		133	10	—	—	46305907
		10.00	0.3937		87		133	10	—	—	0007648
		10.20	0.4016		87		133	5	—	—	0007655
13/32			0.4063	3.7/8		5.1/4		6	010526	—	—
13/32			0.4063		87		133	5	—	—	0007822
		10.50	0.4134		87		133	5	—	—	0007662
27/64			0.4219	3.15/16		5.3/8		6	010527	—	—
27/64			0.4219		94		142	5	—	—	46305908
		10.80	0.4252		94		142	5	—	—	0007679
		11.00	0.4331		94		142	5	—	—	0007686
7/16			0.4375	4.1/16		5.1/2		6	010528	—	—
7/16			0.4375		94		142	5	—	—	0008683
		11.50	0.4528		94		142	5	—	—	0007693

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>2</sub> mm	l <sub>1</sub> Inch	l <sub>1</sub> mm	Pack Qty	R10H	R18H	A108
29/64			0.4531	4.3/16		5.5/8		6	010529	—	—
29/64			0.4531		94		142	5	—	—	46305909
		11.80	0.4646		94		142	5	—	—	0007709
15/32			0.4687	4.5/16		5.3/4		6	010530	—	—
15/32			0.4687		101		151	5	—	—	0007907
		12.00	0.4724		101		151	5	—	—	0007754
31/64			0.4844	4.3/8		5.7/8		6	010531	—	—
31/64			0.4844		101		151	5	—	—	46305920
		12.50	0.4921		101		151	5	—	—	0007778
1/2			0.5000	4.1/2		6		5	0010532	—	—
1/2			0.5000		101		151	5	—	—	0007747
		12.80	0.5039		101		151	5	—	—	0007785
		12.90	0.5079		101		151	5	—	—	0007792
		13.00	0.5118		101		151	5	—	—	0007808
		13.50	0.5315		108		160	5	—	—	0007815
		14.00	0.5512		108		160	5	—	—	0007853
		14.50	0.5709		114		169	1	—	—	0007860
		15.00	0.5906		114		169	1	—	—	0007877
		15.25	0.6004		120		178	1	—	—	0007884
		15.50	0.6102		120		178	1	—	—	0007891
		16.00	0.6299		120		178	1	—	—	0007921



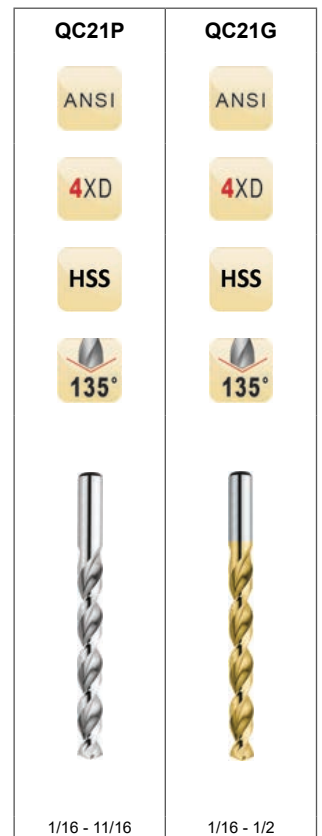
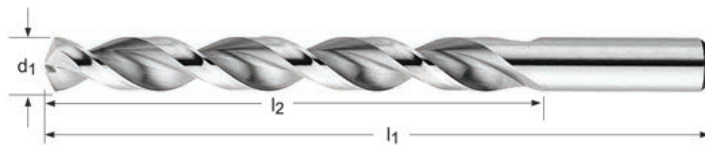
# JOBBER DRILL

## General Purpose Jobber Length Parabolic Flute

Heavy-Duty Parabolic Flute design for efficient chip removal. Allows greater drilling depths in one pass. Low thrust design self centering Split Point for easier penetration.

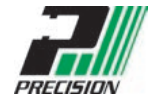
**QC21P** Bright Finish improves chip flow in soft or non-ferrous materials.

**QC21G** TiN Coating increases wear resistance and improves tool life.



$d_1$ Ø "/Nr./letter	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	QC21P	QC21G
1/16	0.0625	7/8	1.7/8	12	015804	081704
52	0.0635	7/8	1.7/8	12	019452	080552
51	0.0670	1"	2"	12	019451	080551
50	0.0700	1"	2"	12	019450	080550
49	0.0730	1"	2"	12	019449	080549
48	0.0760	1"	2"	12	019448	080548
5/64	0.0781	1"	2"	12	015805	081705
47	0.0785	1"	2"	12	019447	080547
46	0.0810	1.1/8	2.1/8	12	019446	080546
45	0.0820	1.1/8	2.1/8	12	019445	080545
44	0.0860	1.1/8	2.1/8	12	019444	080544
43	0.0890	1.1/4	2.1/4	12	019443	080543
42	0.0935	1.1/4	2.1/4	12	019442	080542
3/32	0.0938	1.1/4	2.1/4	12	015806	081706
41	0.0960	1.3/8	2.3/8	12	019441	080541
40	0.0980	1.3/8	2.3/8	12	019440	080540
39	0.0995	1.3/8	2.3/8	12	019439	080539
38	0.1015	1.7/16	2.1/2	12	019438	080538
37	0.1040	1.7/16	2.1/2	12	019437	080537
36	0.1065	1.7/16	2.1/2	12	019436	080536
7/64	0.1094	1.1/2	2.5/8	12	015807	081707
35	0.1100	1.1/2	2.5/8	12	019435	080535
34	0.1110	1.1/2	2.5/8	12	019434	080534
33	0.1130	1.1/2	2.5/8	12	019433	080533
32	0.1160	1.5/8	2.3/4	12	019432	080532
31	0.1200	1.5/8	2.3/4	12	019431	080531
1/8	0.1250	1.5/8	2.3/4	12	015808	081708
30	0.1285	1.5/8	2.3/4	12	019430	080530
29	0.1360	1.3/4	2.7/8	12	019429	080529
28	0.1405	1.3/4	2.7/8	12	019428	080528
9/64	0.1406	1.3/4	2.7/8	12	015809	081709
27	0.1440	1.7/8	3"	12	019427	080527
26	0.1470	1.7/8	3"	12	019426	080526

# JOBBER DRILL



d <sub>1</sub> Ø "/Nr./letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	QC21P	QC21G
25	0.1495	1.7/8	3"	12	019425	080525
24	0.1520	2"	3.1/8	12	019424	080524
23	0.1540	2"	3.1/8	12	019423	080523
5/32	0.1563	2"	3.1/8	12	015810	081710
22	0.1570	2"	3.1/8	12	019422	080522
21	0.1590	2.1/8	3.1/4	12	019421	080521
20	0.1610	2.1/8	3.1/4	12	019420	080520
19	0.1660	2.1/8	3.1/4	12	019419	080519
18	0.1695	2.1/8	3.1/4	12	019418	080518
11/64	0.1719	2.1/8	3.1/4	12	015811	081711
17	0.1730	2.3/16	3.3/8	12	019417	080517
16	0.1770	2.3/16	3.3/8	12	019416	080516
15	0.1800	2.3/16	3.3/8	12	019415	080515
14	0.1820	2.3/16	3.3/8	12	019414	080514
13	0.1850	2.5/16	3.1/2	12	019413	080513
3/16	0.1875	2.5/16	3.1/2	12	015812	081712
12	0.1890	2.5/16	3.1/2	12	019412	080512
11	0.1910	2.5/16	3.1/2	12	019411	080511
10	0.1935	2.7/16	3.5/8	12	019410	080510
9	0.1960	2.7/16	3.5/8	12	019409	080509
8	0.1990	2.7/16	3.5/8	12	019408	080508
7	0.2010	2.7/16	3.5/8	12	019407	080507
13/64	0.2031	2.7/16	3.5/8	12	015813	081713
6	0.2040	2.1/2	3.3/4	12	019406	080506
5	0.2055	2.1/2	3.3/4	12	019405	080505
4	0.2090	2.1/2	3.3/4	12	019404	080504
3	0.2130	2.1/2	3.3/4	12	019403	080503
7/32	0.2188	2.1/2	3.3/4	12	015814	081714
2	0.2210	2.5/8	3.7/8	12	019402	080502
1	0.2280	2.5/8	3.7/8	12	019401	080501
A	0.2340	2.5/8	3.7/8	12	019301	—
15/64	0.2344	2.5/8	3.7/8	12	015815	081715
B	0.2374	2.3/4	4"	12	019302	—
C	0.2421	2.3/4	4"	12	019303	—
D	0.2461	2.3/4	4"	12	019304	—
1/4	0.2500	2.3/4	4"	12	015816	081716
F	0.2571	2.7/8	4.1/8	12	019306	—
G	0.2610	2.7/8	4.1/8	12	019307	—
17/64	0.2656	2.7/8	4.1/8	12	015817	081717
H	0.2661	2.7/8	4.1/8	12	019308	—
I	0.2720	2.7/8	4.1/8	12	019309	—
J	0.2772	2.7/8	4.1/8	12	019310	—
K	0.2811	2.15/16	4.1/4	12	019311	—
9/32	0.2813	2.15/16	4.1/4	12	015818	081718
L	0.2902	2.15/16	4.1/4	12	019312	—
M	0.2949	3.1/16	4.3/8	12	019313	—
19/64	0.2969	3.1/16	4.3/8	12	015819	081719
N	0.3020	3.1/16	4.3/8	12	019314	—
5/16	0.3125	3.3/16	4.1/2	6	015820	081720
O	0.3161	3.3/16	4.1/2	6	019315	—
P	0.3228	3.5/16	4.5/8	6	019316	—
21/64	0.3281	3.5/16	4.5/8	6	015821	081721
Q	0.3319	3.7/16	4.3/4	6	019317	—
R	0.3390	3.7/16	4.3/4	6	019318	—
11/32	0.3437	3.7/16	4.3/4	6	015822	081722
S	0.3480	3.1/2	4.7/8	6	019319	—
T	0.3580	3.1/2	4.7/8	6	019320	—
23/64	0.3594	3.1/2	4.7/8	6	015823	081723
U	0.3680	3.5/8	5"	6	019321	—
3/8	0.3750	3.5/8	5"	6	015824	081724
V	0.3772	3.5/8	5"	6	019322	—
W	0.3858	3.3/4	5.1/8	6	019323	—
25/64	0.3906	3.3/4	5.1/8	6	015825	081725
X	0.3969	3.3/4	5.1/8	6	019324	—
Y	0.4039	3.7/8	5.1/4	6	019325	—
13/32	0.4063	3.7/8	5.1/4	6	015826	081726

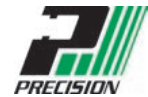




# JOBBER DRILL

$d_1$ Ø "/Nr./letter	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	QC21P	QC21G
Z	0.4130	3.7/8	5.1/4	6	019326	—
27/64	0.4219	3.15/16	5.3/8	6	015827	081727
7/16	0.4375	4.1/16	5.1/2	6	015828	081728
29/64	0.4531	4.3/16	5.5/8	6	015829	081729
15/32	0.4687	4.5/16	5.3/4	6	015830	081730
31/64	0.4844	4.3/8	5.7/8	6	015831	081731
1/2	0.5000	4.1/2	6"	6	015832	081732
33/64	0.5156	4.13/16	6.5/8	1	015833	—
17/32	0.5313	4.13/16	6.5/8	1	015834	—
35/64	0.5469	4.13/16	6.5/8	1	015835	—
9/16	0.5625	4.13/16	6.5/8	1	015836	—
37/64	0.5781	4.13/16	6.5/8	1	015837	—
19/32	0.5937	5.3/16	7.1/8	1	015838	—
39/64	0.6094	5.3/16	7.1/8	1	015839	—
5/8	0.6250	5.3/16	7.1/8	1	015840	—
41/64	0.6406	5.3/16	7.1/8	1	015841	—
21/32	0.6563	5.3/16	7.1/8	1	015842	—
43/64	0.6719	5.5/8	7.5/8	1	015843	—
11/16	0.6875	5.5/8	7.5/8	1	015844	—

# JOBBER DRILL

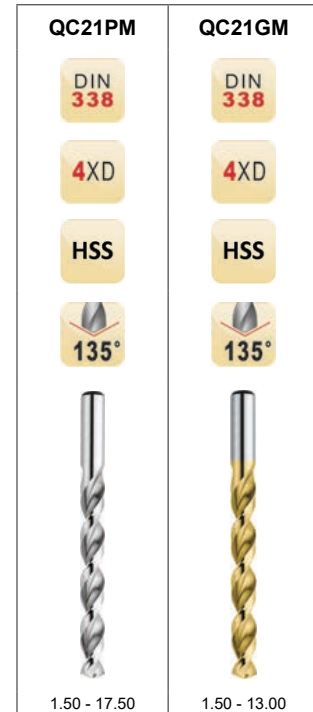
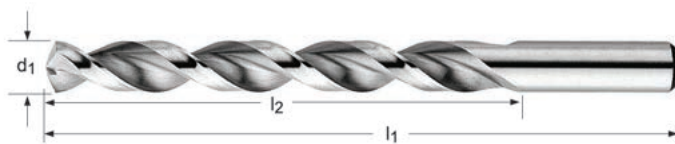


## General Purpose Jobber Length Parabolic Flute, Metric

Heavy-Duty Parabolic Flute design for efficient chip removal. Allows greater drilling depths in one pass. Low thrust design self centering Split Point for easier penetration.

**QC21PM** Bright Finish improves chip flow in soft or non-ferrous materials.

**QC21GM** TiN Coating increases wear resistance and improves tool life.



$d_1$ Ø mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	QC21PM	QC21GM
1.50	0.0591	18	40	12	013115	019815
2.00	0.0787	24	49	12	013120	019820
2.50	0.0984	30	57	12	013125	019825
3.00	0.1181	33	61	12	013130	019830
3.50	0.1378	39	70	12	013135	—
4.00	0.1575	43	75	12	013140	019840
4.50	0.1772	47	80	12	013145	—
5.00	0.1969	52	86	12	013150	019850
5.20	0.2047	52	86	12	013152	019852
5.50	0.2165	57	93	12	013155	019855
5.60	0.2205	57	93	12	013156	019856
6.00	0.2362	57	93	12	013160	019860
6.50	0.2559	63	101	12	013165	019865
6.80	0.2677	69	109	12	013168	019868
7.00	0.2756	69	109	12	013170	019870
7.50	0.2953	69	109	12	013175	019875
8.00	0.3150	75	117	6	013180	019880
8.20	0.3228	75	117	6	013182	019882
8.50	0.3346	75	117	6	013185	019885
8.60	0.3386	81	125	6	013186	019886
9.00	0.3543	81	125	6	013190	019890
9.50	0.3740	81	125	6	013195	019895
10.00	0.3937	87	133	6	014900	019900
10.50	0.4134	87	133	6	014905	019905
11.00	0.4331	94	142	6	014910	019910
11.50	0.4528	94	142	6	014915	—
12.00	0.4724	101	151	6	014920	019920
12.50	0.4921	101	151	6	014925	019925
13.00	0.5118	101	151	1	014930	019930
13.50	0.5315	108	160	1	014935	—
14.00	0.5512	108	160	1	014940	—
14.50	0.5709	114	169	1	014945	—
15.00	0.5906	114	169	1	014950	—
15.50	0.6102	120	178	1	014955	—
16.00	0.6299	120	178	1	014960	—
16.50	0.6496	125	184	1	014965	—
17.00	0.6693	125	184	1	014970	—
17.50	0.6890	130	191	1	014975	—



# COBALT JOBBER DRILL

## Heavy Duty Jobber Length (NAS 907 Type J)

\* Sets Available on pg. 234-235

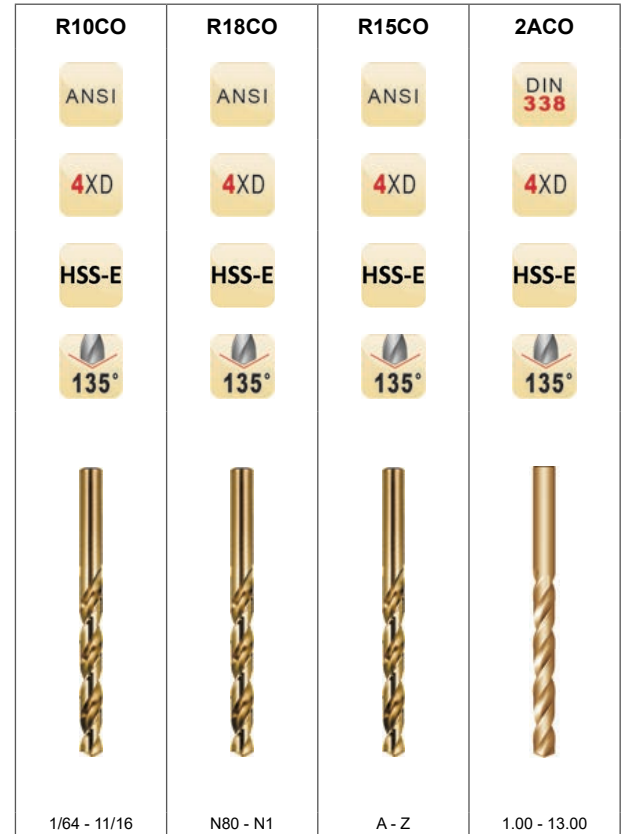
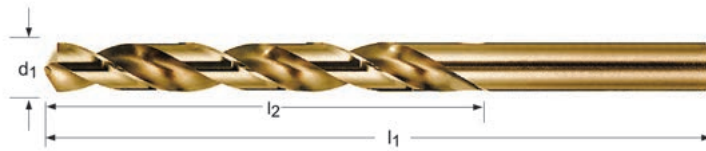
**R10CO** - Fractional Sizes

**R18CO** - Wire Gauge Sizes

**R15CO** - Letter Sizes

**2ACO** - Metric Sizes

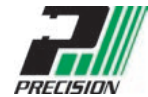
Low thrust design self centering Split Point for easier penetration. Cobalt base material with Bronze Oxide for wear resistance & lubricity. For enhanced tool life in ferrous materials



d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> Ø mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>2</sub> mm	l <sub>1</sub> Inch	l <sub>1</sub> mm	Pack Qty	R10CO	R18CO	R15CO	2ACO
	80			0.0135	1/8		3/4		12	— <sup>1)</sup>	018380	—	—
	79			0.0145	1/8		3/4		12	— <sup>1)</sup>	018379	—	—
1/64				0.0156	3/16		3/4		12	010301 <sup>1)</sup>	—	—	—
	78			0.0160	3/16		7/8		12	— <sup>1)</sup>	018378	—	—
	77			0.0180	3/16		7/8		12	— <sup>1)</sup>	018377	—	—
	76			0.0200	3/16		7/8		12	— <sup>1)</sup>	018376	—	—
	75			0.0210	1/4		1"		12	— <sup>1)</sup>	018375	—	—
	74			0.0225	1/4		1"		12	— <sup>1)</sup>	018374	—	—
	73			0.0240	5/16		1.1/8		12	— <sup>1)</sup>	018373	—	—
	72			0.0250	5/16		1.1/8		12	— <sup>1)</sup>	018372	—	—
	71			0.0260	3/8		1.1/4		12	— <sup>1)</sup>	018371	—	—
	70			0.0280	3/8		1.1/4		12	— <sup>1)</sup>	018370	—	—
	69			0.0292	1/2		1.3/8		12	— <sup>1)</sup>	018369	—	—
	68			0.0310	1/2		1.3/8		12	— <sup>1)</sup>	018368	—	—
1/32				0.0313	1/2		1.3/8		12	010302 <sup>1)</sup>	—	—	—
	67			0.0320	1/2		1.3/8		12	— <sup>1)</sup>	018367	—	—
	66			0.0330	1/2		1.3/8		12	— <sup>1)</sup>	018366	—	—
	65			0.0350	5/8		1.1/2		12	— <sup>1)</sup>	018365	—	—
	64			0.0360	5/8		1.1/2		12	— <sup>1)</sup>	018364	—	—
	63			0.0370	5/8		1.1/2		12	— <sup>1)</sup>	018363	—	—
	62			0.0380	5/8		1.1/2		12	— <sup>1)</sup>	018362	—	—
	61			0.0390	11/16		1.5/8		12	— <sup>1)</sup>	018361	—	—
		1.00		0.0394		12		34	12	—	—	—	016410
	60			0.0400	11/16		1.5/8		12	—	018360	—	—
	59			0.0410	11/16		1.5/8		12	—	018359	—	—
		1.05		0.0413		12		34	12	—	—	—	016355
	58			0.0420	11/16		1.5/8		12	—	018358	—	—
	57			0.0430	3/4		1.3/4		12	—	018357	—	—
		1.10		0.0433		14		36	12	—	—	—	016411
		1.15		0.0453		14		36	12	—	—	—	016356
	56			0.0465	3/4		1.3/4		12	—	018356	—	—
3/64				0.0469	3/4		1.3/4		12	010303	—	—	—

<sup>1)</sup> No Split Point

# COBALT JOBBER DRILL



d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> Ø mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>2</sub> mm	l <sub>1</sub> Inch	l <sub>1</sub> mm	Pack Qty	R10CO	R18CO	R15CO	2ACO
			1.20	0.0472		16		38	12	—	—	—	016412
			1.25	0.0492		16		38	12	—	—	—	016357
			1.30	0.0512		16		38	12	—	—	—	016413
	55			0.0520	7/8		1.7/8		12	—	018355	—	—
			1.35	0.0531		18		40	12	—	—	—	016358
			1.40	0.0551		18		40	12	—	—	—	016414
	54			0.0550	7/8		1.7/8		12	—	018354	—	—
			1.45	0.0571		18		40	12	—	—	—	016359
			1.50	0.0591		18		40	12	—	—	—	016415
	53			0.0595	7/8		1.7/8		12	—	018353	—	—
			1.55	0.0610		20		43	12	—	—	—	016360
1/16				0.0625	7/8		1.7/8		12	010304	—	—	—
			1.60	0.0630		20		43	12	—	—	—	016416
	52			0.0635	7/8		1.7/8		12	—	018352	—	—
			1.65	0.0650		20		43	12	—	—	—	016361
			1.70	0.0669		20		43	12	—	—	—	016417
	51			0.0670	1"		2"		12	—	018351	—	—
			1.75	0.0689		22		46	12	—	—	—	016362
	50			0.0700	1"		2"		12	—	018350	—	—
			1.80	0.0709		22		46	12	—	—	—	016418
			1.85	0.0728		22		46	12	—	—	—	016363
	49			0.0730	1"		2"		12	—	018349	—	—
			1.90	0.0748		22		46	12	—	—	—	016419
	48			0.0760	1"		2"		12	—	018348	—	—
			1.95	0.0768		24		49	12	—	—	—	016364
5/64				0.0781	1"		2"		12	010305	—	—	—
	47			0.0785	1"		2"		12	—	018347	—	—
			2.00	0.0787		24		49	12	—	—	—	016420
			2.05	0.0807		24		49	12	—	—	—	016365
	46			0.0810	1.1/8		2.1/8		12	—	018346	—	—
	45			0.0820	1.1/8		2.1/8		12	—	018345	—	—
			2.10	0.0827		24		49	12	—	—	—	016421
	44			0.0860	1.1/8		2.1/8		12	—	018344	—	—
			2.20	0.0866		27		53	12	—	—	—	016422
	43			0.0890	1.1/4		2.1/4		12	—	018343	—	—
			2.30	0.0906		27		53	12	—	—	—	016423
			2.35	0.0925		27		53	12	—	—	—	016368
	42			0.0935	1.1/4		2.1/4		12	—	018342	—	—
3/32				0.0938	1.1/4		2.1/4		12	010306	—	—	—
			2.40	0.0945		30		57	12	—	—	—	016424
	41			0.0960	1.3/8		2.3/8		12	—	018341	—	—
	40			0.0980	1.3/8		2.3/8		12	—	018340	—	—
			2.50	0.0984		30		57	12	—	—	—	016425
	39			0.0995	1.3/8		2.3/8		12	—	018339	—	—
	38			0.1015	1.7/16		2.1/2		12	—	018338	—	—
			2.60	0.1024		30		57	12	—	—	—	016426
	37			0.1040	1.7/16		2.1/2		12	—	018337	—	—
			2.70	0.1063		33		61	12	—	—	—	016427
	36			0.1065	1.7/16		2.1/2		12	—	018336	—	—
7/64				0.1094	1.1/2		2.5/8		12	010307	—	—	—
	35			0.1100	1.1/2		2.5/8		12	—	018335	—	—
			2.80	0.1102		33		61	12	—	—	—	016428
	34			0.1110	1.1/2		2.5/8		12	—	018334	—	—
	33			0.1130	1.1/2		2.5/8		12	—	018333	—	—
			2.90	0.1142		33		61	12	—	—	—	016429
	32			0.1160	1.5/8		2.3/4		12	—	018332	—	—
			3.00	0.1181		33		61	12	—	—	—	016430
	31			0.1200	1.5/8		2.3/4		12	—	018331	—	—
			3.10	0.1220		36		65	12	—	—	—	016431
1/8				0.1250	1.5/8		2.3/4		12	010308	—	—	—
			3.20	0.1260		36		65	12	—	—	—	016432
			3.25	0.1280		36		65	12	—	—	—	016371
	30			0.1285	1.5/8		2.3/4		12	—	018330	—	—
			3.30	0.1299		36		65	12	—	—	—	016433
			3.40	0.1339		39		70	12	—	—	—	016434
	29			0.1360	1.3/4		2.7/8		12	—	018329	—	—



# COBALT JOBBER DRILL

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> Ø mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>2</sub> mm	l <sub>1</sub> Inch	l <sub>1</sub> mm	Pack Qty	R10CO	R18CO	R15CO	2ACO	
			3.50	0.1378		39		70	12	—	—	—	016435	
9/64	28			0.1405	1.3/4		2.7/8		12	—	018328	—	—	
				0.1406	1.3/4		2.7/8		12	010309	—	—	—	
				3.60	0.1417		39		70	12	—	—	—	016436
	27			0.1440	1.7/8		3"		12	—	018327	—	—	
			3.70	0.1457		39		70	12	—	—	—	016437	
	26			0.1470	1.7/8		3"		12	—	018326	—	—	
			3.75	0.1476		39		70	12	—	—	—	016372	
			3.80	0.1496		43		75	12	—	—	—	016438	
	25			0.1495	1.7/8		3"		12	—	018325	—	—	
	24			0.1520	2"		3.1/8		12	—	018324	—	—	
5/32	23			0.1540	2"		3.1/8		12	—	018323	—	—	
				0.1563	2"		3.1/8		12	010310	—	—	—	
				0.1570	2"		3.1/8		12	—	018322	—	—	
			4.00	0.1575		43		75	12	—	—	—	016440	
	21			0.1590	2.1/8		3.1/4		12	—	018321	—	—	
	20			0.1610	2.1/8		3.1/4		12	—	018320	—	—	
			4.10	0.1614		43		75	12	—	—	—	016441	
			4.20	0.1654		43		75	12	—	—	—	016442	
	19			0.1660	2.1/8		3.1/4		12	—	018319	—	—	
				4.25	0.1673		43		75	12	—	—	—	016373
				4.30	0.1693		47		80	12	—	—	—	016443
11/64	18			0.1695	2.1/8		3.1/4		12	—	018318	—	—	
				0.1719	2.1/8		3.1/4		12	010311	—	—	—	
				0.1730	2.3/16		3.3/8		12	—	018317	—	—	
			4.40	0.1732		47		80	12	—	—	—	016444	
			4.50	0.1772		47		80	12	—	—	—	016445	
	16			0.1770	2.3/16		3.3/8		12	—	018316	—	—	
	15			0.1800	2.3/16		3.3/8		12	—	018315	—	—	
	14			0.1820	2.3/16		3.3/8		12	—	018314	—	—	
			4.70	0.1850		47		80	12	—	—	—	016447	
3/16	13			0.1850	2.5/16		3.1/2		12	—	018313	—	—	
				0.1875	2.5/16		3.1/2		12	010312	—	—	—	
				4.80	0.1890		52		86	12	—	—	—	016448
	12			0.1890	2.5/16		3.1/2		12	—	018312	—	—	
	11			0.1910	2.5/16		3.1/2		12	—	018311	—	—	
	10			0.1935	2.7/16		3.5/8		12	—	018310	—	—	
	9			0.1960	2.7/16		3.5/8		12	—	018309	—	—	
			5.00	0.1969		52		86	12	—	—	—	016450	
	8			0.1990	2.7/16		3.5/8		12	—	018308	—	—	
			5.10	0.2008		52		86	12	—	—	—	016451	
13/64	7			0.2010	2.7/16		3.5/8		12	—	018307	—	—	
				0.2031	2.7/16		3.5/8		12	010313	—	—	—	
				0.2040	2.1/2		3.3/4		12	—	018306	—	—	
			5.20	0.2047		52		86	12	—	—	—	016452	
	5			0.2055	2.1/2		3.3/4		12	—	018305	—	—	
				5.25	0.2067		52		86	12	—	—	—	016375
				5.30	0.2087		52		86	12	—	—	—	016453
	4			0.2090	2.1/2		3.3/4		12	—	018304	—	—	
	3			0.2130	2.1/2		3.3/4		12	—	018303	—	—	
7/32				0.2165		57		93	12	—	—	—	016455	
				0.2188	2.1/2		3.3/4		12	010314	—	—	—	
				5.60	0.2205		57		93	12	—	—	—	016456
	2			0.2210	2.5/8		3.7/8		12	—	018302	—	—	
			5.70	0.2244		57		93	12	—	—	—	016457	
	1			0.2280	2.5/8		3.7/8		12	—	018301	—	—	
				5.90	0.2323		57		93	12	—	—	—	016459
		A			0.2340	2.5/8		3.7/8		12	—	—	015301	—
15/64				0.2344	2.5/8		3.7/8		12	010315	—	—	—	
				6.00	0.2362		57		93	12	—	—	—	016460
			B			0.2374	2.3/4		4"		12	—	—	015302
			6.10	0.2402		63		101	12	—	—	—	016461	
	C			0.2421	2.3/4		4"		12	—	—	015303	—	
				6.20	0.2441		63		101	12	—	—	—	016462
		D			0.2461	2.3/4		4"		12	—	—	015304	—
			6.30	0.2480		63		101	12	—	—	—	016463	

# COBALT JOBBER DRILL



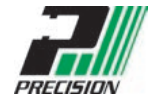
d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> Ø mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>2</sub> mm	l <sub>1</sub> Inch	l <sub>1</sub> mm	Pack Qty	R10CO	R18CO	R15CO	2ACO	
1/4	E			0.2500	2.3/4		4"		12	—	—	015305	—	
				0.2500	2.3/4		4"		12	010316	—	—	—	
				6.40	0.2520			101	12	—	—	—	016464	
				6.50	0.2559			101	12	—	—	—	016465	
		F			0.2571	2.7/8		4.1/8		12	—	—	015306	—
					6.60	0.2598			101	12	—	—	—	016466
	G			0.2610	2.7/8		4.1/8		12	—	—	015307	—	
				6.70	0.2638			101	12	—	—	—	016467	
17/64		H		0.2656	2.7/8		4.1/8		12	010317	—	—	—	
				0.2661	2.7/8		4.1/8		12	—	—	015308	—	
				6.80	0.2677			109	12	—	—	—	016468	
				6.90	0.2717			109	12	—	—	—	016469	
		I			0.2720	2.7/8		4.1/8		12	—	—	015309	—
					7.00	0.2756			109	12	—	—	—	016470
	J			0.2772	2.7/8		4.1/8		12	—	—	015310	—	
				7.10	0.2795			109	12	—	—	—	016471	
9/32	K			0.2811	2.15/16		4.1/4		12	—	—	015311	—	
				0.2813	2.15/16		4.1/4		12	010318	—	—	—	
				7.20	0.2835			109	12	—	—	—	016472	
				7.25	0.2854			109	12	—	—	—	016379	
				7.30	0.2874			109	12	—	—	—	016473	
					L		0.2902	2.15/16		4.1/4		12	—	—
	M		0.2949				3.1/16		4.3/8		12	—	—	015313
						7.50	0.2953			109	12	—	—	—
19/64						0.2969	3.1/16		4.3/8		12	010319	—	—
				N		0.3020	3.1/16		4.3/8		12	—	—	015314
						7.80	0.3071			117	12	—	—	—
						7.90	0.3110			117	12	—	—	—
5/16						0.3125	3.3/16		4.1/2		6	010320	—	—
			8.00	0.3150			117	6	—	—	—	016480		
		O			0.3161	3.3/16		4.1/2		6	—	—	015315	—
					8.20	0.3228			117	6	—	—	—	016482
					0.3228	3.5/16		4.5/8		6	—	—	015316	—
					0.3281	3.5/16		4.5/8		6	010321	—	—	—
21/64				8.40	0.3307			117	6	—	—	—	016484	
					Q		0.3319	3.7/16		4.3/4		6	—	—
			8.50				0.3346			117	6	—	—	—
			11/32				0.3390	3.7/16		4.3/4		6	—	—
							0.3437	3.7/16		4.3/4		6	010322	—
							8.80	0.3465			125	6	—	—
	S						0.3480	3.1/2		4.7/8		6	—	—
							8.90	0.3504			125	6	—	—
							9.00	0.3543			125	6	—	—
								0.3580	3.1/2		4.7/8		6	—
23/64								9.10	0.3583			125	6	—
						0.3594	3.1/2		4.7/8		6	010323	—	—
							9.20	0.3622			125	6	—	—
								9.30	0.3661			125	6	—
3/8	U							0.3680	3.5/8		5"		6	—
			9.40	0.3701				125	6	—	—	—	016494	
					9.50	0.3740			125	6	—	—	—	016495
									0.3750	3.5/8		5"		6
		V							0.3772	3.5/8		5"		6
									9.60	0.3780			133	6
				9.70					0.3819			133	6	—
								9.80	0.3858			133	6	—
25/64								0.3858	3.3/4		5.1/8		6	—
								0.3906	3.3/4		5.1/8		6	010325
								10.00	0.3937			133	6	—
					X			0.3969	3.3/4		5.1/8		6	—
								10.20	0.4016			133	6	—
				13/32				0.4039	3.7/8		5.1/4		6	—
								0.4063	3.7/8		5.1/4		6	010326
								0.4130	3.7/8		5.1/4		6	—
27/64								10.50	0.4134			133	6	—
								0.4219	3.15/16		5.3/8		6	010327



# COBALT JOBBER DRILL

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> Ø mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>2</sub> mm	l <sub>1</sub> Inch	l <sub>1</sub> mm	Pack Qty	R10CO	R18CO	R15CO	2ACO
			10.80	0.4252		94		142	6	—	—	—	016308
			11.00	0.4331		94		142	6	—	—	—	016310
7/16				0.4375	4.1/16		5.1/2		6	010328	—	—	—
			11.20	0.4409		94		142	6	—	—	—	016312
			11.50	0.4528		94		142	6	—	—	—	016315
29/64				0.4531	4.3/16		5.5/8		6	010329	—	—	—
			11.80	0.4646		94		142	6	—	—	—	016318
15/32				0.4687	4.5/16		5.3/4		6	010330	—	—	—
			12.00	0.4724		101		151	6	—	—	—	016320
			12.20	0.4803		101		151	6	—	—	—	016322
31/64				0.4844	4.3/8		5.7/8		6	010331	—	—	—
			12.50	0.4921		101		151	6	—	—	—	016325
1/2				0.5000	4.1/2		6"		6	010332	—	—	—
			13.00	0.5118		101		151	1	—	—	—	016330
33/64				0.5156	4.13/16		6.5/8		1	010333	—	—	—
17/32				0.5313	4.13/16		6.5/8		1	010334	—	—	—
35/64				0.5469	4.13/16		6.5/8		1	010335	—	—	—
9/16				0.5625	4.13/16		6.5/8		1	010336	—	—	—
37/64				0.5781	4.13/16		6.5/8		1	010337	—	—	—
19/32				0.5937	5.3/16		7.1/8		1	010338	—	—	—
39/64				0.6094	5.3/16		7.1/8		1	010339	—	—	—
5/8				0.6250	5.3/16		7.1/8		1	010340	—	—	—
41/64				0.6406	5.3/16		7.1/8		1	010341	—	—	—
21/32				0.6563	5.3/16		7.1/8		1	010342	—	—	—
43/64				0.6719	5.5/8		7.5/8		1	010343	—	—	—
11/16				0.6875	5.5/8		7.5/8		1	010344	—	—	—

# COBALT JOBBER DRILL

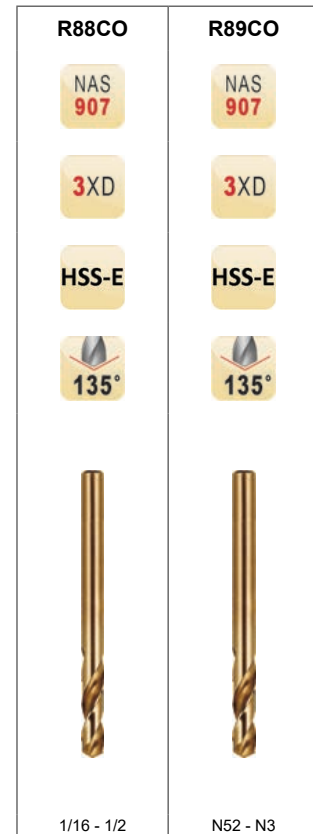
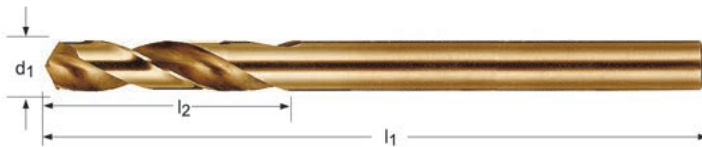


## Heavy Duty Jobber Length (NAS 907 Type D)

**R88CO** - Fractional Sizes

**R89CO** - Wire Gauge Sizes

Low thrust design self centering Split Point for easier penetration. Shorter Flute Lengths. Cobalt base material with Bronze Oxide for wear resistance and lubricity.



$d_1$ Ø Inch	$d_1$ Ø Nr.	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	R88CO	R89CO
1/16		0.0625	7/16	1.7/8	12	058704	—
	52	0.0635	7/16	1.7/8	12	—	058852
	51	0.0670	1/2	2"	12	—	058851
	50	0.0700	1/2	2"	12	—	058850
	49	0.0730	1/2	2"	12	—	058849
5/64		0.0781	1/2	2"	12	058705	—
	46	0.0810	9/16	2.1/8	12	—	058846
	45	0.0820	9/16	2.1/8	12	—	058845
	44	0.0860	9/16	2.1/8	12	—	058844
	43	0.0890	5/8	2.1/4	12	—	058843
	42	0.0935	5/8	2.1/4	12	—	058842
3/32		0.0938	5/8	2.1/4	12	058706	—
	41	0.0960	5/8	2.3/8	12	—	058841
	40	0.0980	13/16	2.3/8	12	—	058840
	39	0.0995	13/16	2.3/8	12	—	058839
	36	0.1065	13/16	2.1/2	12	—	058836
7/64		0.1094	13/16	2.5/8	12	058707	—
	31	0.1200	7/8	2.3/4	12	—	058831
1/8		0.1250	7/8	2.3/4	12	058708	—
	30	0.1285	15/16	2.3/4	12	—	058830
	29	0.1360	15/16	2.7/8	12	—	058829
9/64		0.1406	15/16	2.7/8	12	058709	—
	27	0.1440	1"	3"	12	—	058827
	26	0.1470	1"	3"	12	—	058826
	25	0.1495	1"	3"	12	—	058825
	24	0.1520	1"	3.1/8	12	—	058824
5/32		0.1563	1"	3.1/8	12	058710	—
	22	0.1570	1.1/16	3.1/8	12	—	058822
	21	0.1590	1.1/16	3.1/4	12	—	058821
	20	0.1610	1.1/16	3.1/4	12	—	058820
11/64		0.1719	1.1/16	3.1/4	12	058711	—
	16	0.1770	1.1/8	3.3/8	12	—	058816
	13	0.1850	1.1/8	3.1/2	12	—	058813





# COBALT JOBBER DRILL

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	R88CO	R89CO
3/16		0.1875	1.1/8	3.1/2	12	058712	—
	12	0.1890	1.1/8	3.1/2	12	—	058812
	11	0.1910	1.3/16	3.1/2	12	—	058811
	10	0.1935	1.3/16	3.5/8	12	—	058810
	9	0.1960	1.3/16	3.5/8	12	—	058809
	8	0.1990	1.3/16	3.5/8	12	—	058808
	7	0.2010	1.3/16	3.5/8	12	—	058807
13/64		0.2031	1.3/16	3.5/8	12	058713	—
	6	0.2040	1.1/4	3.3/4	12	—	058806
	5	0.2055	1.1/4	3.3/4	12	—	058805
	3	0.2130	1.1/4	3.3/4	12	—	058803
7/32		0.2188	1.1/4	3.3/4	12	058714	—
15/64		0.2344	1.5/16	3.7/8	12	058715	—
1/4		0.2500	1.3/8	4"	12	058716	—
17/64		0.2656	1.7/16	4.1/8	12	058717	—
9/32		0.2813	1.1/2	4.1/4	12	058718	—
19/64		0.2969	1.9/16	4.3/8	12	058719	—
5/16		0.3125	1.5/8	4.1/2	6	058720	—
21/64		0.3281	1.11/16	4.5/8	6	058721	—
11/32		0.3437	1.11/16	4.3/4	6	058722	—
23/64		0.3594	1.3/4	4.7/8	6	058723	—
3/8		0.3750	1.13/16	5"	6	058724	—
25/64		0.3906	1.7/8	5.1/8	6	058725	—
13/32		0.4063	1.15/16	5.1/4	6	058726	—
27/64		0.4219	2"	5.3/8	6	058727	—
7/16		0.4375	2.1/16	5.1/2	6	058728	—
29/64		0.4531	2.1/8	5.5/8	6	058729	—
15/32		0.4687	2.1/8	5.3/4	6	058730	—
31/64		0.4844	2.3/16	5.7/8	6	058731	—
1/2		0.5000	2.1/4	6"	6	058732	—

# SCREW MACHINE DRILL



## General Purpose Screw Machine Length

\* Sets Available on pg. 236

**R40** - Fractional Sizes

**R41** - Wire Gauge Sizes

**R42** - Letter Sizes

Bright Finish improves chip flow in soft or non-ferrous materials



1) Sizes 45/64 and larger are steam oxide

2) 1" reduced shank

3) 1-1/4" reduced shank

4) 1-1/2" reduced shank

R40	R41	R42
ANSI	ANSI	ANSI
2.5XD	2.5XD	2.5XD
HSS	HSS	HSS
118°	118°	118°
3/64 - 2"	N60 - N1	A - Z

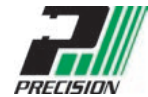
d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	R40	R41	R42
	60		0.0400	1/2	1.3/8	12	—	041060	—
	59		0.0410	1/2	1.3/8	12	—	041059	—
	58		0.0420	1/2	1.3/8	12	—	041058	—
	57		0.0430	1/2	1.3/8	12	—	041057	—
	56		0.0465	1/2	1.3/8	12	—	041056	—
3/64			0.0469	1/2	1.3/8	12	040003	—	—
	55		0.0520	5/8	1.5/8	12	—	041055	—
	54		0.0550	5/8	1.5/8	12	—	041054	—
	53		0.0595	5/8	1.5/8	12	—	041053	—
1/16			0.0625	5/8	1.5/8	12	040004	—	—
	52		0.0635	11/16	1.11/16	12	—	041052	—
	51		0.0670	11/16	1.11/16	12	—	041051	—
	50		0.0700	11/16	1.11/16	12	—	041050	—
	49		0.0730	11/16	1.11/16	12	—	041049	—
	48		0.0760	11/16	1.11/16	12	—	041048	—
5/64			0.0781	11/16	1.11/16	12	040005	—	—
	47		0.0785	11/16	1.11/16	12	—	041047	—
	46		0.0810	3/4	1.3/4	12	—	041046	—
	45		0.0820	3/4	1.3/4	12	—	041045	—
	44		0.0860	3/4	1.3/4	12	—	041044	—
	43		0.0890	3/4	1.3/4	12	—	041043	—
	42		0.0935	3/4	1.3/4	12	—	041042	—
3/32			0.0938	3/4	1.3/4	12	040006	—	—
	41		0.0960	13/16	1.13/16	12	—	041041	—
	40		0.0980	13/16	1.13/16	12	—	041040	—
	39		0.0995	13/16	1.13/16	12	—	041039	—
	38		0.1015	13/16	1.13/16	12	—	041038	—
	37		0.1040	13/16	1.13/16	12	—	041037	—
	36		0.1065	13/16	1.13/16	12	—	041036	—
7/64			0.1094	13/16	1.13/16	12	040007	—	—
	35		0.1100	7/8	1.7/8	12	—	041035	—
	34		0.1110	7/8	1.7/8	12	—	041034	—
	33		0.1130	7/8	1.7/8	12	—	041033	—
	32		0.1160	7/8	1.7/8	12	—	041032	—



# SCREW MACHINE DRILL

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	R40	R41	R42
1/8	31		0.1200	7/8	1.7/8	12	—	041031	—
			0.1250	7/8	1.7/8	12	040008	—	—
	30		0.1285	15/16	1.15/16	12	—	041030	—
	29		0.1360	15/16	1.15/16	12	—	041029	—
9/64	28		0.1405	15/16	1.15/16	12	—	041028	—
			0.1406	15/16	1.15/16	12	040009	—	—
	27		0.1440	1"	2.1/16	12	—	041027	—
	26		0.1470	1"	2.1/16	12	—	041026	—
5/32	25		0.1495	1"	2.1/16	12	—	041025	—
	24		0.1520	1"	2.1/16	12	—	041024	—
	23		0.1540	1"	2.1/16	12	—	041023	—
			0.1563	1"	2.1/16	12	040010	—	—
	22		0.1570	1.1/16	2.1/8	12	—	041022	—
	21		0.1590	1.1/16	2.1/8	12	—	041021	—
	20		0.1610	1.1/16	2.1/8	12	—	041020	—
11/64	19		0.1660	1.1/16	2.1/8	12	—	041019	—
	18		0.1695	1.1/16	2.1/8	12	—	041018	—
			0.1719	1.1/16	2.1/8	12	040011	—	—
	17		0.1730	1.1/8	2.3/16	12	—	041017	—
	16		0.1770	1.1/8	2.3/16	12	—	041016	—
	15		0.1800	1.1/8	2.3/16	12	—	041015	—
	14		0.1820	1.1/8	2.3/16	12	—	041014	—
3/16	13		0.1850	1.1/8	2.3/16	12	—	041013	—
			0.1875	1.1/8	2.3/16	12	040012	—	—
	12		0.1890	1.3/16	2.1/4	12	—	041012	—
	11		0.1910	1.3/16	2.1/4	12	—	041011	—
	10		0.1935	1.3/16	2.1/4	12	—	041010	—
	9		0.1960	1.3/16	2.1/4	12	—	041009	—
	8		0.1990	1.3/16	2.1/4	12	—	041008	—
13/64	7		0.2010	1.3/16	2.1/4	12	—	041007	—
			0.2031	1.3/16	2.1/4	12	040013	—	—
	6		0.2040	1.1/4	2.3/8	12	—	041006	—
	5		0.2055	1.1/4	2.3/8	12	—	041005	—
	4		0.2090	1.1/4	2.3/8	12	—	041004	—
	3		0.2130	1.1/4	2.3/8	12	—	041003	—
	7/32			0.2188	1.1/4	2.3/8	12	040014	—
2			0.2210	1.5/16	2.7/16	12	—	041002	—
1			0.2280	1.5/16	2.7/16	12	—	041001	—
		A	0.2340	1.5/16	2.7/16	12	—	—	042001
15/64			0.2344	1.5/16	2.7/16	12	040015	—	—
		B	0.2374	1.3/8	2.1/2	12	—	—	042002
		C	0.2421	1.3/8	2.1/2	12	—	—	042003
		D	0.2461	1.3/8	2.1/2	12	—	—	042004
		E	0.2500	1.3/8	2.1/2	12	—	—	042005
1/4			0.2500	1.3/8	2.1/2	12	040016	—	—
		F	0.2571	1.7/16	2.5/8	12	—	—	042006
		G	0.2610	1.7/16	2.5/8	12	—	—	042007
17/64			0.2656	1.7/16	2.5/8	12	040017	—	—
		H	0.2661	1.1/2	2.11/16	12	—	—	042008
		I	0.2720	1.1/2	2.11/16	12	—	—	042009
		J	0.2772	1.1/2	2.11/16	12	—	—	042010
		K	0.2811	1.1/2	2.11/16	12	—	—	042011
9/32			0.2813	1.1/2	2.11/16	12	040018	—	—
		L	0.2902	1.9/16	2.3/4	12	—	—	042012
		M	0.2949	1.9/16	2.3/4	12	—	—	042013
19/64			0.2969	1.9/16	2.3/4	12	040019	—	—
		N	0.3020	1.5/8	2.13/16	12	—	—	042014
5/16			0.3125	1.5/8	2.13/16	6	040020	—	—
		O	0.3161	1.11/16	2.15/16	6	—	—	042015
		P	0.3228	1.11/16	2.15/16	6	—	—	042016
21/64			0.3281	1.11/16	2.15/16	6	040021	—	—
		Q	0.3319	1.11/16	3"	6	—	—	042017
11/32			0.3390	1.11/16	3"	6	—	—	042018
			0.3437	1.11/16	3"	6	040022	—	—
		S	0.3480	1.3/4	3.1/16	6	—	—	042019

# SCREW MACHINE DRILL



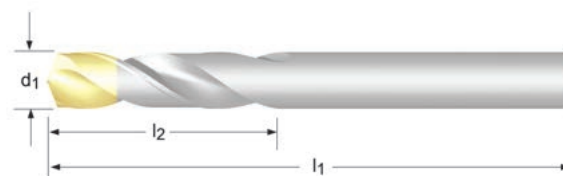
d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	R40	R41	R42
		T	0.3580	1.3/4	3.1/16	6	—	—	042020
23/64			0.3594	1.3/4	3.1/16	6	040023	—	—
		U	0.3680	1.13/16	3.1/8	6	—	—	042021
3/8			0.3750	1.13/16	3.1/8	6	040024	—	—
		V	0.3772	1.7/8	3.1/4	6	—	—	042022
		W	0.3858	1.7/8	3.1/4	6	—	—	042023
25/64			0.3906	1.7/8	3.1/4	6	040025	—	—
		X	0.3969	1.15/16	3.5/16	6	—	—	042024
		Y	0.4039	1.15/16	3.5/16	6	—	—	042025
13/32			0.4063	1.15/16	3.5/16	6	040026	—	—
		Z	0.4130	2"	3.3/8	6	—	—	042026
27/64			0.4219	2"	3.3/8	6	040027	—	—
7/16			0.4375	2.1/16	3.7/16	6	040028	—	—
29/64			0.4531	2.1/8	3.9/16	6	040029	—	—
15/32			0.4687	2.1/8	3.5/8	6	040030	—	—
31/64			0.4844	2.3/16	3.11/16	6	040031	—	—
1/2			0.5000	2.1/4	3.3/4	6	040032	—	—
33/64			0.5156	2.3/8	3.7/8	1	040033	—	—
17/32			0.5313	2.3/8	3.7/8	1	040034	—	—
35/64			0.5469	2.1/2	4"	1	040035	—	—
9/16			0.5625	2.1/2	4"	1	040036	—	—
37/64			0.5781	2.5/8	4.1/8	1	040037	—	—
19/32			0.5937	2.5/8	4.1/8	1	040038	—	—
39/64			0.6094	2.3/4	4.1/4	1	040039	—	—
5/8			0.6250	2.3/4	4.1/4	1	040040	—	—
41/64			0.6406	2.7/8	4.1/2	1	040041	—	—
21/32			0.6563	2.7/8	4.1/2	1	040042	—	—
43/64			0.6719	2.7/8	4.5/8	1	040043	—	—
11/16			0.6875	2.7/8	4.5/8	1	040044	—	—
45/64			0.7031	3"	4.3/4	1	040545 <sup>1)</sup>	—	—
23/32			0.7188	3"	4.3/4	1	040546 <sup>1)</sup>	—	—
47/64			0.7344	3.1/8	5"	1	040547 <sup>1)</sup>	—	—
3/4			0.7500	3.1/8	5"	1	040548 <sup>1)</sup>	—	—
49/64			0.7656	3.1/4	5.1/8	1	040549 <sup>1)</sup>	—	—
25/32			0.7813	3.1/4	5.1/8	1	040550 <sup>1)</sup>	—	—
51/64			0.7969	3.3/8	5.1/4	1	040551 <sup>1)</sup>	—	—
13/16			0.8125	3.3/8	5.1/4	1	040552 <sup>1)</sup>	—	—
53/64			0.8281	3.1/2	5.3/8	1	040553 <sup>1)</sup>	—	—
27/32			0.8438	3.1/2	5.3/8	1	040554 <sup>1)</sup>	—	—
55/64			0.8594	3.1/2	5.1/2	1	040555 <sup>1)</sup>	—	—
7/8			0.8750	3.1/2	5.1/2	1	040556 <sup>1)</sup>	—	—
57/64			0.8906	3.5/8	5.5/8	1	040557 <sup>1)</sup>	—	—
29/32			0.9063	3.5/8	5.5/8	1	040558 <sup>1)</sup>	—	—
59/64			0.9219	3.3/4	5.3/4	1	040559 <sup>1)</sup>	—	—
15/16			0.9375	3.3/4	5.3/4	1	040560 <sup>1)</sup>	—	—
61/64			0.9531	3.7/8	5.7/8	1	040561 <sup>1)</sup>	—	—
31/32			0.9688	3.7/8	5.7/8	1	040562 <sup>1)</sup>	—	—
63/64			0.9844	4"	6"	1	040563 <sup>1)</sup>	—	—
1"			1.0000	4"	6"	1	040600 <sup>1)</sup>	—	—
1.1/16			1.0625	4"	6.1/4	1	040604 <sup>1)2)</sup>	—	—
1.1/8			1.1250	4"	6.3/8	1	040608 <sup>1)2)</sup>	—	—
1.3/16			1.1875	4.1/4	6.5/8	1	040612 <sup>1)2)</sup>	—	—
1.1/4			1.2500	4.3/8	6.3/4	1	040616 <sup>1)2)</sup>	—	—
1.5/16			1.3125	4.3/8	7"	1	040620 <sup>1)3)</sup>	—	—
1.3/8			1.3750	4.1/2	7.1/8	1	040624 <sup>1)3)</sup>	—	—
1.7/16			1.4375	4.3/4	7.3/8	1	040628 <sup>1)3)</sup>	—	—
1.1/2			1.5000	4.7/8	7.1/2	1	040632 <sup>1)3)</sup>	—	—
1.9/16			1.5625	4.7/8	7.3/4	1	040636 <sup>1)4)</sup>	—	—
1.5/8			1.6250	4.7/8	7.3/4	1	040640 <sup>1)4)</sup>	—	—
1.3/4			1.7500	5.1/8	8"	1	040648 <sup>1)4)</sup>	—	—
1.13/16			1.8125	5.3/8	8.1/4	1	040652 <sup>1)4)</sup>	—	—
1.7/8			1.8750	5.3/8	8.1/4	1	040656 <sup>1)4)</sup>	—	—
1.15/16			1.9375	5.5/8	8.1/2	1	040660 <sup>1)4)</sup>	—	—
2"			2.0000	5.5/8	8.1/2	1	040700 <sup>1)4)</sup>	—	—

## General Purpose Screw Machine Length

\* Sets Available on pg. 237

**A022** Low thrust design self centering Split Point for easier penetration. TiN Coated Tip increases wear resistance and improves tool life.

Metric sizes to DIN1897 lengths.  
Fractional sizes to ANSI lengths.



**A022**

DIN  
ANSI

**2.5XD**

**HSS**

**135°**



0.50 - 16.00

\* 2mm and smaller are bright with no split point

$d_1$ $\varnothing h_8$ Inch	$d_1$ $\varnothing h_8$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	<b>A022</b>
	0.50	0.0197	3	20	10	0600382
	0.60	0.0236	3.5	21	10	0600399
	0.70	0.0276	4.5	23	10	0600405
1/32	0.79	0.0313	13	35	10	0600542
	0.80	0.0315	5	24	10	0600412
	0.90	0.0354	5.5	25	10	0600429
	1.00	0.0394	6	26	10	0600436
	1.10	0.0433	7	28	10	0600443
3/64	1.19	0.0469	13	35	10	0600559
	1.20	0.0472	8	30	10	0600450
	1.30	0.0512	8	30	10	0600467
	1.40	0.0551	9	32	10	0600474
	1.50	0.0591	9	32	10	0600481
1/16	1.59	0.0625	16	41	10	0600535
	1.60	0.0630	10	34	10	0600498
	1.70	0.0669	10	34	10	0600504
	1.80	0.0709	11	36	10	0600511
	1.90	0.0748	11	36	10	0600528
5/64	1.98	0.0781	17	43	10	0600566
	2.00	0.0787	12	38	10	0600115
	2.10	0.0827	12	38	10	0600122
	2.20	0.0866	13	40	10	0600139
	2.25	0.0886	13	40	10	0600146
	2.30	0.0906	13	40	10	0600153
3/32	2.38	0.0937	20	45	10	0600238
	2.40	0.0945	14	43	10	0600160
	2.50	0.0984	14	43	10	0600177
	2.60	0.1024	14	43	10	0600184
	2.65	0.1043	14	43	10	0600191
	2.70	0.1063	16	46	10	0600207
7/64	2.78	0.1094	22	47	10	0600245
	2.80	0.1102	16	46	10	0600214
	2.90	0.1142	16	46	10	0600221

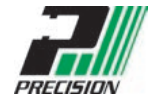
# SCREW MACHINE DRILL



$d_1$ $\varnothing h_8$ Inch	$d_1$ $\varnothing h_8$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A022
	3.00	0.1181	16	46	10	0588697
	3.10	0.1220	18	49	10	0589083
1/8	3.18	0.1250	23	49	10	0588727
	3.20	0.1260	18	49	10	0589090
	3.25	0.1280	18	49	10	0589106
	3.30	0.1299	18	49	10	0589113
	3.40	0.1339	20	52	10	0589120
	3.50	0.1378	20	52	10	0589137
9/64	3.57	0.1406	25	50	10	0589878
	3.60	0.1417	20	52	10	0589144
	3.70	0.1457	20	52	10	0589151
	3.80	0.1496	22	55	10	0589168
	3.90	0.1535	22	55	10	0589175
5/32	3.97	0.1563	26	53	10	0589410
	4.00	0.1575	22	55	10	0589205
	4.10	0.1614	22	55	10	0589212
	4.20	0.1654	22	55	10	0589229
	4.30	0.1693	24	58	10	0589236
11/64	4.37	0.1719	28	55	10	0588932
	4.40	0.1732	24	58	10	0589243
	4.50	0.1772	24	58	10	0589250
	4.60	0.1811	24	58	10	0589267
	4.70	0.1850	24	58	10	0589274
3/16	4.76	0.1875	30	57	10	0589182
	4.80	0.1890	26	62	10	0589281
	4.90	0.1929	26	62	10	0589298
	5.00	0.1969	26	62	10	0589304
	5.10	0.2008	26	62	10	0589311
13/64	5.16	0.2031	31	58	10	0589014
	5.20	0.2047	26	62	10	0589328
	5.30	0.2087	26	62	10	0589335
	5.40	0.2126	28	66	10	0589342
	5.50	0.2165	28	66	10	0589359
7/32	5.56	0.2188	33	61	10	0589649
	5.60	0.2205	28	66	10	0589366
	5.70	0.2244	28	66	10	0589373
	5.80	0.2283	28	66	10	0589380
	5.90	0.2323	28	66	10	0589397
15/64	5.95	0.2344	34	63	10	0589069
	6.00	0.2362	28	66	10	0589434
	6.10	0.2402	31	70	10	0589441
	6.20	0.2441	31	70	10	0589458
	6.30	0.2480	31	70	10	0589465
1/4	6.35	0.2500	36	65	10	0588710
	6.40	0.2520	31	70	10	0589472
	6.50	0.2559	31	70	10	0589489
	6.60	0.2598	31	70	10	0589496
	6.70	0.2638	31	70	10	0589502
	6.80	0.2677	34	74	10	0589519
	6.90	0.2717	34	74	10	0589526
	7.00	0.2756	34	74	10	0589533
	7.10	0.2795	34	74	10	0589540
9/32	7.14	0.2813	40	70	10	0589861
	7.20	0.2835	34	74	10	0589557
	7.30	0.2874	34	74	10	0589564
	7.40	0.2913	34	74	10	0589571
	7.50	0.2953	34	74	10	0589588
	7.60	0.2992	37	79	10	0589595
	7.70	0.3031	37	79	10	0589601
	7.80	0.3071	37	79	10	0589618
	7.90	0.3110	37	79	10	0589625
5/16	7.94	0.3125	43	73	10	0589403
	8.00	0.3150	37	79	10	0589656
	8.10	0.3189	37	79	10	0589663
	8.20	0.3228	37	79	10	0589670
	8.30	0.3268	37	79	10	0589687

$d_1$ $\varnothing_{h_8}$ Inch	$d_1$ $\varnothing_{h_8}$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A022
	8.40	0.3307	37	79	10	0589694
	8.50	0.3346	37	79	10	0589700
	8.60	0.3386	40	84	10	0589717
	8.70	0.3425	40	84	10	0589724
11/32	8.73	0.3438	45	78	10	0588925
	8.80	0.3465	40	84	10	0589731
	8.90	0.3504	40	84	10	0589748
	9.00	0.3543	40	84	10	0589755
	9.10	0.3583	40	84	10	0589762
	9.20	0.3622	40	84	10	0589779
	9.30	0.3661	40	84	10	0589786
	9.40	0.3701	40	84	10	0589793
	9.50	0.3740	40	84	10	0589809
3/8	9.52	0.3750	48	81	10	0589199
	9.60	0.3780	43	89	10	0589816
	9.70	0.3819	43	89	10	0589823
	9.80	0.3858	43	89	10	0589830
	9.90	0.3898	43	89	10	0589847
	10.00	0.3937	43	89	10	0588734
	10.10	0.3976	43	89	5	0588741
	10.20	0.4016	43	89	5	0588758
	10.30	0.4055	43	89	5	0588765
13/32	10.32	0.4062	51	86	5	0589007
	10.40	0.4094	43	89	5	0588772
	10.50	0.4134	43	89	5	0588789
	10.60	0.4173	43	89	5	0588796
	10.70	0.4213	47	95	5	0588802
	10.80	0.4252	47	95	5	0588819
	10.90	0.4291	47	95	5	0588826
	11.00	0.4331	47	95	5	0588833
	11.10	0.4370	47	95	5	0588840
7/16	11.11	0.4375	54	89	5	0589632
	11.20	0.4409	47	95	5	0588857
	11.30	0.4449	47	95	5	0588864
	11.50	0.4528	47	95	5	0588871
	11.60	0.4567	47	95	5	0588888
	11.70	0.4606	47	95	5	0588895
	11.80	0.4646	47	95	5	0588901
	11.90	0.4685	51	102	5	0588918
	12.00	0.4724	51	102	5	0588949
	12.10	0.4764	51	102	5	0588956
	12.20	0.4803	51	102	5	0588963
	12.50	0.4921	51	102	5	0588970
1/2	12.70	0.5000	60	98	5	0588703
	13.00	0.5118	51	102	5	0588987
	13.50	0.5315	54	107	1	0588994
	14.00	0.5512	54	107	1	0589021
9/16	14.29	0.5625	67	105	1	0589854
	14.50	0.5709	56	111	1	0589038
	15.00	0.5906	56	111	1	0589045
	15.50	0.6102	58	115	1	0589052
5/8	15.88	0.6250	73	111	1	0589427
	16.00	0.6299	58	115	1	0589076

# SCREW MACHINE DRILL



## Heavy Duty Screw Machine Length (NAS 907 Type C)

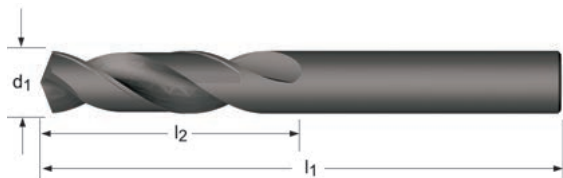
\* Sets Available on pg. 238

**R40C** - Fractional Sizes

**R41C** - Wire Gauge Sizes

**R42C** - Letter Sizes

Low thrust design self centering Split Point for easier penetration. Steam Oxide surface treatment for increased wear resistance and lubricity.



R40C	R41C	R42C
ANSI	ANSI	ANSI
2.5XD	2.5XD	2.5XD
HSS	HSS	HSS
135°	135°	135°
1/16 - 1/2	N60 - N1	A - Z

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	R40C	R41C	R42C
	60		0.0400	1/2	1.3/8	12	—	041860	<sup>1)</sup> —
	59		0.0410	1/2	1.3/8	12	—	041859	<sup>1)</sup> —
	58		0.0420	1/2	1.3/8	12	—	041858	<sup>1)</sup> —
	57		0.0430	1/2	1.3/8	12	—	041857	<sup>1)</sup> —
	56		0.0465	1/2	1.3/8	12	—	041856	<sup>1)</sup> —
	55		0.0520	5/8	1.5/8	12	—	041855	<sup>1)</sup> —
	54		0.0550	5/8	1.5/8	12	—	041854	<sup>1)</sup> —
	53		0.0595	5/8	1.5/8	12	—	041853	<sup>1)</sup> —
1/16			0.0625	5/8	1.5/8	12	040804	—	—
	52		0.0635	11/16	1.11/16	12	—	041852	—
	51		0.0670	11/16	1.11/16	12	—	041851	—
	50		0.0700	11/16	1.11/16	12	—	041850	—
	49		0.0730	11/16	1.11/16	12	—	041849	—
	48		0.0760	11/16	1.11/16	12	—	041848	—
5/64			0.0781	11/16	1.11/16	12	040805	—	—
	47		0.0785	11/16	1.11/16	12	—	041847	—
	46		0.0810	3/4	1.3/4	12	—	041846	—
	45		0.0820	3/4	1.3/4	12	—	041845	—
	44		0.0860	3/4	1.3/4	12	—	041844	—
	43		0.0890	3/4	1.3/4	12	—	041843	—
	42		0.0935	3/4	1.3/4	12	—	041842	—
3/32			0.0938	3/4	1.3/4	12	040806	—	—
	41		0.0960	13/16	1.13/16	12	—	041841	—
	40		0.0980	13/16	1.13/16	12	—	041840	—
	39		0.0995	13/16	1.13/16	12	—	041839	—
	38		0.1015	13/16	1.13/16	12	—	041838	—
	37		0.1040	13/16	1.13/16	12	—	041837	—
	36		0.1065	13/16	1.13/16	12	—	041836	—
7/64			0.1094	13/16	1.13/16	12	040807	—	—
	35		0.1100	7/8	1.7/8	12	—	041835	—
	34		0.1110	7/8	1.7/8	12	—	041834	—

<sup>1)</sup> Not Split Point

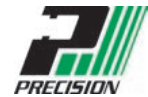




# SCREW MACHINE DRILL

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	R40C	R41C	R42C
	33		0.1130	7/8	1.7/8	12	—	041833	—
	32		0.1160	7/8	1.7/8	12	—	041832	—
	31		0.1200	7/8	1.7/8	12	—	041831	—
1/8			0.1250	7/8	1.7/8	12	040808	—	—
	30		0.1285	15/16	1.15/16	12	—	041830	—
	29		0.1360	15/16	1.15/16	12	—	041829	—
	28		0.1405	15/16	1.15/16	12	—	041828	—
9/64			0.1406	15/16	1.15/16	12	040809	—	—
	27		0.1440	1"	2.1/16	12	—	041827	—
	26		0.1470	1"	2.1/16	12	—	041826	—
	25		0.1495	1"	2.1/16	12	—	041825	—
	24		0.1520	1"	2.1/16	12	—	041824	—
	23		0.1540	1"	2.1/16	12	—	041823	—
5/32			0.1563	1"	2.1/16	12	040810	—	—
	22		0.1570	1.1/16	2.1/8	12	—	041822	—
	21		0.1590	1.1/16	2.1/8	12	—	041821	—
	20		0.1610	1.1/16	2.1/8	12	—	041820	—
	19		0.1660	1.1/16	2.1/8	12	—	041819	—
	18		0.1695	1.1/16	2.1/8	12	—	041818	—
11/64			0.1719	1.1/16	2.1/8	12	040811	—	—
	17		0.1730	1.1/8	2.3/16	12	—	041817	—
	16		0.1770	1.1/8	2.3/16	12	—	041816	—
	15		0.1800	1.1/8	2.3/16	12	—	041815	—
	14		0.1820	1.1/8	2.3/16	12	—	041814	—
	13		0.1850	1.1/8	2.3/16	12	—	041813	—
3/16			0.1875	1.1/8	2.3/16	12	040812	—	—
	12		0.1890	1.3/16	2.1/4	12	—	041812	—
	11		0.1910	1.3/16	2.1/4	12	—	041811	—
	10		0.1935	1.3/16	2.1/4	12	—	041810	—
	9		0.1960	1.3/16	2.1/4	12	—	041809	—
	8		0.1990	1.3/16	2.1/4	12	—	041808	—
	7		0.2010	1.3/16	2.1/4	12	—	041807	—
13/64			0.2031	1.3/16	2.1/4	12	040813	—	—
	6		0.2040	1.1/4	2.3/8	12	—	041806	—
	5		0.2055	1.1/4	2.3/8	12	—	041805	—
	4		0.2090	1.1/4	2.3/8	12	—	041804	—
	3		0.2130	1.1/4	2.3/8	12	—	041803	—
7/32			0.2188	1.1/4	2.3/8	12	040814	—	—
	2		0.2210	1.5/16	2.7/16	12	—	041802	—
	1		0.2280	1.5/16	2.7/16	12	—	041801	—
		A	0.2340	1.5/16	2.7/16	12	—	—	042801
15/64			0.2344	1.5/16	2.7/16	12	040815	—	—
		B	0.2380	1.3/8	2.1/2	12	—	—	042802
		C	0.2420	1.3/8	2.1/2	12	—	—	042803
		D	0.2460	1.3/8	2.1/2	12	—	—	042804
		E	0.2500	1.3/8	2.1/2	12	—	—	042805
1/4			0.2500	1.3/8	2.1/2	12	040816	—	—
		F	0.2570	1.7/16	2.5/8	12	—	—	042806
		G	0.2610	1.7/16	2.5/8	12	—	—	042807
17/64			0.2656	1.7/16	2.5/8	12	040817	—	—
		H	0.2660	1.1/2	2.11/16	12	—	—	042808
		I	0.2720	1.1/2	2.11/16	12	—	—	042809
		J	0.2770	1.1/2	2.11/16	12	—	—	042810
		K	0.2810	1.1/2	2.11/16	12	—	—	042811
9/32			0.2813	1.1/2	2.11/16	12	040818	—	—
		L	0.2900	1.9/16	2.3/4	12	—	—	042812
		M	0.2950	1.9/16	2.3/4	12	—	—	042813
19/64			0.2969	1.9/16	2.3/4	12	040819	—	—
		N	0.3020	1.5/8	2.13/16	12	—	—	042814
5/16			0.3125	1.5/8	2.13/16	6	040820	—	—
		O	0.3160	1.11/16	2.15/16	6	—	—	042815
		P	0.3230	1.11/16	2.15/16	6	—	—	042816
21/64			0.3281	1.11/16	2.15/16	6	040821	—	—
		Q	0.3320	1.11/16	3"	6	—	—	042817
		R	0.3390	1.11/16	3"	6	—	—	042818
11/32			0.3437	1.11/16	3"	6	040822	—	—

# SCREW MACHINE DRILL



$d_1$ Ø Inch	$d_1$ Ø Nr.	$d_1$ Ø letter	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	R40C	R41C	R42C
		S	0.3480	1.3/4	3.1/16	6	—	—	042819
		T	0.3580	1.3/4	3.1/16	6	—	—	042820
23/64			0.3594	1.3/4	3.1/16	6	040823	—	—
		U	0.3680	1.13/16	3.1/8	6	—	—	042821
3/8			0.3750	1.13/16	3.1/8	6	040824	—	—
		V	0.3770	1.7/8	3.1/4	6	—	—	042822
		W	0.3860	1.7/8	3.1/4	6	—	—	042823
25/64			0.3906	1.7/8	3.1/4	6	040825	—	—
		X	0.3970	1.15/16	3.5/16	6	—	—	042824
		Y	0.4040	1.15/16	3.5/16	6	—	—	042825
13/32			0.4063	1.15/16	3.5/16	6	040826	—	—
		Z	0.4130	2"	3.3/8	6	—	—	042826
27/64			0.4219	2"	3.3/8	6	040827	—	—
7/16			0.4375	2.1/16	3.7/16	6	040828	—	—
29/64			0.4531	2.1/8	3.9/16	6	040829	—	—
15/32			0.4687	2.1/8	3.5/8	6	040830	—	—
31/64			0.4844	2.3/16	3.11/16	6	040831	—	—
1/2			0.5000	2.1/4	3.3/4	6	040832	—	—

**4ASM** Low thrust design self centering Split Point for easier penetration.  
Steam Oxide surface treatment for increased wear resistance & lubricity.

**4ASM**

DIN  
**1897**

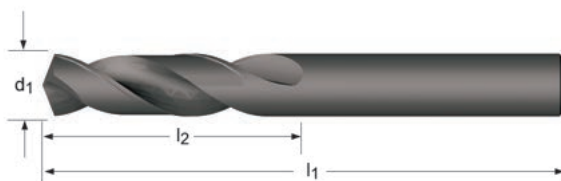
**2.5XD**

**HSS**

**135°**



1.00 - 12.50



<b>d<sub>1</sub></b> <b>Ø</b> <b>mm</b>	<b>d<sub>1</sub></b> <b>decimal</b> <b>Inch</b>	<b>l<sub>2</sub></b> <b>mm</b>	<b>l<sub>1</sub></b> <b>mm</b>	<b>Pack</b> <b>Qty</b>	<b>4ASM</b>
1.00	0.0394	6	22	12	046100 <sup>1)</sup>
1.25	0.0492	8	30	12	046125 <sup>1)</sup>
1.30	0.0512	8	30	12	046130 <sup>1)</sup>
1.65	0.0650	11	34	12	046165
2.00	0.0787	12	38	12	046200
2.30	0.0906	13	40	12	046230
2.40	0.0945	14	43	12	046240
2.50	0.0984	14	43	12	046250
3.00	0.1181	16	46	12	046300
3.10	0.1220	18	49	12	046310
3.20	0.1260	18	49	12	046320
3.30	0.1299	18	49	12	046330
3.40	0.1339	20	52	12	046340
3.50	0.1378	20	52	12	046350
3.70	0.1457	20	52	12	046370
4.00	0.1575	22	55	12	046400
4.20	0.1654	22	55	12	046420
4.50	0.1772	24	58	12	046450
5.00	0.1969	26	62	12	046500
5.50	0.2165	28	66	12	046550
5.70	0.2244	28	66	12	046570
5.80	0.2283	28	66	12	046580
6.00	0.2362	28	66	12	046600
6.20	0.2441	31	70	12	046620
6.40	0.2520	31	70	12	046640
6.50	0.2559	31	70	12	046650
6.60	0.2598	31	70	12	046660
6.80	0.2677	34	74	12	046680
6.90	0.2717	34	74	12	046690
7.00	0.2756	34	74	12	046700
7.20	0.2835	34	74	12	046720
7.50	0.2953	37	79	12	046750

<sup>1)</sup> Not Split Point

# SCREW MACHINE DRILL



$d_1$ Ø mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	4ASM
8.00	0.3150	37	79	6	046800
8.10	0.3189	37	79	6	046810
8.40	0.3307	37	79	6	046840
8.50	0.3346	37	79	6	046850
8.70	0.3425	40	84	6	046870
9.00	0.3543	40	84	6	046900
9.10	0.3583	40	84	6	046910
9.20	0.3622	40	84	6	046920
9.30	0.3661	40	84	6	046930
9.50	0.3740	40	84	6	046950
9.70	0.3819	43	89	6	046970
10.00	0.3937	43	89	6	047000
10.20	0.4016	43	89	6	047002
10.50	0.4134	43	89	6	047005
10.80	0.4252	47	95	6	047008
11.00	0.4331	47	95	6	047110
11.20	0.4409	47	95	6	047112
11.50	0.4528	47	95	6	047115
11.80	0.4646	47	95	6	047118
12.00	0.4724	51	102	6	047200
12.20	0.4803	51	102	6	047220
12.50	0.4921	51	102	6	047250



# SCREW MACHINE DRILL

## General Purpose Screw Machine Length Parabolic Flute

Heavy-Duty Parabolic Flute design for efficient chip removal. Allows greater drilling depths in one pass. Low thrust design self centering Split Point for easier penetration.

**QC41P** Bright Finish improves chip flow in soft or non-ferrous materials.

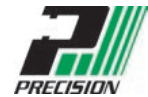
**QC41G** TiN Coating increases wear resistance and improves tool life.



QC41P	QC41G
1/16 - 11/16	1/16 - 1/2

d <sub>1</sub> Ø " / Nr.	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	QC41P	QC41G
1/16	0.0625	5/8	1.5/8	12	058304	062304
5/64	0.0781	11/16	1.11/16	12	058305	062305
3/32	0.0938	3/4	1.3/4	12	058306	062306
40	0.0980	13/16	1.13/16	12	060040	061440
39	0.0995	13/16	1.13/16	12	060039	061439
38	0.1015	13/16	1.13/16	12	060038	061438
37	0.1040	13/16	1.13/16	12	060037	061437
36	0.1065	13/16	1.13/16	12	060036	061436
7/64	0.1094	13/16	1.13/16	12	058307	062307
35	0.1100	7/8	1.7/8	12	060035	061435
34	0.1110	7/8	1.7/8	12	060034	061434
33	0.1130	7/8	1.7/8	12	060033	061433
32	0.1160	7/8	1.7/8	12	060032	061432
31	0.1200	7/8	1.7/8	12	060031	061431
1/8	0.1250	7/8	1.7/8	12	058308	062308
30	0.1285	15/16	1.15/16	12	060030	061430
29	0.1360	15/16	1.15/16	12	060029	061429
28	0.1405	15/16	1.15/16	12	060028	061428
9/64	0.1406	15/16	1.15/16	12	058309	062309
27	0.1440	1"	2.1/16	12	060027	061427
26	0.1470	1"	2.1/16	12	060026	061426
25	0.1495	1"	2.1/16	12	060025	061425
24	0.1520	1"	2.1/16	12	060024	061424
23	0.1540	1"	2.1/16	12	060023	061423
5/32	0.1563	1"	2.1/16	12	058310	062310
22	0.1570	1.1/16	2.1/8	12	060022	061422
21	0.1590	1.1/16	2.1/8	12	060021	061421
20	0.1610	1.1/16	2.1/8	12	060020	061420
19	0.1660	1.1/16	2.1/8	12	060019	061419
18	0.1695	1.1/16	2.1/8	12	060018	061418
11/64	0.1719	1.1/16	2.1/8	12	058311	062311
17	0.1730	1.1/8	2.3/16	12	060017	061417
16	0.1770	1.1/8	2.3/16	12	060016	061416

# SCREW MACHINE DRILL



d <sub>1</sub> Ø "/Nr.	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	QC41P	QC41G
15	0.1800	1.1/8	2.3/16	12	060015	061415
14	0.1820	1.1/8	2.3/16	12	060014	061414
13	0.1850	1.1/8	2.3/16	12	060013	061413
3/16	0.1875	1.1/8	2.3/16	12	058312	062312
12	0.1890	1.3/16	2.1/4	12	060012	061412
11	0.1910	1.3/16	2.1/4	12	060011	061411
10	0.1935	1.3/16	2.1/4	12	060010	061410
9	0.1960	1.3/16	2.1/4	12	060009	061409
8	0.1990	1.3/16	2.1/4	12	060008	061408
7	0.2010	1.3/16	2.1/4	12	060007	061407
13/64	0.2031	1.3/16	2.1/4	12	058313	062313
6	0.2040	1.1/4	2.3/8	12	060006	061406
5	0.2055	1.1/4	2.3/8	12	060005	061405
4	0.2090	1.1/4	2.3/8	12	060004	061404
3	0.2130	1.1/4	2.3/8	12	060003	061403
7/32	0.2188	1.1/4	2.3/8	12	058314	062314
2	0.2210	1.5/16	2.7/16	12	060002	061402
1	0.2280	1.5/16	2.7/16	12	060001	061401
15/64	0.2344	1.5/16	2.7/16	12	058315	062315
1/4	0.2500	1.3/8	2.1/2	12	058316	062316
17/64	0.2656	1.7/16	2.5/8	12	058317	062317
9/32	0.2812	1.1/2	2.11/16	12	058318	062318
19/64	0.2969	1.9/16	2.3/4	12	058319	062319
5/16	0.3125	1.5/8	2.13/16	6	058320	062320
21/64	0.3281	1.11/16	2.15/16	6	058321	062321
11/32	0.3437	1.11/16	3"	6	058322	062322
23/64	0.3594	1.3/4	3.1/16	6	058323	062323
3/8	0.3750	1.13/16	3.1/8	6	058324	062324
25/64	0.3906	1.7/8	3.1/4	6	058325	062325
13/32	0.4063	1.15/16	3.5/16	6	058326	062326
27/64	0.4219	2"	3.3/8	6	058327	062327
7/16	0.4375	2.1/16	3.7/16	6	058328	062328
29/64	0.4531	2.1/8	3.9/16	6	058329	062329
15/32	0.4687	2.1/8	3.5/8	6	058330	062330
31/64	0.4844	2.3/16	3.3/4	6	058331	062331
1/2	0.5000	2.1/4	3.3/4	6	058332	062332
33/64	0.5156	2.3/8	3.7/8	1	058333	—
17/32	0.5313	2.3/8	3.7/8	1	058334	—
35/64	0.5469	2.1/2	4"	1	058335	—
9/16	0.5625	2.1/2	4"	1	058336	—
37/64	0.5781	2.5/8	4.1/8	1	058337	—
19/32	0.5937	2.5/8	4.1/8	1	058338	—
5/8	0.6250	2.3/4	4.1/4	1	058340	—
11/16	0.6875	2.7/8	4.5/8	1	058344	—

## MICRO - Screw Machine Length Drills

### A720

- 1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4 4.1 4.2  
4.3 5.1 5.2 5.3 6.1 6.2 6.3 6.4 7.1 7.2 7.3 7.4 8.1 8.2

Smallest size range available. Bright finish improves chip flow in soft or non-ferrous materials. Good wear resistance in abrasive or hard materials.



A720

DIN  
1899

2.5XD

HSS-E

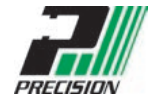
118°



0.15 - 1.40

d <sub>1</sub> Ø mm	d <sub>1</sub> decimal inch	l <sub>2</sub> mm	l <sub>1</sub> mm	d <sub>2</sub> Ø mm	Pack Qty	A720
0.15	0.0059	1.0	25	1	10	0044988
0.16	0.0063	1.4	25	1	10	0566961
0.17	0.0067	1.4	25	1	10	0612057
0.18	0.0070	1.4	25	1	10	0044995
0.20	0.0078	1.8	25	1	10	0045008
0.22	0.0087	1.8	25	1	10	0045015
0.25	0.0098	2.2	25	1	10	0045022
0.27	0.0106	2.2	25	1	10	0566978
0.28	0.0110	2.2	25	1	10	0045039
0.30	0.0118	2.2	25	1	10	0045046
0.35	0.0138	2.8	25	1	10	0045053
0.38	0.0150	2.8	25	1	10	0045060
0.39	0.0154	3.6	25	1	10	0045077
0.40	0.0157	3.6	25	1	10	0045084
0.45	0.0177	3.6	25	1	10	0045107
0.50	0.0197	4.0	25	1	10	0045114
0.55	0.0217	4.5	25	1	10	0612064
0.60	0.0236	4.5	25	1	10	0045121
0.62	0.0244	5.0	25	1	10	0612071
0.65	0.0256	5.0	25	1	10	0612088
0.70	0.0276	5.6	25	1	10	0615577
0.75	0.0295	5.6	25	1	10	0612101
0.80	0.0315	6.3	25	1.5	10	0615584
0.85	0.0335	6.3	25	1.5	10	0612125
0.90	0.0354	7.1	25	1.5	10	0615591
0.95	0.0374	7.1	25	1.5	10	0612149
1.00	0.0394	8.0	25	1.5	10	0615607
1.05	0.0413	8.0	25	1.5	10	0612163
1.10	0.0433	9.0	25	1.5	10	0615614
1.20	0.0472	10.0	25	1.5	10	0615621
1.30	0.0512	10.0	25	1.5	10	0615638
1.40	0.0551	11.2	25	1.5	10	0615645

# COBALT SCREW MACHINE DRILL



## Heavy Duty Screw Machine Length

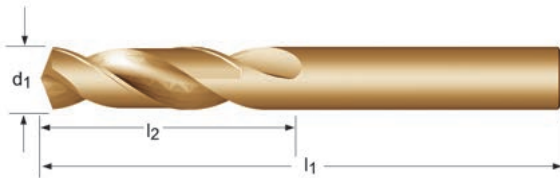
\* Sets Available on pg. 239

**M40CO** - Fractional Sizes

**M41CO** - Wire Gauge Sizes

**M42CO** - Letter Sizes

Low thrust design self centering Split Point for easier penetration. Cobalt base material with Bronze Oxide for wear resistance and lubricity.



$d_1$ Ø Inch	$d_1$ Ø Nr.	$d_1$ Ø letter	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	M40CO	M41CO	M42CO
	60		0.0400	1/2	1.3/8	12	—	041360 <sup>1)</sup>	—
	59		0.0410	1/2	1.3/8	12	—	041359 <sup>1)</sup>	—
	58		0.0420	1/2	1.3/8	12	—	041358 <sup>1)</sup>	—
	57		0.0430	1/2	1.3/8	12	—	041357 <sup>1)</sup>	—
	56		0.0465	1/2	1.3/8	12	—	041356 <sup>1)</sup>	—
	55		0.0520	5/8	1.5/8	12	—	041355 <sup>1)</sup>	—
	54		0.0550	5/8	1.5/8	12	—	041354 <sup>1)</sup>	—
	53		0.0595	5/8	1.5/8	12	—	041353 <sup>1)</sup>	—
1/16			0.0625	5/8	1.5/8	12	040304	—	—
	52		0.0635	11/16	1.11/16	12	—	041352	—
	51		0.0670	11/16	1.11/16	12	—	041351	—
	50		0.0700	11/16	1.11/16	12	—	041350	—
	49		0.0730	11/16	1.11/16	12	—	041349	—
	48		0.0760	11/16	1.11/16	12	—	041348	—
5/64			0.0781	11/16	1.11/16	12	040305	—	—
	47		0.0785	11/16	1.11/16	12	—	041347	—
	46		0.0810	3/4	1.3/4	12	—	041346	—
	45		0.0820	3/4	1.3/4	12	—	041345	—
	44		0.0860	3/4	1.3/4	12	—	041344	—
	43		0.0890	3/4	1.3/4	12	—	041343	—
	42		0.0935	3/4	1.3/4	12	—	041342	—
3/32			0.0938	3/4	1.3/4	12	040306	—	—
	41		0.0960	13/16	1.13/16	12	—	041341	—
	40		0.0980	13/16	1.13/16	12	—	041340	—
	39		0.0995	13/16	1.13/16	12	—	041339	—
	38		0.1015	13/16	1.13/16	12	—	041338	—
	37		0.1040	13/16	1.13/16	12	—	041337	—
	36		0.1065	13/16	1.13/16	12	—	041336	—
7/64			0.1094	13/16	1.13/16	12	040307	—	—
	35		0.1100	7/8	1.7/8	12	—	041335	—
	34		0.1110	7/8	1.7/8	12	—	041334	—
	33		0.1130	7/8	1.7/8	12	—	041333	—

<sup>1)</sup> Not Split Point

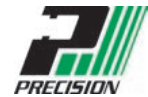




# COBALT SCREW MACHINE DRILL

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	M40CO	M41CO	M42CO
	32		0.1160	7/8	1.7/8	12	—	041332	—
	31		0.1200	7/8	1.7/8	12	—	041331	—
1/8			0.1250	7/8	1.7/8	12	040308	—	—
	30		0.1285	15/16	1.15/16	12	—	041330	—
	29		0.1360	15/16	1.15/16	12	—	041329	—
	28		0.1405	15/16	1.15/16	12	—	041328	—
9/64			0.1406	15/16	1.15/16	12	040309	—	—
	27		0.1440	1"	2.1/16	12	—	041327	—
	26		0.1470	1"	2.1/16	12	—	041326	—
	25		0.1495	1"	2.1/16	12	—	041325	—
	24		0.1520	1"	2.1/16	12	—	041324	—
	23		0.1540	1"	2.1/16	12	—	041323	—
5/32			0.1563	1"	2.1/16	12	040310	—	—
	22		0.1570	1.1/16	2.1/8	12	—	041322	—
	21		0.1590	1.1/16	2.1/8	12	—	041321	—
	20		0.1610	1.1/16	2.1/8	12	—	041320	—
	19		0.1660	1.1/16	2.1/8	12	—	041319	—
	18		0.1695	1.1/16	2.1/8	12	—	041318	—
11/64			0.1719	1.1/16	2.1/8	12	040311	—	—
	17		0.1730	1.1/8	2.3/16	12	—	041317	—
	16		0.1770	1.1/8	2.3/16	12	—	041316	—
	15		0.1800	1.1/8	2.3/16	12	—	041315	—
	14		0.1820	1.1/8	2.3/16	12	—	041314	—
	13		0.1850	1.1/8	2.3/16	12	—	041313	—
3/16			0.1875	1.1/8	2.3/16	12	040312	—	—
	12		0.1890	1.3/16	2.1/4	12	—	041312	—
	11		0.1910	1.3/16	2.1/4	12	—	041311	—
	10		0.1935	1.3/16	2.1/4	12	—	041310	—
	9		0.1960	1.3/16	2.1/4	12	—	041309	—
	8		0.1990	1.3/16	2.1/4	12	—	041308	—
	7		0.2010	1.3/16	2.1/4	12	—	041307	—
13/64			0.2031	1.3/16	2.1/4	12	040313	—	—
	6		0.2040	1.1/4	2.3/8	12	—	041306	—
	5		0.2055	1.1/4	2.3/8	12	—	041305	—
	4		0.2090	1.1/4	2.3/8	12	—	041304	—
	3		0.2130	1.1/4	2.3/8	12	—	041303	—
7/32			0.2188	1.1/4	2.3/8	12	040314	—	—
	2		0.2210	1.5/16	2.7/16	12	—	041302	—
	1		0.2280	1.5/16	2.7/16	12	—	041301	—
		A	0.2340	1.5/16	2.7/16	12	—	—	042301
15/64			0.2344	1.5/16	2.7/16	12	040315	—	—
		B	0.2380	1.3/8	2.1/2	12	—	—	042302
		C	0.2420	1.3/8	2.1/2	12	—	—	042303
		D	0.2460	1.3/8	2.1/2	12	—	—	042304
		E	0.2500	1.3/8	2.1/2	12	—	—	042305
1/4			0.2500	1.3/8	2.1/2	12	040316	—	—
		F	0.2570	1.7/16	2.5/8	12	—	—	042306
		G	0.2610	1.7/16	2.5/8	12	—	—	042307
17/64			0.2656	1.7/16	2.5/8	12	040317	—	—
		H	0.2660	1.1/2	2.11/16	12	—	—	042308
		I	0.2720	1.1/2	2.11/16	12	—	—	042309
		J	0.2770	1.1/2	2.11/16	12	—	—	042310
		K	0.2810	1.1/2	2.11/16	12	—	—	042311
9/32			0.2813	1.1/2	2.11/16	12	040318	—	—
		L	0.2900	1.9/16	2.3/4	12	—	—	042312
		M	0.2950	1.9/16	2.3/4	12	—	—	042313
19/64			0.2969	1.9/16	2.3/4	12	040319	—	—
		N	0.3020	1.5/8	2.13/16	12	—	—	042314
5/16			0.3125	1.5/8	2.13/16	6	040320	—	—
		O	0.3160	1.11/16	2.15/16	6	—	—	042315
		P	0.3230	1.11/16	2.15/16	6	—	—	042316
21/64			0.3281	1.11/16	2.15/16	6	040321	—	—
		Q	0.3320	1.11/16	3"	6	—	—	042317
		R	0.3390	1.11/16	3"	6	—	—	042318
11/32			0.3437	1.11/16	3"	6	040322	—	—
		S	0.3480	1.3/4	3.1/16	6	—	—	042319

# COBALT SCREW MACHINE DRILL



d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	M40CO	M41CO	M42CO
		T	0.3580	1.3/4	3.1/16	6	—	—	042320
23/64			0.3594	1.3/4	3.1/16	6	040323	—	—
		U	0.3680	1.13/16	3.1/8	6	—	—	042321
3/8			0.3750	1.13/16	3.1/8	6	040324	—	—
		V	0.3770	1.7/8	3.1/4	6	—	—	042322
		W	0.3860	1.7/8	3.1/4	6	—	—	042323
25/64			0.3906	1.7/8	3.1/4	6	040325	—	—
		X	0.3970	1.15/16	3.5/16	6	—	—	042324
		Y	0.4040	1.15/16	3.5/16	6	—	—	042325
13/32			0.4063	1.15/16	3.5/16	6	040326	—	—
		Z	0.4130	2"	3.3/8	6	—	—	042326
27/64			0.4219	2"	3.3/8	6	040327	—	—
7/16			0.4375	2.1/16	3.7/16	6	040328	—	—
29/64			0.4531	2.1/8	3.9/16	6	040329	—	—
15/32			0.4687	2.1/8	3.5/8	6	040330	—	—
31/64			0.4844	2.3/16	3.11/16	6	040331	—	—
1/2			0.5000	2.1/4	3.3/4	6	040332	—	—
33/64			0.5156	2.3/8	3.7/8	1	046033	—	—
17/32			0.5313	2.3/8	3.7/8	1	046034	—	—
35/64			0.5469	2.1/2	4"	1	046035	—	—
9/16			0.5625	2.1/2	4"	1	046036	—	—
37/64			0.5781	2.5/8	4.1/8	1	046037	—	—
19/32			0.5937	2.5/8	4.1/8	1	046038	—	—
39/64			0.6094	2.3/4	4.1/4	1	046039	—	—
5/8			0.6250	2.3/4	4.1/4	1	046040	—	—
41/64			0.6406	2.7/8	4.1/2	1	046041	—	—
21/32			0.6563	2.7/8	4.1/2	1	046042	—	—
43/64			0.6719	2.7/8	4.5/8	1	046043	—	—
11/16			0.6875	2.7/8	4.5/8	1	046044	—	—
45/64			0.7031	3"	4.3/4	1	046045	—	—
23/32			0.7188	3"	4.3/4	1	046046	—	—
47/64			0.7344	3.1/8	5"	1	046047	—	—
3/4			0.7500	3.1/8	5"	1	046048	—	—

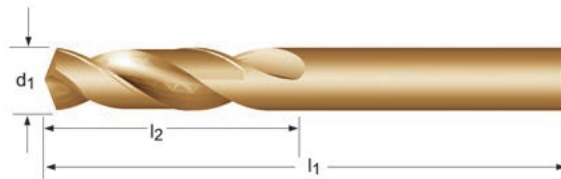


# COBALT SCREW MACHINE DRILL

## Heavy Duty Screw Machine Length, Metric

### 4ASMCO

Low thrust design self centering Split Point for easier penetration.  
Cobalt base material with Bronze Oxide for wear resistance and lubricity.



4ASMCO

DIN  
1897

2.5XD

HSS-E

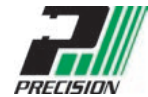
135°



2.30 - 12.00

d <sub>1</sub> Ø mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	Pack Qty	4ASMCO
2.30	0.0906	13	40	12	032230
2.50	0.0984	14	43	12	032250
3.00	0.1181	16	46	12	032300
3.10	0.1220	18	49	12	032310
3.20	0.1260	18	49	12	032320
3.30	0.1299	18	49	12	032330
3.40	0.1339	20	52	12	032340
3.50	0.1378	20	52	12	032350
3.60	0.1417	20	52	12	032360
3.70	0.1457	20	52	12	032370
4.00	0.1575	22	55	12	032400
4.10	0.1614	22	55	12	032410
4.20	0.1654	22	55	12	032420
4.70	0.1850	24	58	12	032470
4.80	0.1890	26	62	12	032480
4.90	0.1929	26	62	12	032490
5.00	0.1969	26	62	12	032500
5.10	0.2008	26	62	12	032510
5.50	0.2165	28	66	12	032550
5.70	0.2244	28	66	12	032570
6.00	0.2362	28	66	12	032600
6.40	0.2520	31	70	12	032640
6.50	0.2559	31	70	12	032650
6.80	0.2677	34	74	12	032680
7.00	0.2756	34	74	12	032700
8.00	0.3150	37	79	6	032800
8.50	0.3346	37	79	6	032850
9.50	0.3740	40	84	6	032950
9.80	0.3858	43	89	6	032980
10.00	0.3937	43	89	6	033000
10.20	0.4016	43	89	6	033002
10.50	0.4134	43	89	6	033005
11.00	0.4331	47	95	6	033110
11.20	0.4409	47	95	6	033112
11.50	0.4528	47	95	6	033115
12.00	0.4724	51	102	6	033200

# TAPER LENGTH DRILL



## General Purpose Taper Length

\* Sets Available on pg. 240

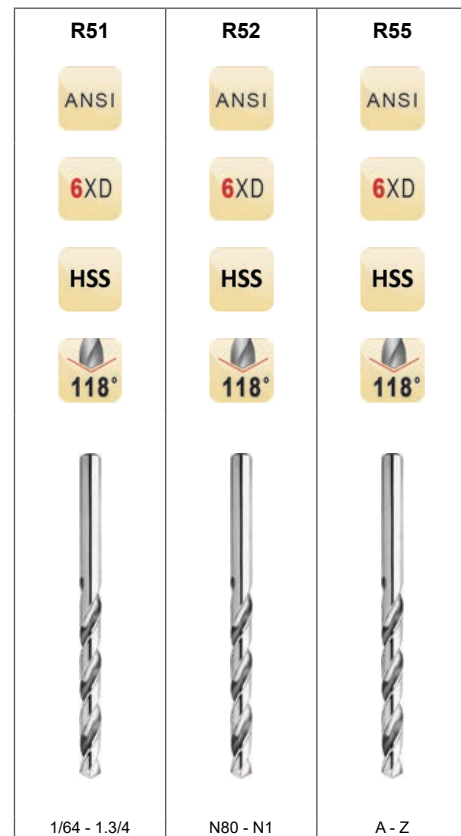
**R51** - Fractional Sizes

**R52** - Wire Gauge Sizes

**R55** - Letter Sizes

Bright finish improves chip flow in soft or non-ferrous materials. Longer flute and Overall length for depth and reach.

\* Sizes 45/64 and larger are steam oxide



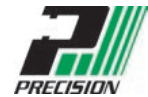
$d_1$ Ø Inch	$d_1$ Ø Nr.	$d_1$ Ø letter	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	R51	R52	R55
	80		0.0135	5/16	1.1/2	12	—	052080	—
	79		0.0145	5/16	1.1/2	12	—	052079	—
1/64			0.0156	5/16	1.1/2	12	051001	—	—
	78		0.0160	5/16	1.1/2	12	—	052078	—
	77		0.0180	5/16	1.1/2	12	—	052077	—
	76		0.0200	5/16	1.1/2	12	—	052076	—
	75		0.0210	5/16	1.1/2	12	—	052075	—
	74		0.0225	5/16	1.1/2	12	—	052074	—
	73		0.0240	5/16	1.1/2	12	—	052073	—
	72		0.0250	5/16	1.1/2	12	—	052072	—
	71		0.0260	3/4	2"	12	—	052071	—
	70		0.0280	3/4	2"	12	—	052070	—
	69		0.0292	3/4	2"	12	—	052069	—
	68		0.0310	3/4	2"	12	—	052068	—
1/32			0.0313	3/4	2"	12	051002	—	—
	67		0.0320	3/4	2"	12	—	052067	—
	66		0.0330	3/4	2"	12	—	052066	—
	65		0.0350	3/4	2"	12	—	052065	—
	64		0.0360	3/4	2"	12	—	052064	—
	63		0.0370	3/4	2"	12	—	052063	—
	62		0.0380	3/4	2"	12	—	052062	—
	61		0.0390	1.1/8	2.1/4	12	—	052061	—
	60		0.0400	1.1/8	2.1/4	12	—	052060	—
	59		0.0410	1.1/8	2.1/4	12	—	052059	—
	58		0.0420	1.1/8	2.1/4	12	—	052058	—
	57		0.0430	1.1/8	2.1/4	12	—	052057	—
	56		0.0465	1.1/8	2.1/4	12	—	052056	—
3/64			0.0469	1.1/8	2.1/4	12	051003	—	—
	55		0.0520	1.3/4	3"	12	—	052055	—
	54		0.0550	1.3/4	3"	12	—	052054	—
	53		0.0595	1.3/4	3"	12	—	052053	—
1/16			0.0625	1.3/4	3"	12	051004	—	—



# TAPER LENGTH DRILL

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	R51	R52	R55
	52		0.0635	2"	3.3/4	12	—	052052	—
	51		0.0670	2"	3.3/4	12	—	052051	—
	50		0.0700	2"	3.3/4	12	—	052050	—
	49		0.0730	2"	3.3/4	12	—	052049	—
	48		0.0760	2"	3.3/4	12	—	052048	—
5/64			0.0781	2"	3.3/4	12	051005	—	—
	47		0.0785	2.1/4	4.1/4	12	—	052047	—
	46		0.0810	2.1/4	4.1/4	12	—	052046	—
	45		0.0820	2.1/4	4.1/4	12	—	052045	—
	44		0.0860	2.1/4	4.1/4	12	—	052044	—
	43		0.0890	2.1/4	4.1/4	12	—	052043	—
	42		0.0935	2.1/4	4.1/4	12	—	052042	—
3/32			0.0938	2.1/4	4.1/4	12	051006	—	—
	41		0.0960	2.1/2	4.5/8	12	—	052041	—
	40		0.0980	2.1/2	4.5/8	12	—	052040	—
	39		0.0995	2.1/2	4.5/8	12	—	052039	—
	38		0.1015	2.1/2	4.5/8	12	—	052038	—
	37		0.1040	2.1/2	4.5/8	12	—	052037	—
	36		0.1065	2.1/2	4.5/8	12	—	052036	—
7/64			0.1094	2.1/2	4.5/8	12	051007	—	—
	35		0.1100	2.3/4	5.1/8	12	—	052035	—
	34		0.1110	2.3/4	5.1/8	12	—	052034	—
	33		0.1130	2.3/4	5.1/8	12	—	052033	—
	32		0.1160	2.3/4	5.1/8	12	—	052032	—
	31		0.1200	2.3/4	5.1/8	12	—	052031	—
1/8			0.1250	2.3/4	5.1/8	12	051008	—	—
	30		0.1285	3"	5.3/8	12	—	052030	—
	29		0.1360	3"	5.3/8	12	—	052029	—
	28		0.1405	3"	5.3/8	12	—	052028	—
9/64			0.1406	3"	5.3/8	12	051009	—	—
	27		0.1440	3"	5.3/8	12	—	052027	—
	26		0.1470	3"	5.3/8	12	—	052026	—
	25		0.1495	3"	5.3/8	12	—	052025	—
	24		0.1520	3"	5.3/8	12	—	052024	—
	23		0.1540	3"	5.3/8	12	—	052023	—
5/32			0.1563	3"	5.3/8	12	051010	—	—
	22		0.1570	3.3/8	5.3/4	12	—	052022	—
	21		0.1590	3.3/8	5.3/4	12	—	052021	—
	20		0.1610	3.3/8	5.3/4	12	—	052020	—
	19		0.1660	3.3/8	5.3/4	12	—	052019	—
	18		0.1695	3.3/8	5.3/4	12	—	052018	—
11/64			0.1719	3.3/8	5.3/4	12	051011	—	—
	17		0.1730	3.3/8	5.3/4	12	—	052017	—
	16		0.1770	3.3/8	5.3/4	12	—	052016	—
	15		0.1800	3.3/8	5.3/4	12	—	052015	—
	14		0.1820	3.3/8	5.3/4	12	—	052014	—
	13		0.1850	3.3/8	5.3/4	12	—	052013	—
3/16			0.1875	3.3/8	5.3/4	12	051012	—	—
	12		0.1890	3.5/8	6"	12	—	052012	—
	11		0.1910	3.5/8	6"	12	—	052011	—
	10		0.1935	3.5/8	6"	12	—	052010	—
	9		0.1960	3.5/8	6"	12	—	052009	—
	8		0.1990	3.5/8	6"	12	—	052008	—
	7		0.2010	3.5/8	6"	12	—	052007	—
13/64			0.2031	3.5/8	6"	12	051013	—	—
	6		0.2040	3.5/8	6"	12	—	052006	—
	5		0.2055	3.5/8	6"	12	—	052005	—
	4		0.2090	3.5/8	6"	12	—	052004	—
	3		0.2130	3.5/8	6"	12	—	052003	—
7/32			0.2188	3.5/8	6"	12	051014	—	—
	2		0.2210	3.3/4	6.1/8	12	—	052002	—
	1		0.2280	3.3/4	6.1/8	12	—	052001	—
		A	0.2340	3.3/4	6.1/8	12	—	—	055001
15/64			0.2344	3.3/4	6.1/8	12	051015	—	—
		B	0.2380	3.3/4	6.1/8	12	—	—	055002
		C	0.2420	3.3/4	6.1/8	12	—	—	055003

# TAPER LENGTH DRILL



d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	R51	R52	R55
		D	0.2460	3.3/4	6.1/8	12	—	—	055004
		E	0.2500	3.3/4	6.1/8	12	—	—	055005
1/4			0.2500	3.3/4	6.1/8	12	051016	—	—
		F	0.2570	3.7/8	6.1/4	12	—	—	055006
		G	0.2610	3.7/8	6.1/4	6	—	—	055007
17/64			0.2656	3.7/8	6.1/4	6	051017	—	—
		H	0.2660	3.7/8	6.1/4	6	—	—	055008
		I	0.2720	3.7/8	6.1/4	6	—	—	055009
		J	0.2770	3.7/8	6.1/4	6	—	—	055010
		K	0.2810	3.7/8	6.1/4	6	—	—	055011
9/32			0.2813	3.7/8	6.1/4	6	051018	—	—
		L	0.2900	4"	6.3/8	6	—	—	055012
		M	0.2950	4"	6.3/8	6	—	—	055013
19/64			0.2969	4"	6.3/8	6	051019	—	—
		N	0.3020	4"	6.3/8	6	—	—	055014
5/16			0.3125	4"	6.3/8	6	051020	—	—
		O	0.3161	4.1/8	6.1/2	6	—	—	055015
		P	0.3230	4.1/8	6.1/2	6	—	—	055016
21/64			0.3281	4.1/8	6.1/2	6	051021	—	—
		Q	0.3320	4.1/8	6.1/2	6	—	—	055017
		R	0.3390	4.1/8	6.1/2	6	—	—	055018
11/32			0.3437	4.1/8	6.1/2	6	051022	—	—
		S	0.3480	4.1/4	6.3/4	6	—	—	055019
		T	0.3580	4.1/4	6.3/4	6	—	—	055020
23/64			0.3594	4.1/4	6.3/4	6	051023	—	—
		U	0.3680	4.1/4	6.3/4	6	—	—	055021
3/8			0.3750	4.1/4	6.3/4	6	051024	—	—
		V	0.3770	4.3/8	7"	6	—	—	055022
		W	0.3860	4.3/8	7"	6	—	—	055023
25/64			0.3906	4.3/8	7"	6	051025	—	—
		X	0.3970	4.3/8	7"	6	—	—	055024
		Y	0.4040	4.3/8	7"	6	—	—	055025
13/32			0.4063	4.3/8	7"	6	051026	—	—
		Z	0.4130	4.5/8	7.1/4	6	—	—	055026
27/64			0.4219	4.5/8	7.1/4	6	051027	—	—
7/16			0.4375	4.5/8	7.1/4	6	051028	—	—
29/64			0.4531	4.3/4	7.1/2	6	051029	—	—
15/32			0.4687	4.3/4	7.1/2	6	051030	—	—
31/64			0.4844	4.3/4	7.3/4	6	051031	—	—
1/2			0.5000	4.3/4	7.3/4	6	051032	—	—
33/64			0.5156	4.3/4	8"	1	051033	—	—
17/32			0.5313	4.3/4	8"	1	051034	—	—
35/64			0.5469	4.7/8	8.1/4	1	051035	—	—
9/16			0.5625	4.7/8	8.1/4	1	051036	—	—
37/64			0.5781	4.7/8	8.3/4	1	051037	—	—
19/32			0.5937	4.7/8	8.3/4	1	051038	—	—
39/64			0.6094	4.7/8	8.3/4	1	051039	—	—
5/8			0.6250	4.7/8	8.3/4	1	051040	—	—
41/64			0.6406	5.1/8	9"	1	051041	—	—
21/32			0.6563	5.1/8	9"	1	051042	—	—
43/64			0.6719	5.3/8	9.1/4	1	051043	—	—
11/16			0.6875	5.3/8	9.1/4	1	051044	—	—
45/64			0.7031	5.5/8	9.1/2	1	051045 <sup>1)</sup>	—	—
23/32			0.7188	5.5/8	9.1/2	1	051046 <sup>1)</sup>	—	—
47/64			0.7344	5.7/8	9.3/4	1	051047 <sup>1)</sup>	—	—
3/4			0.7500	5.7/8	9.3/4	1	051048 <sup>1)</sup>	—	—
49/64			0.7656	6"	9.7/8	1	051049 <sup>1)</sup>	—	—
25/32			0.7813	6"	9.7/8	1	051050 <sup>1)</sup>	—	—
51/64			0.7969	6.1/8	10"	1	051051 <sup>1)</sup>	—	—
13/16			0.8125	6.1/8	10"	1	051052 <sup>1)</sup>	—	—
53/64			0.8281	6.1/8	10"	1	051053 <sup>1)</sup>	—	—
27/32			0.8438	6.1/8	10"	1	051054 <sup>1)</sup>	—	—
55/64			0.8594	6.1/8	10"	1	051055 <sup>1)</sup>	—	—
7/8			0.8750	6.1/8	10"	1	051056 <sup>1)</sup>	—	—
57/64			0.8906	6.1/8	10"	1	051057 <sup>1)</sup>	—	—

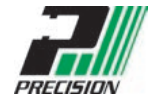
<sup>1)</sup> steam oxide

# TAPER LENGTH DRILL

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	R51	R52	R55
29/32			0.9063	6.1/8	10"	1	051058 <sup>1)</sup>	—	—
59/64			0.9219	6.1/8	10.3/4	1	051059 <sup>1)</sup>	—	—
15/16			0.9375	6.1/8	10.3/4	1	051060 <sup>1)</sup>	—	—
61/64			0.9531	6.3/8	11"	1	051061 <sup>1)</sup>	—	—
31/32			0.9688	6.3/8	11"	1	051062 <sup>1)</sup>	—	—
63/64			0.9844	6.3/8	11"	1	051063 <sup>1)</sup>	—	—
1"			1.0000	6.3/8	11"	1	051100 <sup>1)</sup>	—	—
1.1/64			1.0156	6.1/2	11.1/8	1	051101 <sup>1)</sup>	—	—
1.1/32			1.0312	6.1/2	11.1/8	1	051102 <sup>1)</sup>	—	—
1.3/64			1.0469	6.5/8	11.1/4	1	051103 <sup>1)</sup>	—	—
1.1/16			1.0625	6.5/8	11.1/4	1	051104 <sup>1)</sup>	—	—
1.5/64			1.0781	6.7/8	11.1/2	1	051105 <sup>1)</sup>	—	—
1.3/32			1.0937	6.7/8	11.1/2	1	051106 <sup>1)</sup>	—	—
1.7/64			1.1094	7.1/8	11.3/4	1	051107 <sup>1)</sup>	—	—
1.1/8			1.1250	7.1/8	11.3/4	1	051108 <sup>1)</sup>	—	—
1.9/64			1.1406	7.1/4	11.7/8	1	051109 <sup>1)</sup>	—	—
1.5/32			1.1563	7.1/4	11.7/8	1	051110 <sup>1)</sup>	—	—
1.11/64			1.1719	7.3/8	12"	1	051111 <sup>1)</sup>	—	—
1.3/16			1.1875	7.3/8	12"	1	051112 <sup>1)</sup>	—	—
1.13/64			1.2031	7.1/2	12.1/8	1	051113 <sup>1)</sup>	—	—
1.7/32			1.2187	7.1/2	12.1/8	1	051114 <sup>1)</sup>	—	—
1.15/64			1.2344	7.7/8	12.1/2	1	051115 <sup>1)</sup>	—	—
1.1/4			1.2500	7.7/8	12.1/2	1	051116 <sup>1)</sup>	—	—
1.5/16			1.3125	8.5/8	14.1/4	1	051120 <sup>1)</sup>	—	—
1.3/8			1.3750	8.7/8	14.1/2	1	051124 <sup>1)</sup>	—	—
1.7/16			1.4375	9.1/8	14.3/4	1	051128 <sup>1)</sup>	—	—
1.1/2			1.5000	9.3/8	15"	1	051132 <sup>1)</sup>	—	—
1.9/16			1.5625	9.5/8	15.1/4	1	051136 <sup>1)</sup>	—	—
1.5/8			1.6250	9.7/8	15.5/8	1	051140 <sup>1)</sup>	—	—
1.3/4			1.7500	10.1/2	16.1/4	1	051148 <sup>1)</sup>	—	—

<sup>1)</sup> steam oxide

# TAPER LENGTH DRILL



## General Purpose Taper Length, Metric

**5ATL** Bright Finish improves chip flow in soft or non-ferrous materials. Longer Flute and Overall length for depth and reach.

\* 18mm and larger are steam oxide



5ATL

DIN  
340

6XD

HSS

118°



1.00 - 31.00

$d_1$ Ø mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	5ATL
1.00	0.0394	33	56	12	056100
1.20	0.0472	41	65	12	056120
1.25	0.0492	41	65	12	056125
1.30	0.0512	41	65	12	056130
1.40	0.0551	45	70	12	056140
1.50	0.0591	45	70	12	056150
1.60	0.0630	50	76	12	056160
1.70	0.0669	50	76	12	056170
1.80	0.0709	53	80	12	056180
1.90	0.0748	53	80	12	056190
2.00	0.0787	56	85	12	056200
2.10	0.0827	56	85	12	056210
2.15	0.0846	59	90	12	056215
2.20	0.0866	59	90	12	056220
2.30	0.0906	59	90	12	056230
2.40	0.0945	62	95	12	056240
2.50	0.0984	62	95	12	056250
3.00	0.1181	66	100	12	056300
3.10	0.1220	69	106	12	056310
3.20	0.1260	69	106	12	056320
3.30	0.1299	69	106	12	056330
3.40	0.1339	73	112	12	056340
3.50	0.1378	73	112	12	056350
3.60	0.1417	73	112	12	056360
3.70	0.1457	73	112	12	056370
3.80	0.1496	78	119	12	056380
4.00	0.1575	78	119	12	056400
4.20	0.1654	78	119	12	056420
4.30	0.1693	82	126	12	056430
4.50	0.1772	82	126	12	056450
4.60	0.1811	82	126	12	056460
4.80	0.1890	87	132	12	056480



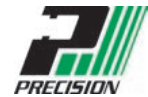


# TAPER LENGTH DRILL

d <sub>1</sub> Ø mm	d <sub>1</sub> decimal inch	l <sub>2</sub> mm	l <sub>1</sub> mm	Pack Qty	5ATL
5.00	0.1969	87	132	12	056500
5.50	0.2165	91	139	12	056550
5.60	0.2205	91	139	12	056560
5.70	0.2244	91	139	12	056570
6.00	0.2362	91	139	12	056600
6.40	0.2520	97	148	6	056640
6.50	0.2559	97	148	6	056650
6.80	0.2677	102	156	6	056680
7.00	0.2756	102	156	6	056770
7.20	0.2835	102	156	6	056720
7.50	0.2953	102	156	6	056750
7.80	0.3071	109	165	6	056780
8.00	0.3150	109	165	6	056800
8.20	0.3228	109	165	6	056820
8.50	0.3346	109	165	6	056850
9.00	0.3543	115	175	6	056900
9.20	0.3622	115	175	6	056920
9.50	0.3740	115	175	6	056950
9.80	0.3858	121	184	6	056980
10.00	0.3937	121	184	6	057100
10.20	0.4016	121	184	6	057102
10.50	0.4134	121	184	6	057105
11.00	0.4331	128	195	6	057110
11.20	0.4409	128	195	6	057112
11.50	0.4528	128	195	6	057115
12.00	0.4724	134	205	6	057120
12.50	0.4921	134	205	6	057125
13.00	0.5118	134	205	1	057130
13.50	0.5315	140	214	1	057135
13.80	0.5433	140	214	1	057138
14.00	0.5512	140	214	1	057140
14.50	0.5709	144	220	1	057145
15.00	0.5906	144	220	1	057150
15.50	0.6102	149	227	1	057155
16.00	0.6299	149	227	1	057160
16.50	0.6496	154	235	1	057165
17.00	0.6693	154	235	1	057170
17.50	0.6890	158	241	1	057175
18.00	0.7087	158	241	1	057180 <sup>1)</sup>
18.50	0.7283	162	247	1	057185 <sup>1)</sup>
19.00	0.7480	162	247	1	057190 <sup>1)</sup>
19.50	0.7677	166	254	1	057195 <sup>1)</sup>
20.00	0.7874	166	254	1	057200 <sup>1)</sup>
20.50	0.8071	171	261	1	057205 <sup>1)</sup>
21.00	0.8268	171	261	1	057210 <sup>1)</sup>
21.50	0.8465	176	268	1	057215 <sup>1)</sup>
22.00	0.8661	176	268	1	057220 <sup>1)</sup>
22.50	0.8858	180	275	1	057225 <sup>1)</sup>
23.00	0.9055	180	275	1	057230 <sup>1)</sup>
23.50	0.9252	180	275	1	057235 <sup>1)</sup>
24.00	0.9449	185	282	1	057240 <sup>1)</sup>
24.50	0.9646	185	282	1	057245 <sup>1)</sup>
25.00	0.9843	185	282	1	057250 <sup>1)</sup>
25.50	1.0039	190	290	1	057255 <sup>1)</sup>
26.00	1.0236	190	290	1	057260 <sup>1)</sup>
26.50	1.0433	190	290	1	057265 <sup>1)</sup>
27.00	1.0630	195	298	1	057270 <sup>1)</sup>
28.00	1.1024	195	298	1	057280 <sup>1)</sup>
28.50	1.1220	201	307	1	057285 <sup>1)</sup>
29.00	1.1417	201	307	1	057290 <sup>1)</sup>
29.50	1.1614	201	307	1	057295 <sup>1)</sup>
30.00	1.1811	201	307	1	057300 <sup>1)</sup>
30.50	1.2008	207	316	1	057305 <sup>1)</sup>
31.00	1.2205	207	316	1	057310 <sup>1)</sup>

<sup>1)</sup> steam oxide

# TAPER LENGTH DRILL



## High Helix Taper Length

**R51FS** High Helix and Bright Finish for better chip flow in soft or non-ferrous materials. Longer Flute and Overall length for depth and reach.

R51FS

ANSI

6XD

HSS

118°



1/16 - 1/2



$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	R51FS
1/16	0.0625	1.3/4	3"	12	051504
5/64	0.0781	2"	3.3/4	12	051505
3/32	0.0938	2.1/4	4.1/4	12	051506
7/64	0.1094	2.1/2	4.5/8	12	051507
1/8	0.1250	2.3/4	5.1/8	12	051508
9/64	0.1406	3"	5.3/8	12	051509
5/32	0.1563	3"	5.3/8	12	051510
11/64	0.1719	3.3/8	5.3/4	12	051511
3/16	0.1875	3.3/8	5.3/4	12	051512
13/64	0.2031	3.5/8	6"	12	051513
7/32	0.2188	3.5/8	6"	12	051514
15/64	0.2344	3.3/4	6.1/8	12	051515
1/4	0.2500	3.3/4	6.1/8	12	051516
17/64	0.2656	3.7/8	6.1/4	6	051517
9/32	0.2813	3.7/8	6.1/4	6	051518
19/64	0.2969	4"	6.3/8	6	051519
5/16	0.3125	4"	6.3/8	6	051520
21/64	0.3281	4.1/8	6.1/2	6	051521
11/32	0.3437	4.1/8	6.1/2	6	051522
23/64	0.3594	4.1/4	6.3/4	6	051523
3/8	0.3750	4.1/4	6.3/4	6	051524
25/64	0.3906	4.3/8	7"	6	051525
13/32	0.4063	4.3/8	7"	6	051526
27/64	0.4219	4.5/8	7.1/4	6	051527
7/16	0.4375	4.5/8	7.1/4	6	051528
29/64	0.4531	4.3/4	7.1/2	6	051529
15/32	0.4687	4.3/4	7.1/2	6	051530
31/64	0.4844	4.3/4	7.3/4	6	051531
1/2	0.5000	4.3/4	7.3/4	6	051532



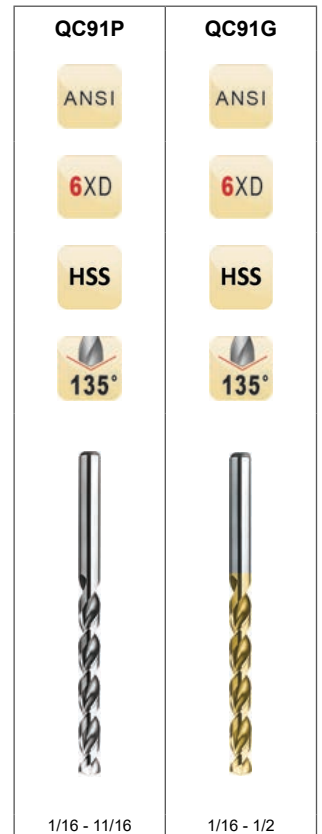
# TAPER LENGTH DRILL

## General Purpose Taper Length Parabolic Flute

Heavy-Duty Parabolic Flute design for efficient chip removal. Allows greater drilling depths in one pass. Low thrust design self centering Split Point for easier penetration.

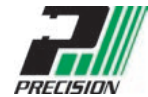
**QC91P** Bright Finish improves chip flow in soft or non-ferrous materials.

**QC91G** TiN Coating increases wear resistance and improves tool life.



$d_1$ Ø " / Nr.	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	QC91P	QC91G
1/16	0.0625	1.3/4	3"	12	057904	055904
52	0.0635	2"	3.3/4	12	059452	050952
51	0.0670	2"	3.3/4	12	059451	050951
50	0.0700	2"	3.3/4	12	059450	050950
49	0.0730	2"	3.3/4	12	059449	050949
48	0.0760	2"	3.3/4	12	059448	—
5/64	0.0781	2"	3.3/4	12	057905	055905
47	0.0785	2.1/4	4.1/4	12	059447	050947
46	0.0810	2.1/4	4.1/4	12	059446	050946
45	0.0820	2.1/4	4.1/4	12	059445	050945
44	0.0860	2.1/4	4.1/4	12	059444	050944
43	0.0890	2.1/4	4.1/4	12	059443	050943
42	0.0935	2.1/4	4.1/4	12	059442	050942
3/32	0.0938	2.1/4	4.1/4	12	057906	055906
41	0.0960	2.1/2	4.5/8	12	059441	050941
40	0.0980	2.1/2	4.5/8	12	059440	050940
39	0.0995	2.1/2	4.5/8	12	059439	050939
38	0.1015	2.1/2	4.5/8	12	059438	050938
37	0.1040	2.1/2	4.5/8	12	059437	050937
36	0.1065	2.1/2	4.5/8	12	059436	050936
7/64	0.1094	2.1/2	4.5/8	12	057907	055907
35	0.1100	2.3/4	5.1/8	12	059435	050935
34	0.1110	2.3/4	5.1/8	12	059434	050934
33	0.1130	2.3/4	5.1/8	12	059433	—
32	0.1160	2.3/4	5.1/8	12	059432	050932
31	0.1200	2.3/4	5.1/8	12	059431	050931
1/8	0.1250	2.3/4	5.1/8	12	057908	055908
30	0.1285	3"	5.3/8	12	059430	050930
29	0.1360	3"	5.3/8	12	059429	050929
28	0.1405	3"	5.3/8	12	059428	050928
9/64	0.1406	3"	5.3/8	12	057909	055909
27	0.1440	3"	5.3/8	12	059427	—
26	0.1470	3"	5.3/8	12	059426	050926

# TAPER LENGTH DRILL



d <sub>1</sub> Ø "/Nr.	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	QC91P	QC91G
25	0.1495	3"	5.3/8	12	059425	050925
24	0.1520	3"	5.3/8	12	059424	050924
23	0.1540	3"	5.3/8	12	059423	—
5/32	0.1563	3"	5.3/8	12	057910	055910
22	0.1570	3.3/8	5.3/4	12	059422	—
21	0.1590	3.3/8	5.3/4	12	059421	050921
20	0.1610	3.3/8	5.3/4	12	059420	050920
19	0.1660	3.3/8	5.3/4	12	059419	050919
18	0.1695	3.3/8	5.3/4	12	059418	050918
11/64	0.1719	3.3/8	5.3/4	12	057911	055911
17	0.1730	3.3/8	5.3/4	12	059417	050917
16	0.1770	3.3/8	5.3/4	12	059416	050916
15	0.1800	3.3/8	5.3/4	12	059415	050915
14	0.1820	3.3/8	5.3/4	12	059414	050914
13	0.1850	3.3/8	5.3/4	12	059413	050913
3/16	0.1875	3.3/8	5.3/4	12	057912	055912
12	0.1890	3.5/8	6"	12	059412	—
11	0.1910	3.5/8	6"	12	059411	050911
10	0.1935	3.5/8	6"	12	059410	—
9	0.1960	3.5/8	6"	12	059409	050909
8	0.1990	3.5/8	6"	12	059408	050908
7	0.2010	3.5/8	6"	12	059407	050907
13/64	0.2031	3.5/8	6"	12	057913	055913
6	0.2040	3.5/8	6"	12	059406	050906
5	0.2055	3.5/8	6"	12	059405	050905
4	0.2090	3.5/8	6"	12	059404	050904
3	0.2130	3.5/8	6"	12	059403	050903
7/32	0.2188	3.5/8	6"	12	057914	055914
2	0.2210	3.3/4	6.1/8	12	059402	050902
1	0.2280	3.3/4	6.1/8	12	059401	—
15/64	0.2344	3.3/4	6.1/8	12	057915	055915
1/4	0.2500	3.3/4	6.1/8	12	057916	055916
17/64	0.2656	3.7/8	6.1/4	6	057917	055917
9/32	0.2813	3.7/8	6.1/4	6	057918	055918
19/64	0.2969	4"	6.3/8	6	057919	055919
5/16	0.3125	4"	6.3/8	6	057920	055920
21/64	0.3281	4.1/8	6.1/2	6	057921	055921
11/32	0.3437	4.1/8	6.1/2	6	057922	055922
23/64	0.3594	4.1/4	6.3/4	6	057923	—
3/8	0.3750	4.1/4	6.3/4	6	057924	055924
25/64	0.3906	4.3/8	7"	6	057925	055925
13/32	0.4063	4.3/8	7"	6	057926	055926
27/64	0.4219	4.5/8	7.1/4	6	057927	055927
7/16	0.4375	4.5/8	7.1/4	6	057928	055928
29/64	0.4531	4.3/4	7.1/2	6	057929	055929
15/32	0.4687	4.3/4	7.1/2	6	057930	—
31/64	0.4844	4.3/4	7.3/4	6	057931	—
1/2	0.5000	4.3/4	7.3/4	6	057932	055932
33/64	0.5156	4.3/4	8"	1	057933	—
17/32	0.5313	4.3/4	8"	1	057934	—
35/64	0.5469	4.7/8	8.1/4	1	057935	—
9/16	0.5625	4.7/8	8.1/4	1	057936	—
37/64	0.5781	4.7/8	8.3/4	1	057937	—
19/32	0.5937	4.7/8	8.3/4	1	057938	—
5/8	0.6250	4.7/8	8.3/4	1	057940	—
21/32	0.6563	5.1/8	9"	1	057942	—
11/16	0.6875	5.3/8	9.1/4	1	057944	—



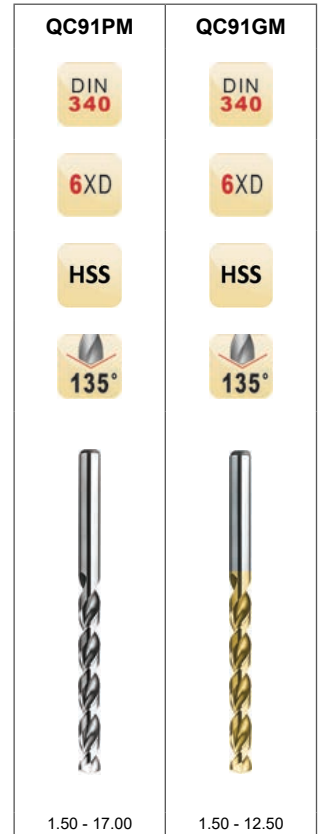
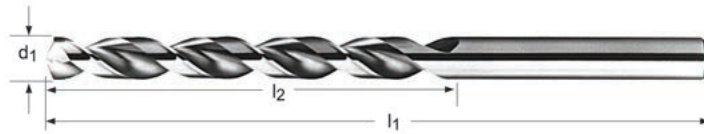
# TAPER LENGTH DRILL

## General Purpose Taper Length Parabolic Flute, Metric

Heavy-Duty Parabolic Flute design for efficient chip evacuation. Allows greater drilling depths in one pass. Low thrust design self centering Split Point for easier penetration.

**QC91PM** Bright Finish improves chip flow in soft or non-ferrous materials.

**QC91GM** TiN Coating increases wear resistance and improves tool life.



$d_1$ Ø mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	QC91PM	QC91GM
1.50	0.0591	45	70	12	050015	050215
2.00	0.0787	56	85	12	050020	050220
2.50	0.0984	62	95	12	050025	050225
3.00	0.1181	66	100	12	050030	050230
3.50	0.1378	73	112	12	050035	050235
4.00	0.1575	78	119	12	050040	050240
4.50	0.1772	82	126	12	050045	050245
5.00	0.1969	87	132	12	050050	050250
5.20	0.2047	87	132	12	050052	050252
5.50	0.2165	91	139	12	050055	050255
6.00	0.2362	91	139	12	050060	050260
6.50	0.2559	97	148	6	050065	050265
6.80	0.2677	102	156	6	050068	—
7.00	0.2756	102	156	6	050070	050270
8.00	0.3150	109	165	6	050080	050280
8.20	0.3228	109	165	6	050082	—
8.50	0.3346	109	165	6	050085	050285
8.60	0.3386	115	175	6	050086	050286
9.00	0.3543	115	175	6	050090	050290
9.50	0.3740	115	175	6	050095	—
10.00	0.3937	121	184	6	050100	050300
10.50	0.4134	121	184	6	050105	050305
11.00	0.4331	128	195	6	050110	—
12.00	0.4724	134	205	6	050120	050320
12.50	0.4921	134	205	6	050125	050325
13.00	0.5118	134	205	1	050130	—
13.50	0.5315	140	214	1	050135	—
14.00	0.5512	140	214	1	050140	—
15.00	0.5906	144	220	1	050150	—
15.50	0.6102	149	227	1	050155	—
16.00	0.6299	149	227	1	050160	—
17.00	0.6693	154	235	1	050170	—

# COBALT TAPER LENGTH DRILL

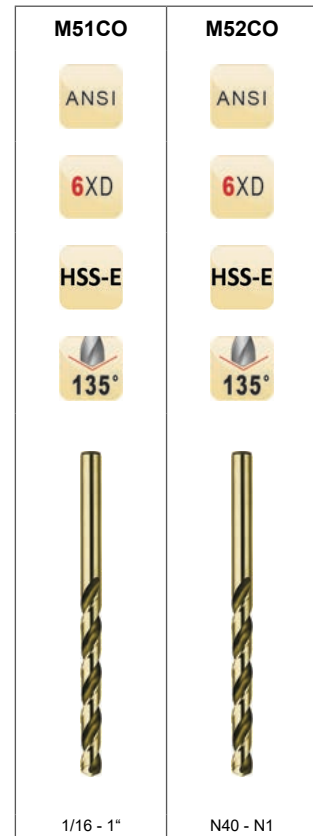
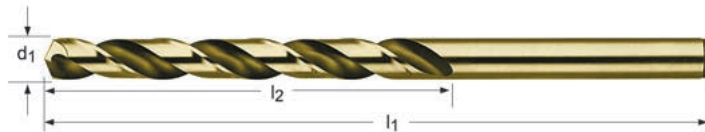


## Heavy Duty Taper Length

**M51CO** - Fractional Sizes

**M52CO** - Wire Gauge Sizes

Low thrust design Heavy Duty self centering Split Point for easier penetration. Cobalt base material with Bronze Oxide for wear resistance and lubricity.



$d_1$ Ø Inch	$d_1$ Ø Nr.	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	M51CO	M52CO
1/16		0.0625	1.3/4	3"	12	051304	—
5/64		0.0781	2"	3.3/4	12	051305	—
3/32		0.0938	2.1/4	4.1/4	12	051306	—
	40	0.0980	2.1/2	4.5/8	12	—	052340
	39	0.0995	2.1/2	4.5/8	12	—	052339
	36	0.1065	2.1/2	4.5/8	12	—	052336
7/64		0.1094	2.1/2	4.5/8	12	051307	—
	35	0.1100	2.3/4	5.1/8	12	—	052335
	34	0.1110	2.3/4	5.1/8	12	—	052334
	33	0.1130	2.3/4	5.1/8	12	—	052333
	32	0.1160	2.3/4	5.1/8	12	—	052332
	31	0.1200	2.3/4	5.1/8	12	—	052331
1/8		0.1250	2.3/4	5.1/8	12	051308	—
	30	0.1285	3"	5.3/8	12	—	052330
	29	0.1360	3"	5.3/8	12	—	052329
	28	0.1405	3"	5.3/8	12	—	052328
9/64		0.1406	3"	5.3/8	12	051309	—
	27	0.1440	3"	5.3/8	12	—	052327
	26	0.1470	3"	5.3/8	12	—	052326
	25	0.1495	3"	5.3/8	12	—	052325
	24	0.1520	3"	5.3/8	12	—	052324
5/32		0.1563	3"	5.3/8	12	051310	—
	22	0.1570	3.3/8	5.3/4	12	—	052322
	21	0.1590	3.3/8	5.3/4	12	—	052321
	20	0.1610	3.3/8	5.3/4	12	—	052320
	19	0.1660	3.3/8	5.3/4	12	—	052319
	18	0.1695	3.3/8	5.3/4	12	—	052318
11/64		0.1719	3.3/8	5.3/4	12	051311	—
	17	0.1730	3.3/8	5.3/4	12	—	052317
	16	0.1770	3.3/8	5.3/4	12	—	052316
	15	0.1800	3.3/8	5.3/4	12	—	052315
	14	0.1820	3.3/8	5.3/4	12	—	052314



# COBALT TAPER LENGTH DRILL

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	M51CO	M52CO
3/16	13	0.1850	3.3/8	5.3/4	12	—	052313
		0.1875	3.3/8	5.3/4	12	051312	—
	12	0.1890	3.5/8	6"	12	—	052312
	11	0.1910	3.5/8	6"	12	—	052311
	10	0.1935	3.5/8	6"	12	—	052310
13/64	9	0.1960	3.5/8	6"	12	—	052309
	8	0.1990	3.5/8	6"	12	—	052308
	7	0.2010	3.5/8	6"	12	—	052307
		0.2031	3.5/8	6"	12	051313	—
	5	0.2055	3.5/8	6"	12	—	052305
7/32	4	0.2090	3.5/8	6"	12	—	052304
	3	0.2130	3.5/8	6"	12	—	052303
		0.2188	3.5/8	6"	12	051314	—
	2	0.2210	3.3/4	6.1/8	12	—	052302
	1	0.2280	3.3/4	6.1/8	12	—	052301
15/64		0.2344	3.3/4	6.1/8	12	051315	—
1/4		0.2500	3.3/4	6.1/8	12	051316	—
17/64		0.2656	3.7/8	6.1/4	6	051317	—
9/32		0.2813	3.7/8	6.1/4	6	051318	—
19/64		0.2969	4"	6.3/8	6	051319	—
5/16		0.3125	4"	6.3/8	6	051320	—
21/64		0.3281	4.1/8	6.1/2	6	051321	—
11/32		0.3437	4.1/8	6.1/2	6	051322	—
23/64		0.3594	4.1/4	6.3/4	6	051323	—
3/8		0.3750	4.1/4	6.3/4	6	051324	—
25/64		0.3906	4.3/8	7"	6	051325	—
13/32		0.4063	4.3/8	7"	6	051326	—
27/64		0.4219	4.5/8	7.1/4	6	051327	—
7/16		0.4375	4.5/8	7.1/4	6	051328	—
29/64		0.4531	4.3/4	7.1/2	6	051329	—
15/32		0.4687	4.3/4	7.1/2	6	051330	—
31/64		0.4844	4.3/4	7.3/4	6	051331	—
1/2		0.5000	4.3/4	7.3/4	6	051332	—
33/64		0.5156	4.3/4	8"	1	051333 <sup>1)</sup>	—
17/32		0.5313	4.3/4	8"	1	051334 <sup>1)</sup>	—
35/64		0.5469	4.7/8	8.1/4	1	051335 <sup>1)</sup>	—
9/16		0.5625	4.7/8	8.1/4	1	051336 <sup>1)</sup>	—
37/64		0.5781	4.7/8	8.3/4	1	051337 <sup>1)</sup>	—
19/32		0.5937	4.7/8	8.3/4	1	051338 <sup>1)</sup>	—
39/64		0.6094	4.7/8	8.3/4	1	051339 <sup>1)</sup>	—
5/8		0.6250	4.7/8	8.3/4	1	051340 <sup>1)</sup>	—
41/64		0.6406	5.1/8	9"	1	051341 <sup>1)</sup>	—
21/32		0.6563	5.1/8	9"	1	051342 <sup>1)</sup>	—
43/64		0.6719	5.3/8	9.1/4	1	051343 <sup>1)</sup>	—
11/16		0.6875	5.3/8	9.1/4	1	051344 <sup>1)</sup>	—
45/64		0.7031	5.5/8	9.1/2	1	051345 <sup>1)</sup>	—
23/32		0.7188	5.5/8	9.1/2	1	051346 <sup>1)</sup>	—
47/64		0.7344	5.7/8	9.3/4	1	051347 <sup>1)</sup>	—
3/4		0.7500	5.7/8	9.3/4	1	051348 <sup>1)</sup>	—
49/64		0.7656	6"	9.7/8	1	051349 <sup>1)</sup>	—
25/32		0.7813	6"	9.7/8	1	051350 <sup>1)</sup>	—
51/64		0.7969	6.1/8	10"	1	051351 <sup>1)</sup>	—
13/16		0.8125	6.1/8	10"	1	051352 <sup>1)</sup>	—
53/64		0.8281	6.1/8	10"	1	051353 <sup>1)</sup>	—
27/32		0.8438	6.1/8	10"	1	051354 <sup>1)</sup>	—
55/64		0.8594	6.1/8	10"	1	051355 <sup>1)</sup>	—
7/8		0.8750	6.1/8	10"	1	051356 <sup>1)</sup>	—
57/64		0.8906	6.1/8	10"	1	051357 <sup>1)</sup>	—
29/32		0.9063	6.1/8	10"	1	051358 <sup>1)</sup>	—
59/64		0.9219	6.1/8	10.3/4	1	051359 <sup>1)</sup>	—
15/16		0.9375	6.1/8	10.3/4	1	051360 <sup>1)</sup>	—
61/64		0.9531	6.3/8	11"	1	051361 <sup>1)</sup>	—
31/32		0.9688	6.3/8	11"	1	051362 <sup>1)</sup>	—
63/64		0.9844	6.3/8	11"	1	051363 <sup>1)</sup>	—
1"		1.0000	6.3/8	11"	1	051364 <sup>1)</sup>	—

<sup>1)</sup> Notched Point

# EXTRA LENGTH DRILL



## General Purpose Extra Length

**0860** 8" Overall length

**1290** 12" Overall length

Bright Finish improves chip flow in soft or non-ferrous materials



$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	0860	1290
1/8	0.1250	6"	8"	1	057408	—
1/8	0.1250	9"	12"	1	—	059608
9/64	0.1406	9"	12"	1	—	059609
5/32	0.1563	6"	8"	1	057410	—
5/32	0.1563	9"	12"	1	—	059610
11/64	0.1719	9"	12"	1	—	059611
3/16	0.1875	6"	8"	1	057412	—
3/16	0.1875	9"	12"	1	—	059612
13/64	0.2031	9"	12"	1	—	059613
7/32	0.2188	6"	8"	1	057414	—
7/32	0.2188	9"	12"	1	—	059614
15/64	0.2344	9"	12"	1	—	059615
1/4	0.2500	6"	8"	1	057416	—
1/4	0.2500	9"	12"	1	—	059616
17/64	0.2656	9"	12"	1	—	059617
9/32	0.2813	6"	8"	1	057418	—
9/32	0.2813	9"	12"	1	—	059618
19/64	0.2969	9"	12"	1	—	059619
5/16	0.3125	6"	8"	1	057420	—
5/16	0.3125	9"	12"	1	—	059620
21/64	0.3281	9"	12"	1	—	059621
11/32	0.3437	6"	8"	1	057422	—
11/32	0.3437	9"	12"	1	—	059622
23/64	0.3594	9"	12"	1	—	059623
3/8	0.3750	6"	8"	1	057424	—
3/8	0.3750	9"	12"	1	—	059624
25/64	0.3906	9"	12"	1	—	059625
13/32	0.4063	6"	8"	1	057426	—
13/32	0.4063	9"	12"	1	—	059626
27/64	0.4219	9"	12"	1	—	059627
7/16	0.4375	6"	8"	1	057428	—
7/16	0.4375	9"	12"	1	—	059628





# EXTRA LENGTH DRILL

<b>d<sub>1</sub></b> <b>Ø</b>	<b>d<sub>1</sub></b> <b>decimal</b>	<b>l<sub>2</sub></b>	<b>l<sub>1</sub></b>	<b>Pack</b> <b>Qty</b>	<b>0860</b>	<b>1290</b>
<b>Inch</b>	<b>Inch</b>	<b>Inch</b>	<b>Inch</b>			
29/64	0.4531	9"	12"	1	—	059629
15/32	0.4687	6"	8"	1	057430	—
15/32	0.4687	9"	12"	1	—	059630
31/64	0.4844	9"	12"	1	—	059631
1/2	0.5000	6"	8"	1	057432	—
1/2	0.5000	9"	12"	1	—	059632
33/64	0.5156	9"	12"	1	—	059633 <sup>1)</sup>
17/32	0.5313	9"	12"	1	—	059634 <sup>1)</sup>
35/64	0.5469	9"	12"	1	—	059635 <sup>1)</sup>
9/16	0.5625	9"	12"	1	—	059636 <sup>1)</sup>
37/64	0.5781	9"	12"	1	—	059637 <sup>1)</sup>
19/32	0.5937	9"	12"	1	—	059638 <sup>1)</sup>
39/64	0.6094	9"	12"	1	—	059639 <sup>1)</sup>
5/8	0.6250	9"	12"	1	—	059640 <sup>1)</sup>
21/32	0.6563	9"	12"	1	—	059642 <sup>1)</sup>
11/16	0.6875	9"	12"	1	—	059644 <sup>1)</sup>
23/32	0.7188	9"	12"	1	—	059646 <sup>1)</sup>
3/4	0.7500	9"	12"	1	—	059648 <sup>1)</sup>

1) 33/64 and larger are steam oxide

**General Purpose Extra Length**

**1511** Bright Finish improves chip flow in soft or  
**1813** non-ferrous materials

**A125** Steam Oxide for increased wear resistance & lubricity.



1813 Series - 33/64 and larger are steam oxide  
 1511 Series - 17/32 and larger are steam oxide  
 A125 Series - under 3/32 are bright



$d_1$ Ø Inch	$d_1$ decimal Inch	$d_1$ Øh <sub>8</sub> mm	$l_2$ Inch	$l_1$ Inch	$l_2$ mm	$l_1$ mm	Pack Qty	1511	1813	A125
	0.0551	1.40			100	160	1	—	—	0019832
	0.0591	1.50			100	160	1	—	—	0019856
	0.0591	1.50			80	125	1	—	—	0019849
1/16	0.0625	1.59			100	160	1	—	—	0173664
1/16	0.0625	1.59			80	125	1	—	—	0173657
	0.0709	1.80			100	160	1	—	—	0019863
5/64	0.0781	1.98			100	160	1	—	—	0173688
5/64	0.0781	1.98			80	125	1	—	—	0173671
	0.0787	2.00			100	160	1	—	—	0020074
	0.0787	2.00			80	125	1	—	—	0020067
	0.0866	2.20			100	160	1	—	—	0020036
3/32	0.0938	2.38			100	160	1	—	—	0173701
3/32	0.0938	2.38			80	125	1	—	—	0173695
	0.0984	2.50			100	160	1	—	—	0020050
	0.0984	2.50			80	125	1	—	—	0020043
7/64	0.1094	2.78			100	160	1	—	—	0173725
7/64	0.1094	2.78			80	125	1	—	—	0173718
	0.1181	3.00			100	160	1	—	—	0020128
	0.1181	3.00			150	200	1	—	—	0020135
	0.1181	3.00			200	250	1	—	—	0020142
1/8	0.1250	3.18			100	160	1	—	—	0173732
1/8	0.1250	3.18			150	200	1	—	—	0173749
1/8	0.1250	3.18			200	250	1	—	—	0173756
1/8	0.1250	3.18			250	310	1	—	—	0173763
	0.1299	3.30			100	160	1	—	—	0020081
	0.1378	3.50			100	160	1	—	—	0020098
	0.1378	3.50			150	200	1	—	—	0020104
	0.1378	3.50			200	250	1	—	—	0020111
9/64	0.1406	3.57			100	160	1	—	—	0173770
9/64	0.1406	3.57			150	200	1	—	—	0173787
9/64	0.1406	3.57			250	310	1	—	—	0214398
5/32	0.1563	3.97			100	160	1	—	—	0173794

d <sub>1</sub> Ø Inch	d <sub>1</sub> decimal Inch	d <sub>1</sub> Øh <sub>8</sub> mm	l <sub>2</sub> Inch	l <sub>1</sub> Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	Pack Qty	1511	1813	A125
5/32	0.1563	3.97			150	200	1	—	—	0173800
5/32	0.1563	3.97			200	250	1	—	—	0173817
5/32	0.1563	3.97			250	310	1	—	—	0173824
	0.1575	4.00			100	160	1	—	—	0020197
	0.1575	4.00			150	200	1	—	—	0020203
	0.1575	4.00			200	250	1	—	—	0020210
	0.1575	4.00			250	310	1	—	—	0020227
11/64	0.1719	4.37			100	160	1	—	—	0173831
11/64	0.1719	4.37			150	200	1	—	—	0173848
11/64	0.1719	4.37			250	310	1	—	—	0214404
	0.1772	4.50			100	160	1	—	—	0020159
	0.1772	4.50			150	200	1	—	—	0020166
	0.1772	4.50			200	250	1	—	—	0020173
	0.1772	4.50			250	310	1	—	—	0020180
3/16	0.1875	4.76			100	160	1	—	—	0173855
3/16	0.1875	4.76			150	200	1	—	—	0173862
3/16	0.1875	4.76			200	250	1	—	—	0173879
3/16	0.1875	4.76			250	310	1	—	—	0173886
3/16	0.1875	4.76			300	400	1	—	—	0173893
3/16	0.1875		11"	15"			1	059512	—	—
	0.1969	5.00			100	160	1	—	—	0020265
	0.1969	5.00			150	200	1	—	—	0020272
	0.1969	5.00			200	250	1	—	—	0020289
	0.1969	5.00			250	310	1	—	—	0020296
	0.1969	5.00			300	400	1	—	—	0020302
13/64	0.2031	5.16			150	200	1	—	—	0173909
13/64	0.2031	5.16			200	250	1	—	—	0173916
13/64	0.2031	5.16			250	310	1	—	—	0173923
	0.2165	5.50			150	200	1	—	—	0020234
	0.2165	5.50			200	250	1	—	—	0020241
	0.2165	5.50			250	310	1	—	—	0020258
7/32	0.2188	5.56			150	200	1	—	—	0173930
7/32	0.2188	5.56			200	250	1	—	—	0173947
7/32	0.2188	5.56			250	310	1	—	—	0173954
15/64	0.2344	5.95			150	200	1	—	—	0173961
15/64	0.2344	5.95			200	250	1	—	—	0173978
15/64	0.2344	5.95			250	310	1	—	—	0214442
	0.2362	6.00			150	200	1	—	—	0020340
	0.2362	6.00			200	250	1	—	—	0020357
	0.2362	6.00			250	310	1	—	—	0020364
	0.2362	6.00			300	400	1	—	—	0020371
1/4	0.2500	6.35			150	200	1	—	—	0173985
1/4	0.2500	6.35			200	250	1	—	—	0173992
1/4	0.2500	6.35			250	310	1	—	—	0174005
1/4	0.2500	6.35			300	400	1	—	—	0174012
1/4	0.2500	6.35			400	460	1	—	—	0174029
1/4	0.2500		11"	15"			1	059516	—	—
1/4	0.2500		13"	18"			1	—	059716	—
	0.2559	6.50			150	200	1	—	—	0020319
	0.2559	6.50			200	250	1	—	—	0020326
	0.2559	6.50			250	310	1	—	—	0020333
17/64	0.2656	6.75			150	200	1	—	—	0174036
17/64	0.2656	6.75			200	250	1	—	—	0174043
17/64	0.2656	6.75			400	460	1	—	—	0214466
17/64	0.2656		13"	18"			1	—	059717	—
	0.2756	7.00			150	200	1	—	—	0020418
	0.2756	7.00			200	250	1	—	—	0020425
	0.2756	7.00			250	310	1	—	—	0020432
9/32	0.2813	7.14			150	200	1	—	—	0174050
9/32	0.2813	7.14			200	250	1	—	—	0174067
9/32	0.2813	7.14			250	310	1	—	—	0174074
9/32	0.2813	7.14			400	460	1	—	—	0214473
9/32	0.2813		13"	18"			1	—	059718	—
	0.2953	7.50			150	200	1	—	—	0020388
	0.2953	7.50			200	250	1	—	—	0020395
	0.2953	7.50			250	310	1	—	—	0020401

d <sub>1</sub> Ø Inch	d <sub>1</sub> decimal Inch	d <sub>1</sub> Øh <sub>8</sub> mm	l <sub>2</sub> Inch	l <sub>1</sub> Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	Pack Qty	1511	1813	A125
19/64	0.2969	7.54			250	310	1	—	—	0214480
19/64	0.2969	7.54			400	460	1	—	—	0214497
19/64	0.2969		13"	18"			1	—	059719	—
5/16	0.3125	7.94			150	200	1	—	—	0174081
5/16	0.3125	7.94			200	250	1	—	—	0174098
5/16	0.3125	7.94			250	310	1	—	—	0174104
5/16	0.3125	7.94			300	400	1	—	—	0174111
5/16	0.3125	7.94			400	460	1	—	—	0174128
5/16	0.3125		11"	15"			1	059520	—	—
5/16	0.3125		13"	18"			1	—	059720	—
	0.3150	8.00			200	250	1	—	—	0020463
	0.3150	8.00			250	310	1	—	—	0020470
	0.3150	8.00			300	400	1	—	—	0020487
21/64	0.3281	8.33			250	310	1	—	—	0174135
21/64	0.3281	8.33			400	460	1	—	—	0214503
21/64	0.3281		13"	18"			1	—	059721	—
	0.3346	8.50			200	250	1	—	—	0020449
	0.3346	8.50			250	310	1	—	—	0020456
11/32	0.3437	8.73			200	250	1	—	—	0174142
11/32	0.3437	8.73			250	310	1	—	—	0174159
11/32	0.3437	8.73			300	400	1	—	—	0174166
11/32	0.3437	8.73			400	460	1	—	—	0214510
11/32	0.3437		11"	15"			1	059522	—	—
11/32	0.3437		13"	18"			1	—	059722	—
	0.3543	9.00			200	250	1	—	—	0020517
	0.3543	9.00			250	310	1	—	—	0020524
	0.3543	9.00			300	400	1	—	—	0020531
23/64	0.3594	9.13			250	310	1	—	—	0174180
23/64	0.3594	9.13			400	460	1	—	—	0214527
23/64	0.3594		13"	18"			1	—	059723	—
	0.3740	9.50			200	250	1	—	—	0020494
	0.3740	9.50			250	310	1	—	—	0020500
3/8	0.3750	9.52			200	250	1	—	—	0174197
3/8	0.3750	9.52			250	310	1	—	—	0174203
3/8	0.3750	9.52			300	400	1	—	—	0174210
3/8	0.3750	9.52			400	460	1	—	—	0174227
3/8	0.3750		11"	15"			1	059524	—	—
3/8	0.3750		13"	18"			1	—	059724	—
25/64	0.3906	9.92			250	310	1	—	—	0214534
25/64	0.3906	9.92			400	460	1	—	—	0214541
25/64	0.3906		13"	18"			1	—	059725	—
	0.3937	10.00			200	250	1	—	—	0019900
	0.3937	10.00			250	310	1	—	—	0019917
	0.3937	10.00			300	400	1	—	—	0019924
13/32	0.4063	10.32			200	250	1	—	—	0174234
13/32	0.4063	10.32			250	310	1	—	—	0174241
13/32	0.4063	10.32			400	460	1	—	—	0214558
13/32	0.4063		13"	18"			1	—	059726	—
	0.4134	10.50			200	250	1	—	—	0019870
	0.4134	10.50			250	310	1	—	—	0019887
	0.4134	10.50			300	400	1	—	—	0019894
27/64	0.4219	10.72			250	310	1	—	—	0214565
27/64	0.4219		13"	18"			1	—	059727	—
	0.4331	11.00			200	250	1	—	—	0019931
	0.4331	11.00			250	310	1	—	—	0019948
	0.4331	11.00			300	400	1	—	—	0019955
7/16	0.4375	11.11			200	250	1	—	—	0174265
7/16	0.4375	11.11			250	310	1	—	—	0174272
7/16	0.4375	11.11			300	400	1	—	—	0174289
7/16	0.4375	11.11			400	460	1	—	—	0214589
7/16	0.4375		11"	15"			1	059528	—	—
7/16	0.4375		13"	18"			1	—	059728	—
29/64	0.4531	11.51			250	310	1	—	—	0214596
29/64	0.4531	11.51			400	460	1	—	—	0214602
29/64	0.4531		13"	18"			1	—	059729	—
15/32	0.4688	11.91			200	250	1	—	—	0174296

d <sub>1</sub> Ø Inch	d <sub>1</sub> decimal Inch	d <sub>1</sub> Øh <sub>8</sub> mm	l <sub>2</sub> Inch	l <sub>1</sub> Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	Pack Qty	1511	1813	A125
15/32	0.4687	11.91			250	310	1	—	—	0174302
15/32	0.4687	11.91			400	460	1	—	—	0214619
15/32	0.4687		13"	18"			1	—	059730	—
	0.4724	12.00			200	250	1	—	—	0019962
	0.4724	12.00			250	310	1	—	—	0019979
	0.4724	12.00			300	400	1	—	—	0019986
31/64	0.4844	12.30			250	310	1	—	—	0214626
31/64	0.4844	12.30			400	460	1	—	—	0214633
31/64	0.4844		13"	18"			1	—	059731	—
1/2	0.5000	12.70			200	250	1	—	—	0174319
1/2	0.5000	12.70			250	310	1	—	—	0174326
1/2	0.5000	12.70			300	400	1	—	—	0174333
1/2	0.5000	12.70			400	460	1	—	—	0174340
1/2	0.5000		11"	15"			1	059532	—	—
1/2	0.5000		13"	18"			1	—	059732	—
	0.5118	13.00			250	310	1	—	—	0019993
	0.5118	13.00			300	400	1	—	—	0020005
33/64	0.5156	13.10			250	310	1	—	—	0214640
33/64	0.5156	13.10			400	460	1	—	—	0214657
33/64	0.5156		13"	18"			1	—	059733	—
17/32	0.5313	13.49			250	310	1	—	—	0214664
17/32	0.5313	13.49			400	460	1	—	—	0214671
17/32	0.5313		11"	15"			1	059534	—	—
17/32	0.5313		13"	18"			1	—	059734	—
35/64	0.5469	13.89			250	310	1	—	—	0214688
35/64	0.5469	13.89			400	460	1	—	—	0214695
35/64	0.5469		13"	18"			1	—	059735	—
	0.5512	14.00			250	310	1	—	—	0020012
	0.5512	14.00			300	400	1	—	—	0020029
9/16	0.5625	14.29			250	310	1	—	—	0214701
9/16	0.5625	14.29			400	460	1	—	—	0214718
9/16	0.5625		11"	15"			1	059536	—	—
9/16	0.5625		13"	18"			1	—	059736	—
37/64	0.5781	14.68			250	310	1	—	—	0214725
37/64	0.5781		13"	18"			1	—	059737	—
19/32	0.5937	15.08			250	310	1	—	—	0214749
19/32	0.5937	15.08			400	460	1	—	—	0214756
19/32	0.5937		13"	18"			1	—	059738	—
39/64	0.6094	15.48			250	310	1	—	—	0214763
39/64	0.6094	15.48			400	460	1	—	—	0214770
39/64	0.6094		13"	18"			1	—	059739	—
5/8	0.6250	15.88			250	310	1	—	—	0214787
5/8	0.6250	15.88			400	460	1	—	—	0214794
5/8	0.6250		11"	15"			1	059540	—	—
5/8	0.6250		13"	18"			1	—	059740	—
21/32	0.6563	16.67			250	310	1	—	—	0214800
21/32	0.6563	16.67			400	460	1	—	—	0214817
21/32	0.6563		11"	15"			1	059542	—	—
21/32	0.6563		13"	18"			1	—	059742	—
11/16	0.6875	17.46			250	310	1	—	—	0214824
11/16	0.6875	17.46			400	460	1	—	—	0214831
11/16	0.6875		11"	15"			1	059544	—	—
11/16	0.6875		13"	18"			1	—	059744	—
23/32	0.7188	18.26			250	310	1	—	—	0214848
23/32	0.7188	18.26			400	460	1	—	—	0214855
23/32	0.7188		11"	15"			1	059546	—	—
23/32	0.7188		13"	18"			1	—	059746	—
3/4	0.7500	19.05			250	310	1	—	—	0214862
3/4	0.7500	19.05			400	460	1	—	—	0214879
3/4	0.7500		11"	15"			1	059548	—	—
3/4	0.7500		13"	18"			1	—	059748	—
25/32	0.7813	19.84			400	460	1	—	—	0214886
25/32	0.7813		11"	15"			1	059550	—	—
25/32	0.7813		13"	18"			1	—	059750	—
13/16	0.8125	20.64			400	460	1	—	—	0214893
13/16	0.8125		11"	15"			1	059552	—	—

$d_1$ $\emptyset$ Inch	$d_1$ decimal Inch	$d_1$ $\emptyset h_8$ mm	$l_2$ Inch	$l_1$ Inch	$l_2$ mm	$l_1$ mm	Pack Qty	1511	1813	A125
13/16	0.8125		13"	18"			1	—	059752	—
7/8	0.8750	22.22			400	460	1	—	—	0214909
7/8	0.8750		11"	15"			1	059554	—	—
7/8	0.8750		13"	18"			1	—	059756	—
15/16	0.9375	23.81			400	460	1	—	—	0214916
15/16	0.9375		11"	15"			1	059556	—	—
15/16	0.9375		13"	18"			1	—	059760	—
1"	1.0000	25.40			400	460	1	—	—	0214923
1"	1.0000		11"	15"			1	059558	—	—
1"	1.0000		13"	18"			1	—	059764	—



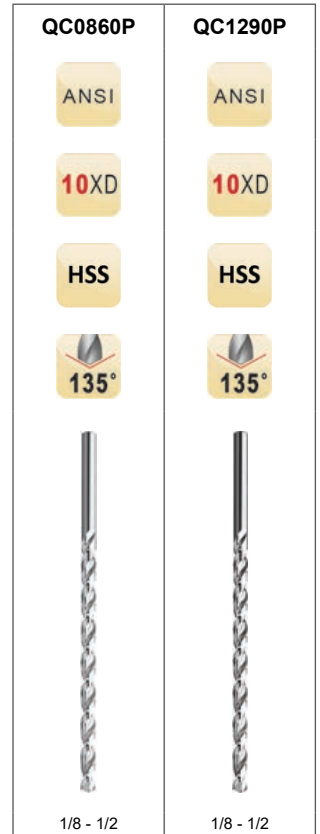
# EXTRA LENGTH DRILL

## General Purpose Extra Length Parabolic Flute

**QC0860P** 8" Overall length

**QC1290P** 12" Overall length

Heavy-Duty Parabolic Flute design for efficient chip removal. Allows greater drilling depths in one pass. Low thrust design self centering Split Point for easier penetration. Bright Finish improves chip flow in soft or non-ferrous materials.



<b>d<sub>1</sub></b> <b>Ø</b>	<b>d<sub>1</sub></b> <b>decimal</b>	<b>l<sub>2</sub></b>	<b>l<sub>1</sub></b>	<b>Pack</b> <b>Qty</b>	<b>QC0860P</b>	<b>QC1290P</b>
<b>Inch</b>	<b>Inch</b>	<b>Inch</b>	<b>Inch</b>			
1/8	0.1250	6"	8"	1	055608	—
1/8	0.1250	9"	12"	1	—	060308
9/64	0.1406	6"	8"	1	055609	—
9/64	0.1406	9"	12"	1	—	060309
5/32	0.1563	6"	8"	1	055610	—
5/32	0.1563	9"	12"	1	—	060310
11/64	0.1719	6"	8"	1	055611	—
11/64	0.1719	9"	12"	1	—	060311
3/16	0.1875	6"	8"	1	055612	—
3/16	0.1875	9"	12"	1	—	060312
13/64	0.2031	6"	8"	1	055613	—
13/64	0.2031	9"	12"	1	—	060313
7/32	0.2188	6"	8"	1	055614	—
7/32	0.2188	9"	12"	1	—	060314
15/64	0.2344	6"	8"	1	055615	—
15/64	0.2344	9"	12"	1	—	060315
1/4	0.2500	6"	8"	1	055616	—
1/4	0.2500	9"	12"	1	—	060316
17/64	0.2656	6"	8"	1	055617	—
17/64	0.2656	9"	12"	1	—	060317
9/32	0.2813	6"	8"	1	055618	—
9/32	0.2813	9"	12"	1	—	060318
19/64	0.2969	6"	8"	1	055619	—
19/64	0.2969	9"	12"	1	—	060319
5/16	0.3125	6"	8"	1	055620	—
5/16	0.3125	9"	12"	1	—	060320
21/64	0.3281	6"	8"	1	055621	—
21/64	0.3281	9"	12"	1	—	060321
11/32	0.3437	6"	8"	1	055622	—
11/32	0.3437	9"	12"	1	—	060322
23/64	0.3594	6"	8"	1	055623	—
23/64	0.3594	9"	12"	1	—	060323
3/8	0.3750	6"	8"	1	055624	—

# EXTRA LENGTH DRILL



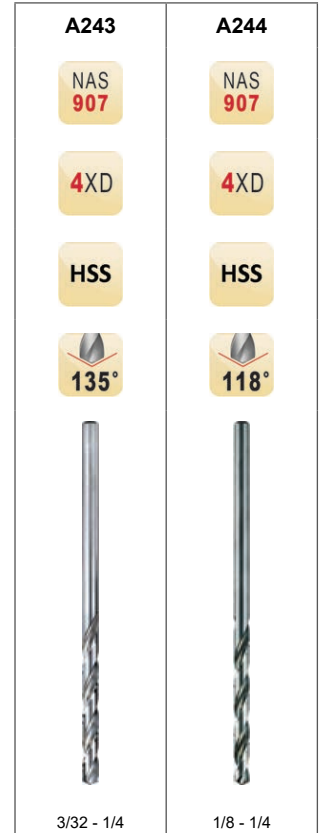
$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	QC0860P	QC1290P
3/8	0.3750	9"	12"	1	—	060324
25/64	0.3906	6"	8"	1	055625	—
25/64	0.3906	9"	12"	1	—	060325
13/32	0.4063	6"	8"	1	055626	—
13/32	0.4063	9"	12"	1	—	060326
27/64	0.4219	6"	8"	1	055627	—
27/64	0.4219	9"	12"	1	—	060327
7/16	0.4375	6"	8"	1	055628	—
7/16	0.4375	9"	12"	1	—	060328
29/64	0.4531	6"	8"	1	055629	—
15/32	0.4687	6"	8"	1	055630	—
15/32	0.4687	9"	12"	1	—	060330
31/64	0.4844	6"	8"	1	055631	—
1/2	0.5000	6"	8"	1	055632	—
1/2	0.5000	9"	12"	1	—	060332



## Aircraft Extension (NAS 907)

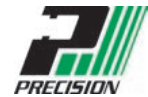
**A243 (NAS 907 Type B)** Low thrust design self centering 135° Split Point for easier penetration. Bright Finish improves chip flow in soft or non-ferrous materials.

**A244 (NAS 907 Type A)** Low thrust design self centering 118° Split Point for easier penetration. Bright Finish improves chip flow in soft or non-ferrous materials.



$d_1$ $\varnothing h_8$ Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	A243	A244
3/32	0.0938	1.1/4	6"	10	0240458	—
40	0.0980	1.3/8	6"	10	0241141	—
1/8	0.1250	1.5/8	6"	10	0240434	0375914
30	0.1285	1.5/8	6"	10	0241035	—
5/32	0.1563	2"	6"	10	0240465	0375938
21	0.1590	2.1/8	6"	10	0240939	—
20	0.1610	2.1/8	6"	10	0240922	—
3/16	0.1875	2.5/16	6"	10	0240441	0375921
11	0.1910	2.5/16	6"	10	0240823	—
10	0.1935	2.7/16	6"	10	0240816	—
1/4	0.2500	2.3/4	6"	10	0240410	0375907

# AIRCRAFT EXTENSION DRILL



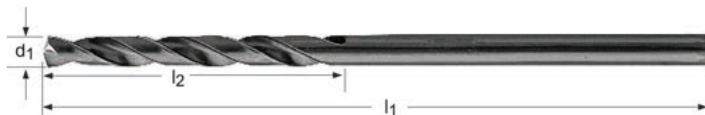
## Aircraft Extension (NAS 907 Type B)

**500-6** - Fractional Sizes

**501-6** - Wire Gauge Sizes

**502-6** - Letter Sizes

Low thrust design self centering 135° Split Point for easier penetration. Steam Oxide for increased wear resistance & lubricity. 6" overall length.



$d_1$ Ø Inch	$d_1$ Ø Nr.	$d_1$ Ø letter	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	500-6	501-6	502-6
	60		0.0400	11/16	6"	12	—	058160 <sup>1)</sup>	—
	59		0.0410	11/16	6"	12	—	058159 <sup>1)</sup>	—
	58		0.0420	11/16	6"	12	—	058158 <sup>1)</sup>	—
	57		0.0430	3/4	6"	12	—	058157 <sup>1)</sup>	—
	56		0.0465	3/4	6"	12	—	058156 <sup>1)</sup>	—
3/64			0.0469	3/4	6"	12	058003	—	—
	55		0.0520	7/8	6"	12	—	058155 <sup>1)</sup>	—
	54		0.0550	7/8	6"	12	—	058154 <sup>1)</sup>	—
	53		0.0595	7/8	6"	12	—	058153 <sup>1)</sup>	—
1/16			0.0625	7/8	6"	12	058004	—	—
	52		0.0635	7/8	6"	12	—	058152	—
	51		0.0670	1"	6"	12	—	058151	—
	50		0.0700	1"	6"	12	—	058150	—
	49		0.0730	1"	6"	12	—	058149	—
	48		0.0760	1"	6"	12	—	058148	—
5/64			0.0781	1"	6"	12	058005	—	—
	47		0.0785	1"	6"	12	—	058147	—
	46		0.0810	1.1/8	6"	12	—	058146	—
	45		0.0820	1.1/8	6"	12	—	058145	—
	44		0.0860	1.1/8	6"	12	—	058144	—
	43		0.0890	1.1/4	6"	12	—	058143	—
	42		0.0935	1.1/4	6"	12	—	058142	—
3/32			0.0938	1.1/4	6"	12	058006	—	—
	41		0.0960	1.3/8	6"	12	—	058141	—
	40		0.0980	1.3/8	6"	12	—	058140	—
	39		0.0995	1.3/8	6"	12	—	058139	—
	38		0.1015	1.7/16	6"	12	—	058138	—
	37		0.1040	1.7/16	6"	12	—	058137	—
	36		0.1065	1.7/16	6"	12	—	058136	—
7/64			0.1094	1.1/2	6"	12	058007	—	—
	35		0.1100	1.1/2	6"	12	—	058135	—
	34		0.1110	1.1/2	6"	12	—	058134	—

<sup>1)</sup> Not Split Point



# AIRCRAFT EXTENSION DRILL

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	500-6	501-6	502-6
	33		0.1130	1.1/2	6"	12	—	058133	—
	32		0.1160	1.5/8	6"	12	—	058132	—
	31		0.1200	1.5/8	6"	12	—	058131	—
1/8			0.1250	1.5/8	6"	12	058008	—	—
	30		0.1285	1.5/8	6"	12	—	058130	—
	29		0.1360	1.3/4	6"	12	—	058129	—
	28		0.1405	1.3/4	6"	12	—	058128	—
9/64			0.1406	1.3/4	6"	12	058009	—	—
	27		0.1440	1.7/8	6"	12	—	058127	—
	26		0.1470	1.7/8	6"	12	—	058126	—
	25		0.1495	1.7/8	6"	12	—	058125	—
	24		0.1520	2"	6"	12	—	058124	—
	23		0.1540	2"	6"	12	—	058123	—
5/32			0.1563	2"	6"	12	058010	—	—
	22		0.1570	2"	6"	12	—	058122	—
	21		0.1590	2.1/8	6"	12	—	058121	—
	20		0.1610	2.1/8	6"	12	—	058120	—
	19		0.1660	2.1/8	6"	12	—	058119	—
	18		0.1695	2.1/8	6"	12	—	058118	—
11/64			0.1719	2.1/8	6"	12	058011	—	—
	17		0.1730	2.3/16	6"	12	—	058117	—
	16		0.1770	2.3/16	6"	12	—	058116	—
	15		0.1800	2.3/16	6"	12	—	058115	—
	14		0.1820	2.3/16	6"	12	—	058114	—
	13		0.1850	2.5/16	6"	12	—	058113	—
3/16			0.1875	2.5/16	6"	12	058012	—	—
	12		0.1890	2.5/16	6"	12	—	058112	—
	11		0.1910	2.5/16	6"	12	—	058111	—
	10		0.1935	2.7/16	6"	12	—	058110	—
	9		0.1960	2.7/16	6"	12	—	058109	—
	8		0.1990	2.7/16	6"	12	—	058108	—
	7		0.2010	2.7/16	6"	12	—	058107	—
13/64			0.2031	2.7/16	6"	12	058013	—	—
	6		0.2040	2.1/2	6"	12	—	058106	—
	5		0.2055	2.1/2	6"	12	—	058105	—
	4		0.2090	2.1/2	6"	12	—	058104	—
	3		0.2130	2.1/2	6"	12	—	058103	—
7/32			0.2188	2.1/2	6"	12	058014	—	—
	2		0.2210	2.5/8	6"	12	—	058102	—
	1		0.2280	2.5/8	6"	12	—	058101	—
		A	0.2340	2.5/8	6"	12	—	—	058201
15/64			0.2344	2.5/8	6"	12	058015	—	—
		B	0.2380	2.3/4	6"	12	—	—	058202
		C	0.2420	2.3/4	6"	12	—	—	058203
		D	0.2460	2.3/4	6"	12	—	—	058204
		E	0.2500	2.3/4	6"	12	—	—	058205
1/4			0.2500	2.3/4	6"	12	058016	—	—
		F	0.2570	2.7/8	6"	12	—	—	058206
		G	0.2610	2.7/8	6"	6	—	—	058207
17/64			0.2656	2.7/8	6"	6	058017	—	—
		H	0.2660	2.7/8	6"	6	—	—	058208
		I	0.2720	2.7/8	6"	6	—	—	058209
		J	0.2770	2.7/8	6"	6	—	—	058210
		K	0.2810	2.15/16	6"	6	—	—	058211
9/32			0.2813	2.15/16	6"	6	058018	—	—
		L	0.2900	2.15/16	6"	6	—	—	058212
		M	0.2950	3.1/16	6"	6	—	—	058213
19/64			0.2969	3.1/16	6"	6	058019	—	—
		N	0.3020	3.1/16	6"	6	—	—	058214
5/16			0.3125	3.3/16	6"	6	058020	—	—
		O	0.3160	3.3/16	6"	6	—	—	058215
		P	0.3230	3.5/16	6"	6	—	—	058216
21/64			0.3281	3.5/16	6"	6	058021	—	—
		Q	0.3320	3.7/16	6"	6	—	—	058217
		R	0.3390	3.7/16	6"	6	—	—	058218
11/32			0.3437	3.7/16	6"	6	058022	—	—

# AIRCRAFT EXTENSION DRILL



$d_1$ Ø Inch	$d_1$ Ø Nr.	$d_1$ Ø letter	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	500-6	501-6	502-6
		S	0.3480	3.1/2	6"	6	—	—	058219
		T	0.3580	3.1/2	6"	6	—	—	058220
23/64			0.3594	3.1/2	6"	6	058023	—	—
		U	0.3680	3.5/8	6"	6	—	—	058221
3/8			0.3750	3.5/8	6"	6	058024	—	—
		V	0.3770	3.5/8	6"	6	—	—	058222
		W	0.3860	3.3/4	6"	6	—	—	058223
25/64			0.3906	3.3/4	6"	6	058025	—	—
		X	0.3970	3.3/4	6"	6	—	—	058224
		Y	0.4040	3.7/8	6"	6	—	—	058225
13/32			0.4063	3.7/8	6"	6	058026	—	—
		Z	0.4130	3.7/8	6"	6	—	—	058226
27/64			0.4219	3.15/16	6"	6	058027	—	—
7/16			0.4375	4.1/16	6"	6	058028	—	—
29/64			0.4531	4.3/16	6"	6	058029	—	—
15/32			0.4687	4.5/16	6"	6	058030	—	—
31/64			0.4844	4.3/8	6"	6	058031	—	—
1/2			0.5000	4.1/2	6"	6	058032	—	—



# AIRCRAFT EXTENSION DRILL

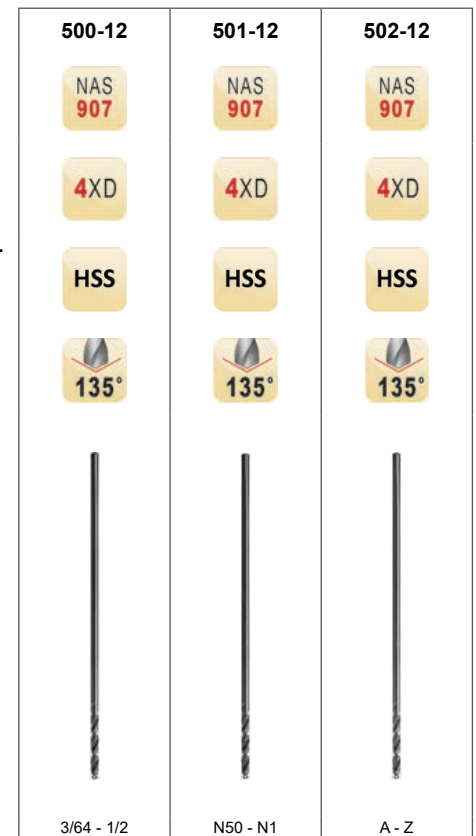
## Aircraft Extension (NAS 907 Type B)

**500-12** - Fractional Sizes

**501-12** - Wire Gauge Sizes

**502-12** - Letter Sizes

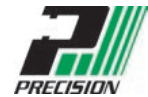
Low thrust design self centering 135° Split Point for easier penetration.  
Steam Oxide for increased wear resistance & lubricity.  
12" Over All Length



$d_1$ Ø Inch	$d_1$ Ø Nr.	$d_1$ Ø letter	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	500-12	501-12	502-12
3/64			0.0469	3/4	12"	12	059003 <sup>1)</sup>	—	—
1/16			0.0625	7/8	12"	12	059004	—	—
	50		0.0700	1"	12"	12	—	059150	—
	49		0.0730	1"	12"	12	—	059149	—
	48		0.0760	1"	12"	12	—	059148	—
5/64			0.0781	1"	12"	12	059005	—	—
	47		0.0785	1"	12"	12	—	059147	—
	46		0.0810	1.1/8	12"	12	—	059146	—
	45		0.0820	1.1/8	12"	12	—	059145	—
	44		0.0860	1.1/8	12"	12	—	059144	—
	43		0.0890	1.1/4	12"	12	—	059143	—
	42		0.0935	1.1/4	12"	12	—	059142	—
3/32			0.0938	1.1/4	12"	12	059006	—	—
	41		0.0960	1.3/8	12"	12	—	059141	—
	40		0.0980	1.3/8	12"	12	—	059140	—
	37		0.1040	1.7/16	12"	12	—	059137	—
	36		0.1065	1.7/16	12"	12	—	059136	—
7/64			0.1094	1.1/2	12"	12	059007	—	—
	31		0.1200	1.5/8	12"	12	—	059131	—
1/8			0.1250	1.5/8	12"	12	059008	—	—
	30		0.1285	1.5/8	12"	12	—	059130	—
	29		0.1360	1.3/4	12"	12	—	059129	—
9/64			0.1406	1.3/4	12"	12	059009	—	—
	27		0.1440	1.7/8	12"	12	—	059127	—
	26		0.1470	1.7/8	12"	12	—	059126	—
	25		0.1495	1.7/8	12"	12	—	059125	—
	23		0.1540	2"	12"	12	—	059123	—
5/32			0.1563	2"	12"	12	059010	—	—
	22		0.1570	2"	12"	12	—	059122	—
	21		0.1590	2.1/8	12"	12	—	059121	—
	20		0.1610	2.1/8	12"	12	—	059120	—
	19		0.1660	2.1/8	12"	12	—	059119	—

<sup>1)</sup> Not Split Point

# AIRCRAFT EXTENSION DRILL



d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	500-12	501-12	502-12
	18		0.1695	2.1/8	12"	12	—	059118	—
11/64			0.1719	2.1/8	12"	12	059011	—	—
	17		0.1730	2.3/16	12"	12	—	059117	—
	16		0.1770	2.3/16	12"	12	—	059116	—
	13		0.1850	2.5/16	12"	12	—	059113	—
3/16			0.1875	2.5/16	12"	6	059012	—	—
	12		0.1890	2.5/16	12"	6	—	059112	—
	11		0.1910	2.5/16	12"	6	—	059111	—
	10		0.1935	2.7/16	12"	6	—	059110	—
	9		0.1960	2.7/16	12"	6	—	059109	—
	7		0.2010	2.7/16	12"	6	—	059107	—
13/64			0.2031	2.7/16	12"	6	059013	—	—
	5		0.2055	2.1/2	12"	6	—	059105	—
	4		0.2090	2.1/2	12"	6	—	059104	—
	3		0.2130	2.1/2	12"	6	—	059103	—
7/32			0.2188	2.1/2	12"	6	059014	—	—
	1		0.2280	2.5/8	12"	6	—	059101	—
		A	0.2340	2.5/8	12"	6	—	—	059201
15/64			0.2344	2.5/8	12"	6	059015	—	—
		B	0.2380	2.3/4	12"	6	—	—	059202
		C	0.2420	2.3/4	12"	6	—	—	059203
		D	0.2460	2.3/4	12"	6	—	—	059204
		E	0.2500	2.3/4	12"	6	—	—	059205
1/4			0.2500	2.3/4	12"	6	059016	—	—
		F	0.2570	2.7/8	12"	6	—	—	059206
		G	0.2610	2.7/8	12"	6	—	—	059207
17/64			0.2656	2.7/8	12"	6	059017	—	—
		H	0.2660	2.7/8	12"	6	—	—	059208
		I	0.2720	2.7/8	12"	6	—	—	059209
		J	0.2770	2.7/8	12"	6	—	—	059210
		K	0.2810	2.15/16	12"	6	—	—	059211
9/32			0.2813	2.15/16	12"	6	059018	—	—
		L	0.2900	2.15/16	12"	6	—	—	059212
		M	0.2950	3.1/16	12"	6	—	—	059213
19/64			0.2969	3.1/16	12"	6	059019	—	—
		N	0.3020	3.1/16	12"	6	—	—	059214
5/16			0.3125	3.3/16	12"	6	059020	—	—
		O	0.3160	3.3/16	12"	6	—	—	059215
		P	0.3230	3.5/16	12"	6	—	—	059216
21/64			0.3281	3.5/16	12"	6	059021	—	—
		Q	0.3320	3.7/16	12"	6	—	—	059217
		R	0.3390	3.7/16	12"	6	—	—	059218
11/32			0.3437	3.7/16	12"	6	059022	—	—
		S	0.3480	3.1/2	12"	3	—	—	059219
		T	0.3580	3.1/2	12"	3	—	—	059220
23/64			0.3594	3.1/2	12"	3	059023	—	—
		U	0.3680	3.5/8	12"	3	—	—	059221
3/8			0.3750	3.5/8	12"	3	059024	—	—
		V	0.3770	3.5/8	12"	3	—	—	059222
		W	0.3860	3.3/4	12"	3	—	—	059223
25/64			0.3906	3.3/4	12"	3	059025	—	—
		X	0.3970	3.3/4	12"	3	—	—	059224
		Y	0.4040	3.7/8	12"	3	—	—	059225
13/32			0.4063	3.7/8	12"	3	059026	—	—
		Z	0.4130	3.7/8	12"	3	—	—	059226
27/64			0.4219	3.15/16	12"	3	059027	—	—
7/16			0.4375	4.1/16	12"	3	059028	—	—
29/64			0.4531	4.3/16	12"	3	059029	—	—
15/32			0.4687	4.5/16	12"	3	059030	—	—
31/64			0.4844	4.3/8	12"	3	059031	—	—
1/2			0.5000	4.1/2	12"	3	059032	—	—



# AIRCRAFT EXTENSION DRILL

## Heavy Duty Cobalt Aircraft Extension (NAS 907 Type J)

**CO500-6** - Fractional Sizes, 6" Over All Length

**CO501-6** - Wire Gauge Sizes, 6" Over All Length

**CO500-12** - Fractional Sizes, 12" Over All Length

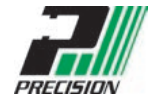
**CO501-12** - Wire Gauge Sizes, 12" Over All Length

Low thrust design self centering 135° Split Point for easier penetration. Low thrust design. Cobalt base material with Bronze Oxide for wear resistance and lubricity. For enhanced tool life in ferrous materials.



d <sub>1</sub> Ø Inch	d <sub>1</sub>	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	CO500-6	CO501-6	CO500-12	CO501-12
1/16		0.0625	7/8	12"	12	—	—	052604	—
1/16		0.0625	7/8	6"	12	053604	—	—	—
	52	0.0635	7/8	6"	12	—	053752	—	—
	51	0.0670	1"	6"	12	—	053751	—	—
	50	0.0700	1"	6"	12	—	053750	—	—
	49	0.0730	1"	6"	12	—	053749	—	—
	48	0.0760	1"	6"	12	—	053748	—	—
5/64		0.0781	1"	12"	12	—	—	052605	—
5/64		0.0781	1"	6"	12	053605	—	—	—
	47	0.0785	1"	6"	12	—	053747	—	—
	46	0.0810	1.1/8	6"	12	—	053746	—	—
	45	0.0820	1.1/8	6"	12	—	053745	—	—
	44	0.0860	1.1/8	6"	12	—	053744	—	—
	43	0.0890	1.1/4	6"	12	—	053743	—	—
	42	0.0935	1.1/4	6"	12	—	053742	—	—
3/32		0.0938	1.1/4	12"	12	—	—	052606	—
3/32		0.0938	1.1/4	6"	12	053606	—	—	—
	41	0.0960	1.3/8	6"	12	—	053741	—	—
	40	0.0980	1.3/8	12"	12	—	—	—	052840
	40	0.0980	1.3/8	6"	12	—	053740	—	—
	39	0.0995	1.3/8	6"	12	—	053739	—	—
	38	0.1015	1.7/16	6"	12	—	053738	—	—
	37	0.1040	1.7/16	6"	12	—	053737	—	—
	36	0.1065	1.7/16	6"	12	—	053736	—	—
7/64		0.1094	1.1/2	12"	12	—	—	052607	—
7/64		0.1094	1.1/2	6"	12	053607	—	—	—
	35	0.1100	1.1/2	6"	12	—	053735	—	—
	34	0.1110	1.1/2	6"	12	—	053734	—	—
	33	0.1130	1.1/2	6"	12	—	053733	—	—
	32	0.1160	1.5/8	6"	12	—	053732	—	—
	31	0.1200	1.5/8	6"	12	—	053731	—	—
1/8		0.1250	1.5/8	12"	12	—	—	052608	—
1/8		0.1250	1.5/8	6"	12	053608	—	—	—

# AIRCRAFT EXTENSION DRILL



d <sub>1</sub> Ø Inch	d <sub>1</sub>	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	CO500-6	CO501-6	CO500-12	CO501-12
	30	0.1285	1.5/8	12"	12	—	—	—	052830
	30	0.1285	1.5/8	6"	12	—	053730	—	—
	29	0.1360	1.3/4	12"	12	—	—	—	052829
	29	0.1360	1.3/4	6"	12	—	053729	—	—
	28	0.1405	1.3/4	6"	12	—	053728	—	—
9/64		0.1406	1.3/4	12"	12	—	—	052609	—
9/64		0.1406	1.3/4	6"	12	053609	—	—	—
	27	0.1440	1.7/8	12"	12	—	—	—	052827
	27	0.1440	1.7/8	6"	12	—	053727	—	—
	26	0.1470	1.7/8	6"	12	—	053726	—	—
	25	0.1495	1.7/8	6"	12	—	053725	—	—
	24	0.1520	2"	6"	12	—	053724	—	—
	23	0.1540	2"	6"	12	—	053723	—	—
5/32		0.1563	2"	12"	12	—	—	052610	—
5/32		0.1563	2"	6"	12	053610	—	—	—
	22	0.1570	2"	6"	12	—	053722	—	—
	21	0.1590	2.1/8	12"	12	—	—	—	052821
	21	0.1590	2.1/8	6"	12	—	053721	—	—
	20	0.1610	2.1/8	12"	12	—	—	—	052820
	20	0.1610	2.1/8	6"	12	—	053720	—	—
	19	0.1660	2.1/8	12"	12	—	—	—	052819
	19	0.1660	2.1/8	6"	12	—	053719	—	—
	18	0.1695	2.1/8	6"	12	—	053718	—	—
11/64		0.1719	2.1/8	12"	12	—	—	052611	—
11/64		0.1719	2.1/8	6"	12	053611	—	—	—
	17	0.1730	2.3/16	6"	12	—	053717	—	—
	16	0.1770	2.3/16	12"	12	—	—	—	052816
	16	0.1770	2.3/16	6"	12	—	053716	—	—
	15	0.1800	2.3/16	6"	12	—	053715	—	—
	14	0.1820	2.3/16	6"	12	—	053714	—	—
	13	0.1850	2.5/16	6"	12	—	053713	—	—
3/16		0.1875	2.5/16	12"	6	—	—	052612	—
3/16		0.1875	2.5/16	6"	12	053612	—	—	—
	12	0.1890	2.5/16	6"	12	—	053712	—	—
	11	0.1910	2.5/16	12"	12	—	—	—	052811
	11	0.1910	2.5/16	6"	12	—	053711	—	—
	10	0.1935	2.7/16	12"	6	—	—	—	052810
	10	0.1935	2.7/16	6"	12	—	053710	—	—
	9	0.1960	2.7/16	6"	12	—	053709	—	—
	8	0.1990	2.7/16	6"	12	—	053708	—	—
	7	0.2010	2.7/16	6"	12	—	053707	—	—
13/64		0.2031	2.7/16	12"	6	—	—	052613	—
13/64		0.2031	2.7/16	6"	12	053613	—	—	—
	6	0.2040	2.1/2	6"	12	—	053706	—	—
	5	0.2055	2.1/2	6"	12	—	053705	—	—
	4	0.2090	2.1/2	6"	12	—	053704	—	—
	3	0.2130	2.1/2	6"	12	—	053703	—	—
7/32		0.2188	2.1/2	12"	6	—	—	052614	—
7/32		0.2188	2.1/2	6"	12	053614	—	—	—
	2	0.2210	2.5/8	12"	6	—	—	—	052802
	2	0.2210	2.5/8	6"	12	—	053702	—	—
	1	0.2280	2.5/8	6"	12	—	053701	—	—
15/64		0.2344	2.5/8	12"	6	—	—	052615	—
15/64		0.2344	2.5/8	6"	12	053615	—	—	—
1/4		0.2500	2.3/4	12"	6	—	—	052616	—
1/4		0.2500	2.3/4	6"	12	053616	—	—	—





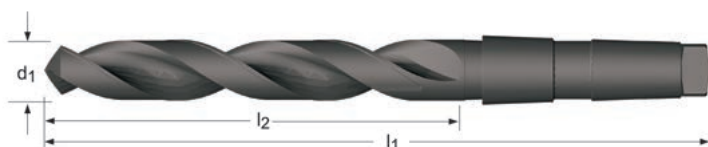
# TAPER SHANK DRILL

## General Purpose Taper Shank

**209** Standard Taper Type

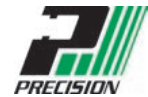
**S209** Small Taper Type

Steam Oxide for increased tool life & lubricity.



$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	MTS	Pack Qty	209	S209
1/8	0.1250	1.7/8	5.1/8	1	1	020008	—
9/64	0.1406	2.1/8	5.3/8	1	1	020009	—
5/32	0.1563	2.1/8	5.3/8	1	1	020010	—
11/64	0.1719	2.1/2	5.3/4	1	1	020011	—
3/16	0.1875	2.1/2	5.3/4	1	1	020012	—
13/64	0.2031	2.3/4	6"	1	1	020013	—
7/32	0.2188	2.3/4	6"	1	1	020014	—
15/64	0.2344	2.7/8	6.1/8	1	1	020015	—
1/4	0.2500	2.7/8	6.1/8	1	1	020016	—
17/64	0.2656	3"	6.1/4	1	1	020017	—
9/32	0.2813	3"	6.1/4	1	1	020018	—
19/64	0.2969	3.1/8	6.3/8	1	1	020019	—
5/16	0.3125	3.1/8	6.3/8	1	1	020020	—
21/64	0.3281	3.1/4	6.1/2	1	1	020021	—
11/32	0.3437	3.1/4	6.1/2	1	1	020022	—
23/64	0.3594	3.1/2	6.3/4	1	1	020023	—
3/8	0.3750	3.1/2	6.3/4	1	1	020024	—
25/64	0.3906	3.5/8	7"	1	1	020025	—
13/32	0.4063	3.5/8	7"	1	1	020026	—
27/64	0.4219	3.7/8	7.1/4	1	1	020027	—
7/16	0.4375	3.7/8	7.1/4	1	1	020028	—
29/64	0.4531	4.1/8	7.1/2	1	1	020029	—
15/32	0.4687	4.1/8	7.1/2	1	1	020030	—
31/64	0.4844	4.3/8	8.1/4	2	1	020031	—
1/2	0.5000	4.3/8	7.3/4	1	1	—	023032
1/2	0.5000	4.3/8	8.1/4	2	1	020032	—
33/64	0.5156	4.5/8	8"	1	1	—	023033
33/64	0.5156	4.5/8	8.1/2	2	1	020033	—
17/32	0.5313	4.5/8	8"	1	1	—	023034
17/32	0.5313	4.5/8	8.1/2	2	1	020034	—
35/64	0.5469	4.7/8	8.1/4	1	1	—	023035
35/64	0.5469	4.7/8	8.3/4	2	1	020035	—
9/16	0.5625	4.7/8	8.1/4	1	1	—	023036

# TAPER SHANK DRILL



d <sub>1</sub> Ø Inch	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	MTS	Pack Qty	209	S209
9/16	0.5625	4.7/8	8.3/4	2	1	020036	—
37/64	0.5781	4.7/8	8.3/4	2	1	020037	—
19/32	0.5937	4.7/8	8.3/4	2	1	020038	—
39/64	0.6094	4.7/8	8.3/4	2	1	020039	—
5/8	0.6250	4.7/8	8.3/4	2	1	020040	—
41/64	0.6406	5.1/8	9"	2	1	020041	—
21/32	0.6563	5.1/8	9"	2	1	020042	—
43/64	0.6719	5.3/8	9.1/4	2	1	020043	—
11/16	0.6875	5.3/8	9.1/4	2	1	020044	—
45/64	0.7031	5.5/8	9.1/2	2	1	020045	—
23/32	0.7188	5.5/8	9.1/2	2	1	020046	—
47/64	0.7344	5.7/8	9.3/4	2	1	020047	—
3/4	0.7500	5.7/8	9.3/4	2	1	020048	—
49/64	0.7656	6"	9.7/8	2	1	020049	—
25/32	0.7813	6"	9.7/8	2	1	020050	—
51/64	0.7969	6.1/8	10"	2	1	—	023051
51/64	0.7969	6.1/8	10.3/4	3	1	020051	—
13/16	0.8125	6.1/8	10"	2	1	—	023052
13/16	0.8125	6.1/8	10.3/4	3	1	020052	—
53/64	0.8281	6.1/8	10"	2	1	—	023053
53/64	0.8281	6.1/8	10.3/4	3	1	020053	—
27/32	0.8438	6.1/8	10"	2	1	—	023054
27/32	0.8438	6.1/8	10.3/4	3	1	020054	—
55/64	0.8594	6.1/8	10.3/4	3	1	020055	—
7/8	0.8750	6.1/8	10"	2	1	—	023056
7/8	0.8750	6.1/8	10.3/4	3	1	020056	—
57/64	0.8906	6.1/8	10.3/4	3	1	020057	—
29/32	0.9063	6.1/8	10"	2	1	—	023058
29/32	0.9063	6.1/8	10.3/4	3	1	020058	—
59/64	0.9219	6.1/8	10.3/4	3	1	020059	—
15/16	0.9375	6.1/8	10.3/4	3	1	020060	—
61/64	0.9531	6.3/8	11"	3	1	020061	—
31/32	0.9688	6.3/8	11"	3	1	020062	—
63/64	0.9844	6.3/8	11"	3	1	020063	—
1"	1.0000	6.3/8	11"	3	1	020100	—
1.1/64	1.0156	6.1/2	11.1/8	3	1	020101	—
1.1/32	1.0312	6.1/2	11.1/8	3	1	020102	—
1.3/64	1.0469	6.5/8	11.1/4	3	1	020103	—
1.1/16	1.0625	6.5/8	11.1/4	3	1	020104	—
1.5/64	1.0781	6.7/8	12.1/2	4	1	020105	—
1.3/32	1.0937	6.7/8	11.1/2	3	1	—	023106
1.3/32	1.0937	6.7/8	12.1/2	4	1	020106	—
1.7/64	1.1094	7.1/8	11.3/4	3	1	—	023107
1.7/64	1.1094	7.1/8	12.3/4	4	1	020107	—
1.1/8	1.1250	7.1/8	11.3/4	3	1	—	023108
1.1/8	1.1250	7.1/8	12.3/4	4	1	020108	—
1.9/64	1.1406	7.1/4	11.7/8	3	1	—	023109
1.9/64	1.1406	7.1/4	12.7/8	4	1	020109	—
1.5/32	1.1563	7.1/4	11.7/8	3	1	—	023110
1.5/32	1.1563	7.1/4	12.7/8	4	1	020110	—
1.11/64	1.1719	7.3/8	12"	3	1	—	023111
1.11/64	1.1719	7.3/8	13"	4	1	020111	—
1.3/16	1.1875	7.3/8	12"	3	1	—	023112
1.3/16	1.1875	7.3/8	13"	4	1	020112	—
1.13/64	1.2031	7.1/2	12.1/8	3	1	—	023113
1.7/32	1.2187	7.1/2	12.1/8	3	1	—	023114
1.7/32	1.2187	7.1/2	13.1/8	4	1	020114	—
1.15/64	1.2344	7.7/8	13.1/2	4	1	020115	—
1.1/4	1.2500	7.7/8	12.1/2	3	1	—	023116
1.1/4	1.2500	7.7/8	13.1/2	4	1	020116	—
1.17/64	1.2656	8.1/2	14.1/8	4	1	020117	—
1.9/32	1.2813	8.1/2	14.1/8	4	1	020118	—
1.19/64	1.2969	8.5/8	14.1/4	4	1	020119	—
1.5/16	1.3125	8.5/8	14.1/4	4	1	020120	—
1.21/64	1.3281	8.3/4	14.3/8	4	1	020121	—
1.11/32	1.3437	8.3/4	14.3/8	4	1	020122	—



# TAPER SHANK DRILL

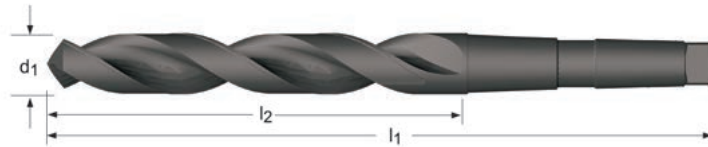
<b>d<sub>1</sub></b> <b>Ø</b>	<b>d<sub>1</sub></b> <b>decimal</b>	<b>l<sub>2</sub></b>	<b>l<sub>1</sub></b>	<b>MTS</b>	<b>Pack</b> <b>Qty</b>	<b>209</b>	<b>S209</b>
<b>Inch</b>	<b>Inch</b>	<b>Inch</b>	<b>Inch</b>				
1.3/8	1.3750	8.7/8	14.1/2	4	1	020124	—
1.13/32	1.4063	9"	14.5/8	4	1	020126	—
1.27/64	1.4219	9.1/8	14.3/4	4	1	020127	—
1.7/16	1.4375	9.1/8	14.3/4	4	1	020128	—
1.15/32	1.4687	9.1/4	14.7/8	4	1	020130	—
1.31/64	1.4844	9.3/8	15"	4	1	020131	—
1.1/2	1.5000	9.3/8	15"	4	1	020132	—
1.33/64	1.5156	9.3/8	15"	4	1	—	023133
1.17/32	1.5313	9.3/8	15"	4	1	—	023134
1.17/32	1.5313	9.3/8	16.3/8	5	1	020134	—
1.35/64	1.5469	9.5/8	15.1/4	4	1	—	023135
1.9/16	1.5625	9.5/8	15.1/4	4	1	—	023136
1.9/16	1.5625	9.5/8	16.5/8	5	1	020136	—
1.19/32	1.5937	9.7/8	15.1/2	4	1	—	023138
1.39/64	1.6094	10"	15.5/8	4	1	—	023139
1.5/8	1.6250	10"	15.5/8	4	1	—	023140
1.5/8	1.6250	10"	17"	5	1	020140	—
1.21/32	1.6563	10.1/8	15.3/4	4	1	—	023142
1.11/16	1.6875	10.1/8	15.3/4	4	1	—	023144
1.11/16	1.6875	10.1/8	17.1/8	5	1	020144	—
1.47/64	1.7344	10.3/8	16.1/4	4	1	—	023147
1.3/4	1.7500	10.1/8	17.1/8	5	1	020148	—
1.3/4	1.7500	10.3/8	16.1/4	4	1	—	023148
1.25/32	1.7813	10.3/8	16.1/4	4	1	—	023150
1.13/16	1.8125	10.1/8	17.1/8	5	1	020152	—
1.13/16	1.8125	10.3/8	16.1/4	4	1	—	023152
1.7/8	1.8750	10.1/2	16.1/2	4	1	—	023156
1.7/8	1.8750	10.3/8	17.3/8	5	1	020156	—
1.15/16	1.9375	10.3/8	17.3/8	5	1	020160	—
1.15/16	1.9375	10.5/8	16.5/8	4	1	—	023160
1.31/32	1.9687	10.5/8	16.5/8	4	1	—	023162
2"	2.0000	10.3/8	17.3/8	5	1	020200	—
2"	2.0000	10.5/8	16.5/8	4	1	—	023200

## General Purpose Taper Shank, Metric

**5ATS** Steam Oxide for increased wear resistance & lubricity.

**A350** Long series. Steam Oxide for increased wear resistance & lubricity.

**A530** TiN Coating increases wear resistance and improves tool life. Thinned Point design above 14mm diameter to reduce thrust and improve chip formation.



5ATS	A350	A530
5.00 - 50.00	5.00 - 50.00	8.50 - 40.00

d <sub>1</sub> Øh <sub>8</sub> mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	MTS	Pack Qty	5ATS	A350	A530
5.00	0.1969	74	155	1	1	—	0034071	—
5.00	0.1969	52	133	1	1	026050	—	—
5.50	0.2165	80	161	1	1	—	0034088	—
5.50	0.2165	57	138	1	1	026055	—	—
6.00	0.2362	80	161	1	1	—	0034118	—
6.00	0.2362	57	138	1	1	026060	—	—
6.50	0.2559	63	144	1	1	026065	—	—
6.70	0.2638	86	167	1	1	—	0034125	—
6.80	0.2677	93	174	1	1	—	0034149	—
6.80	0.2677	69	150	1	1	026068	—	—
7.00	0.2756	93	174	1	1	—	0034156	—
7.00	0.2756	69	150	1	1	026070	—	—
7.50	0.2953	93	174	1	1	—	0034163	—
7.50	0.2953	69	150	1	1	026075	—	—
8.00	0.3150	100	181	1	1	—	0034187	—
8.00	0.3150	75	156	1	1	026080	—	—
8.40	0.3307	100	181	1	1	—	0034200	—
8.50	0.3346	100	181	1	1	—	0034217	—
8.50	0.3346	75	156	1	1	026085	—	0041277
8.75	0.3445	107	188	1	1	—	0034224	—
9.00	0.3543	107	188	1	1	—	0034248	—
9.00	0.3543	81	162	1	1	026090	—	0041284
9.50	0.3740	107	188	1	1	—	0034279	—
9.50	0.3740	81	162	1	1	026095	—	—
9.80	0.3858	116	197	1	1	—	0034293	—
10.00	0.3937	116	197	1	1	—	0033241	—
10.00	0.3937	87	168	1	1	026100	—	0040713
10.20	0.4016	116	197	1	1	—	0033265	—
10.20	0.4016	87	168	1	1	026102	—	0040720
10.50	0.4134	116	197	1	1	—	0033289	—
10.50	0.4134	87	168	1	1	026105	—	0040737
10.70	0.4213	125	206	1	1	—	0033296	—
11.00	0.4331	125	206	1	1	—	0033319	—

d <sub>1</sub> Øh <sub>8</sub> mm	d <sub>1</sub> decimal Inch	l <sub>2</sub> mm	l <sub>1</sub> mm	MTS	Pack Qty	5ATS	A350	A530
11.00	0.4331	94	175	1	1	026110	—	0040744
11.50	0.4528	125	206	1	1	—	0033333	—
11.50	0.4528	94	175	1	1	026115	—	0040751
11.75	0.4626	125	206	1	1	—	0033340	—
11.75	0.4626	94	175	1	1	—	—	0040768
11.80	0.4646	125	206	1	1	—	0033357	—
12.00	0.4724	134	215	1	1	—	0033364	—
12.00	0.4724	101	182	1	1	026120	—	0040775
12.20	0.4803	101	182	1	1	026122	—	—
12.50	0.4921	134	215	1	1	—	0033395	—
12.50	0.4921	101	182	1	1	026125	—	0040799
12.80	0.5039	101	182	1	1	026128	—	—
13.00	0.5118	134	215	1	1	—	0033401	—
13.00	0.5118	101	182	1	1	026130	—	0040812
13.50	0.5315	142	223	1	1	—	0033418	—
13.50	0.5315	108	189	1	1	026135	—	0040829
13.80	0.5433	108	189	1	1	026138	—	—
14.00	0.5512	142	223	1	1	—	0033432	—
14.00	0.5512	108	189	1	1	026140	—	0040836
14.25	0.5610	147	245	2	1	—	0033449	—
14.25	0.5610	114	212	2	1	026142	—	—
14.50	0.5709	147	245	2	1	—	0033456	—
14.50	0.5709	114	212	2	1	026145	—	0040850
14.75	0.5807	147	245	2	1	—	0033463	—
14.75	0.5807	114	212	2	1	026147	—	—
15.00	0.5906	147	245	2	1	—	0033470	—
15.00	0.5906	114	212	2	1	026150	—	0040874
15.25	0.6004	120	218	2	1	—	—	0040881
15.25	0.6004	153	251	2	1	—	0033487	—
15.50	0.6102	153	251	2	1	—	0033494	—
15.50	0.6102	120	218	2	1	026155	—	0040898
15.75	0.6201	153	251	2	1	—	0033500	—
15.75	0.6201	120	218	2	1	026157	—	—
16.00	0.6299	153	251	2	1	—	0033517	—
16.00	0.6299	120	218	2	1	026160	—	0040911
16.25	0.6398	159	257	2	1	—	0033524	—
16.50	0.6496	159	257	2	1	—	0033531	—
16.50	0.6496	125	223	2	1	026165	—	0040935
16.75	0.6594	159	257	2	1	—	0033548	—
17.00	0.6693	159	257	2	1	—	0033555	—
17.00	0.6693	125	223	2	1	026170	—	0040942
17.25	0.6791	165	263	2	1	—	0033562	—
17.50	0.6890	165	263	2	1	—	0033579	—
17.50	0.6890	130	228	2	1	026175	—	0040966
18.00	0.7087	165	263	2	1	—	0033593	—
18.00	0.7087	130	228	2	1	026180	—	0040980
18.50	0.7283	171	269	2	1	—	0033616	—
18.50	0.7283	135	233	2	1	026185	—	0040997
19.00	0.7480	171	269	2	1	—	0033623	—
19.00	0.7480	135	233	2	1	026190	—	0041017
19.50	0.7677	177	275	2	1	—	0033647	—
19.50	0.7677	140	238	2	1	026195	—	0041024
19.75	0.7776	177	275	2	1	—	0033654	—
20.00	0.7874	177	275	2	1	—	0033661	—
20.00	0.7874	140	238	2	1	026200	—	0041048
20.25	0.7972	184	282	2	1	—	0033678	—
20.50	0.8071	184	282	2	1	—	0033685	—
20.50	0.8071	145	243	2	1	026205	—	0041055
21.00	0.8268	184	282	2	1	—	0033692	—
21.00	0.8268	145	243	2	1	026210	—	0041062
21.50	0.8465	191	289	2	1	—	0033708	—
21.50	0.8465	150	248	2	1	026215	—	0041079
22.00	0.8661	191	289	2	1	—	0033715	—
22.00	0.8661	150	248	2	1	026220	—	0041086
22.50	0.8858	198	296	2	1	—	0033722	—
22.50	0.8858	155	253	2	1	026225	—	0041093

$d_1$ $\varnothing h_8$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	MTS	Pack Qty	5ATS	A350	A530
23.00	0.9055	198	296	2	1	—	0033739	—
23.00	0.9055	155	253	2	1	026230	—	0041109
23.50	0.9252	198	319	3	1	—	0033746	—
23.50	0.9252	155	276	3	1	026235	—	0041116
24.00	0.9449	206	327	3	1	—	0033753	—
24.00	0.9449	160	281	3	1	026240	—	0041123
24.50	0.9646	206	327	3	1	—	0033760	—
24.50	0.9646	160	281	3	1	026245	—	0041130
25.00	0.9843	206	327	3	1	—	0033777	—
25.00	0.9843	160	281	3	1	026250	—	0041147
25.50	1.0039	165	286	3	1	—	—	0041154
25.50	1.0039	214	335	3	1	—	0033784	—
26.00	1.0236	214	335	3	1	—	0033791	—
26.00	1.0236	165	286	3	1	026260	—	0041161
26.50	1.0433	214	335	3	1	—	0033807	—
26.50	1.0433	165	286	3	1	026265	—	0041178
27.00	1.0630	222	343	3	1	—	0033814	—
27.00	1.0630	170	291	3	1	026270	—	0041185
27.50	1.0827	170	291	3	1	—	—	0041192
27.50	1.0827	222	343	3	1	—	0033821	—
28.00	1.1024	222	343	3	1	—	0033838	—
28.00	1.1024	170	291	3	1	026280	—	0041208
28.50	1.1220	175	296	3	1	—	—	0041215
29.00	1.1417	230	351	3	1	—	0033845	—
29.00	1.1417	175	296	3	1	026290	—	0041222
29.50	1.1614	175	296	3	1	—	—	0041239
30.00	1.1811	230	351	3	1	—	0033852	—
30.00	1.1811	175	296	3	1	026300	—	0041246
30.50	1.2008	239	360	3	1	—	0033869	—
31.00	1.2205	239	360	3	1	—	0033876	—
31.00	1.2205	180	301	3	1	026310	—	0041253
31.50	1.2402	239	360	3	1	—	0033883	—
32.00	1.2598	248	397	4	1	—	0033890	—
32.00	1.2598	185	334	4	1	026320	—	0041260
33.00	1.2992	185	334	4	1	—	—	0148433
33.00	1.2992	248	397	4	1	—	0033906	—
34.00	1.3386	257	406	4	1	—	0033913	—
34.00	1.3386	190	339	4	1	026340	—	—
35.00	1.3780	257	406	4	1	—	0033920	—
35.00	1.3780	190	339	4	1	026350	—	0148457
36.00	1.4173	267	416	4	1	—	0033937	—
36.00	1.4173	195	344	4	1	026360	—	—
37.00	1.4567	267	416	4	1	—	0033944	—
37.00	1.4567	195	344	4	1	026370	—	—
38.00	1.4961	277	426	4	1	—	0033951	—
38.00	1.4961	200	349	4	1	026380	—	—
39.00	1.5354	277	426	4	1	—	0033968	—
40.00	1.5748	277	426	4	1	—	0033975	—
40.00	1.5748	200	349	4	1	026400	—	0148471
41.00	1.6142	287	436	4	1	—	0033982	—
42.00	1.6535	287	436	4	1	—	0033999	—
42.00	1.6535	205	354	4	1	026420	—	—
43.00	1.6929	298	447	4	1	—	0034002	—
44.00	1.7323	298	447	4	1	—	0034019	—
44.00	1.7323	210	359	4	1	026440	—	—
45.00	1.7717	298	447	4	1	—	0034026	—
46.00	1.8110	310	459	4	1	—	0034033	—
47.00	1.8504	310	459	4	1	—	0034040	—
48.00	1.8898	321	470	4	1	—	0034057	—
50.00	1.9685	321	470	4	1	—	0034101	—
50.00	1.9685	220	369	4	1	026500	—	—

## General Purpose Taper Shank - Extra Length

**A345** Steam Oxide for increase wear resistance & lubricity.

**A345**

DIN  
**1870/1**

**10XD**

**HSS**

**118°**



8.00 - 50.00



$d_1$ $\varnothing_{h_8}$ Inch	$d_1$ $\varnothing_{h_8}$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	MTS	Pack Qty	<b>A345</b>
	8.00	0.3150	165	265	1	1	0418383
	8.50	0.3346	165	265	1	1	0418390
	9.00	0.3543	175	275	1	1	0418406
	9.50	0.3740	175	275	1	1	0420201
3/8	9.52	0.3750	185	285	1	1	0418307
	10.00	0.3937	185	285	1	1	0418062
13/32	10.32	0.4063	185	285	1	1	0418116
	10.50	0.4134	185	285	1	1	0420171
	11.00	0.4331	195	300	1	1	0418079
7/16	11.11	0.4375	195	300	1	1	0418369
	11.50	0.4528	195	300	1	1	0419564
29/64	11.51	0.4531	205	310	1	1	0418284
	12.00	0.4724	205	310	1	1	0418093
	12.50	0.4921	205	310	1	1	0419571
1/2	12.70	0.5000	205	310	1	1	0418055
	13.00	0.5118	205	310	1	1	0418109
17/32	13.49	0.5313	220	325	1	1	0418161
	13.50	0.5315	220	325	1	1	0419588
	14.00	0.5512	220	325	1	1	0418123
9/16	14.29	0.5625	220	340	2	1	0418413
37/64	14.68	0.5781	220	340	2	1	0418321
	15.00	0.5906	220	340	2	1	0418130
39/64	15.48	0.6094	230	355	2	1	0418338
	15.50	0.6102	230	355	2	1	0419601
5/8	15.88	0.6250	230	355	2	1	0418352
	16.00	0.6299	230	355	2	1	0418147
41/64	16.27	0.6406	230	355	2	1	0418345
	16.50	0.6496	230	355	2	1	0419618
21/32	16.67	0.6563	230	355	2	1	0418215
	17.00	0.6693	230	355	2	1	0418154
11/16	17.46	0.6875	245	370	2	1	0418086
	17.50	0.6890	245	370	2	1	0419625

# TAPER SHANK DRILL



$d_1$ $\varnothing h_8$ Inch	$d_1$ $\varnothing h_8$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	MTS	Pack Qty	A345
3/4	18.00	0.7087	245	370	2	1	0418178
	18.50	0.7283	245	370	2	1	0419632
	19.00	0.7480	245	370	2	1	0418185
	19.05	0.7500	260	385	2	1	0418291
	19.50	0.7677	260	385	2	1	0419649
	20.00	0.7874	260	385	2	1	0418192
	20.50	0.8071	260	385	2	1	0419656
	21.00	0.8268	260	385	2	1	0418208
	21.50	0.8465	270	405	2	1	0419663
7/8	22.00	0.8661	270	405	2	1	0418222
	22.22	0.8750	270	405	2	1	0418376
	22.50	0.8858	270	405	2	1	0419670
	23.00	0.9055	270	405	2	1	0419687
	23.50	0.9252	270	425	3	1	0419694
	24.00	0.9449	290	440	3	1	0418239
	24.50	0.9646	290	440	3	1	0419700
	25.00	0.9843	290	440	3	1	0418246
	1"	25.40	1.0000	290	440	3	1
25.50		1.0039	290	440	3	1	0419717 <sup>1)</sup>
26.00		1.0236	290	440	3	1	0418253 <sup>1)</sup>
26.50		1.0433	290	440	3	1	0419724 <sup>1)</sup>
27.00		1.0630	305	460	3	1	0418260 <sup>1)</sup>
28.00		1.1024	305	460	3	1	0418277 <sup>1)</sup>
29.00		1.1417	305	460	3	1	0419731 <sup>1)</sup>
30.00		1.1811	305	460	3	1	0418314 <sup>1)</sup>
1.1/4		31.75	1.2500	320	480	3	1
	31.00	1.2205	320	480	3	1	0419748 <sup>1)</sup>
	32.00	1.2598	320	505	4	1	0419755 <sup>1)</sup>
	33.00	1.2992	320	505	4	1	0422564 <sup>1)</sup>
	34.00	1.3386	340	530	4	1	0419762 <sup>1)</sup>
	35.00	1.3780	340	530	4	1	0419779 <sup>1)</sup>
	36.00	1.4173	340	530	4	1	0419786 <sup>1)</sup>
	37.00	1.4567	340	530	4	1	0419793 <sup>1)</sup>
	38.00	1.4961	360	555	4	1	0419809 <sup>1)</sup>
1.1/2	38.10	1.5000	360	555	4	1	0419540 <sup>1)</sup>
	39.00	1.5354	360	555	4	1	0419816 <sup>1)</sup>
	40.00	1.5748	360	555	4	1	0419823 <sup>1)</sup>
	41.00	1.6142	360	555	4	1	0419830 <sup>1)</sup>
	42.00	1.6535	360	555	4	1	0419847 <sup>1)</sup>
1.3/4	44.45	1.7500	385	585	4	1	0419557 <sup>1)</sup>
	45.00	1.7717	385	585	4	1	0419854 <sup>1)</sup>
	48.00	1.8898	405	605	4	1	0419861 <sup>1)</sup>
	50.00	1.9685	405	605	4	1	0419878 <sup>1)</sup>

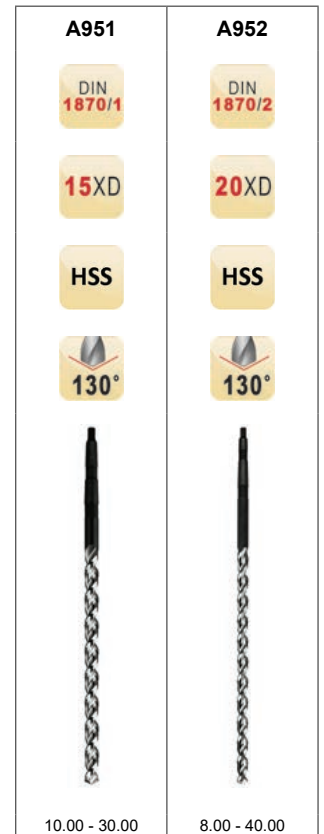
<sup>1)</sup> < 10xD



## General Purpose Parabolic Flute Taper Shank - Extra Length, Metric

- A951** Parabolic Flute design for efficient chip removal. Allows greater drilling depths in one pass. Bright Finish in flutes improves chip flow for soft or non-ferrous materials.
- A952**

\* Lands are steam oxide for increased wear resistance & lubricity.



$d_1$ $\varnothing h_8$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	MTS	Pack Qty	A951	A952
8.00	0.3150	210	330	1	1	—	0423639
8.50	0.3346	210	330	1	1	—	0423646
9.00	0.3543	220	345	1	1	—	0423653
10.00	0.3937	185	285	1	1	0418420	—
10.00	0.3937	235	360	1	1	—	0419885
10.50	0.4134	235	360	1	1	—	0419892
11.00	0.4331	195	300	1	1	0418437	—
11.00	0.4331	250	375	1	1	—	0419908
11.50	0.4528	250	375	1	1	—	0419915
12.00	0.4724	205	310	1	1	0418444	—
12.00	0.4724	260	395	1	1	—	0419922
12.50	0.4921	205	310	1	1	0418451	—
12.50	0.4921	260	395	1	1	—	0419939
13.00	0.5118	205	310	1	1	0418468	—
13.00	0.5118	260	395	1	1	—	0420188
13.50	0.5315	220	325	1	1	0418475	—
13.50	0.5315	275	410	1	1	—	0419946
14.00	0.5512	220	325	1	1	0418482	—
14.00	0.5512	275	410	1	1	—	0419953
14.50	0.5709	220	340	2	1	0418499 <sup>1)</sup>	—
14.50	0.5709	275	425	2	1	—	0419960 <sup>2)</sup>
15.00	0.5906	220	340	2	1	0418505 <sup>1)</sup>	—
15.00	0.5906	275	425	2	1	—	0419977 <sup>2)</sup>
15.50	0.6102	230	355	2	1	0418512 <sup>1)</sup>	—
15.50	0.6102	295	445	2	1	—	0419984 <sup>2)</sup>
16.00	0.6299	230	355	2	1	0418529 <sup>1)</sup>	—
16.00	0.6299	295	445	2	1	—	0420195 <sup>2)</sup>
16.50	0.6496	230	355	2	1	0418536 <sup>1)</sup>	—
16.50	0.6496	295	445	2	1	—	0419991 <sup>2)</sup>
17.00	0.6693	230	355	2	1	0418543 <sup>1)</sup>	—
17.00	0.6693	295	445	2	1	—	0420003 <sup>2)</sup>

<sup>1)</sup> < 15xD  
<sup>2)</sup> < 20xD

# TAPER SHANK DRILL



$d_1$ $\varnothing_{h_8}$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	MTS	Pack Qty	A951	A952
17.50	0.6890	245	370	2	1	0418550 <sup>1)</sup>	—
17.50	0.6890	310	465	2	1	—	0420010 <sup>2)</sup>
18.00	0.7087	245	370	2	1	0418567 <sup>1)</sup>	—
18.00	0.7087	310	465	2	1	—	0420027 <sup>2)</sup>
18.50	0.7283	245	370	2	1	0418574 <sup>1)</sup>	—
18.50	0.7283	310	465	2	1	—	0420034 <sup>2)</sup>
19.00	0.7480	245	370	2	1	0418581 <sup>1)</sup>	—
19.00	0.7480	310	465	2	1	—	0420041 <sup>2)</sup>
19.50	0.7677	260	385	2	1	0418598 <sup>1)</sup>	—
19.50	0.7677	325	490	2	1	—	0420058 <sup>2)</sup>
20.00	0.7874	260	385	2	1	0418604 <sup>1)</sup>	—
20.00	0.7874	325	490	2	1	—	0420065 <sup>2)</sup>
21.00	0.8268	260	385	2	1	0418611 <sup>1)</sup>	—
21.00	0.8268	325	490	2	1	—	0420072 <sup>2)</sup>
22.00	0.8661	270	405	2	1	0418628 <sup>1)</sup>	—
22.00	0.8661	345	515	2	1	—	0420089 <sup>2)</sup>
23.00	0.9055	270	405	2	1	0418635 <sup>1)</sup>	—
23.00	0.9055	345	515	2	1	—	0420096 <sup>2)</sup>
24.00	0.9449	290	440	3	1	0418642 <sup>1)</sup>	—
24.00	0.9449	365	555	3	1	—	0420102 <sup>2)</sup>
25.00	0.9843	290	440	3	1	0418659 <sup>1)</sup>	—
25.00	0.9843	365	555	3	1	—	0420119 <sup>2)</sup>
26.00	1.0236	290	440	3	1	0418666 <sup>1)</sup>	—
26.00	1.0236	365	555	3	1	—	0420126 <sup>2)</sup>
27.00	1.0630	305	460	3	1	0418673 <sup>1)</sup>	—
27.00	1.0630	385	580	3	1	—	0420133 <sup>2)</sup>
28.00	1.1024	305	460	3	1	0418680 <sup>1)</sup>	—
28.00	1.1024	385	580	3	1	—	0420140 <sup>2)</sup>
29.00	1.1417	305	460	3	1	0418697 <sup>1)</sup>	—
29.00	1.1417	385	580	3	1	—	0420157 <sup>2)</sup>
30.00	1.1811	305	460	3	1	0418703 <sup>1)</sup>	—
30.00	1.1811	385	580	3	1	—	0420164 <sup>2)</sup>
31.00	1.2205	410	610	3	1	—	0423585 <sup>2)</sup>
32.00	1.2598	410	635	4	1	—	0423592 <sup>2)</sup>
33.00	1.2992	410	635	4	1	—	0423608 <sup>2)</sup>
34.00	1.3386	430	665	4	1	—	0423660 <sup>2)</sup>
35.00	1.3780	430	665	4	1	—	0423677 <sup>2)</sup>
38.00	1.4961	460	695	4	1	—	0423615 <sup>2)</sup>
40.00	1.5748	460	695	4	1	—	0423622 <sup>2)</sup>

<sup>1)</sup> < 15xD

<sup>2)</sup> < 20xD



# COBALT TAPER SHANK DRILL

## Cobalt Heavy Duty Taper Shank

**209CO** Notched Point reduces thrust. Cobalt base material with Bronze Oxide for wear resistance and lubricity. Suitable for ferrous materials.



209CO

ANSI

4XD

HSS-E

135°



1/4 - 1 1/2

d <sub>1</sub> Ø Inch	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	MTS	Pack Qty	209CO
1/4	0.2500	2.7/8	6.1/8	1	1	021316
9/32	0.2813	3"	6.1/4	1	1	021318
5/16	0.3125	3.1/8	6.3/8	1	1	021320
11/32	0.3437	3.1/4	6.1/2	1	1	021322
3/8	0.3750	3.1/2	7.3/8	2	1	021324
13/32	0.4063	3.5/8	7.1/2	2	1	021326
27/64	0.4219	3.7/8	7.3/4	2	1	021327
7/16	0.4375	3.7/8	7.3/4	2	1	021328
29/64	0.4531	4.1/8	8"	2	1	021329
15/32	0.4687	4.1/8	8"	2	1	021330
31/64	0.4844	4.3/8	8.1/4	2	1	021331
1/2	0.5000	4.3/8	8.1/4	2	1	021332
33/64	0.5156	4.5/8	8.1/2	2	1	021333
17/32	0.5313	4.5/8	8.1/2	2	1	021334
35/64	0.5469	4.7/8	8.3/4	2	1	021335
9/16	0.5625	4.7/8	8.3/4	2	1	021336
37/64	0.5781	4.7/8	8.3/4	2	1	021337
19/32	0.5937	4.7/8	8.3/4	2	1	021338
39/64	0.6094	4.7/8	8.3/4	2	1	021339
5/8	0.6250	4.7/8	8.3/4	2	1	021340
41/64	0.6406	5.1/8	9"	2	1	021341
21/32	0.6563	5.1/8	9.3/4	3	1	021342
43/64	0.6719	5.3/8	10"	3	1	021343
11/16	0.6875	5.3/8	10"	3	1	021344
45/64	0.7031	5.5/8	10.1/4	3	1	021345
23/32	0.7188	5.5/8	10.1/4	3	1	021348
47/64	0.7344	5.7/8	10.1/2	3	1	021347
3/4	0.7500	5.7/8	10.1/2	3	1	021350
49/64	0.7656	6"	10.5/8	3	1	021349
25/32	0.7813	6"	10.5/8	3	1	021352
51/64	0.7969	6.1/8	10.3/4	3	1	021351
13/16	0.8125	6.1/8	10.3/4	3	1	021354
53/64	0.8281	6.1/8	10.3/4	3	1	021353

# COBALT TAPER SHANK DRILL



$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	MTS	Pack Qty	209CO
27/32	0.8438	6.1/8	10.3/4	3	1	021355
55/64	0.8594	6.1/8	10.3/4	3	1	021357
7/8	0.8750	6.1/8	10.3/4	3	1	021356
57/64	0.8906	6.1/8	10.3/4	3	1	021358
29/32	0.9062	6.1/8	10.3/4	3	1	021359
59/64	0.9219	6.1/8	10.3/4	3	1	021362
15/16	0.9375	6.1/8	10.3/4	3	1	021360
61/64	0.9531	6.3/8	11"	3	1	021363
31/32	0.9688	6.3/8	11"	3	1	021364
63/64	0.9844	6.3/8	11"	3	1	021365
1"	1.0000	6.3/8	11"	3	1	021400
1.1/64	1.0156	6.1/2	12.1/8	4	1	021401
1.1/32	1.0312	6.1/2	12.1/8	4	1	021402
1.1/16	1.0625	6.5/8	12.1/4	4	1	021404
1.3/32	1.0937	6.7/8	12.1/2	4	1	021406
1.7/64	1.1094	7.1/8	12.3/4	4	1	021407
1.1/8	1.1250	7.1/8	12.3/4	4	1	021408
1.11/64	1.1719	7.3/8	13"	4	1	021411
1.3/16	1.1875	7.3/8	13"	4	1	021412
1.7/32	1.2188	7.1/2	13.1/8	4	1	021414
1.1/4	1.2500	7.7/8	13.1/2	4	1	021416
1.9/32	1.2813	8.1/2	14.1/8	4	1	021418
1.11/32	1.3437	8.3/4	14.3/8	4	1	021422
1.3/8	1.3750	8.7/8	14.1/2	4	1	021424
1.7/16	1.4375	9.1/8	14.3/4	4	1	021428
1.1/2	1.5000	9.3/8	15"	4	1	021432



# COBALT TAPER SHANK DRILL

## Metric Cobalt Heavy Duty Taper Shank

**A730** Notched Point reduces thrust. Cobalt base material with Bronze Oxide for wear resistance and lubricity. Suitable for ferrous materials.



A730

DIN  
345

4XD

HSS-E

118°



1/4 - 1.1/2

d <sub>1</sub> Ø mm	d <sub>1</sub> decimal mm	l <sub>2</sub> mm	l <sub>1</sub> mm	MTS	Pack Qty	A730
10.00	0.3937	87	168	1	1	0045190
10.20	0.4016	87	168	1	1	0045206
10.50	0.4134	87	168	1	1	0045213
10.80	0.4252	94	175	1	1	0045220
11.00	0.4331	94	175	1	1	0045237
11.50	0.4528	94	175	1	1	0045244
11.80	0.4646	94	175	1	1	0045251
12.00	0.4724	101	182	1	1	0045268
12.20	0.4803	101	182	1	1	0045275
12.50	0.4921	101	182	1	1	0045282
12.80	0.5039	101	182	1	1	0045299
13.00	0.5118	101	182	1	1	0045305
13.50	0.5315	108	189	1	1	0045312
13.80	0.5433	108	189	1	1	0045329
14.00	0.5512	108	189	1	1	0045336
14.25	0.5610	114	212	2	1	0045343
14.50	0.5709	114	212	2	1	0045350
14.75	0.5807	114	212	2	1	0045367
15.00	0.5906	114	212	2	1	0045374
15.25	0.6004	120	218	2	1	0045381
15.50	0.6102	120	218	2	1	0045398
15.75	0.6201	120	218	2	1	0045404
16.00	0.6299	120	218	2	1	0045411
16.25	0.6398	120	218	2	1	0045428
16.50	0.6496	125	223	2	1	0045435
17.00	0.6693	125	223	2	1	0045459
17.25	0.6791	130	228	2	1	0045466
17.50	0.6890	130	228	2	1	0045473
17.75	0.6988	130	228	2	1	0045480
18.00	0.7087	130	228	2	1	0045497
18.25	0.7185	135	233	2	1	0045503
18.50	0.7283	135	233	2	1	0045510
18.75	0.7382	135	233	2	1	0045527

# COBALT TAPER SHANK DRILL



$d_1$ Ø mm	$d_1$ decimal mm	$l_2$ mm	$l_1$ mm	MTS	Pack Qty	A730
19.00	0.7480	135	233	2	1	0045534
19.25	0.7579	140	238	2	1	0045541
19.50	0.7677	140	238	2	1	0045558
19.75	0.7776	140	238	2	1	0045565
20.00	0.7874	140	238	2	1	0045572
20.25	0.7972	145	243	2	1	0045589
20.50	0.8071	145	243	2	1	0045596
20.75	0.8169	145	243	2	1	0045602
21.00	0.8268	145	243	2	1	0045619
21.50	0.8465	150	248	2	1	0045626
22.00	0.8661	150	248	2	1	0045640
22.50	0.8858	155	253	2	1	0045664
23.00	0.9055	155	253	2	1	0045688
23.50	0.9252	155	276	3	1	0045695
24.00	0.9449	160	281	3	1	0045701
24.50	0.9646	160	281	3	1	0045718
25.00	0.9843	160	281	3	1	0045725
25.50	1.0039	165	286	3	1	0045732
26.00	1.0236	165	286	3	1	0045749
26.50	1.0433	165	286	3	1	0045756
27.00	1.0630	170	291	3	1	0045763
27.50	1.0827	170	291	3	1	0045770
28.00	1.1024	170	291	3	1	0045787
28.50	1.1220	175	296	3	1	0045794
29.00	1.1417	175	296	3	1	0045800
30.00	1.1811	175	296	3	1	0045824
31.00	1.2205	180	301	3	1	0045848
32.00	1.2598	185	334	4	1	0045862



# HSS CORE DRILL

## Taper Shank - 4-Flute

**T400** Core drill with taper shank for enlarging pre-drilled or cast holes in a wide range of materials.



**T400**

HSS

ST

ANSI

1/2 - 1.5/8

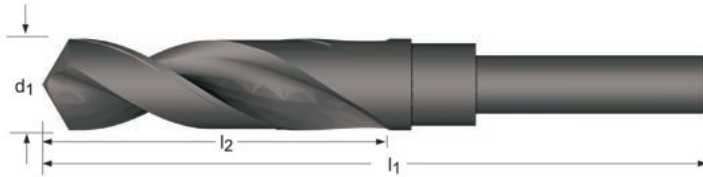
$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	MTS	Pack Qty	T400
1/2	0.5000	4.3/8	8.1/4	2	1	024532
17/32	0.5312	4.5/8	8.1/2	2	1	024534
9/16	0.5625	4.7/8	8.3/4	2	1	024536
5/8	0.6250	4.7/8	8.3/4	2	1	024540
21/32	0.6562	5.1/8	9"	2	1	024542
3/4	0.7500	5.7/8	9.3/4	2	1	024548
25/32	0.7812	6"	9.7/8	2	1	024550
7/8	0.8750	6.1/8	10.3/4	3	1	024556
1"	1.0000	6.3/8	11"	3	1	024600
1.1/32	1.0312	6.1/2	11.1/8	3	1	024602
1.1/16	1.0625	6.5/8	11.1/4	3	1	024604
1.1/8	1.1250	7.1/8	12.3/4	4	1	024608
1.5/32	1.1562	7.1/4	12.7/8	4	1	024610
1.1/4	1.2500	7.7/8	13.1/2	4	1	024616
1.5/16	1.3125	8.5/8	14.1/4	4	1	024620
1.11/32	1.3438	8.3/4	14.3/8	4	1	024622
1.3/8	1.3750	8.7/8	14.1/2	4	1	024624
1.1/2	1.5000	9.3/8	15"	4	1	024632
1.9/16	1.5625	9.5/8	16.5/8	5	1	024636
1.5/8	1.6250	10"	17"	5	1	024640

# REDUCED SHANK DRILL



## General Purpose Reduced Shank - 1/2" Shank

**A170** Silver & Deming Drills. Steam Oxide for increased wear resistance & lubricity.



A170



4XD

HSS



13.00 - 1.1/2

$d_1$ Øh <sub>8</sub> Inch	$d_1$ Øh <sub>8</sub> mm	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A170
	13.00	0.5118					1	0030165
33/64	13.10	0.5157	3.1/8	6"			1	0121870
17/32	13.49	0.5313	3.1/8	6"			1	0030295
	13.50	0.5315			83	156	1	0030172
35/64	13.89	0.5469	3.1/8	6"			1	0121887
	14.00	0.5512			83	156	1	0030196
9/16	14.29	0.5625	3.1/8	6"			1	0030523
	14.50	0.5709			83	156	1	0030202
37/64	14.68	0.5781	3.1/8	6"			1	0121894
	15.00	0.5906			83	156	1	0030219
19/32	15.08	0.5937	3.1/8	6"			1	0030349
39/64	15.48	0.6094	3.1/8	6"			1	0121900
	15.50	0.6102			83	156	1	0030226
5/8	15.88	0.6250	3.1/8	6"			1	0030509
	16.00	0.6299			84	157	1	0030240
41/64	16.27	0.6406	3.1/8	6"			1	0030479
	16.50	0.6496			84	157	1	0030257
21/32	16.67	0.6563	3.1/8	6"			1	0030370
	17.00	0.6693			84	157	1	0030264
43/64	17.07	0.6719	3.1/8	6"			1	0121917
11/16	17.46	0.6875	3.1/8	6"			1	0030141
	17.50	0.6890			84	157	1	0030271
45/64	17.86	0.7031	3.1/8	6"			1	0030288
	18.00	0.7087			84	157	1	0030301
23/32	18.26	0.7188	3.1/8	6"			1	0030400
	18.50	0.7283			84	157	1	0030318
47/64	18.65	0.7344	3.1/8	6"			1	0121924
	19.00	0.7480			84	157	1	0030325
3/4	19.05	0.7500	3.1/8	6"			1	0030462
49/64	19.45	0.7656	3"	6"			1	0121931
	19.50	0.7677			81	158	1	0030332
25/32	19.84	0.7812	3"	6"			1	0030431
	20.00	0.7874			81	158	1	0030356



$d_1$ $\varnothing h_8$ Inch	$d_1$ $\varnothing h_8$ mm	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A170
51/64	20.24	0.7969	3"	6"			1	0030486
13/16	20.64	0.8125	3"	6"			1	0030189
	21.00	0.8268			82	158	1	0030363
53/64	21.03	0.8281	3"	6"			1	0121948
27/32	21.43	0.8437	3"	6"			1	0030448
55/64	21.83	0.8594	3"	6"			1	0121955
	22.00	0.8661			82	158	1	0030387
7/8	22.22	0.8750	3"	6"			1	0030516
57/64	22.62	0.8906	3"	6"			1	0030493
	23.00	0.9055			82	158	1	0030394
29/32	23.02	0.9062	3"	6"			1	0121863
59/64	23.42	0.9220	3"	6"			1	0121962
15/16	23.81	0.9375	3"	6"			1	0030233
	24.00	0.9449			83	159	1	0030417
61/64	24.21	0.9531	3"	6"			1	0121979
31/32	24.61	0.9688	3"	6"			1	0030455
	25.00	0.9843			83	159	1	0030424
63/64	25.00	0.9844	3"	6"			1	0121986
1"	25.40	1.0000	3"	6"			1	0030134
1.1/32	26.19	1.0312	3"	6"			1	0172728
1.1/16	26.99	1.0625	3"	6"			1	0172735
1.7/64	28.18	1.1094	3"	6"			1	0238288
1.1/8	28.58	1.1250	3"	6"			1	0172759
1.9/64	28.97	1.1406	3"	6"			1	0238301
1.5/32	29.37	1.1563	3"	6"			1	0172766
1.3/16	30.16	1.1875	3"	6"			1	0172773
1.7/32	30.96	1.2188	3"	6"			1	0172780
1.1/4	31.75	1.2500	3"	6"			1	0172797
1.5/16	33.34	1.3125	3"	6"			1	0172803
1.3/8	34.93	1.3750	3"	6"			1	0172810
1.7/16	36.51	1.4375	3"	6"			1	0172827
1.1/2	38.10	1.5000	3"	6"			1	0172834

# REDUCED SHANK DRILL



## General Purpose Reduced Shank - 1/2" Shank

\* Sets Available on pg. 241

**R56** Silver & Deming Drills. Steam Oxide for increased wear resistance & lubricity.

R56

ANSI

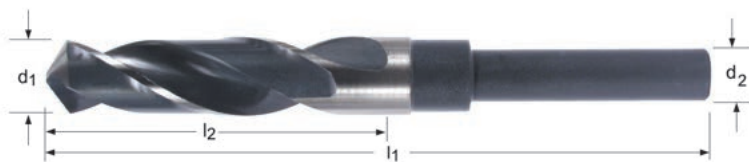
4XD

HSS

118°



33/64 - 1.1/2



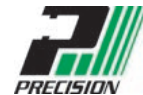
d <sub>1</sub> Ø Inch	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	d <sub>2</sub> Ø Inch	Pack Qty	R56
33/64	0.5156	3"	6"	1/2	1	091433
17/32	0.5313	3"	6"	1/2	1	091434
35/64	0.5469	3"	6"	1/2	1	091435
9/16	0.5625	3"	6"	1/2	1	091436
37/64	0.5781	3"	6"	1/2	1	091437
19/32	0.5937	3"	6"	1/2	1	091438
39/64	0.6094	3"	6"	1/2	1	091439
5/8	0.6250	3"	6"	1/2	1	091440
41/64	0.6406	3"	6"	1/2	1	091441
21/32	0.6563	3"	6"	1/2	1	091442
43/64	0.6719	3"	6"	1/2	1	091443
11/16	0.6875	3"	6"	1/2	1	091444
45/64	0.7031	3"	6"	1/2	1	091445
23/32	0.7188	3"	6"	1/2	1	091446
47/64	0.7344	3"	6"	1/2	1	091447
3/4	0.7500	3"	6"	1/2	1	091448
49/64	0.7656	3"	6"	1/2	1	091449
25/32	0.7813	3"	6"	1/2	1	091450
51/64	0.7969	3"	6"	1/2	1	091451
13/16	0.8125	3"	6"	1/2	1	091452
53/64	0.8281	3"	6"	1/2	1	091453
27/32	0.8438	3"	6"	1/2	1	091454
55/64	0.8594	3"	6"	1/2	1	091455
7/8	0.8750	3"	6"	1/2	1	091456
57/64	0.8906	3"	6"	1/2	1	091457
29/32	0.9063	3"	6"	1/2	1	091458
59/64	0.9219	3"	6"	1/2	1	091459
15/16	0.9375	3"	6"	1/2	1	091460
61/64	0.9531	3"	6"	1/2	1	091461
31/32	0.9688	3"	6"	1/2	1	091462
63/64	0.9844	3"	6"	1/2	1	091463
1"	1.0000	3"	6"	1/2	1	091464
1.1/64	1.0156	3"	6"	1/2	1	091465



# REDUCED SHANK DRILL

<b>d<sub>1</sub></b> <b>Ø</b> <b>Inch</b>	<b>d<sub>1</sub></b> <b>decimal</b> <b>Inch</b>	<b>l<sub>2</sub></b> <b>Inch</b>	<b>l<sub>1</sub></b> <b>Inch</b>	<b>d<sub>2</sub></b> <b>Ø</b> <b>Inch</b>	<b>Pack</b> <b>Qty</b>	<b>R56</b>
1.1/32	1.0312	3"	6"	1/2	1	091486
1.3/64	1.0469	3"	6"	1/2	1	091467
1.1/16	1.0625	3"	6"	1/2	1	091468
1.5/64	1.0781	3"	6"	1/2	1	091469
1.3/32	1.0937	3"	6"	1/2	1	091470
1.7/64	1.1094	3"	6"	1/2	1	091471
1.1/8	1.1250	3"	6"	1/2	1	091472
1.9/64	1.1406	3"	6"	1/2	1	091473
1.5/32	1.1563	3"	6"	1/2	1	091487
1.11/64	1.1719	3"	6"	1/2	1	091474
1.3/16	1.1875	3"	6"	1/2	1	091476
1.13/64	1.2031	3"	6"	1/2	1	091475
1.7/32	1.2187	3"	6"	1/2	1	091488
1.15/64	1.2344	3"	6"	1/2	1	091477
1.1/4	1.2500	3"	6"	1/2	1	091480
1.9/32	1.2813	3"	6"	1/2	1	091479
1.5/16	1.3125	3"	6"	1/2	1	091482
1.11/32	1.3437	3"	6"	1/2	1	091497
1.3/8	1.3750	3"	6"	1/2	1	091483
1.13/32	1.4063	3"	6"	1/2	1	091492
1.7/16	1.4375	3"	6"	1/2	1	091484
1.15/32	1.4687	3"	6"	1/2	1	091495
1.1/2	1.5000	3"	6"	1/2	1	091485

# REDUCED SHANK DRILL



## General Purpose Reduced Shank - 1/2" Shank with 3-Flats

\* Sets Available on pg. 241

**R57** Silver & Deming Drills with 3-Flat Shank. Steam Oxide for increased wear resistance & lubricity.

R57

ANSI

4XD

HSS

118°



33/64 - 1.1/2

d <sub>1</sub> Ø Inch	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	d <sub>2</sub> Ø Inch	Pack Qty	R57
33/64	0.5156	3"	6"	1/2	1	091533
17/32	0.5313	3"	6"	1/2	1	091534
35/64	0.5469	3"	6"	1/2	1	091535
9/16	0.5625	3"	6"	1/2	1	091536
37/64	0.5781	3"	6"	1/2	1	091537
19/32	0.5937	3"	6"	1/2	1	091538
39/64	0.6094	3"	6"	1/2	1	091539
5/8	0.6250	3"	6"	1/2	1	091540
41/64	0.6406	3"	6"	1/2	1	091541
21/32	0.6563	3"	6"	1/2	1	091542
43/64	0.6719	3"	6"	1/2	1	091543
11/16	0.6875	3"	6"	1/2	1	091544
45/64	0.7031	3"	6"	1/2	1	091545
23/32	0.7188	3"	6"	1/2	1	091546
47/64	0.7344	3"	6"	1/2	1	091547
3/4	0.7500	3"	6"	1/2	1	091548
49/64	0.7656	3"	6"	1/2	1	091549
25/32	0.7813	3"	6"	1/2	1	091550
51/64	0.7969	3"	6"	1/2	1	091551
13/16	0.8125	3"	6"	1/2	1	091552
53/64	0.8281	3"	6"	1/2	1	091553
27/32	0.8438	3"	6"	1/2	1	091554
55/64	0.8594	3"	6"	1/2	1	091555
7/8	0.8750	3"	6"	1/2	1	091556
57/64	0.8906	3"	6"	1/2	1	091557
29/32	0.9063	3"	6"	1/2	1	091558
59/64	0.9219	3"	6"	1/2	1	091559
15/16	0.9375	3"	6"	1/2	1	091560
61/64	0.9531	3"	6"	1/2	1	091561
31/32	0.9688	3"	6"	1/2	1	091562
63/64	0.9844	3"	6"	1/2	1	091563
1"	1.0000	3"	6"	1/2	1	091564
1.1/64	1.0156	3"	6"	1/2	1	091565



# REDUCED SHANK DRILL

<b>d<sub>1</sub></b> <b>Ø</b> <b>Inch</b>	<b>d<sub>1</sub></b> <b>decimal</b> <b>Inch</b>	<b>l<sub>2</sub></b> <b>Inch</b>	<b>l<sub>1</sub></b> <b>Inch</b>	<b>d<sub>2</sub></b> <b>Ø</b> <b>Inch</b>	<b>Pack</b> <b>Qty</b>	<b>R57</b>
1.1/32	1.0312	3"	6"	1/2	1	091586
1.3/64	1.0469	3"	6"	1/2	1	091567
1.1/16	1.0625	3"	6"	1/2	1	091568
1.5/64	1.0781	3"	6"	1/2	1	091569
1.3/32	1.0937	3"	6"	1/2	1	091570
1.7/64	1.1094	3"	6"	1/2	1	091571
1.1/8	1.1250	3"	6"	1/2	1	091572
1.9/64	1.1406	3"	6"	1/2	1	091573
1.5/32	1.1563	3"	6"	1/2	1	091587
1.11/64	1.1719	3"	6"	1/2	1	091575
1.3/16	1.1875	3"	6"	1/2	1	091576
1.13/64	1.2031	3"	6"	1/2	1	091577
1.7/32	1.2187	3"	6"	1/2	1	091588
1.15/64	1.2344	3"	6"	1/2	1	091579
1.1/4	1.2500	3"	6"	1/2	1	091580
1.9/32	1.2813	3"	6"	1/2	1	091589
1.5/16	1.3125	3"	6"	1/2	1	091582
1.11/32	1.3437	3"	6"	1/2	1	091592
1.3/8	1.3750	3"	6"	1/2	1	091583
1.13/32	1.4063	3"	6"	1/2	1	091595
1.7/16	1.4375	3"	6"	1/2	1	091584
1.15/32	1.4687	3"	6"	1/2	1	091598
1.1/2	1.5000	3"	6"	1/2	1	091585

# REDUCED SHANK DRILL



## General Purpose Reduced Shank - 3/4" Shank

**R58** Silver & Deming Drills. Steam Oxide for increased wear resistance & lubricity

R58

ANSI

1.5XD

HSS

118°



1" - 2"

d <sub>1</sub> Ø Inch	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	d <sub>2</sub> Ø Inch	Pack Qty	R58
1"	1.0000	3"	6"	3/4"	1	091264
1.1/32	1.0312	3"	6"	3/4"	1	091266
1.1/16	1.0625	3"	6"	3/4"	1	091268
1.3/32	1.0937	3"	6"	3/4"	1	091270
1.1/8	1.1250	3"	6"	3/4"	1	091272
1.5/32	1.1563	3"	6"	3/4"	1	091274
1.3/16	1.1875	3"	6"	3/4"	1	091276
1.7/32	1.2187	3"	6"	3/4"	1	091278
1.1/4	1.2500	3"	6"	3/4"	1	091280
1.9/32	1.2813	3"	6"	3/4"	1	091282
1.5/16	1.3125	3"	6"	3/4"	1	091284
1.11/32	1.3437	3"	6"	3/4"	1	091286
1.3/8	1.3750	3"	6"	3/4"	1	091288
1.13/32	1.4063	3"	6"	3/4"	1	091290
1.7/16	1.4375	3"	6"	3/4"	1	091292
1.15/32	1.4687	3"	6"	3/4"	1	091294
1.1/2	1.5000	3"	6"	3/4"	1	091296
1.9/16	1.5625	3"	6"	3/4"	1	091298
1.5/8	1.6250	3"	6"	3/4"	1	091300
1.11/16	1.6875	3"	6"	3/4"	1	091302
1.3/4	1.7500	3"	6"	3/4"	1	091304
1.13/16	1.8125	3"	6"	3/4"	1	091306
1.7/8	1.8750	3"	6"	3/4"	1	091308
1.15/16	1.9375	3"	6"	3/4"	1	091310
2"	2.0000	3"	6"	3/4"	1	091312

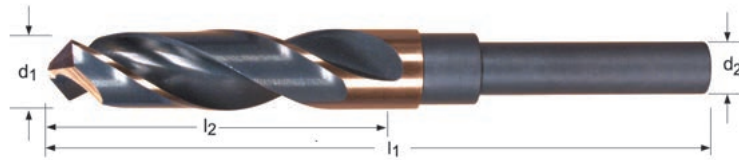


# REDUCED SHANK DRILL

## Cobalt, Heavy Duty, Reduced Shank - 1/2" Shank

\* Sets Available on pg. 241

**R56CO** Silver & Deming Drills. Self centering Split Point reduces thrust. Cobalt base material with Bronze/Steam Oxide for wear resistance and lubricity. Suitable for ferrous materials.



R56CO

ANSI

4XD

HSS-E

118°



33/64 - 1"

d <sub>1</sub> Ø Inch	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	d <sub>2</sub> Ø Inch	Pack Qty	R56CO
33/64	0.5156	3"	6"	1/2	1	092333
17/32	0.5313	3"	6"	1/2	1	092334
35/64	0.5469	3"	6"	1/2	1	092335
9/16	0.5625	3"	6"	1/2	1	092336
37/64	0.5781	3"	6"	1/2	1	092337
19/32	0.5937	3"	6"	1/2	1	092338
39/64	0.6094	3"	6"	1/2	1	092339
5/8	0.6250	3"	6"	1/2	1	092340
41/64	0.6406	3"	6"	1/2	1	092341
21/32	0.6563	3"	6"	1/2	1	092342
43/64	0.6719	3"	6"	1/2	1	092343
11/16	0.6875	3"	6"	1/2	1	092344
45/64	0.7031	3"	6"	1/2	1	092345
23/32	0.7188	3"	6"	1/2	1	092346
47/64	0.7344	3"	6"	1/2	1	092347
3/4	0.7500	3"	6"	1/2	1	092348
49/64	0.7656	3"	6"	1/2	1	092349
25/32	0.7813	3"	6"	1/2	1	092350
51/64	0.7969	3"	6"	1/2	1	092351
13/16	0.8125	3"	6"	1/2	1	092352
53/64	0.8281	3"	6"	1/2	1	092353
27/32	0.8438	3"	6"	1/2	1	092354
55/64	0.8594	3"	6"	1/2	1	092355
7/8	0.8750	3"	6"	1/2	1	092356
57/64	0.8906	3"	6"	1/2	1	092357
29/32	0.9063	3"	6"	1/2	1	092358
59/64	0.9219	3"	6"	1/2	1	092359
15/16	0.9375	3"	6"	1/2	1	092360
61/64	0.9531	3"	6"	1/2	1	092361
31/32	0.9688	3"	6"	1/2	1	092362
63/64	0.9844	3"	6"	1/2	1	092363
1"	1.0000	3"	6"	1/2	1	092364

# SPECIAL PURPOSE DRILL



## Jobber Length Carbide Tipped

**D444** Heavy-Duty Brazed Carbide Tipped for abrasive materials or non-ferrous materials.

D444

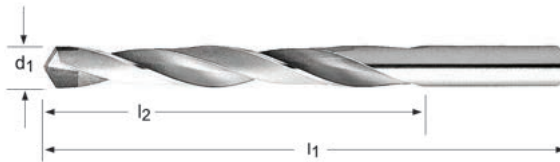


4XD

HSS  
HM



N32 - 1/2



$d_1$ Ø "/Nr./letter	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	D444
32	0.1160	1.5/8	2.3/4	1	034632
1/8	0.1250	1.5/8	2.3/4	1	034408
30	0.1285	1.5/8	2.3/4	1	034630
29	0.1360	1.3/4	2.7/8	1	034629
9/64	0.1406	1.3/4	2.7/8	1	034409
25	0.1495	1.7/8	3"	1	034625
5/32	0.1563	2"	3.1/8	1	034410
21	0.1590	2.1/8	3.1/4	1	034621
20	0.1610	2.1/8	3.1/4	1	034620
19	0.1660	2.1/8	3.1/4	1	034619
18	0.1695	2.1/8	3.1/4	1	034618
11/64	0.1719	2.1/8	3.1/4	1	034411
17	0.1730	2.3/16	3.3/8	1	034617
15	0.1800	2.3/16	3.3/8	1	034615
14	0.1820	2.3/16	3.3/8	1	034614
13	0.1850	2.5/16	3.1/2	1	034613
3/16	0.1875	2.5/16	3.1/2	1	034412
11	0.1910	2.5/16	3.1/2	1	034611
10	0.1935	2.7/16	3.5/8	1	034610
9	0.1960	2.7/16	3.5/8	1	034609
7	0.2010	2.7/16	3.5/8	1	034607
13/64	0.2031	2.7/16	3.5/8	1	034413
3	0.2130	2.1/2	3.3/4	1	034603
7/32	0.2188	2.1/2	3.3/4	1	034414
1	0.2280	2.5/8	3.7/8	1	034601
15/64	0.2344	2.5/8	3.7/8	1	034415
B	0.2380	2.3/4	4"	1	034502
C	0.2420	2.3/4	4"	1	034503
E	0.2500	2.3/4	4"	1	034505
1/4	0.2500	2.3/4	4"	1	034416
F	0.2570	2.7/8	4.1/8	1	034506
G	0.2610	2.7/8	4.1/8	1	034507
17/64	0.2656	2.7/8	4.1/8	1	034417





# SPECIAL PURPOSE DRILL

$d_1$ Ø "/Nr./letter	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	D444
H	0.2660	2.7/8	4.1/8	1	034508
I	0.2720	2.7/8	4.1/8	1	034509
J	0.2770	2.7/8	4.1/8	1	034510
K	0.2810	2.15/16	4.1/4	1	034511
9/32	0.2813	2.15/16	4.1/4	1	034418
L	0.2900	2.15/16	4.1/4	1	034512
19/64	0.2969	3.1/16	4.3/8	1	034419
N	0.3020	3.1/16	4.3/8	1	034514
5/16	0.3125	3.3/16	4.1/2	1	034420
O	0.3160	3.3/16	4.1/2	1	034515
P	0.3230	3.5/16	4.5/8	1	034516
21/64	0.3281	3.5/16	4.5/8	1	034421
Q	0.3320	3.7/16	4.3/4	1	034517
R	0.3390	3.7/16	4.3/4	1	034518
11/32	0.3437	3.7/16	4.3/4	1	034422
S	0.3480	3.1/2	4.7/8	1	034519
T	0.3580	3.1/2	4.7/8	1	034520
23/64	0.3594	3.1/2	4.7/8	1	034423
U	0.3680	3.5/8	5"	1	034521
3/8	0.3750	3.5/8	5"	1	034424
25/64	0.3906	3.3/4	5.1/8	1	034425
13/32	0.4063	3.7/8	5.1/4	1	034426
Z	0.4130	3.7/8	5.1/4	1	034526
27/64	0.4219	3.15/16	5.3/8	1	034427
7/16	0.4375	4.1/16	5.1/2	1	034428
29/64	0.4531	4.3/16	5.5/8	1	034429
15/32	0.4687	4.5/16	5.3/4	1	034430
31/64	0.4844	4.3/8	5.7/8	1	034431
1/2	0.5000	4.1/2	6"	1	034432

# SPECIAL PURPOSE DRILL



## Jobber Length Carbide Tipped

**A160** Heavy-Duty Brazed Carbide Tipped for abrasive materials or non-ferrous materials.

A160

DIN  
338

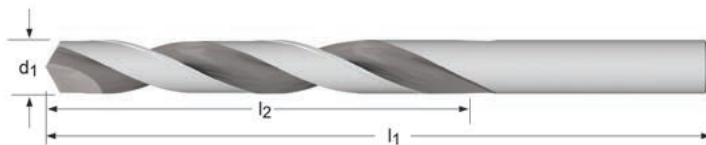
4XD

HSS  
HM

118°



4.00 - 16.00



$d_1$ $\varnothing h_8$ mm	$d_1$ decimal Inch	$l_2$ mm	$l_1$ mm	Pack Qty	A160
4.00	0.1575	43	75	1	0029725
4.50	0.1772	47	80	1	0029732
5.00	0.1969	52	86	1	0029749
5.50	0.2165	57	93	1	0029756
6.00	0.2362	57	93	1	0029763
6.50	0.2559	63	101	1	0029770
6.80	0.2677	69	109	1	0029787
7.00	0.2756	69	109	1	0029794
7.50	0.2953	69	109	1	0029800
8.00	0.3150	75	117	1	0029817
8.50	0.3346	75	117	1	0029824
9.00	0.3543	81	125	1	0029831
9.50	0.3740	81	125	1	0029848
10.00	0.3937	87	133	1	0029626
10.20	0.4016	87	133	1	0029633
10.50	0.4134	87	133	1	0029640
11.00	0.4331	94	142	1	0029657
11.50	0.4528	94	142	1	0029664
12.00	0.4724	101	151	1	0029671
13.00	0.5118	101	151	1	0029688
14.00	0.5512	108	160	1	0029695
15.00	0.5906	114	169	1	0029701
16.00	0.6299	120	178	1	0029718



# SOLID CARBIDE DRILL

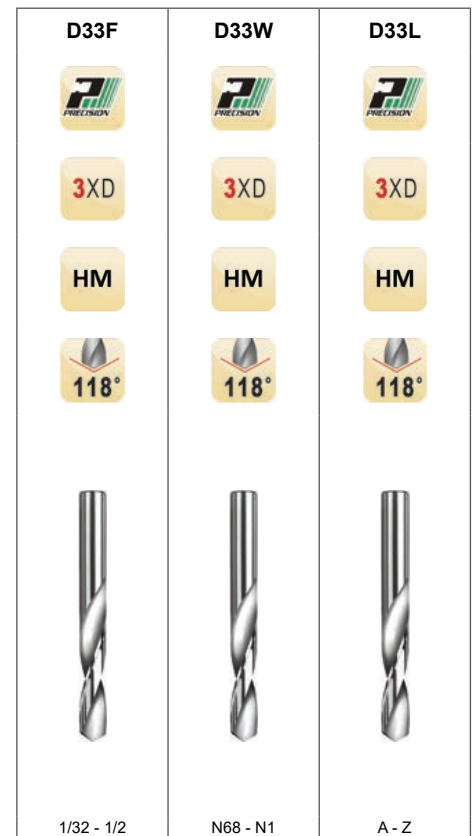
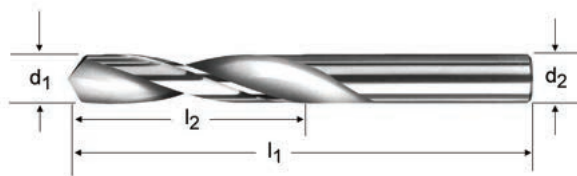
## General Purpose Solid Carbide Jobber Length

**D33F** - Fractional Sizes

**D33W** - Wire Gauge Sizes

**D33L** - Letter Sizes

4-Facet Self Centering Point. Low thrust design. For abrasive or non-ferrous materials.



$d_1$ Ø Inch	$d_1$ Ø Nr.	$d_1$ Ø letter	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	D33F	D33W	D33L
1/32	68		0.0310	5/16	1.1/4	1	—	003500	—
			0.0313	5/16	1.1/4	1	003501	—	—
		67		0.0320	5/16	1.1/4	1	—	003502
		66		0.0330	5/16	1.1/4	1	—	003503
		65		0.0350	5/8	1.3/8	1	—	003504
		64		0.0360	5/8	1.3/8	1	—	003505
		63		0.0370	5/8	1.3/8	1	—	003506
		62		0.0380	5/8	1.3/8	1	—	003507
		61		0.0390	5/8	1.3/8	1	—	003508
		60		0.0400	3/4	1.1/2	1	—	003509
		59		0.0410	3/4	1.1/2	1	—	003510
		58		0.0420	3/4	1.1/2	1	—	003511
		57		0.0430	3/4	1.1/2	1	—	003512
		56		0.0465	3/4	1.1/2	1	—	003513
3/64			0.0469	3/4	1.1/2	1	003514	—	—
		55		0.0520	3/4	1.1/2	1	—	003515
		54		0.0550	3/4	1.1/2	1	—	003516
		53		0.0595	3/4	1.1/2	1	—	003517
1/16			0.0625	3/4	1.1/2	1	003518	—	—
		52		0.0635	3/4	1.1/2	1	—	003519
		51		0.0670	3/4	1.1/2	1	—	003520
		50		0.0700	7/8	1.3/4	1	—	003521
		49		0.0730	7/8	1.3/4	1	—	003522
		48		0.0760	7/8	1.3/4	1	—	003523
5/64			0.0781	7/8	1.3/4	1	003524	—	—
		47		0.0785	7/8	1.3/4	1	—	003525
		46		0.0810	7/8	1.3/4	1	—	003526
		45		0.0820	7/8	1.3/4	1	—	003527
		44		0.0860	1"	2"	1	—	003528
		43		0.0890	1"	2"	1	—	003529
		42		0.0935	1"	2"	1	—	003530
		41		0.0960	1"	2"	1	—	003532
3/32			0.0938	1"	2"	1	003531	—	—
		41		0.0960	1"	2"	1	—	003532

# SOLID CARBIDE DRILL



d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	D33F	D33W	D33L
	40		0.0980	1"	2"	1	—	003533	—
	39		0.0995	1.1/4	2.1/4	1	—	003534	—
	38		0.1015	1.1/4	2.1/4	1	—	003535	—
	37		0.1040	1.1/4	2.1/4	1	—	003536	—
	36		0.1065	1.1/4	2.1/4	1	—	003537	—
7/64			0.1094	1.1/4	2.1/4	1	003538	—	—
	35		0.1100	1.1/4	2.1/4	1	—	003539	—
	34		0.1110	1.1/4	2.1/4	1	—	003540	—
	33		0.1130	1.1/4	2.1/4	1	—	003541	—
	32		0.1160	1.1/4	2.1/4	1	—	003542	—
	31		0.1200	1.1/4	2.1/4	1	—	003543	—
1/8			0.1250	1.1/4	2.1/4	1	003544	—	—
	30		0.1285	1.3/8	2.1/2	1	—	003545	—
	29		0.1360	1.3/8	2.1/2	1	—	003546	—
	28		0.1405	1.3/8	2.1/2	1	—	003547	—
9/64			0.1406	1.3/8	2.1/2	1	003548	—	—
	27		0.1440	1.3/8	2.1/2	1	—	003549	—
	26		0.1470	1.3/8	2.1/2	1	—	003550	—
	25		0.1495	1.3/8	2.1/2	1	—	003551	—
	24		0.1520	1.3/8	2.1/2	1	—	003552	—
	23		0.1540	1.3/8	2.1/2	1	—	003553	—
5/32			0.1563	1.3/8	2.1/2	1	003554	—	—
	22		0.1570	1.3/8	2.1/2	1	—	003555	—
	21		0.1590	1.3/8	2.1/2	1	—	003556	—
	20		0.1610	1.3/8	2.1/2	1	—	003557	—
	19		0.1660	1.5/8	2.3/4	1	—	003558	—
	18		0.1695	1.5/8	2.3/4	1	—	003559	—
11/64			0.1719	1.5/8	2.3/4	1	003560	—	—
	17		0.1730	1.5/8	2.3/4	1	—	003561	—
	16		0.1770	1.5/8	2.3/4	1	—	003562	—
	15		0.1800	1.5/8	2.3/4	1	—	003563	—
	14		0.1820	1.5/8	2.3/4	1	—	003564	—
	13		0.1850	1.5/8	2.3/4	1	—	003565	—
3/16			0.1875	1.5/8	2.3/4	1	003566	—	—
	12		0.1890	1.5/8	2.3/4	1	—	003567	—
	11		0.1910	1.5/8	2.3/4	1	—	003568	—
	10		0.1935	1.5/8	2.3/4	1	—	003569	—
	9		0.1960	1.3/4	3"	1	—	003570	—
	8		0.1990	1.3/4	3"	1	—	003571	—
	7		0.2010	1.3/4	3"	1	—	003572	—
13/64			0.2031	1.3/4	3"	1	003573	—	—
	6		0.2040	1.3/4	3"	1	—	003574	—
	5		0.2055	1.3/4	3"	1	—	003575	—
	4		0.2090	1.3/4	3"	1	—	003576	—
	3		0.2130	1.3/4	3"	1	—	003577	—
7/32			0.2188	1.3/4	3"	1	003578	—	—
	2		0.2210	1.3/4	3"	1	—	003579	—
	1		0.2280	1.3/4	3"	1	—	003580	—
15/64		A	0.2340	2"	3.1/4	1	—	—	003581
			0.2344	2"	3.1/4	1	003582	—	—
		B	0.2380	2"	3.1/4	1	—	—	003583
		C	0.2420	2"	3.1/4	1	—	—	003584
		D	0.2460	2"	3.1/4	1	—	—	003585
1/4			0.2500	2"	3.1/4	1	003586	—	—
		F	0.2570	2"	3.1/4	1	—	—	003587
		G	0.2610	2.1/8	3.1/2	1	—	—	003588
17/64			0.2656	2.1/8	3.1/2	1	003589	—	—
		H	0.2660	2.1/8	3.1/2	1	—	—	003590
		I	0.2720	2.1/8	3.1/2	1	—	—	003591
		J	0.2770	2.1/8	3.1/2	1	—	—	003592
		K	0.2810	2.1/8	3.1/2	1	—	—	003593
9/32			0.2813	2.1/8	3.1/2	1	003594	—	—
		L	0.2900	2.1/8	3.1/2	1	—	—	003595
		M	0.2950	2.3/8	4"	1	—	—	003596
19/64			0.2969	2.3/8	4"	1	003597	—	—
		N	0.3020	2.3/8	4"	1	—	—	003598



# SOLID CARBIDE DRILL

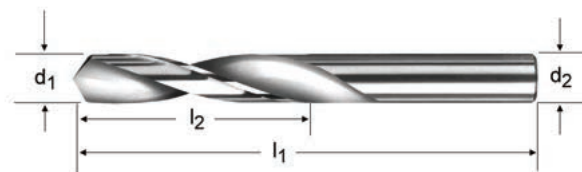
d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø Nr.	d <sub>1</sub> Ø letter	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	D33F	D33W	D33L
5/16			0.3125	2.3/8	4"	1	003599	—	—
		O	0.3160	2.3/8	4"	1	—	—	003600
		P	0.3230	2.3/8	4"	1	—	—	003601
21/64			0.3281	2.3/8	4"	1	003602	—	—
		Q	0.3320	2.3/8	4"	1	—	—	003603
		R	0.3390	2.3/8	4"	1	—	—	003604
11/32			0.3437	2.3/8	4"	1	003605	—	—
		S	0.3480	2.3/8	4"	1	—	—	003606
		T	0.3580	2.3/4	4.1/4	1	—	—	003607
23/64			0.3594	2.3/4	4.1/4	1	003608	—	—
		U	0.3680	2.3/4	4.1/4	1	—	—	003609
3/8			0.3750	2.3/4	4.1/4	1	003610	—	—
		V	0.3770	2.3/4	4.1/4	1	—	—	003611
		W	0.3860	2.7/8	4.1/2	1	—	—	003612
25/64			0.3906	2.7/8	4.1/2	1	003613	—	—
		X	0.3970	2.7/8	4.1/2	1	—	—	003614
		Y	0.4040	2.7/8	4.1/2	1	—	—	003615
13/32			0.4063	2.7/8	4.1/2	1	003616	—	—
		Z	0.4130	2.7/8	4.1/2	1	—	—	003617
27/64			0.4219	2.7/8	4.1/2	1	003618	—	—
7/16			0.4375	2.7/8	4.1/2	1	003619	—	—
29/64			0.4531	3"	4.3/4	1	003620	—	—
15/32			0.4687	3"	4.3/4	1	003621	—	—
31/64			0.4844	3"	4.3/4	1	003622	—	—
1/2			0.5000	3"	4.3/4	1	003623	—	—

# SOLID CARBIDE DRILL



## General Purpose Solid Carbide Jobber Length, Metric

**D33M** Self Centering Point. Low thrust design. For abrasive or non-ferrous materials.



D33M



1.00 - 12.00

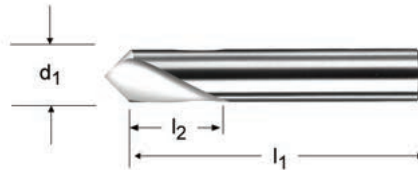
$d_1$ Ø	$d_1$ decimal	$l_2$	$l_1$	Pack Qty	D33M
mm	Inch	inch	inch		
1.00	0.0394	5/8	1.1/2	1	003472
1.50	0.0591	3/4	1.1/2	1	003473
2.00	0.0787	7/8	1.3/4	1	003474
2.05	0.0807	7/8	1.3/4	1	003475
2.50	0.0984	1"	2"	1	003476
3.00	0.1181	1.1/4	2.1/4	1	003477
3.30	0.1299	1.3/8	2.1/2	1	003624
3.50	0.1378	1.3/8	2.1/2	1	003478
4.00	0.1575	1.3/8	2.1/2	1	003626
4.50	0.1772	1.5/8	2.3/4	1	003479
5.00	0.1969	1.3/4	3"	1	003630
5.50	0.2165	1.3/4	3"	1	003480
6.00	0.2362	2"	3.1/4	1	003481
6.50	0.2559	2"	3.1/4	1	003482
7.00	0.2756	2.1/8	3.1/2	1	003483
7.50	0.2953	2.3/8	4"	1	003484
8.00	0.3150	2.3/8	4"	1	003485
8.50	0.3346	2.3/8	4"	1	003486
9.00	0.3543	2.3/4	4.1/4	1	003487
9.50	0.3740	2.3/4	4.1/4	1	003488
10.00	0.3937	2.7/8	4.1/2	1	003631
10.50	0.4134	2.7/8	4.1/2	1	003489
10.75	0.4232	2.7/8	4.1/2	1	003490
11.00	0.4331	2.7/8	4.1/2	1	003491
11.50	0.4528	3"	4.3/4	1	003492
12.00	0.4724	3"	4.3/4	1	003493



# SOLID CARBIDE DRILL

## General Purpose Solid Carbide Standard Length - Spotting Drill

**DS-90** Provides 90°, 120° or 142° included angle spot locations or chamfers for  
**DS-120** follow-up drilling & tapping operations.  
**DS-142**



DS-90	DS-120	DS-142
1/8 - 1/2	1/8 - 1/2	1/8 - 1/2

$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	DS-90	DS-120	DS-142
1/8	0.1250	3/8	2"	1	003332	7378063	7378069
3/16	0.1875	3/4	3"	1	003334	7378064	7378970
1/4	0.2500	3/4	3"	1	003336	7378068	7378974
5/16	0.3125	1"	2.1/2	1	003338	7378066	7378972
3/8	0.3750	1"	3"	1	003340	7378065	7378971
1/2	0.5000	1"	4"	1	003342	7378067	7378973

# SPECIAL PURPOSE DRILL



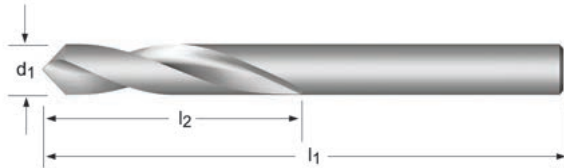
## Spotting Drill - Short Length

**SPS-90** Bright Finish improves chip flow in soft or non-ferrous materials

**SPSG-90** TiN Coating for increased wear resistance and improved tool life.

**SPS-120** Bright Finish improves chip flow in soft or non-ferrous materials

**SPSG-120** TiN Coating for increased wear resistance and improved tool life.



SPS-90	SPSG-90	SPS-120	SPSG-120
1/4 - 1"	1/4 - 1"	1/4 - 1"	1/4 - 1"

$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	SPS-90	SPSG-90	SPS-120	SPSG-120
1/4	0.2500	3/4	2.1/2	1	087900	087906	087950	087956
3/8	0.3750	1.1/8	3.1/8	1	087901	087907	087951	087957
1/2	0.5000	1.3/8	3.3/4	1	087902	087908	087952	087958
5/8	0.6250	1.5/8	4.3/8	1	087903	087909	087953	087959
3/4	0.7500	1.7/8	5"	1	087904	087910	087954	087960
1"	1.0000	2.1/4	6"	1	087905	087911	087955	087961





# SPECIAL PURPOSE DRILL

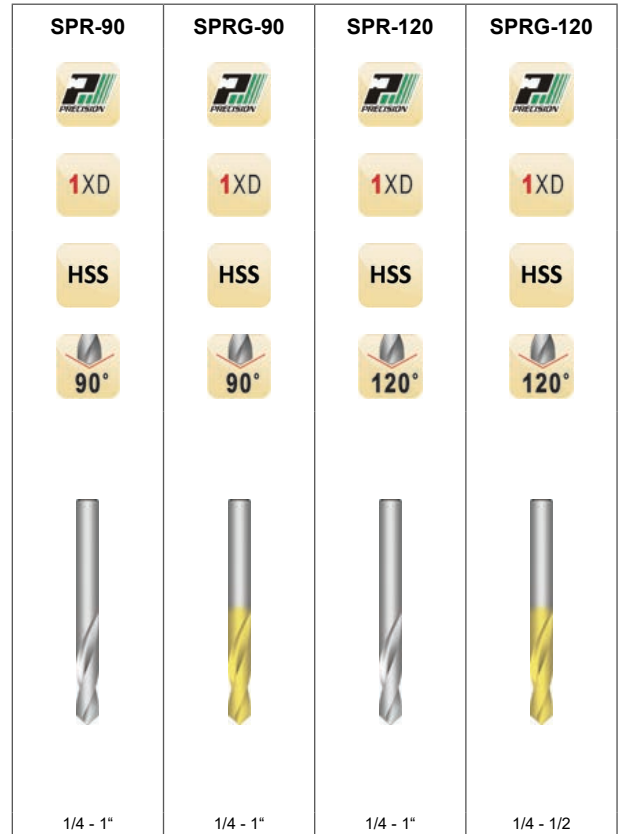
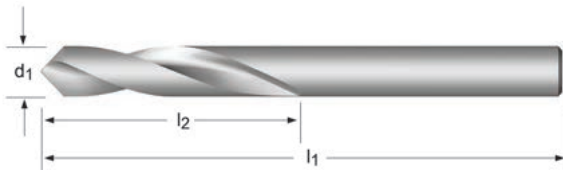
## Spotting Drill - Regular Length

**SPR-90** Bright Finish improves chip flow in soft or non-ferrous materials

**SPRG-90** TiN Coating for increased wear resistance and improved tool life.

**SPR-120** Bright Finish improves chip flow in soft or non-ferrous materials

**SPRG-120** TiN Coating for increased wear resistance and improved tool life.



$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	SPR-90	SPRG-90	SPR-120	SPRG-120
1/4	0.2500	3/4	4"	1	087912	087918	087962	087968
3/8	0.3750	1.1/8	5"	1	087913	087919	087963	087969
1/2	0.5000	1.3/8	6"	1	087914	087920	087964	087970
5/8	0.6250	1.5/8	7"	1	087915	087921	087965	—
3/4	0.7500	1.7/8	8"	1	087916	087922	087966	—
1"	1.0000	2.1/4	8"	1	087917	087923	087967	—

# SPECIAL PURPOSE DRILL



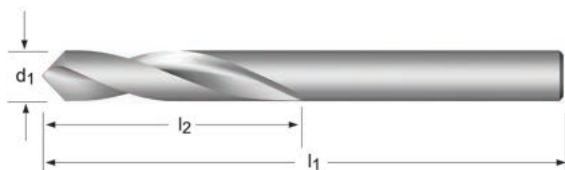
## Spotting Drill - Long Length

**SPL-90** Bright Finish improves chip flow in soft or non-ferrous materials

**SPLG-90** TiN Coating for increased wear resistance and improved tool life.

**SPL-120** Bright Finish improves chip flow in soft or non-ferrous materials

**SPLG-120** TiN Coating for increased wear resistance and improved tool life.



SPL-90	SPLG-90	SPL-120	SPLG-120
1/4 - 1"	1/4 - 1"	1/4 - 5/8	1/4 - 1/2

$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	Pack Qty	SPL-90	SPLG-90	SPL-120	SPLG-120
1/4	0.2500	3/4	6"	1	087924	087930	087974	087980
3/8	0.3750	1.1/8	7"	1	087925	087931	087975	087981
1/2	0.5000	1.3/8	8"	1	087926	087932	087976	087982
5/8	0.6250	1.5/8	9"	1	087927	—	087977	—
3/4	0.7500	1.7/8	10"	1	087928	087934	—	—
1"	1.0000	2.1/4	10"	1	087929	087935	—	—



# SOLID CARBIDE DRILL

## General Purpose Combined Drill and Countersink (Center Drill)

**DC** 60° C'sink. Better abrasion resistance / Longer tool life. Bright Finish improves chip flow in soft or non-ferrous materials



DC



1XD

HM



N0 - N6

Nr.	$d_1$ Ø Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ Ø Inch	Pack Qty	DC
0	1/32	1/32	1.1/2	1/8	1	003251
1	3/64	3/64	1.1/2	1/8	1	003252
2	5/64	5/64	2"	3/16	1	003253
3	7/64	7/64	2"	1/4	1	003254
4	1/8	1/8	2.1/8	5/16	1	003255
5	3/16	3/16	2.3/4	7/16	1	003256
6	7/32	7/32	3"	1/2	1	003257

# SPECIAL PURPOSE DRILL



## General Purpose Combined Drill and Countersink (Center Drill)

**76HA** 60° C'sink. Bright Finish improves chip flow in soft or non-ferrous materials



76HA

ANSI

1XD

HSS



N000 - N8

Nr.	d <sub>1</sub> Ø Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	d <sub>2</sub> Ø Inch	Pack Qty	76HA
000	0.0200	0.0300	1.1/4	1/8	12	097630
00	0.0250	0.0300	1.1/8	1/8	12	097620
0	1/32	0.0380	1.1/8	1/8	12	097610
1	3/64	3/64	1.1/4	1/8	12	097601
2	5/64	5/64	1.7/8	3/16	12	097602
3	7/64	7/64	2"	1/4	12	097603
4	1/8	1/8	2.1/8	5/16	12	097604
5	3/16	3/16	2.3/4	7/16	6	097605
6	7/32	7/32	3"	1/2	6	097606
7	1/4	1/4	3.1/4	5/8	1	097607
8	5/16	5/16	3.1/2	3/4	1	097608

## General Purpose Combined Drill and Countersink (Center Drill)

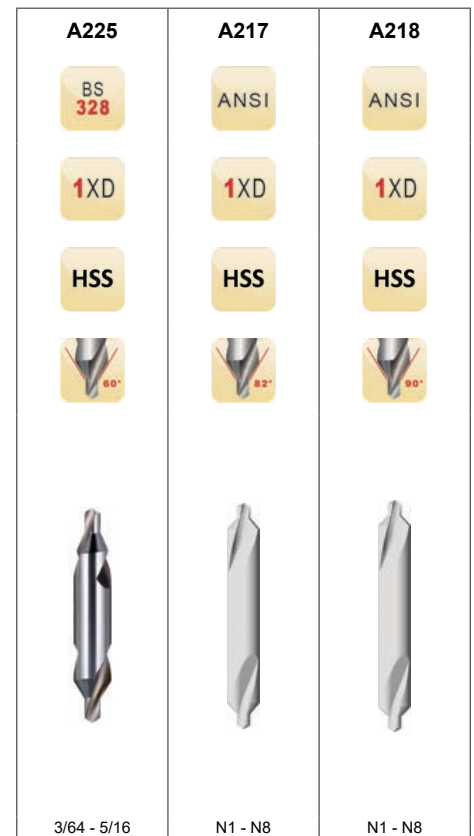
**A225** 60° C'sink. Bright Finish improves chip flow in soft or non-ferrous materials

**A217** 82° C'sink. Bright Finish improves chip flow in soft or non-ferrous materials

**A217SET** 5 pc. set consists of N1, N2, N3, N4 & N5

**A218** 90° C'sink. Bright Finish improves chip flow in soft or non-ferrous materials

**A218SET** 5 pc. set consists of N1, N2, N3, N4 & N5



Nr.	d <sub>1</sub> Ø Inch	d <sub>1</sub> decimal Inch	l <sub>2</sub> max/min Inch	l <sub>1</sub> Inch	d <sub>2</sub> Ø Inch	Pack Qty	A225	A217	A218
BS1	3/64	0.0469	5/64 - 1/16	1.1/2	1/8	1	0172988	—	—
BS2	1/16	0.0625	3/32 - 5/64	1.3/4	3/16	1	0172995	—	—
BS3	3/32	0.0938	5/32 - 1/8	2"	1/4	1	0173008	—	—
BS4	1/8	0.1250	3/16 - 5/32	2.1/4	5/16	1	0173015	—	—
BS5	3/16	0.1875	9/32 - 1/4	2.1/2	7/16	1	0173022	—	—
BS5A	7/32	0.2188	5/16 - 9/32	2.3/4	1/2	1	0173039	—	—
BS6	1/4	0.2500	3/8 - 5/16	3"	5/8	1	0173046	—	—
BS7	5/16	0.3125	15/32 - 13/32	3.1/2	3/4	1	0173053	—	—
1		0.0469	.055-.067	1.1/4	1/8	1	—	0239216	—
1		0.0469	.055-.067	1.1/4	1/8	1	—	—	0239292
2		0.0781	.094-.106	1.7/8	3/16	1	—	0239223	—
2		0.0781	.094-.106	1.7/8	3/16	1	—	—	0239308
3		0.1094	.130-.154	2"	1/4	1	—	0239230	—
3		0.1094	.130-.154	2"	1/4	1	—	—	0239315
4		0.1250	.150-.173	2.1/8	5/16	1	—	0239247	—
4		0.1250	.150-.173	2.1/8	5/16	1	—	—	0239322
5		0.1875	.232-.256	2.3/4	7/16	1	—	0239254	—
5		0.1875	.232-.256	2.3/4	7/16	1	—	—	0239339
6		0.2188	.272-.295	3"	1/2	1	—	0239261	—
6		0.2188	.272-.295	3"	1/2	1	—	—	0239346
7		0.2500	.315-.339	3.1/4	5/8	1	—	0239278	—
7		0.2500	.315-.339	3.1/4	5/8	1	—	—	0239353
8		0.3125	.394-.417	3.1/2	3/4	1	—	0239285	—
8		0.3125	.394-.417	3.1/2	3/4	1	—	—	0239360

Set	Style	Pieces per set	Contents of set	Pack Qty	A217 set	A218 set
A217SET	A217	5	N1, N2, N3, N4, N5	1	0423912	—
A218SET	A218	5	N1, N2, N3, N4, N5	1	—	0423929

# SPECIAL PURPOSE DRILL



## Cobalt Combined Drill and Countersink (Center Drill)

**A221** 60° C'sink. Cobalt base material for wear resistance. Bright Finish improves chip flow in soft or non-ferrous materials

### A221SET

5 peice set includes N1, N2, N3, N4 & N5



Nr.	Set	d <sub>1</sub> Ø Inch	Style	d <sub>1</sub> decimal Inch	Pieces per Set	l <sub>2</sub> Inch	Contents of set	l <sub>1</sub> Inch	d <sub>2</sub> Ø Inch	Pack Qty	A221	A221SET
00		0.025		0.0250		1/32		1.1/8	1/8	1	0241851	<sup>1)</sup> —
0		1/32		0.0313		1/32		1.1/8	1/8	1	0241844	<sup>1)</sup> —
1		3/64		0.0469		3/64		1.1/4	1/8	1	0241868	—
2		5/64		0.0781		5/64		1.7/8	3/16	1	0241875	—
3		7/64		0.1094		7/64		2"	1/4	1	0241882	—
4		1/8		0.1250		1/8		2.1/8	5/16	1	0241899	—
5		3/16		0.1875		3/16		2.3/4	7/16	1	0241905	—
6		7/32		0.2188		7/32		3"	1/2	1	0241912	—
7		1/4		0.2500		1/4		3.1/4	5/8	1	0241929	—
8		5/16		0.3125		5/16		3.1/2	3/4	1	0241936	—
	A221SET		A221		5		N1, N2, N3, N4, N5			1	—	0423936

<sup>1)</sup> single ended only



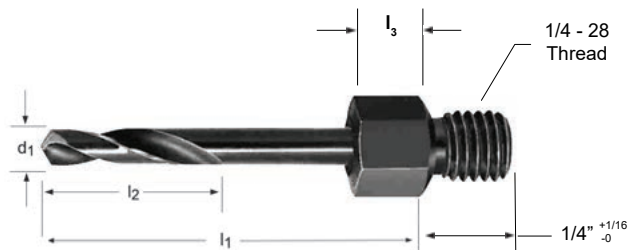
# SPECIAL PURPOSE DRILL

## HSS, Threaded Hex Shank Drills

- TS41HS** - Stub, Wire Gauge Sizes
- TS40HS** - Stub, Fractional Sizes
- TS42HS** - Stub, Letter Sizes
- TS18HS** - Short, Wire Gauge Sizes
- TS10HS** - Short, Fractional Sizes
- TS15HS** - Short, Letter Sizes
- TS52HS** - Long, Wire Gauge Sizes
- TS51HS** - Long, Fractional Sizes
- TS55HS** - Long, Wire Gauge Sizes

**NAS-965 Type B** Steam Oxide for increased wear resistance & lubricity. Shank design for drilling in confined spaces. Low thrust design self centering Split Point for easier penetration.

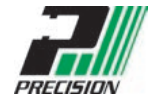
1/4-28 thread



TS41HS TS40HS TS42HS	TS18HS TS10HS TS15HS	TS52HS TS51HS TS55HS
HSS	HSS	HSS
135°	135°	135°
		
N50 - N1 3/32 - 3/8 A - G	N50 - N1 3/32 - 3/8 A - G	N50 - N1 3/32 - 3/8 A - G

$d_1$ Ø Nr.	$l_2$ Inch	$l_1$ Inch	$l_3$ Inch	Pack Qty	TS41HS TS40HS TS42HS	TS18HS TS10HS TS15HS	TS52HS TS51HS TS55HS
N50	5/16	1/2	1/8	1	7877827	—	—
N50	9/16	1"	1/4	1	—	7877968	—
N50	7/8	2 1/8	1/4	1	—	—	7878029
3/32	5/16	1/2	1/8	1	7877828	—	—
3/32	9/16	1"	1/4	1	—	7877969	—
3/32	7/8	2 1/8	1/4	1	—	—	7878030
N40	5/16	1/2	1/8	1	7877829	—	—
N40	9/16	1"	1/4	1	—	7877970	—
N40	7/8	2 1/8	1/4	1	—	—	7878031
N39	5/16	1/2	1/8	1	7877910	—	—
N39	9/16	1"	1/4	1	—	7877971	—
N39	7/8	2 1/8	1/4	1	—	—	7878032
N38	5/16	1/2	1/8	1	7877911	—	—
N38	9/16	1"	1/4	1	—	7877972	—
N38	7/8	2 1/8	1/4	1	—	—	7878033
N37	5/16	1/2	1/8	1	7877912	—	—
N37	9/16	1"	1/4	1	—	7877973	—
N37	7/8	2 1/8	1/4	1	—	—	7878034
N36	5/16	1/2	1/8	1	7877913	—	—
N36	9/16	1"	1/4	1	—	7877974	—
N36	7/8	2 1/8	1/4	1	—	—	7878035
7/64	5/16	1/2	1/8	1	7877914	—	—
7/64	9/16	1"	1/4	1	—	7877975	—
7/64	7/8	2 1/8	1/4	1	—	—	7878036
N35	5/16	1/2	1/8	1	7877915	—	—
N35	9/16	1"	1/4	1	—	7877976	—
N35	7/8	2 1/8	1/4	1	—	—	7878037
N34	5/16	1/2	1/8	1	7877916	—	—
N34	9/16	1"	1/4	1	—	7877977	—
N34	7/8	2 1/8	1/4	1	—	—	7878038
N33	5/16	1/2	1/8	1	7877917	—	—

# SPECIAL PURPOSE DRILL



d <sub>1</sub> Ø Nr.	l <sub>2</sub> Inch	l <sub>1</sub> Inch	l <sub>3</sub> Inch	Pack Qty	TS41HS TS40HS TS42HS	TS18HS TS10HS TS15HS	TS52HS TS51HS TS55HS
N33	9/16	1"	1/4	1	—	7877978	—
N33	7/8	2 1/8	1/4	1	—	—	7878039
N32	5/16	1/2	1/8	1	7877918	—	—
N32	9/16	1"	1/4	1	—	7877979	—
N32	7/8	2 1/8	1/4	1	—	—	7878040
N31	5/16	1/2	1/8	1	7877919	—	—
N31	9/16	1"	1/4	1	—	7877980	—
N31	7/8	2 1/8	1/4	1	—	—	7878041
1/8	5/16	1/2	1/8	1	7877920	—	—
1/8	9/16	1"	1/4	1	—	7877981	—
1/8	7/8	2 1/8	1/4	1	—	—	7878042
N30	5/16	9/16	1/8	1	7877921	—	—
N30	9/16	1 1/4	1/4	1	—	7877982	—
N30	1 1/8	2 1/8	1/4	1	—	—	7878043
N29	5/16	9/16	1/8	1	7877922	—	—
N29	9/16	1 1/4	1/4	1	—	7877983	—
N29	1 1/8	2 1/8	1/4	1	—	—	7878044
N28	5/16	9/16	1/8	1	7877923	—	—
N28	9/16	1 1/4	1/4	1	—	7877984	—
N28	1 1/8	2 1/8	1/4	1	—	—	7878045
9/64	5/16	9/16	1/8	1	7877924	—	—
9/64	9/16	1 1/4	1/4	1	—	7877985	—
9/64	1 1/8	2 1/8	1/4	1	—	—	7878046
N27	5/16	9/16	1/8	1	7877925	—	—
N27	9/16	1 1/4	1/4	1	—	7877986	—
N27	1 1/8	2 1/8	1/4	1	—	—	7878047
N26	5/16	9/16	1/8	1	7877926	—	—
N26	9/16	1 1/4	1/4	1	—	7877987	—
N26	1 1/8	2 1/8	1/4	1	—	—	7878048
N25	5/16	9/16	1/8	1	7877927	—	—
N25	9/16	1 1/4	1/4	1	—	7877988	—
N25	1 1/8	2 1/8	1/4	1	—	—	7878049
N24	5/16	9/16	1/8	1	7877928	—	—
N24	9/16	1 1/4	1/4	1	—	7877989	—
N24	1 1/8	2 1/8	1/4	1	—	—	7878050
N23	5/16	9/16	1/8	1	7877929	—	—
N23	9/16	1 1/4	1/4	1	—	7877990	—
N23	1 1/8	2 1/8	1/4	1	—	—	7878051
5/32	5/16	9/16	1/8	1	7877930	—	—
5/32	9/16	1 1/4	1/4	1	—	7877991	—
5/32	1 1/8	2 1/8	1/4	1	—	—	7878052
N22	5/16	9/16	1/8	1	7877931	—	—
N22	9/16	1 1/4	1/4	1	—	7877992	—
N22	1 1/8	2 1/8	1/4	1	—	—	7878053
N21	5/16	9/16	1/8	1	7877932	—	—
N21	9/16	1 1/4	1/4	1	—	7877993	—
N21	1 1/8	2 1/8	1/4	1	—	—	7878054
N20	5/16	9/16	1/8	1	7877933	—	—
N20	9/16	1 1/4	1/4	1	—	7877994	—
N20	1 1/8	2 1/8	1/4	1	—	—	7878055
N19	5/16	9/16	1/8	1	7877934	—	—
N19	9/16	1 1/4	1/4	1	—	7877995	—
N19	1 1/8	2 1/8	1/4	1	—	—	7878056
N18	5/16	9/16	1/8	1	7877935	—	—
N18	9/16	1 1/4	1/4	1	—	7877996	—
N18	1 1/8	2 1/8	1/4	1	—	—	7878057
11/64	5/16	9/16	1/8	1	7877936	—	—
11/64	9/16	1 1/4	1/4	1	—	7877997	—
11/64	1 1/8	2 1/8	1/4	1	—	—	7878357
N17	5/16	9/16	1/8	1	7877937	—	—
N17	9/16	1 1/4	1/4	1	—	7877998	—
N17	1 1/8	2 1/8	1/4	1	—	—	7878059





# SPECIAL PURPOSE DRILL

d <sub>1</sub> Ø Nr.	l <sub>2</sub> Inch	l <sub>1</sub> Inch	l <sub>3</sub> Inch	Pack Qty	TS41HS TS40HS TS42HS	TS18HS TS10HS TS15HS	TS52HS TS51HS TS55HS
N16	5/16	9/16	1/8	1	7877938	—	—
N16	9/16	1 1/4	1/4	1	—	7877999	—
N16	1 1/8	2 1/8	1/4	1	—	—	7878060
N15	5/16	9/16	1/8	1	7877939	—	—
N15	9/16	1 1/4	1/4	1	—	7878000	—
N15	1 1/8	2 1/8	1/4	1	—	—	7878061
N14	5/16	9/16	1/8	1	7877940	—	—
N14	9/16	1 1/4	1/4	1	—	7878001	—
N14	1 1/8	2 1/8	1/4	1	—	—	7878062
N13	5/16	9/16	1/8	1	7877941	—	—
N13	9/16	1 1/4	1/4	1	—	7878002	—
N13	1 1/8	2 1/8	1/4	1	—	—	7878063
3/16	5/16	9/16	1/8	1	7877942	—	—
3/16	9/16	1 1/4	1/4	1	—	7878003	—
3/16	1 1/8	2 1/8	1/4	1	—	—	7878064
N12	5/16	9/16	1/8	1	7877943	—	—
N12	9/16	1 1/4	1/4	1	—	7878004	—
N12	1 1/8	2 1/8	1/4	1	—	—	7878065
N11	5/16	9/16	1/8	1	7877944	—	—
N11	9/16	1 1/4	1/4	1	—	7878005	—
N11	1 1/8	2 1/8	1/4	1	—	—	7878066
N10	5/16	9/16	1/8	1	7877945	—	—
N10	9/16	1 1/4	1/4	1	—	7878006	—
N10	1 1/8	2 1/8	1/4	1	—	—	7878067
N9	5/16	5/8	1/4	1	7877946	—	—
N9	9/16	1 1/4	5/16	1	—	7878007	—
N9	1 1/8	2 1/8	5/16	1	—	—	7878068
N8	5/16	5/8	1/4	1	7877947	—	—
N8	9/16	1 1/4	5/16	1	—	7878008	—
N8	1 1/8	2 1/8	5/16	1	—	—	7878069
N7	5/16	5/8	1/4	1	7877948	—	—
N7	9/16	1 1/4	5/16	1	—	7878009	—
N7	1 1/8	2 1/8	5/16	1	—	—	7878070
13/64	5/16	5/8	1/4	1	7877949	—	—
13/64	9/16	1 1/4	5/16	1	—	7878010	—
13/64	1 1/8	2 1/8	5/16	1	—	—	7878071
N6	5/16	5/8	1/4	1	7877950	—	—
N6	9/16	1 1/4	5/16	1	—	7878011	—
N6	1 1/8	2 1/8	5/16	1	—	—	7878072
N5	5/16	5/8	1/4	1	7877951	—	—
N5	9/16	1 1/4	5/16	1	—	7878012	—
N5	1 1/8	2 1/8	5/16	1	—	—	7878073
N4	5/16	5/8	1/4	1	7877952	—	—
N4	9/16	1 1/4	5/16	1	—	7878013	—
N4	1 1/8	2 1/8	5/16	1	—	—	7878074
N3	5/16	5/8	1/4	1	7877953	—	—
N3	9/16	1 1/4	5/16	1	—	7878014	—
N3	1 1/8	2 1/8	5/16	1	—	—	7878075
7/32	5/16	5/8	1/4	1	7877954	—	—
7/32	9/16	1 1/4	5/16	1	—	7878015	—
7/32	1 1/8	2 1/8	5/16	1	—	—	7878076
N2	5/16	5/8	1/4	1	7877955	—	—
N2	9/16	1 1/4	5/16	1	—	7878016	—
N2	1 1/8	2 1/8	5/16	1	—	—	7878077
N1	5/16	5/8	1/4	1	7877956	—	—
N1	9/16	1 1/4	5/16	1	—	7878017	—
N1	1 1/8	2 1/8	5/16	1	—	—	7878078
A	5/16	5/8	1/4	1	7877957	—	—
A	9/16	1 1/4	5/16	1	—	7878018	—
A	1 1/8	2 1/8	5/16	1	—	—	7878079
15/64	5/16	5/8	1/4	1	7877958	—	—
15/64	9/16	1 1/4	5/16	1	—	7878019	—
15/64	1 1/8	2 1/8	5/16	1	—	—	7878080
B	5/16	5/8	1/4	1	7877959	—	—

# SPECIAL PURPOSE DRILL



$d_1$ Ø Nr.	$l_2$ Inch	$l_1$ Inch	$l_3$ Inch	Pack Qty	TS41HS TS40HS TS42HS	TS18HS TS10HS TS15HS	TS52HS TS51HS TS55HS
B	9/16	1 1/4	5/16	1	—	7878020	—
B	1 1/8	2 1/8	5/16	1	—	—	7878081
C	5/16	5/8	1/4	1	7877960	—	—
C	9/16	1 1/4	5/16	1	—	7878021	—
C	1 1/8	2 1/8	5/16	1	—	—	7878082
D	5/16	5/8	1/4	1	7877961	—	—
D	9/16	1 1/4	5/16	1	—	7878022	—
D	1 1/8	2 1/8	5/16	1	—	—	7878083
1/4	5/16	5/8	1/4	1	7877962	—	—
1/4	9/16	1 1/4	5/16	1	—	7878023	—
1/4	1 1/8	2 1/8	5/16	1	—	—	7878084
F	5/16	5/8	1/4	1	7877963	—	—
F	9/16	1 1/4	5/16	1	—	7878024	—
F	1 1/8	2 1/8	5/16	1	—	—	7878085
G	5/16	5/8	1/4	1	7877964	—	—
G	9/16	1 1/4	5/16	1	—	7878025	—
G	1 1/8	2 1/8	5/16	1	—	—	7878086
9/32	5/16	5/8	1/4	1	7877965	—	—
9/32	9/16	1 1/4	5/16	1	—	7878026	—
9/32	1 1/8	2 1/8	5/16	1	—	—	7878087
5/16	5/16	5/8	1/4	1	7877966	—	—
5/16	9/16	1 1/4	5/16	1	—	7878027	—
5/16	1 1/8	2 1/8	5/16	1	—	—	7878088
3/8	5/16	5/8	1/4	1	7877967	—	—
3/8	9/16	1 1/4	5/16	1	—	7878028	—
3/8	1 1/8	2 1/8	5/16	1	—	—	7878089

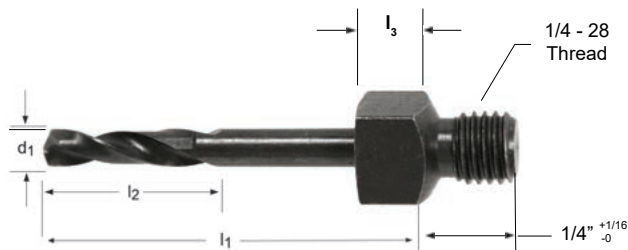


# SPECIAL PURPOSE DRILL

## Cobalt, Threaded Square Shank Drills

- TS41CO** - Stub, Wire Gauge Sizes
- TS40CO** - Stub, Fractional Sizes
- TS42CO** - Stub, Letter Sizes
- TS18CO** - Short, Wire Gauge Sizes
- TS10CO** - Short, Fractional Sizes
- TS15CO** - Short, Letter Sizes
- TS52CO** - Long, Wire Gauge Sizes
- TS51CO** - Long, Fractional Sizes
- TS55CO** - Long, Wire Gauge Sizes

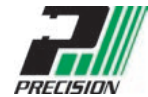
**NAS-965 Type D** Steam Oxide for increased wear resistance & lubricity. Shank design for drilling in confined spaces. Low thrust design self centering Split Point for easier penetration.  
1/4-28 thread



TS41CO TS40CO TS42CO	TS18CO TS10CO TS15CO	TS52CO TS51CO TS55CO
HSS-E	HSS-E	HSS-E
135°	135°	135°
		
N50 - N1 3/32 - 3/8 A - G	N50 - N1 3/32 - 3/8 A - G	N50 - N1 3/32 - 3/8 A - G

d <sub>1</sub> Ø Nr.	l <sub>2</sub> Inch	l <sub>1</sub> Inch	l <sub>3</sub> Inch	Pack Qty	TS41CO TS40CO TS42CO	TS18CO TS10CO TS15CO	TS52CO TS51CO TS55CO
N50	5/16	1/2	1/8	1	7878110	—	—
N50	9/16	1"	1/4	1	—	7878171	—
N50	7/8	2 1/8	1/4	1	—	—	7878232
3/32	5/16	1/2	1/8	1	7878111	—	—
3/32	9/16	1"	1/4	1	—	7878172	—
3/32	7/8	2 1/8	1/4	1	—	—	7878233
N40	5/16	1/2	1/8	1	7878112	—	—
N40	9/16	1"	1/4	1	—	7878173	—
N40	7/8	2 1/8	1/4	1	—	—	7878234
N39	5/16	1/2	1/8	1	7878113	—	—
N39	9/16	1"	1/4	1	—	7878174	—
N39	7/8	2 1/8	1/4	1	—	—	7878235
N38	5/16	1/2	1/8	1	7878114	—	—
N38	9/16	1"	1/4	1	—	7878175	—
N38	7/8	2 1/8	1/4	1	—	—	7878236
N37	5/16	1/2	1/8	1	7878115	—	—
N37	9/16	1"	1/4	1	—	7878176	—
N37	7/8	2 1/8	1/4	1	—	—	7878237
N36	5/16	1/2	1/8	1	7878116	—	—
N36	9/16	1"	1/4	1	—	7878177	—
N36	7/8	2 1/8	1/4	1	—	—	7878238
7/64	5/16	1/2	1/8	1	7878117	—	—
7/64	9/16	1"	1/4	1	—	7878178	—
7/64	7/8	2 1/8	1/4	1	—	—	7878239
N35	5/16	1/2	1/8	1	7878118	—	—
N35	9/16	1"	1/4	1	—	7878179	—
N35	7/8	2 1/8	1/4	1	—	—	7878240
N34	5/16	1/2	1/8	1	7878119	—	—
N34	9/16	1"	1/4	1	—	7878180	—
N34	7/8	2 1/8	1/4	1	—	—	7878241
N33	5/16	1/2	1/8	1	7878120	—	—

# SPECIAL PURPOSE DRILL



d <sub>1</sub> Ø Nr.	l <sub>2</sub> Inch	l <sub>1</sub> Inch	l <sub>3</sub> Inch	Pack Qty	TS41CO TS40CO TS42CO	TS18CO TS10CO TS15CO	TS52CO TS51CO TS55CO
N33	9/16	1"	1/4	1	—	7878181	—
N33	7/8	2 1/8	1/4	1	—	—	7878242
N32	5/16	1/2	1/8	1	7878121	—	—
N32	9/16	1"	1/4	1	—	7878182	—
N32	7/8	2 1/8	1/4	1	—	—	7878243
N31	5/16	1/2	1/8	1	7878122	—	—
N31	9/16	1"	1/4	1	—	7878183	—
N31	7/8	2 1/8	1/4	1	—	—	7878244
1/8	5/16	1/2	1/8	1	7878123	—	—
1/8	9/16	1"	1/4	1	—	7878184	—
1/8	7/8	2 1/8	1/4	1	—	—	7878245
N30	5/16	9/16	1/8	1	7878124	—	—
N30	9/16	1 1/4	1/4	1	—	7878185	—
N30	1 1/8	2 1/8	1/4	1	—	—	7878246
N29	5/16	9/16	1/8	1	7878125	—	—
N29	9/16	1 1/4	1/4	1	—	7878186	—
N29	1 1/8	2 1/8	1/4	1	—	—	7878247
N28	5/16	9/16	1/8	1	7878126	—	—
N28	9/16	1 1/4	1/4	1	—	7878187	—
N28	1 1/8	2 1/8	1/4	1	—	—	7878248
9/64	5/16	9/16	1/8	1	7878127	—	—
9/64	9/16	1 1/4	1/4	1	—	7878188	—
9/64	1 1/8	2 1/8	1/4	1	—	—	7878249
N27	5/16	9/16	1/8	1	7878128	—	—
N27	9/16	1 1/4	1/4	1	—	7878189	—
N27	1 1/8	2 1/8	1/4	1	—	—	7878250
N26	5/16	9/16	1/8	1	7878129	—	—
N26	9/16	1 1/4	1/4	1	—	7878190	—
N26	1 1/8	2 1/8	1/4	1	—	—	7878251
N25	5/16	9/16	1/8	1	7878130	—	—
N25	9/16	1 1/4	1/4	1	—	7878191	—
N25	1 1/8	2 1/8	1/4	1	—	—	7878252
N24	5/16	9/16	1/8	1	7878131	—	—
N24	9/16	1 1/4	1/4	1	—	7878192	—
N24	1 1/8	2 1/8	1/4	1	—	—	7878253
N23	5/16	9/16	1/8	1	7878132	—	—
N23	9/16	1 1/4	1/4	1	—	7878193	—
N23	1 1/8	2 1/8	1/4	1	—	—	7878254
5/32	5/16	9/16	1/8	1	7878133	—	—
5/32	9/16	1 1/4	1/4	1	—	7878194	—
5/32	1 1/8	2 1/8	1/4	1	—	—	7878255
N22	5/16	9/16	1/8	1	7878134	—	—
N22	9/16	1 1/4	1/4	1	—	7878195	—
N22	1 1/8	2 1/8	1/4	1	—	—	7878256
N21	5/16	9/16	1/8	1	7878135	—	—
N21	9/16	1 1/4	1/4	1	—	7878196	—
N21	1 1/8	2 1/8	1/4	1	—	—	7878257
N20	5/16	9/16	1/8	1	7878136	—	—
N20	9/16	1 1/4	1/4	1	—	7878197	—
N20	1 1/8	2 1/8	1/4	1	—	—	7878258
N19	5/16	9/16	1/8	1	7878137	—	—
N19	9/16	1 1/4	1/4	1	—	7878198	—
N19	1 1/8	2 1/8	1/4	1	—	—	7878259
N18	5/16	9/16	1/8	1	7878138	—	—
N18	9/16	1 1/4	1/4	1	—	7878199	—
N18	1 1/8	2 1/8	1/4	1	—	—	7878260
11/64	5/16	9/16	1/8	1	7878139	—	—
11/64	9/16	1 1/4	1/4	1	—	7878200	—
11/64	1 1/8	2 1/8	1/4	1	—	—	7878261
N17	5/16	9/16	1/8	1	7878140	—	—
N17	9/16	1 1/4	1/4	1	—	7878201	—
N17	1 1/8	2 1/8	1/4	1	—	—	7878262



# SPECIAL PURPOSE DRILL

d <sub>1</sub> Ø Nr.	l <sub>2</sub> Inch	l <sub>1</sub> Inch	l <sub>3</sub> Inch	Pack Qty	TS41CO TS40CO TS42CO	TS18CO TS10CO TS15CO	TS52CO TS51CO TS55CO
N16	5/16	9/16	1/8	1	7878141	—	—
N16	9/16	1 1/4	1/4	1	—	7878202	—
N16	1 1/8	2 1/8	1/4	1	—	—	7878263
N15	5/16	9/16	1/8	1	7878142	—	—
N15	9/16	1 1/4	1/4	1	—	7878203	—
N15	1 1/8	2 1/8	1/4	1	—	—	7878264
N14	5/16	9/16	1/8	1	7878143	—	—
N14	9/16	1 1/4	1/4	1	—	7878204	—
N14	1 1/8	2 1/8	1/4	1	—	—	7878265
N13	5/16	9/16	1/8	1	7878144	—	—
N13	9/16	1 1/4	1/4	1	—	7878205	—
N13	1 1/8	2 1/8	1/4	1	—	—	7878266
3/16	5/16	9/16	1/8	1	7878145	—	—
3/16	9/16	1 1/4	1/4	1	—	7878206	—
3/16	1 1/8	2 1/8	1/4	1	—	—	7878267
N12	5/16	9/16	1/8	1	7878146	—	—
N12	9/16	1 1/4	1/4	1	—	7878207	—
N12	1 1/8	2 1/8	1/4	1	—	—	7878268
N11	5/16	9/16	1/8	1	7878147	—	—
N11	9/16	1 1/4	1/4	1	—	7878208	—
N11	1 1/8	2 1/8	1/4	1	—	—	7878269
N10	5/16	9/16	1/8	1	7878148	—	—
N10	9/16	1 1/4	1/4	1	—	7878209	—
N10	1 1/8	2 1/8	1/4	1	—	—	7878270
N9	5/16	5/8	1/4	1	7878149	—	—
N9	9/16	1 1/4	5/16	1	—	7878210	—
N9	1 1/8	2 1/8	5/16	1	—	—	7878271
N8	5/16	5/8	1/4	1	7878150	—	—
N8	9/16	1 1/4	5/16	1	—	7878211	—
N8	1 1/8	2 1/8	5/16	1	—	—	7878272
N7	5/16	5/8	1/4	1	7878151	—	—
N7	9/16	1 1/4	5/16	1	—	7878212	—
N7	1 1/8	2 1/8	5/16	1	—	—	7878273
13/64	5/16	5/8	1/4	1	7878152	—	—
13/64	9/16	1 1/4	5/16	1	—	7878213	—
13/64	1 1/8	2 1/8	5/16	1	—	—	7878274
N6	5/16	5/8	1/4	1	7878153	—	—
N6	9/16	1 1/4	5/16	1	—	7878214	—
N6	1 1/8	2 1/8	5/16	1	—	—	7878275
N5	5/16	5/8	1/4	1	7878154	—	—
N5	9/16	1 1/4	5/16	1	—	7878215	—
N5	1 1/8	2 1/8	5/16	1	—	—	7878276
N4	5/16	5/8	1/4	1	7878155	—	—
N4	9/16	1 1/4	5/16	1	—	7878216	—
N4	1 1/8	2 1/8	5/16	1	—	—	7878277
N3	5/16	5/8	1/4	1	7878156	—	—
N3	9/16	1 1/4	5/16	1	—	7878217	—
N3	1 1/8	2 1/8	5/16	1	—	—	7878278
7/32	5/16	5/8	1/4	1	7878157	—	—
7/32	9/16	1 1/4	5/16	1	—	7878218	—
7/32	1 1/8	2 1/8	5/16	1	—	—	7878279
N2	5/16	5/8	1/4	1	7878158	—	—
N2	9/16	1 1/4	5/16	1	—	7878219	—
N2	1 1/8	2 1/8	5/16	1	—	—	7878280
N1	5/16	5/8	1/4	1	7878159	—	—
N1	9/16	1 1/4	5/16	1	—	7878220	—
N1	1 1/8	2 1/8	5/16	1	—	—	7878281
A	5/16	5/8	1/4	1	7878160	—	—
A	9/16	1 1/4	5/16	1	—	7878221	—
A	1 1/8	2 1/8	5/16	1	—	—	7878079
15/64	5/16	5/8	1/4	1	7878161	—	—
15/64	9/16	1 1/4	5/16	1	—	7878222	—
15/64	1 1/8	2 1/8	5/16	1	—	—	7878283
B	5/16	5/8	1/4	1	7878162	—	—

# SPECIAL PURPOSE DRILL



d <sub>1</sub> Ø Nr.	l <sub>2</sub> Inch	l <sub>1</sub> Inch	l <sub>3</sub> Inch	Pack Qty	TS41CO TS40CO TS42CO	TS18CO TS10CO TS15CO	TS52CO TS51CO TS55CO
B	9/16	1 1/4	5/16	1	—	7878223	—
B	1 1/8	2 1/8	5/16	1	—	—	7878081
C	5/16	5/8	1/4	1	7878163	—	—
C	9/16	1 1/4	5/16	1	—	7878224	—
C	1 1/8	2 1/8	5/16	1	—	—	7878082
D	5/16	5/8	1/4	1	7878164	—	—
D	9/16	1 1/4	5/16	1	—	7878225	—
D	1 1/8	2 1/8	5/16	1	—	—	7878083
1/4	5/16	5/8	1/4	1	7878165	—	—
1/4	9/16	1 1/4	5/16	1	—	7878226	—
1/4	1 1/8	2 1/8	5/16	1	—	—	7878287
F	5/16	5/8	1/4	1	7878166	—	—
F	9/16	1 1/4	5/16	1	—	7878227	—
F	1 1/8	2 1/8	5/16	1	—	—	7878085
G	5/16	5/8	1/4	1	7878167	—	—
G	9/16	1 1/4	5/16	1	—	7878228	—
G	1 1/8	2 1/8	5/16	1	—	—	7878086
9/32	5/16	5/8	1/4	1	7878168	—	—
9/32	9/16	1 1/4	5/16	1	—	7878229	—
9/32	1 1/8	2 1/8	5/16	1	—	—	7878290
5/16	5/16	5/8	1/4	1	7878169	—	—
5/16	9/16	1 1/4	5/16	1	—	7878230	—
5/16	1 1/8	2 1/8	5/16	1	—	—	7878291
3/8	5/16	5/8	1/4	1	7878170	—	—
3/8	9/16	1 1/4	5/16	1	—	7878231	—
3/8	1 1/8	2 1/8	5/16	1	—	—	7878292



# SPECIAL PURPOSE DRILL

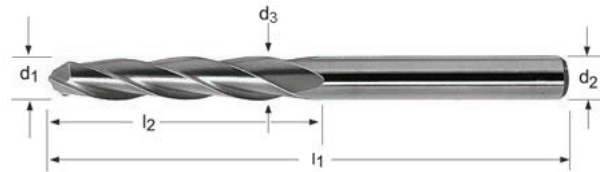
## 3-Flute Tapered Aircraft Router

**ATR41** For cutting, trimming and routing without pre-drilling. 1/4" Taper per foot. Bright Finish improves chip flow in soft or non-ferrous materials

ATR41



N1 - N4



Router Nr.	d <sub>1</sub> Ø Inch	d <sub>2</sub> Ø Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	d <sub>3</sub> Ø Inch	# of Flutes	Pack Qty	ATR41
1	0.0810	0.0980	13/16	2"	0.0980	3	12	041701
2	0.1100	0.1280	7/8	2.1/4	0.1280	3	12	041702
3	0.1650	0.1875	1.1/16	2.1/2	0.1875	3	12	041703
4	0.2240	0.2500	1.1/4	2.3/4	0.2500	4	12	041704

# JOBBER DRILL SETS



## General Purpose Jobber Length Sets

**C15R10P** Bright Finish improves chip flow in  
**C29R10P** soft or non-ferrous materials



**C15R10** Steam Oxide reduces wear and chip  
**C29R10** welding in harder ferrous materials.



C15R10P C29R10P	C15R10 C29R10
ANSI	ANSI
4XD	4XD
HSS	HSS
118°	118°
Set	Set

Set	Style	Pieces per Set	Sizes	Pack Qty	R10P Sets	R10 Sets
C15R10	R10	15	1/16 - 1/2 x 32nds	1	—	099978
C29R10	R10	29	1/16 - 1/2 x 64ths	1	—	099977
C15R10P	R10P	15	1/16-1/2 x 32nds	1	090163	—
C29R10P	R10P	29	1/16 - 1/2 x 64ths	1	090162	—



## General Purpose Jobber Length Sets

**A097** Self centering Split Point, low thrust design. TiN Coated Tip increases surface hardness and improves tool life.



**C20R18P** Bright Finish improves chip flow in soft or non-ferrous materials  
**C60R18P**



**C20R18** Steam Oxide for increased wear resistance & lubricity.  
**C60R18**



A097	C20R18 C60R18	C20R18P C60R18P
Set	Set	Set

Set	Style	Pieces per Set	Sizes	Pack Qty	A097	R18 sets	R18P sets
12	A012	60	Nr.1 - Nr.60	1	0574324	—	—
14	A012	26	A - Z	1	0574331	—	—
18	A012	29	1/16 - 1/2 x 1/64	1	0574317	—	—
20	A012	15	1/16 - 1/2 x 1/32	1	0574348	—	—
30	A012	115	1/16 - 1/2 x 1/64, Nr.1 - Nr.60, A-Z	1	0574362	—	—
60	A012	13	1/16 - 1/4 x 1/64	1	0574355	—	—
C20R18	R18	20	N61 - N80	1	—	099981	—
C60R18	R18	60	N1 - N60	1	—	099976	—
C20R18P	R18P	20	N61 - N80	1	—	—	090161
C60R18P	R18P	60	N1 - N60	1	—	—	090101

# JOBBER DRILL SETS



## General Purpose Jobber Length and Combination Sets

### C26R15P

Bright Finish improves chip flow in soft or non-ferrous materials



### C26R15

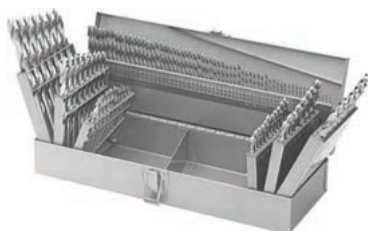
Steam Oxide for increased wear resistance & lubricity.



### C114COMBP

### C115COMBP

Bright Finish improves chip flow in soft or non-ferrous materials



C26R15P	C26R15	C115COMBP	C114COMBP
ANSI	ANSI	ANSI	ANSI
4XD	4XD	4XD	4XD
HSS	HSS	HSS	HSS
118°	118°	118°	118°
Set	Set	Set	Set

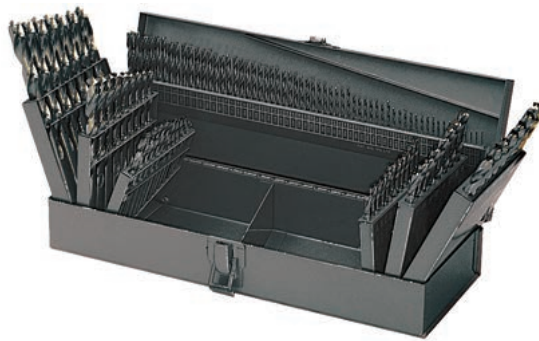
Set	Style	Pieces per Set	Sizes	Pack Qty	C26R15P	C26R15	C115COMBP	C114COMBP
C114COMBP	R10P, R18P, R10PM	114	1/16-1/2 x 64ths, N1-N60, 1-13mm x 5 mm	1	—	—	—	090114
C115COMBP	R10P, R18P, R15P	115	1/16-1/2 x 64ths, N1-6N0, A-Z	1	—	—	090123	—
C26R15	R15	26	A - Z	1	—	099983	—	—
C26R15P	R15P	26	A - Z	1	090126	—	—	—



# JOBBER DRILL SETS

## General Purpose Jobber Length Combination Sets

**C114COMB** Steam Oxide for increased wear resistance & lubricity.  
**C115COMB**



C114COMB	C115COMB
ANSI	ANSI
4XD	4XD
HSS	HSS
118°	118°
Set	Set

Set	Style	Pieces per Set	Sizes	Pack Qty	C114COMB	C115COMB
C114COMB	R10, R18, 2AB	114	1/16-1/2 x 64ths, N1-N60, 1-13mm x .5 mm	1	099990	—
C115COMB	R10, R18, R15	115	1/16-1/2 x 64ths, N1-N60, A-Z	1	—	099982

## General Purpose Jobber Length Metric Sets

**A191** Steam Oxide for increased wear resistance & lubricity.  
**A190**



**C252A** Bright Finish improves chip flow in soft or non-ferrous materials



**C252AB** Steam Oxide for increased wear resistance & lubricity.  
**C502AB**



A191	A190	C252A	C252AB C502AB
Set	Set	Set	Set

Set	Style	Pieces per Set	Sizes	Pack Qty	A191	A190	C252A	C252AB C502AB
12	A100	60	No. 1 - No. 60	1	—	0179437	—	—
18	A100	29	1/16 inch - 1/2 inch x 1/64 inch	1	—	0179451	—	—
20	A100	15	1/16 inch - 1/2 inch x 1/32 inch	1	—	0179468	—	—
201	A100	19	1.0 mm - 10.0 mm x 0.5 mm	1	—	0030547	—	—
202	A100	51	1.0 mm - 6.0 mm x 0.1 mm	1	—	0030554	—	—
203	A100	41	6.0 mm - 10.0 mm x 0.1 mm	1	—	0030561	—	—
204	A100	25	1.0 mm - 13.0 mm x 0.5 mm	1	—	0030578	—	—
206	A100	29	1.0 mm - 13.0 mm x 0.5 mm + 3.3 mm, 4.2 mm, 6.8 mm, 10.2 mm	1	—	0030585	—	—
209	A100	91	1.0 mm - 10.0 mm x 0.1 mm	1	—	0179482	—	—
3	A100	21	1/16 inch - 3/8 inch x 1/64 inch	1	—	0179413	—	—
31M	A100	20	0.3 mm - 1.0 mm x 0.05 mm + 0.38 mm, 0.52 mm, 0.58 mm, 0.78 mm, 0.82 mm	1	0149133	—	—	—
413	A100	13	1.5 mm - 6.5 mm x 0.5 mm + 3.3 mm, 4.2 mm	1	0030608	—	—	—
419	A100	19	1.0 mm - 10.0 mm x 0.5 mm	1	0030615	—	—	—
61-80	A100	20	No. 61 - No. 80	1	0179499	—	—	—
C252A	2A	25	1.0mm - 13mm x .5mm	1	—	—	099987	—
C252AB	2AB	25	1.0mm - 13mm x .5mm	1	—	—	—	099988
C502AB	2AB	50	1.0mm - 5.9mm x .1mm	1	—	—	—	099985

**General Purpose Jobber Length Metric Sets**

**A094** Low thrust design self centering Split Point for easier penetration. TiN Coated Tip increases wear resistance and improves tool life.



**A094**

DIN 338

4XD

HSS

118°

Set

Set	Sizes	Pieces per Set	Sizes	Pack Qty	A094
413	A002	13	1.5 mm - 6.5 mm x 0.5 mm + 3.3 mm, 4.2 mm	1	46610302
419	A002	19	1.0 mm - 10.0 mm x 0.5 mm	1	46610303

# JOBBER DRILL SETS



## General Purpose Jobber Length Metric Sets

**A095** Low thrust design self centering Split Point for easier penetration.  
TiN Coated Tip increases wear resistance and improves tool life.



A095

DIN  
338

4XD

HSS

118°



Set

Set	Style	Pieces per Set	C	Pack Qty	A095
18	A002	29	1/16 inch - 1/2 inch x 1/64 inch	1	0385395
20	A002	15	1/16 inch - 1/2 inch x 1/32 inch	1	46610305
200	A002	24	1.0 mm - 10.5 mm x 0.5 mm + 3.3 mm, 4.2 mm, 6.8 mm, 10.2 mm	1	46610306
201	A002	19	1.0 mm - 10.0 mm x 0.5 mm	1	0385418
202	A002	51	1.0 mm - 6.0 mm x 0.1 mm	1	0385425
203	A002	41	6.0 mm - 10.0 mm x 0.1 mm	1	0385432
204	A002	25	1.0 mm - 13.0 mm x 0.5 mm	1	0385449
206	A002	29	1.0 mm - 13.0 mm x 0.5 mm + 3.3 mm, 4.2 mm, 6.8 mm, 10.2 mm	1	0392331
209	A002	91	1.0 mm - 10.0 mm x 0.1 mm	1	0385562



# JOBBER DRILL SETS

## General Purpose Jobber Length Left Hand Sets

**C15L10** Bright Finish improves chip flow in soft or non-ferrous materials  
**C29L10**



C15L10	C29L10
Set	Set

Set	Style	Pieces per Set	Sizes	Pack Qty	C15L10	C29L10
C15L10	L10	15	1/16-1/2 x 32nds, Left Hand	1	099955	—
C29L10	L10	29	1/16 - 1/2 x 64ths, Left Hand	1	—	099935

# JOBBER DRILL SETS



## High Helix Jobber Length Set

**A287** Low thrust design self centering Split Point for easier penetration. Steam Oxide surface treatment for increased wear resistance & lubricity. Fast spiral helix for improved chip flow when drilling stainless steel.



A287

ANSI

4XD

HSS

135°



Set

Set	Style	Pieces per Set	C	Pack Qty	A287
18	A108	29	1/16 - 1/2 x 1/64	1	0308523





# JOBBER DRILL SETS

## Heavy Duty Jobber Length Set

**C29HX10** Low thrust design self centering Split Point for easier penetration. Stronger and more Rigid. Unique surface treatment for improved wear resistance.



**C29HX10**

- ANSI
- 4XD
- HSS
- 135°



Set

Set	Style	Pieces per Set	Sizes	Pack Qty	C29HX10
C29HX10	HX10	29	1/16 -1/2 x 64ths	1	091010

# JOBBER DRILL SETS



## Heavy Duty Cobalt Jobber Length Sets (NAS 907 Type J)

**C13R10CO**

**C15R10CO**

**C21R10CO**

**C29R10CO**

**C60R18CO**

**C26R15CO**

Low thrust design self centering 135° Split Point for easier penetration. Cobalt base material with Bronze Oxide for wear resistance and lubricity. Suitable for ferrous materials.



C13R10CO  
C15R10CO  
C21R10CO  
C29R10CO

ANSI

4XD

HSS-E

135°



Set

C26R15CO

ANSI

4XD

HSS-E

135°



Set

C60R18CO

ANSI

4XD

HSS-E

135°



Set

Set	Style	Pieces per Set	Sizes	Pack Qty	C29R10CO	C26R15CO	C60R18CO
C13R10CO	R10CO	13	1/16-1/4 x 64ths	1	099944	—	—
C15R10CO	R10CO	15	1/16-1/2 x 32nds	1	090291	—	—
C21R10CO	R10CO	21	1/16-3/8 x 64ths	1	099701	—	—
C26R15CO	R15CO	26	A - Z	1	—	090292	—
C29R10CO	R10CO	29	1/16 - 1/2 x 64ths	1	090290	—	—
C60R18CO	R18CO	60	N1 - N60	1	—	—	090600



# JOBBER DRILL SETS

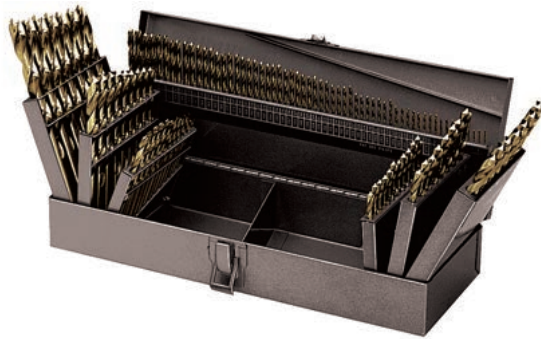
## Heavy Duty Cobalt Jobber Length Combination Sets (NAS 907 Type J)

**C115COMBC**

Low thrust design self centering 135°

**C114COMBC**

Split Point for easier penetration. Cobalt base material with Bronze Oxide for wear resistance and lubricity. Suitable for ferrous materials.



C115COMBC	C114COMBC
Set	Set

Set	Style	Pieces per Set	Sizes	Pack Qty	C115COMBC	C114COMBC
C114COMBC	R10CO, R18CO, 2ACO	114	1/16-1/2 x 64ths, N1-N60, 1-13mm x .5 mm	1	—	099705
C115COMBC	R10CO, R18CO, R15CO	115	1/16-1/2 x 64ths, N1-N60, A-Z	1	099706	—

# SCREW MACHINE DRILL SETS



## General Purpose Screw Machine Drill Sets

**C29R40**  
**C60R41**  
**C26R42**

Bright Finish improves chip flow in soft or non-ferrous materials



C29R40	C60R41	C26R42
ANSI	ANSI	ANSI
2.5XD	2.5XD	2.5XD
HSS	HSS	HSS
118°	118°	118°
Set	Set	Set

Set	Style	Pieces per Set	Sizes	Pack Qty	C29R40	C60R41	C26R42
C26R42	R42	26	A - Z	1	—	—	090173
C29R40	R40	29	1/16-1/2 x 64ths	1	090170	—	—
C60R41	R41	60	N1 - N60	1	—	090174	—

**General Purpose Screw Machine Drill Set**

**A088** Low thrust design self centering Split Point for easier penetration. TiN Coated Tip increases wear resistance and improves tool life.



**A088**

DIN ANSI

2.5XD

HSS

135°

Set

Set	Style	Pieces per Set	Sizes	Pack Qty	A088
200S	A022	24	1.0 mm - 10.5 mm x 0.5 mm + 3.3 mm, 4.2 mm, 6.8 mm, 10.2 mm	1	0616185

# SCREW MACHINE DRILL SETS



## Heavy Duty Screw Machine Drill Set

**C29R40C**

**C60R41C**

Low thrust design self centering Split Point for easier penetration. Steam Oxide for increased wear resistance & lubricity.



C29R40C	C60R41C
Set	Set

Set	Style	Pieces per Set	Sizes	Pack Qty	C29R40C	C60R41C
C29R40C	R40C	29	1/16 - 1/2 x 64ths	1	099903	—
C60R41C	R41C	60	N1 - N60	1	—	099930



# SCREW MACHINE DRILL SETS

## Cobalt Heavy Duty Screw Machine Drill Sets

**C29M40CO** Low thrust design self centering Split Point for easier penetration. Cobalt base material with Bronze Oxide for wear resistance and lubricity. Suitable for ferrous materials.

**C60M41CO**

**C26M42CO**



C29M40CO	C60M41CO	C26M42CO
Set	Set	Set

Set	Style	Pieces per Set	Sizes	Pack Qty	C29M40CO	C60M41CO	C26M42CO
C26M42CO	M42CO	26	A - Z	1	—	—	099961
C29M40CO	M40CO	29	1/16 - 1/2 x 64ths	1	099962	—	—
C60M41CO	M41CO	60	N1 - N60	1	—	099960	—

# TAPER LENGTH DRILL SETS



## General Purpose Taper Length Drill Sets

**C29R51** Bright Finish improves chip flow in soft or non-ferrous materials. Longer Flute and Overall length for depth and reach.



**C29R51**

ANSI

6XD

HSS

118°



Set

Set	Style	Pieces per Set	Sizes	Pack Qty	C29R51
C29R51	R51	29	1/16 - 1/2 x 64ths	1	090154





# REDUCED SHANK DRILL SETS

## Reduced Shank Drill Sets

**C8R56 C33R56** Silver & Deming Drills. Steam Oxide for increased wear resistance & lubricity.

**C8R57** Silver & Deming Drills with **Tri-Flat** Shank. Steam Oxide for increased wear resistance & lubricity.

**C8R56CO** Heavy Duty Cobalt Silver & Deming Drills. Self centering 118° Split Point reduces thrust. Cobalt base material with Bronze/Steam Oxide for wear resistance and lubricity. Suitable for ferrous materials.



Set	Style	Pieces per Set	Sizes	Pack Qty	C8R56 C33R56	C8R57	C8R56CO
C33R56	R56	33	1/2" Reduced Shank*, 1/2 - 1"x 64ths, S&D	1	090231	—	—
C8R56	R56	8	1/2" Reduced Shank, 9/16 - 1" x 16ths, S&D	1	090556	—	—
C8R56CO	R56CO	8	1/2" Reduced Shank, 9/16 - 1" x 16ths, S&D	1	—	—	090328
C8R57	R57	8	1/2" Reduced Shank, 9/16 - 1" x 16ths, S&D	1	—	090558	—

\*1/2" R56 drill is a straight shank, not a reduced shank


























































# Visual Index - Taps

Application Material Groups (AMG)			Hardness HRC	ISO
1. Steel	1.1 Magnetic soft steel	12L14, 12L15	<120 HB	P 1
	1.2 Structural Steel/ case carburising steel	1005-1025, 1214, 1215, A36	<200 HB	P 1
	1.3 Plain Carbon steel	1030-1060, 1050-1060, 1144-1146	<24	P 2
	1.4 Alloy steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	<24	P 3
	1.5 Alloy steel/ Hardened and tempered steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	>24<38	P 4
	1.6 Alloy steel/ Hardened and tempered steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	>38	H 1
	1.7 Alloy steel Hardened	A2-D2, H10-H41, L1-L6, M1-M42, T1	49-55	H 3
	1.8 Alloy steel Hardened	A2-D2, H10-H41, L1-L6, M1-M42, T1	55-63	H 4
2. Stainless Steel	2.1 Free machining Stainless Steel	200, 303, 416, 420F, 430F, 440	<24	M 1
	2.2 Austenitic	301, 302, 304, 316, 321, 330, CUSTOM 455, AM-350	<24	M 3
	2.3 Ferritic + Austenitic, Martensitic	318-329, 400-446, DUPLEX	<32	M 2
	2.4 Precipitation Hardened	15-5PH, Custom 450 17-4PH	<32	S 2
3. Cast Iron	3.1 Lamellar graphite	Grey, G10, Gg40, J431C, A48 CLASS 20	<150 HB	K 1
	3.2 Lamellar graphite	Grey, GG25-Gg40, J158, A48 CLASS 40-60	>150 HB<32	K 2
	3.3 Nodular graphite/ Malleable Cast Iron	A220, A436, A439, A602, Black, GGG40-GGG70	<200 HB	K 3
	3.4 Nodular graphite/ Malleable Cast Iron	Black Gts/Gtw, J434C	>200 HB<32	K 4
4. Titanium	4.1 Titanium, unalloyed	Commercially Pure	<200 HB	S 1
	4.2 Titanium, alloyed	6Al4V, 6Al4V-2Sn, Monel, Monel K	<28	S 2
	4.3 Titanium, alloyed	6Al4V-4Mo, 7Al4V-4Mo, 4911-4967	>28<38	S 3
5. Nickel	5.1 Nickel, unalloyed	Commercially Pure, 17644, 200, 5553	<150 HB	S 1
	5.2 Nickel, alloyed	Monel 400, Hastelloy C, Inconel 625, Waspaloy	<28	S 2
	5.3 Nickel, alloyed	Inconel 718, Nimonic 75-95, Rene 41, Inconel 825, A286	>28<38	S 3
6. Copper	6.1 Copper	Commercially Pure	<100 HB	N 3
	6.2 β-Brass, Bronze	314-340, 350-370	<200 HB	N 4
	6.3 α-Brass	Alloyed Cu + Al + Fe, Long Chipping	<200 HB	N 3
	6.4 High Strength Bronze	Ampco 18-25	<49	N 4
7. Aluminium Magnesium	7.1 Al, Mg, unalloyed	Commercially Pure	<100 HB	N 1
	7.2 Al alloyed, Si<0.5%	6061 T6, 7075, 314-340	<150 HB	N 1
	7.3 Al alloyed, Si>0.5%<10%	6061 T6, 380-390	<120 HB	N 1
	7.4 Al alloyed, Si>10% Mg alloys	Magnesium Whisker Reinforced	<120 HB	N 2
8. Synthetic Materials	8.1 Thermoplastics	Ultramid, Polystrol	---	O
	8.2 Thermosetting plastics	Bakelit, Pertinax	---	O
	8.3 Reinforced plastic materials	CFK, GFKAFK	---	O
9. Hard Mat.	9.1 Cermets (Metal-ceramics)	Ferrotic	<54	H
10. Graphite	10.1 Standard graphite		---	O

# Visual Index - Taps

Thread Form:	UNC	UNC	UNF	UNF	M	M	MF	MF	UNC	UNF	UNC	UNF	UNC	UNF	UNC	
Standard:	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	
Class of Fit:	2BX	2BX	2BX	2BX	6HX	6HX	6HX	6HX	2B	2B	2B 3B	2B 3B	2B	2B	2BX	
Hole Type:																
Depth of Cut:	2XD	2.5XD	2XD	2.5XD	2XD	2.5XD	2XD	2.5XD	2.5XD	2.5XD	2.5XD	2.5XD	2.5XD	2.5XD	2.5XD	
Tool Material:	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	
Chamfer:	C 2-3	E 1.5-2	C 2-3	E 1.5-2	C 2-3	E 1.5-2	C 2-3	E 1.5-2	B 3.5-5	B 3.5-5	B 3.5-5	B 3.5-5	B 3.5-5	B 3.5-5	B 3.5-5	
Flute Geometry:																
Direction of Cut:																
Finish/Coating:	TiAIN Top	TiAIN Top	TiAIN Top	TiAIN Top	TiAIN Top	TiAIN Top	TiAIN Top	TiAIN Top	TiAIN Top	TiAIN Top	Super B	Super B	TiAIN Top	TiAIN Top	TiAIN Top	
Coolant Through:																
Style:	E814	E815	E914	E915	E630	E631	E770	E771	E809	E909	E813	E913	E811	E911	E816	
Range:	1/4 - 1"	1/4 - 1"	No.10 - 7/8	1/4 - 1"	M5 - M24	M6 - M24	M8 - M14	M10 - M14	No.4 - 1"	No.10 - 1"	No.4 - 1"	No.10 - 1"	No.4 - 1"	No.10 - 1"	No.4 - 3/4	
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AMG																ISO
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1.2									■ 95	■ 95	● 72	● 72				P 1
1.3									■ 75	■ 75	● 59	● 59				P 2
1.4									● 69	● 69	● 52	● 52	■ 98	■ 98		P 3
1.5									● 43	● 42	● 33	● 33	■ 66	■ 66	● 55	P 4
1.6													● 36	● 36	■ 42	H 1
1.7															● 22	H 3
1.8																H 4
2.1												■ 46	■ 46			M 1
2.2												■ 33	■ 33			M 3
2.3												■ 20	■ 20			M 2
2.4																S 2
3.1	■ 98	■ 98	■ 98	■ 98	■ 98	■ 98	■ 98	■ 98								K 1
3.2	■ 82	■ 82	■ 82	■ 82	■ 82	■ 82	■ 82	■ 82								K 2
3.3	■ 115	■ 115	■ 115	■ 115	■ 115	■ 115	■ 115	■ 115								K 3
3.4	● 82	● 82	● 82	● 82	● 82	● 82	● 82	● 82								K 4
4.1																S 1
4.2													● 33	● 33	● 42	S 2
4.3															■ 26	S 3
5.1																S 1
5.2													● 33	● 33	● 16	S 2
5.3															■ 10	S 3
6.1									■ 39	■ 39						N 3
6.2	● 98	● 98	● 98	● 98	● 98	● 98	● 98	● 98	● 98	● 98						N 3
6.3									■ 66	■ 66						N 3
6.4	● 16	● 16	● 16	● 16	● 16	● 16	● 16	● 16								N 4
7.1																N 1
7.2																N 1
7.3																N 1
7.4	● 66	● 66	● 66	● 66	● 66	● 66	● 66	● 66								N 2
8.1																O
8.2	■ 49	■ 49	■ 49	■ 49	■ 49	■ 49	■ 49	■ 49								O
8.3																O
9.1																H
10.1																O

# Visual Index - Taps

	UNF	M	MF	M	MF	M	MF	M	MF	UNC	UNF	UNC	UNF	UNC	UNF	UNC	UNF	M	
	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	
	2BX	6H	6H	6H	6H	6H	6H	6H	6H	2B	2B	2B 3B	2B 3B	2B	2B	2BX	2BX	6H	
																			
	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	
	B 3.5-5	B 3.5-5	B 3.5-5	B 3.5-5	B 3.5-5	B 3.5-5	B 3.5-5	B 3.5-5	B 3.5-5	B 3.5-5	C 2-3	C 2-3	C 2-3	C 2-3	C 2-3	C 2-3	C 2-3	C 2-3	
																			
																			
	No. 10 - 3/4	M4 - M24	M8 - M18	M4 - M24	M8 - M18	M3 - M24	M8 - M14	M3 - M12	M3 - M12	No. 4 - 1"	No. 10 - 1"	No. 4 - 1"	No. 10 - 1"	No. 4 - 1"	No. 10 - 1"	No. 4 - 3/4	No. 10 - 3/4	M4 - M24	
		265	266	266	267	267	268	268	269	269	270	270	271	271	273	273	274	274	275
AMG																			ISO
1.1		■ 108	■ 108							■ 108	■ 108							■ 108	P 1
1.2		■ 95	■ 95	● 72	● 72					■ 95	■ 95	● 72	● 72					■ 95	P 1
1.3		■ 75	■ 75	● 59	● 59					■ 75	■ 75	● 59	● 59					■ 75	P 2
1.4		● 69	● 69	● 52	● 52	■ 98	■ 98			● 69	● 69	● 52	● 52	■ 98	■ 98			● 69	P 3
1.5	● 55	● 43	● 43	● 33	● 33	■ 66	■ 66	● 55	● 55	● 43	● 43	● 33	● 33	■ 66	■ 66	● 55	● 55	● 43	P 4
1.6	■ 42					● 36	● 36	■ 42	■ 42					● 36	● 36	■ 42	■ 42		H 1
1.7	● 22							● 22	● 22							● 22	● 22		H 3
1.8																			H 4
2.1				■ 46	■ 46							■ 46	■ 46						M 1
2.2				■ 33	■ 33							■ 33	■ 33						M 3
2.3				■ 20	■ 20							■ 20	■ 20						M 2
2.4																			S 2
3.1																			K 1
3.2																			K 2
3.3																			K 3
3.4																			K 4
4.1																			S 1
4.2	● 42					● 33	● 33	● 42	● 42					● 33	● 33	● 42	● 42		S 2
4.3	■ 26							■ 26	■ 26							■ 26	■ 26		S 3
5.1																			S 1
5.2	● 16					● 33	● 33	● 16	● 16					● 33	● 33	● 16	● 16		S 2
5.3	■ 10							■ 10	■ 10							■ 10	■ 10		S 3
6.1		■ 39	■ 39							■ 39	■ 39							■ 39	N 3
6.2		● 98	● 98							● 98	● 98							● 98	N 3
6.3		■ 66	■ 66							■ 66	■ 66							■ 66	N 3
6.4																			N 4
7.1																			N 1
7.2																			N 1
7.3																			N 1
7.4																			N 2
8.1																			O
8.2																			O
8.3																			O
9.1																			H
10.1																			O

# Visual Index - Taps

	MF	M	MF	M	MF	M	MF	UNC	UNF	UNC	UNF	UNC	UNF	UNC	UNF	UNC	UNF
	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	ANSI	ANSI	ANSI	ANSI	DIN 2184-1	DIN 2184-1
	6H	6H	6H	6H	6H	6H	6H	2B	2B	2B	2B	3B	3B	3B	3B	2B	2B
	2XD	2.5XD	2.5XD	2.5XD	2.5XD	1.5XD	1.5XD	3XD	3XD	3XD	3XD	2.5XD	2.5XD	2.5XD	2.5XD	2.5XD	2.5XD
	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM	HSS PM	HSS PM	HSS PM	HSS PM	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E
	C 2-3	C 2-3	C 2-3	C 2-3	C 2-3	C 2-3	C 2-3	P	P	P	P	B 3.5-5	B 3.5-5	B 3.5-5	B 3.5-5	B 3.5-5	C 2-3
	TiAlN Top	Super B	Super B	TiAlN Top	TiAlN Top	TiAlN Top	TiAlN Top	TiCN	TiCN	TiCN	TiCN			ST	ST		
	E764	E628	E768	E626	E766	E806	E906	1672AP (UNC)	1672AP (UNF)	1674 (UNC)	1674 (UNF)	E025	E035	E026	E036	EP20	EP30
	M8 - M18	M4 - M24	M8 - M18	M3 - M24	M8 - M14	M3 - M12	M8 - M12	No.4 - 1"	No.10 - 3/4"	1/4 - 1"	1/4 - 1"	No.6 - 1"	No.6 - 1"	No.2 - 1"	No.10 - 1"	No.4 - 1"	No.8 - 1"
	275	276	276	277	277	278	278	279	279	279	279	280	280	280	280	282	278
1.1	■ 108							110	110	120	120	82	82	82	82	82	82
1.2	■ 95	● 72	● 72					90	90	100	100	72	72	72	72	72	72
1.3	■ 75	● 59	● 59					55	55	65	65	59	59	59	59	59	59
1.4	● 69	● 52	● 52	■ 98	■ 98			55	55	65	65	52	52	52	52	52	52
1.5	● 43	● 33	● 33	■ 66	■ 66	● 55	● 55	45	45	50	50	33	33	33	33	33	33
1.6				● 36	● 36	■ 42	■ 42					16	16	16	16	16	16
1.7						● 22	● 22										
1.8																	
2.1		■ 46	■ 46					50	50	60	60			26	26		
2.2		■ 33	■ 33					40	40	40	40			23	23		
2.3		■ 20	■ 20					40	40	45	45			16	16		
2.4																	
3.1												49	49	49	49	49	49
3.2												26	26	26	26	26	26
3.3												49	49	49	49	49	49
3.4												26	26	26	26	26	26
4.1								35	35	40	40	33	33			33	33
4.2				● 33	● 33	● 42	● 42	25	25	30	30	16	16			16	16
4.3						■ 26	■ 26										
5.1								35	35	40	40	39	39			39	39
5.2				● 33	● 33	● 16	● 16	20	20	25	25	16	16			16	16
5.3						■ 10	■ 10										
6.1	■ 39							45	45	50	50	39	39			39	39
6.2	● 98							120	120	125	125	98	98			98	98
6.3	■ 66							100	100	110	110	66	66			66	66
6.4																	
7.1								85	85	95	95	52	52			52	52
7.2								100	100	120	120	115	115			115	115
7.3								85	85	95	95	66	66			66	66
7.4								30	30	40	40	49	49			49	49
8.1												98	98			98	98
8.2																	
8.3																	
9.1																	
10.1																	

# Visual Index - Taps

	UNC	UNF	UNC	UNF	M	MF	M	M	M	MF	M	M	MF	MF	M	M	MF
	DIN 2184-1	DIN 2184-1	ISO 529	ISO 529	DIN ANSI	DIN ANSI	DIN ANSI	ANSI	ANSI	ANSI	DIN 374	DIN 374	DIN 374	DIN 374	ISO 529	ISO 529	ISO 529
	2B	2B	2B	2B	6H	6H	6H	6H	6H	6H	6H	6H	6H	6H	6H	6H	6H
	2.5XD	2.5XD	2.5XD	2.5XD	3XD	3XD	3XD	2.5XD	2.5XD	2.5XD	2.5XD	2.5XD	2.5XD	2.5XD	2.5XD	2.5XD	2.5XD
	HSS-E	HSS-E	HSS-E	HSS-E	HSS PM	HSS PM	HSS PM	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E
	B 3.5-5	C 2-3	B 3.5-5	B 3.5-5	P	P	P	B 3.5-5	B 3.5-5	B 3.5-5	B 3.5-5	B 3.5-5	B 3.5-5	B 3.5-5	B 3.5-5	B 3.5-5	B 3.5-5
	ST	ST	ST	ST	TCN	TCN	TCN		ST	ST		ST		ST		ST	ST
	EP21	EP31	E021	E031	1673AP (M)	1673AP (MF)	1675 (M)	E005	E006	E016	EP006H	EP016H	EP10	EP11	E000	E001	E011
	No.4 - 1"	No.8 - 1"	No.2 - 1"	No.8 - 1"	M4 - M24	M8 - M24	M12 - M20	M4 - M20	M4 - M20	M8 - M14	M2 - M30	M2 - M30	M4 - M30	M4 - M30	M1.6 - M24	M1.6 - M24	M4 - M24
	282	282	283	283	284	284	284	285	285	285	286	286	287	287	288	288	288
1.1	82	82	82	82	110	110	120	82	82	82	82	82	82	82	82	82	82
1.2	72	72	72	72	90	90	100	72	72	72	72	72	72	72	72	72	72
1.3	59	59	59	59	55	55	65	59	59	59	59	59	59	59	59	59	59
1.4	52	52	52	52	55	55	65	52	52	52	52	52	52	52	52	52	52
1.5	33	33	33	33	45	45	50	33	33	33	33	33	33	33	33	33	33
1.6	16	16	16	16				16	16	16	16	16	16	16	16	16	16
1.7																	
1.8																	
2.1	23	23	23	23	50	50	60		26	26		23		23		23	23
2.2	20	20	20	20	40	40	40		23	23		20		20		20	20
2.3	13	13	13	13	40	40	45		16	16		13		13		13	13
2.4																	
3.1	49	49	49	49				49	49	49	49	49	49	49	49	49	49
3.2	26	26	26	26				26	26	26	26	26	26	26	26	26	26
3.3	49	49	49	49				49	49	49	49	49	49	49	49	49	49
3.4	26	26	26	26				26	26	26	26	26	26	26	26	26	26
4.1					35	35	40	33			33	33	33	33	33	33	33
4.2					25	25	30	16			16	16	16	16	16	16	16
4.3																	
5.1					35	35	40	39			39	39	39	39	39	39	39
5.2					20	20	25	16			16	16	16	16	16	16	16
5.3																	
6.1					45	45	50	39			39	39	39	39	39	39	39
6.2					120	120	125	98			98	98	98	98	98	98	98
6.3					100	100	110	66			66	66	66	66	66	66	66
6.4																	
7.1					85	85	95	52			52	52	52	52	52	52	52
7.2					100	100	120	115			115	115	115	115	115	115	115
7.3					85	85	95	66			66	66	66	66	66	66	66
7.4					30	30	40	49			49	49	49	49	49	49	49
8.1								98			98	98	98	98	98	98	98
8.2																	
8.3																	
9.1																	
10.1																	

# Visual Index - Taps

	M	UNC	UNF	M	M	M	UNC	UNF	UNC	UNF	UNC	UNF	UNC	UNF	UNC	UNF	UNC	
	ISO 529	DIN ANSI	DIN ANSI	DIN ANSI	DIN 371	DIN 376	ANSI	ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	ANSI	ANSI	ANSI	ANSI	DIN 2184-1	
	6H	2B	2B	6H	6HX	6HX	2B	2B	2B	2B	2B	2B	3B	3B	3B	3B	2B	
	HSS-E	HSS PM	HSS PM	HSS PM	HSS-E PM	HSS-E PM	HSS	HSS	HSS PM	HSS PM	HSS PM	HSS PM	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	
	B 3-5-5	P	P	P	C 2-3	C 2-3			Semi-B	Semi-B	Semi-B	Semi-B	C 2-3	C 2-3	C 2-3	C 2-3	C 2-3	
	TN	TAIN Top	TAIN Top	TAIN Top	ST	ST	ST	ST	TiCN	TiCN	TiCN	TiCN			ST	ST		
	E000TIN	1629AP (UNC)	1629AP (UNF)	1659AP (M)	E201	E252	1985 (UNC)	1985 (UNF)	1676AP (UNC)	1676AP (UNF)	1678 (UNC)	1678 (UNF)	E027	E037	E028	E038	EX20	
	M3 - M20	No.4 - 1"	No.10 - 5/8	M3 - M12	M3 - M10	M8 - M24	No.4 - 1"	No.4 - 7/8	No.4 - 1"	No.10 - 7/8	1/4 - 1"	1/4 - 7/8	No.6 - 1"	No.10 - 1"	No.4 - 1"	No.10 - 1"	No.4 - 1"	
	288	290	290	291	292	292	293	293	294	294	294	294	295	295	295	295	296	
1.1	131						75	75	100	100	110	110	82	82	82	82	82	
1.2	131						69	69	80	80	90	90	72	72	72	72	72	
1.3	105						49	49	50	50	55	55	59	59	59	59	59	
1.4	89						49	49	50	50	55	55	52	52	52	52	52	
1.5	43	45	45	45			30	30	40	40	45	45	33	33	33	33	33	
1.6	36	25	25	25			16	16									16	
1.7																		
1.8																		
2.1	26						36	36	45	45	50	50			23	23		
2.2	23						20	20	30	30	35	35			20	20		
2.3	16								35	35	40	40			13	13		
2.4		30	30	30														
3.1	72	90	90	90	49	49												
3.2	59	70	70	70	26	26												
3.3	82	65	65	65	49	49												
3.4	59	35	35	35	26	26												
4.1	49						20	20	30	30	35	35	33	33			33	
4.2	23						16	16	20	20	25	25	16	16			16	
4.3		10	10	10			7	7										
5.1	59						30	30	30	30	35	35	39	39			39	
5.2	26						16	16	15	15	20	20	16	16			16	
5.3		15	15	15			10	10										
6.1	59								40	40	45	45	39					
6.2	148				66	66			100	100	120	120	98					
6.3	115								90	90	100	100	66					
6.4		25	25	25	16	16												
7.1									80	80	90	90	52	52			52	
7.2									95	95	115	115	115	115			115	
7.3	98								80	80	90	90	66	66			66	
7.4	72				49	49			30	30	35	35	49	49			49	
8.1													98	98				
8.2	148				33	33												
8.3																		
9.1																		
10.1																		



# Visual Index - Taps

	UNF	UNC	UNF	UNC	UNF	M	MF	M	M	M	MF	M	M	MF	MF	M	M	
	DIN 2184-1	DIN 2184-1	DIN 2184-1	ISO 529	ISO 529	DIN ANSI	DIN ANSI	DIN ANSI	ANSI	ANSI	ANSI	DIN 3746	DIN 3746	DIN 374	DIN 374	ISO 529	ISO 529	
	2B	2B	2B	2B	2B	6H	6H	6H	6H	6H	6H	6H	6H	6H	6H	6H	6H	
	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	HSS PM	HSS PM	HSS PM	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	
	C 2-3	C 2-3	C 2-3	C 2-3	C 2-3	Semi-B	Semi-B	Semi-B	C 2-3	C 2-3	C 2-3	C 2-3	C 2-3	C 2-3	C 2-3	C 2-3	C 2-3	
	EX30	EX21	EX31	E023	E033	1677AP (M)	1677AP (MF)	1679 (M)(MF)	E007	E008	E018	EX006H	EX016H	EX10	EX11	E002	E003	
	No.8 - 1"	No.4 - 1"	No.8 - 1"	No.2 - 1"	No.8 - 1"	M4 - M24	M8 - M24	M6 - M24	M4 - M16	M4 - M20	M8 - M14	M2 - M64	M2 - M64	M4 - M30	M4 - M30	M2 - M24	M2 - M24	
		296	296	296	297	297	298	298	298	299	299	299	300	300	301	301	302	302
1.1	82	82	82	82	82	100	100	110	82	82	82	82	82	82	82	82	82	82
1.2	72	72	72	72	72	80	80	90	72	72	72	72	72	72	72	72	72	72
1.3	59	59	59	59	59	50	50	55	59	59	59	59	59	59	59	59	59	59
1.4	52	52	52	52	52	50	50	55	52	52	52	52	52	52	52	52	52	52
1.5	33	33	33	33	33	40	40	45	33	33	33	33	33	33	33	33	33	33
1.6					16													
1.7																		
1.8																		
2.1		23	23	23	23	45	45	50		23	23		23		23		23	
2.2		20	20	20	20	30	30	35		20	20		20		20		20	
2.3		13	13	13	13	35	35	40		13	13		13		13		13	
2.4																		
3.1																		
3.2																		
3.3																		
3.4																		
4.1	33					30	30	35	33			33		33		33		33
4.2	16					20	20	25	16			16		16		16		16
4.3																		
5.1	39					30	30	35	39			39		39		39		39
5.2	16					15	15	20	16			16		16		16		16
5.3																		
6.1						40	40	45										
6.2						100	100	120										
6.3						90	90	100										
6.4																		
7.1	52					80	80	89	52			52		52		52		52
7.2	115					95	95	115	115			115		115		115		115
7.3	66					80	80	90	66			66		66		66		66
7.4	49					30	30	35	49			49		49		49		49
8.1																		
8.2																		
8.3																		
9.1																		
10.1																		

# Visual Index - Taps

	MF	UNC	UNF	M	UNC	UNF	M	UNC	UNF	UNC	UNF	M	MF	M	G	G	G
	ISO 529	DIN ANSI	DIN ANSI	DIN ANSI	ANSI	ANSI	ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI	DIN 5156	DIN 5156	DORMER ISO
	6H	2B	2B	6H	2B 3B	2B 3B	6H	2B	2B	2B	2B	6H	6H	6H	Normal	Normal	Normal
	HSS-E	HSS PM	HSS PM	HSS PM	HSS PM	HSS PM	HSS PM	HSS PM	HSS PM	HSS PM	HSS PM	HSS PM	HSS PM	HSS PM	HSS-E	HSS-E	HSS-E
	C 2-3	Semi-B	Semi-B	Semi-B	E 1.5-2	E 1.5-2	E 1.5-2	Semi-B	Semi-B	Semi-B	Semi-B	Semi-B	Semi-B	Semi-B	B 3.5-5	B 3.5-5	B 3.5-5
	E013	1630AP (UNC)	1630AP (UNF)	1660AP (M)	1641 (UNC)	1641 (UNF)	1671 (M)	1681AP (UNC)	1681AP (UNF)	1691AP (UNC)	1691AP (UNF)	1687AP (M)	1687AP (MF)	1697AP (M)	EP40	EP41	E041
	M4 - M22	No.4 - 1"	No.10 - 7/8	M3 - M12	No.4 - 1/2	No.10 - 3/8	M3 - M10	No.4 - 1"	No.10 - 7/8	1/4 - 1"	5/16 - 1/2	M4 - M20	M10 - M16	M6 - M20	1/8 - 1"	1/8 - 1"	1/8 - 3/4
	302	303	303	304	305	305	306	307	307	308	308	309	309	309	310	310	311
1.1	82				150	150	150	150	150	165	165	150	150	165	82	82	82
1.2	72				125	125	125	125	125	135	135	125	125	135	72	72	72
1.3	59				90	90	90	90	90	100	100	90	90	100	59	59	59
1.4	52				90	90	90	90	90	100	100	90	90	100	52	52	52
1.5	33	45	45	45											33	33	33
1.6		25	25	25											16	16	16
1.7																	
1.8																	
2.1	23				70	70	70	70	70	80	80	70	70	80		23	23
2.2	20				60	60	60	60	60	70	70	60	60	70		20	20
2.3	13				50	50	50	50	50	60	60	50	50	60		13	13
2.4		30	30	30													
3.1		90	90	90											49	49	49
3.2		70	70	70											26	26	26
3.3		65	65	65											49	49	49
3.4		35	35	35											26	26	26
4.1					60	60	60	60	60	70	70	60	60	70	33		
4.2															16		
4.3		10	10	10													
5.1					45	45	45	45	45	55	55	45	45	55	39		
5.2															16		
5.3		15	15	15													
6.1					55	55	55	55	55	70	70	55	55	70	39		
6.2					180	180	180	180	180	200	200	180	180	200	98		
6.3					130	130	130	130	130	160	160	130	130	160	66		
6.4		25	25	25													
7.1					180	180	180	180	180	200	200	180	180	200	52		
7.2					200	200	200	200	200	240	240	200	200	240	115		
7.3					230	230	230	230	230	260	260	230	230	260	66		
7.4															49		
8.1															98		
8.2																	
8.3																	
9.1																	
10.1																	

# Visual Index - Taps

	G	G	G	UNC	UNF	UNS	UNC	UNF	UNC	UNF	UNC	UNF	M	MF	UNC	UNF	UNS	
	DIN 5156	DIN 5156	DORNER ISO	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ISO 529	ISO 529	ANSI	ANSI	ANSI	
	Normal	Normal	Normal	2B 3B	2B 3B	3B	2B 3B	2B 3B	3B	3B	3B	3B	6H	6H	3B	3B	3B	
	HSS-E	HSS-E	HSS-E	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	
	C 2-3	C 2-3	C 2-3															
	EX40	EX41	E043	1500 (UNC)	1500 (UNF)	1500 (UNS)	1528 (UNC)	1528 (UNF)	1500A (UNC)	1500A (UNF)	TN1500 (UNC)	TN1500 (UNF)	E500	E513	1500L (UNC)	1500L (UNF)	1500L (UNS)	
	1/8 - 1.1/2	1/8 - 1.1/2	1/8 - 3/4	1/4 - 1.1/2	1/4 - 1.1/2	11/16 - 1"	No.1 - No.12	No.0 - No.12	1/4 - 1"	1/4 - 7/8	1/4 - 7/8	1/4 - 3/4	M1 - M56	M3 - M50	1/4 - 1"	1/4 - 1"	1"	
		312	312	313	314	314	314	314	314	317	317	318	318	319	321	323	323	323
1.1	82	82	82	60	60	60	60	60	60	60	59	59	23	23	60	60	60	
1.2	72	72	72	45	45	45	45	45	45	45	46	46	20	20	45	45	45	
1.3	59	59	59	30	30	30	30	30	30	30	30	30	16	16	30	30	30	
1.4	52	52	52	30	30	30	30	30	30	30	30	30	13	13	30	30	30	
1.5	33	33	33	20	20	20	20	20	20	20	20	20	10	10	20	20	20	
1.6			16	10	10	10	10	10	10	10	10	10			10	10	10	
1.7																		
1.8																		
2.1		23	23	25	25	25	25	25	25	25	26	26			25	25	25	
2.2		20	20	15	15	15	15	15	15	15	15	15			15	15	15	
2.3		13	13	15	15	15	15	15	15	15	16	16			15	15	15	
2.4																		
3.1				50	50	50	50	50	50	50	49	49	39	39	50	50	50	
3.2				30	30	30	30	30	30	30	30	30	23	23	30	30	30	
3.3				30	30	30	30	30	30	30	30	30	33	33	30	30	30	
3.4				15	15	15	15	15	15	15	16	16	16	16	15	15	15	
4.1	33			20	20	20	20	20	20	20	20	20			20	20	20	
4.2	16			15	15	15	15	15	15	15	16	16			15	15	15	
4.3																		
5.1	39			20	20	20	20	20	20	20	20	20			20	20	20	
5.2	16			10	10	10	10	10	10	10	10	10			10	10	10	
5.3																		
6.1				25	25	25	25	25	25	25	26	26	13	13	25	25	25	
6.2				80	80	80	80	80	80	80	79	79	33	33	80	80	80	
6.3				60	60	60	60	60	60	60	59	59	23	23	60	60	60	
6.4				10	10	10	10	10	10	10	10	10	7	7	10	10	10	
7.1	52			50	50	50	50	50	50	50	49	49			50	50	50	
7.2	115			100	100	100	100	100	100	100	98	98	39	39	100	100	100	
7.3	66			75	75	75	75	75	75	75	75	75	23	23	75	75	75	
7.4	49			20	20	20	20	20	20	20	20	20	16	16	20	20	20	
8.1	98			25	25	25	25	25	25	25	30	30			25	25	25	
8.2				15	15	15	15	15	15	15	16	16	16	16	15	15	15	
8.3													10	10				
9.1																		
10.1																		

# Visual Index - Taps

	UNC	UNF	UNC	UNF	UNC	UNF	M	M	UNC	UNS	UNC	UNF	UNC	UNF	M	M	M
	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ISO 529	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ISO 529
	2B 3B	2B 3B	3B	2B 3B	3B	3B	6H	6H		2B	3B	3B	2B	2B	6H	6H	6H
	1.5XD	1.5XD	1.5XD	1.5XD	1.5XD	1.5XD	1.5XD	1.5XD	1.5XD	1.5XD	1.5XD	1.5XD	1.5XD	1.5XD	1.5XD	1.5XD	1.5XD
	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS
									P								
	E061	E071	1508 (UNC)	1508 (UNF)	1595 (UNC)	1595 (UNF)	1700 (M)	E501	1500OV (UNC)	1505 (UNS)	1599 (UNC)	1599 (UNF)	1600 (UNC)	1600 (UNF)	1599 (M)	1599SB (M)	E504
	No.6 - 1.1/2	No.6 - 1.1/2	1/4 - 1/2	1/4 - 1/2	1/4 - 5/16	1/4 - 1/4	M1.6 - M36	M3 - M24	1/4 - 5/8	1.1/8 - 2"	1/4 - 3/4	1/4 - 3/4	1/4 - 3/4	1/4 - 3/4	M6 - M14	M6 - M12	M3 - M24
	324	324	325	325	325	325	326	327	328	329	330	330	330	330	331	331	332
1.1	72	72	60	60	66	66	49	23	49	49							46
1.2	66	66	45	45	59	59	36	20	36	36							39
1.3	52	52	30	30	39	39	26	16	26	26							33
1.4	39	39	30	30	39	39	26	13	26	26							26
1.5	23	23	20	20	26	26	16	10	16	16							20
1.6	13	13	10	10	16	16	7		7	7							
1.7																	
1.8																	
2.1			25	25	30	30	20		20	20							
2.2			15	15	20	20	13		13	13							
2.3			15	15	20	20	13		13	13							
2.4																	
3.1	39	39	50	50	46	46	39	39	39	39	49	49	49	49	49	49	59
3.2	23	23	30	30	26	26	26	23	26	26	36	36	36	36	36	36	39
3.3	33	33	30	30	26	26	26	33	26	26	36	36	36	36	36	36	72
3.4	16	16	15	15	16	16	13	16	13	13	20	20	20	20	20	20	39
4.1			20	20	20	20	16		16	16							
4.2			15	15	16	16	13		13	13							
4.3					7	7											
5.1			20	20	26	26	16		16	16							
5.2			10	10	10	10	7		7	7							
5.3																	
6.1	39	39	25	25	30	30	20	13	20	20							
6.2	98	98	80	80	89	89	66	33	66	66							66
6.3	66	66	60	60	69	69	49	23	49	49							46
6.4			10	10	10	10	7	7	7	7	13	13	13	13	13	13	13
7.1			50	50	49	49	39	39	39	39							
7.2			100	100	98	98	79	39	79	79							79
7.3	66	66	75	75	66	66	59	23	59	59							46
7.4	49	49	20	20	20	20	16	16	16	16							33
8.1			25	25	98	98	26		26	26							
8.2	39	39	15	15	26	26	13	16	13	13	13	13	13	13	13	13	33
8.3	23	23						10									20
9.1																	
10.1																	

# Visual Index - Taps

	UNC	UNF	UNC	UNF	UNC	UNF	UNC	UNF	UNC	UNF	UNC	UNF	M	M	UNC	UNF	UNS
	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI
	2B 3B	2B 3B	2B	2B	3B	3B	2B 3B	2B 3B	2B 3B	3B	3B	3B	6H	6H	2B 3B	2B 3B	3B
	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS-E	HSS-E	HSS	HSS	HSS	HSS	HSS
											P	P					
			TN	TN			ST	ST	TN	TN							
	1534 (UNC) No.5 - No.12	1534 (UNF) No.5 - No.12	TN1534 (UNC) No.4 - No.12	TN1534 (UNF) No.10	1585 (UNC) 1/4 - 3/4	1585 (UNF) 1/4 - 3/4	1585A (UNC) 1/4 - 3/4	1585A (UNF) 1/4 - 3/4	TN1585 (UNC) 1/4 - 1/2	TN1585 (UNF) 1/4 - 1/2	1634 (UNC) No.4 - No.8	1634 (UNF) No.10	1785M M2 - M18	TN1785 M4 - M12	1534NR (UNC) No.1 - No.12	1534NR (UNF) No.0 - No.12	1534NR (UNS) No.4
	333	333	333	333	334	334	334	334	334	334	336	336	337	337	338	338	338
1.1	66	66	79	79	66	66	66	66	79	79	66	66	66	79	66	66	66
1.2	66	66	75	75	66	66	66	66	75	75	66	66	66	75	66	66	66
1.3	39	39	49	49	39	39	39	39	49	49	39	39	39	49	39	39	39
1.4	39	39	49	49	39	39	39	39	49	49	39	39	39	49	39	39	39
1.5	26	26	30	30	26	26	26	26	30	30	26	26	26	30	26	26	26
1.6	16	16	20	20	16	16	16	16	20	20	16	16	16	20	16	16	16
1.7																	
1.8																	
2.1	30	30	39	39	30	30	30	30	39	39	30	30	30	39	30	30	30
2.2	20	20	26	26	20	20	20	20	26	26	20	20	20	26	20	20	20
2.3	20	20	26	26	20	20	20	20	26	26	20	20	20	26	20	20	20
2.4																	
3.1	46	46	49	49	46	46	46	46	49	49	46	46	46	49	46	46	46
3.2	26	26	30	30	26	26	26	26	30	30	26	26	26	30	26	26	26
3.3	26	26	30	30	26	26	26	26	30	30	26	26	26	30	26	26	26
3.4	16	16	20	20	16	16	16	16	20	20	16	16	16	20	16	16	16
4.1	20	20			20	20	20	20			20	20	20		20	20	20
4.2	16	16			16	16	16	16			16	16	16		16	16	16
4.3	7	7			7	7	7	7			7	7	7		7	7	7
5.1	26	26	30	30	26	26	26	26	30	30	26	26	26	30	26	26	26
5.2	10	10	13	13	10	10	10	10	13	13	10	10	10	13	10	10	10
5.3																	
6.1	30	30	39	39	30	30	30	30	39	39	30	30	30	39	30	30	30
6.2	89	89	115	115	89	89	89	89	115	115	89	89	89	115	89	89	89
6.3	69	69	89	89	69	69	69	69	89	89	69	69	69	89	69	69	69
6.4	10	10	13	13	10	10	10	10	13	13	10	10	10	13	10	10	10
7.1	49	49	66	66	49	49	49	49	66	66	49	49	49	66	49	49	49
7.2	98	98	125	125	98	98	98	98	125	125	98	98	98	125	98	98	98
7.3	66	66	79	79	66	66	66	66	79	79	66	66	66	79	66	66	66
7.4	20	20	26	26	20	20	20	20	26	26	20	20	20	26	20	20	20
8.1	98	98	121	121	98	98	98	98	121	121	98	98	98	121	98	98	98
8.2	26	26	30	30	26	26	26	26	30	30	26	26	26	30	26	26	26
8.3																	
9.1																	
10.1																	

# Visual Index - Taps

	UNC	UNF	M	UNC	UNF	UNC	UNF	UNC	UNC	UNF	UNC	UNF	UNC	UNF	UNC	UNF	UNC
	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI
	2B 3B	2B 3B	6H	3B	2B 3B	2B 3B	2B 3B	2B	3B	3B	3B	3B	3B	3B	2B 3B	2B 3B	3B
	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS
				P	P												
									$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 52^\circ$	$\lambda 52^\circ$	$\lambda 52^\circ$	$\lambda 52^\circ$	$\lambda 40^\circ$
																	ST
	1585NR (UNC)	1585NR (UNF)	1785NR	1534NE (UNC)	1534NE (UNF)	1593 (UNC)	1593 (UNF)	1585OV (UNC)	1582 (UNC)	1582 (UNF)	1586 (UNC)	1586 (UNF)	1587 (UNC)	1587 (UNF)	1588 (UNC)	1588 (UNF)	1590 (UNC)
	1/4 - 3/4	1/4 - 3/4	M1.6 - M20	No.4 - 1/2	No.10 - 1/2	No.6 - No.10	No.10	1/4 - 5/8	No.4 - No.10	No.10 - No.10	1/4 - 1/2	1/4 - 1/2	No.3 - No.12	No.4 - No.10	1/4 - 1/2	1/4 - 1/2	No.6 - No.10
	340	340	341	342	342	343	343	343	344	344	344	344	345	345	345	345	346
1.1	66	66	66	66	66	66	66	66	66	66	66	66					69
1.2	59	59	59	66	66	66	66	66	49	49	49	49					59
1.3	46	46	46	39	39	39	39	39	36	36	36	36					39
1.4	33	33	33	39	39	39	39	39	36	36	36	36					39
1.5	16	16	16	26	26	26	26	26									30
1.6	10	10	10	16	16	16	16	16									
1.7																	
1.8																	
2.1	20	20	20	30	30	30	30	30	26	26	26	26					30
2.2	13	13	13	20	20	20	20	20	20	20	20	20					26
2.3	10	10	10	20	20	20	20	20	20	20	20	20					20
2.4																	
3.1			46	46	46	46	46	46									
3.2			26	26	26	26	26	26									
3.3			26	26	26	26	26	26									
3.4			16	16	16	16	16	16									
4.1				20	20	20	20	20	20	20	20	20					20
4.2				16	16	16	16	16	16	16	16	16					16
4.3	10	10	10	7	7	7	7	7	7	7	7	7					7
5.1	33	33	33	26	26	26	26	26	20	20	20	20					
5.2	13	13	13	10	10	10	10	10	16	16	16	16					
5.3																	10
6.1	33	33	33	30	30	30	30	30					30	30	30	30	
6.2				89	89	89	89	89					79	79	79	79	
6.3	49	49	49	69	69	69	69	69					79	79	79	79	
6.4				10	10	10	10	10									
7.1	33	33	33	49	49	49	49	49					49	49	49	49	
7.2	82	82	82	98	98	98	98	98					66	66	66	66	
7.3	43	43	43	66	66	66	66	66					66	66	66	66	
7.4	33	33	33	20	20	20	20	20									
8.1	66	66	66	98	98	98	98	98									
8.2				26	26	26	26	26									
8.3																	
9.1																	
10.1																	

# Visual Index - Taps

	UNF	UNC	UNF	M	UNC	UNF	M	UNC	UNF	M	UNC	UNF	NPT	NPT	NPT	NPT	NPT
	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI	ANSI B94.9	ANSI B94.9	ANSI B94.9
	3B	3B	3B	6H	2B 3B	2B 3B	6H	2B 3B	2B 3B	6H	2B	2B	Normal	Normal	Normal	Normal	Normal
	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS
											E 1.5-2	E 1.5-2			C 2-3	C 2-3	C 2-3
	1590 (UNF)	1591 (UNC)	1591 (UNF)	1788 (M)	1580 (UNC)	1580 (UNF)	1580 (M)	3300 (UNC)	3300 (UNF)	3300 (M)	3306E (UNC)	3306E (UNF)	1541 (NPT)	TN1541	E710	E721	6541
	No.6 - No.10	1/4 - 1/2	1/4 - 1/2	M3 - M12	No.2 - 3/8	No.10 - 3/8	M3 - M12	No.1 - 1/2	No.0 - 3/8	M3 - M10	No.4 - 5/16	No.10 - 5/16	1/16 - 2"	1/8 - 3/4	1/16 - 2"	1/8 - 1"	1/8 - 2"
		346	346	346	347	348	348	349	350	350	351	352	352	353	353	354	355
1.1	69	69	69		98	98	98	98	98	98	98	98	98	13	16	13	13
1.2	59	59	59		79	79	79	79	79	79	79	79	79	13	16	13	13
1.3	39	39	39		49	49	49	49	49	49	49	49	49	20	23	20	20
1.4	39	39	39		49	49	49	49	49	49	49	49	49	16	20	16	16
1.5	30	30	30		30	30	30	30	30	30	30	30	30	10	13	10	10
1.6																	
1.7																	
1.8																	
2.1	30	30	30		39	39	39	39	39	39	39	39					
2.2	26	26	26		30	30	30	30	30	30	30	30					
2.3	20	20	20														
2.4																	
3.1													20	23	20	20	20
3.2													13	16	13	13	13
3.3													20	23	20	20	20
3.4													13	16	13	13	13
4.1	20	20	20		30	30	30	30	30	30	30	30					
4.2	16	16	16		26	26	26	26	26	26	26	26					
4.3	7	7	7														
5.1					30	30	30	30	30	30	30	30					
5.2																	
5.3	10	10	10														
6.1				30	39	39	39	39	39	39	39	39					
6.2				79	121	121	121	121	121	121	121	121	36	39	36	36	36
6.3				79	98	98	98	98	98	98	98	98					
6.4																	
7.1				49	79	79	79	79	79	79	79	79					
7.2				66	161	161	161	161	161	161	161	161					
7.3				66	98	98	98	98	98	98	98	98	36	39	36	36	36
7.4													23	26	23	23	23
8.1													13	16	13	13	13
8.2																	
8.3																	
9.1																	
10.1																	

# Visual Index - Taps

	NPT	NPT	NPT	NPT	NPT	NPT	NPTF	NPTF	NPTF	NPTF	NPTF	NPSM	NPSF	Rc	G	UNC	UNF
	ANSI B94.9	ANSI	ANSI	ANSI	ANSI	ANSI B94.9	ANSI	ANSI	ANSI	ANSI	ANSI B94.9	ANSI	ANSI	ISO 2284	ISO 2284	ANSI	ANSI
	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	3B	3B
	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS
						C 2-3					C 2-3			C 2-3			
	1544 (NPT)	1545 (NPT)	1545A (NPT)	1548 (NPT)	1568 (NPT)	E711	1543 (NPTF)	TN1543	1549 (NPTF)	1567 (NPTF)	E712	1542 (NPS)	1592 (NPSF)	E550	E547	1572 (UNC)	1572 (UNF)
	1/16 - 1.1/4	1/8 - 1"	1/16 - 3/4	1/16 - 1"	1/8 - 1.1/2"	1/8 - 1.1/2	1/16 - 1"	1/8 - 3/4	1/16 - 3/4	1/8 - 1"	1/16 - 1.1/4	1/8 - 1"	1/8 - 3/4	1/8 - 2"	1/8 - 2"	No.4 - 1/2	No.10 - 1/4
	356	357	357	358	359	360	361	361	362	363	364	365	365	366	367	368	368
1.1	13	13	13	13	13	13	13	16	13	13	13	13	13	72	23	49	49
1.2	13	13	13	13	13	13	13	16	13	13	13	13	13	66	20	30	30
1.3	20	20	20	20	20	20	20	23	20	20	20	20	20	52	16	26	26
1.4	16	16	16	16	16	16	16	20	16	16	16	16	16	39	13	26	26
1.5	10	10	10	10	10	10	10	13	10	10	10	10	10	23	10		
1.6														13			
1.7																	
1.8																	
2.1														23		16	16
2.2														16		7	7
2.3														23			
2.4																	
3.1	20	20	20	20	20	20	20	23	20	20	20	20	20	39	39		
3.2	13	13	13	13	13	13	13	16	13	13	13	13	13	23	23		
3.3	20	20	20	20	20	20	20	23	20	20	20	20	20	33	33		
3.4	13	13	13	13	13	13	13	16	13	13	13	13	13	16	16		
4.1																	
4.2																	
4.3																	
5.1																	
5.2																	
5.3																	
6.1														39	13	26	26
6.2	36	36	36	36	36	36	36	39	36	36	36	36	36	98	33	66	66
6.3														66	23	49	49
6.4														13	7		
7.1																39	39
7.2														115	39	79	79
7.3	36	36	36	36	36	36	36	39	36	36	36	36	36	66	23	59	59
7.4	23	23	23	23	23	23	23	26	23	23	23	23	23	49	16	16	16
8.1	13	13	13	13	13	13	13	16	13	13	13	13	13				
8.2														39	16		
8.3														23	10		
9.1																	
10.1																	



# Visual Index - Taps

	UNC	UNF	EGM	EGM	UNC	UNC	UNC	UNF	UNC	UNF	M	NPT
	ANSI	ANSI	DORMER ISO	DORMER ISO	ANSI	ANSI	ANSI	ANSI	DORMER DIN	DORMER DIN	DORMER ISO	ANSI
	2B 3B	2B 3B	6H	6H	3B	3B	2B	2B	2B	Medium	6H	Normal
	1.5XD	1.5XD	1.5XD	2XD	3.5XD	1.5XD	1.5XD	1.5XD	1.5XD	1.5XD	1.5XD	1.5XD
	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS
			C 2-3	C 2-3	T	P			C 2-3	C 2-3	C 2-3	
	<b>1578 (UNC)</b>	<b>1578 (UNF)</b>	<b>E620</b>	<b>E621</b>	<b>U1511</b>	<b>1519 (UNC)</b>	<b>1994 (UNC)</b>	<b>1994 (UNF)</b>	<b>E651</b>	<b>E654</b>	<b>E650</b>	<b>E653</b>
	No.4 - 1/4	No.10 - 1/4	M3 - M16	M3 - M16	1/4 - 1/2	1/4 - 3/4	No.4 - 1/2	No.10 - 1/2	No.6 - 5/8	No.8 - 5/8	M3 - M16	1/8 - 1"
	<b>368</b>	<b>368</b>	<b>369</b>	<b>369</b>	<b>370</b>	<b>371</b>	<b>372</b>	<b>372</b>	<b>373</b>	<b>373</b>	<b>374</b>	<b>375</b>
1.1	66	66	23		39	49	82	82	82	82	82	82
1.2	59	59	20	59	33	36	72	72	72	72	72	72
1.3	46	46	16	46	26	26	59	59	59	59	59	59
1.4	33	33	13	33	20	26	49	49	49	49	49	49
1.5	16	16	10	16	16	16						
1.6	10	10				7						
1.7												
1.8												
2.1	20	20		20		20						
2.2	13	13		13		13						
2.3	10	10		10		13						
2.4												
3.1			39		46	39						
3.2			23		26	26	26	26	26	26	26	26
3.3			33		39	26						
3.4			16			13						
4.1						16						
4.2						13						
4.3	10	10										
5.1	33	33				16						
5.2	13	13		13		7						
5.3												
6.1	33	33	13			20						
6.2			33		52	66	98	98	98	98	98	98
6.3	49	49	23		39	49	66	66	66	66	66	66
6.4			7			7						
7.1	33	33		33		39	59	59	59	59	59	59
7.2	82	82	39	82	66	79	115	115	115	115	115	115
7.3	43	43	23	43	39	59						
7.4	33	33	16	33		16						
8.1	66	66				26	98	98	98	98	98	98
8.2			16		26	13						
8.3			10									
9.1												
10.1												

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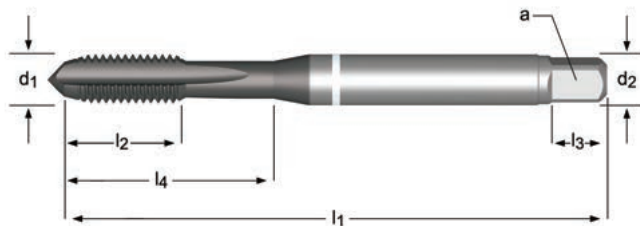
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## DIN ANSI Machine Tap, White Shark for Cast Iron

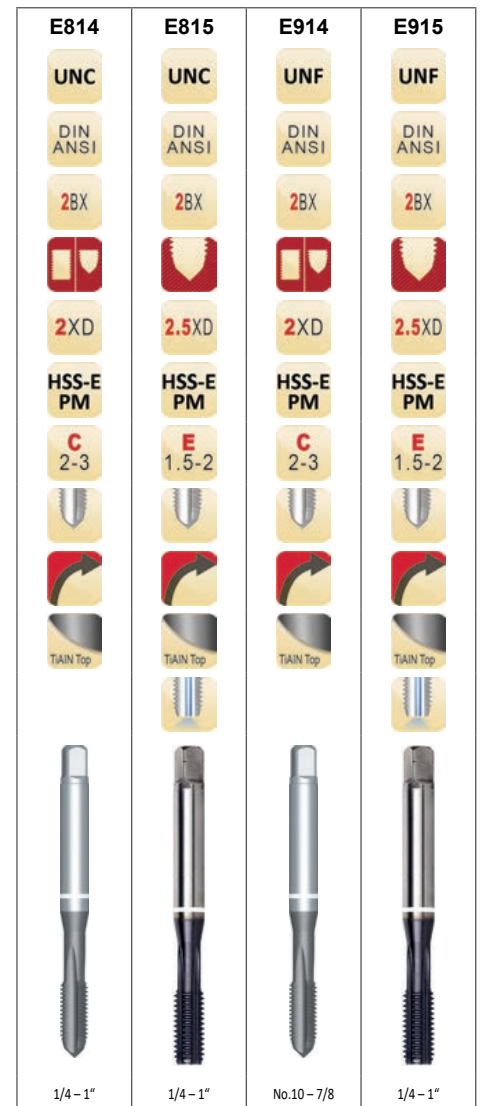
**E814** Designed for semi-bottoming or through hole tapping in Cast Iron applications. Premium HSCo Powder Metal substrate with TiAlN-Top Coating combine to offer superior abrasion resistance, higher operating speeds, improved thread quality, reduced cycle times and longer tool life.

**E815** Coolant through design allows for higher tapping speeds and better tool life. This design eliminates the problems associated with inadequate coolant supply in some applications. Full Bottoming.

- 3.1 3.2 3.3 8.2
- 3.4 6.2 6.4 7.4



Pack Qty = 1 pc



UNC	UNF	TPI	l <sub>1</sub> Inch	l <sub>2</sub> Inch	l <sub>4</sub> Inch	d <sub>2</sub> Ø Inch	a Inch	l <sub>3</sub> Inch	No. of flutes	Flute Width	Flute Depth	Limits	E814	E815	E914	E915
	10	32	2.756	0.551	1.102	0.194	0.150	0.250	4	4.10	N21	H4	—	—	7350222	—
1/4	20	20	3.150	0.591	0.984	0.255	0.189	0.310	4	5.10	N7	H5	7350203	7350231	—	—
	1/4	28	3.150	0.591	0.984	0.255	0.189	0.310	4	5.50	N3	H5	—	—	7350223	—
	1/4	28	3.150	0.591	0.984	0.255	0.189	0.310	4	5.50	N3	H4	—	—	—	7350240
5/16	18	18	3.543	0.709	1.339	0.318	0.236	0.380	4	6.60	F	H5	7350204	—	—	—
5/16	18	18	3.543	0.787	1.339	0.318	0.236	0.380	4	6.60	F	H5	—	7350232	—	—
	5/16	24	3.543	0.709	1.339	0.318	0.236	0.380	4	6.90	I	H5	—	—	7350224	—
	5/16	24	3.543	0.787	1.339	0.318	0.236	0.380	4	6.90	I	H5	—	—	—	7350241
3/8	16	16	3.937	0.787	1.535	0.381	0.284	0.440	4	8.00	5/16	H5	7350205	7350233	—	—
	3/8	24	3.543	0.787	1.476	0.381	0.284	0.440	4	8.50	Q	H5	—	—	7350225	7350242
7/16	14	14	3.937	0.787	—	0.323	0.240	0.410	4	9.40	U	H5	7350206	7350234	—	—
	7/16	20	3.937	0.787	—	0.323	0.240	0.410	4	9.90	25/64	H5	—	—	7350226	7350243
1/2	13	13	4.331	0.906	—	0.367	0.273	0.440	4	10.80	27/64	H5	7350207	7350235	—	—
	1/2	20	3.937	0.827	—	0.367	0.273	0.440	4	11.50	29/64	H5	—	—	7350227	7350244
5/8	11	11	4.331	0.906	—	0.480	0.358	0.560	4	13.50	17/32	H5	7350208	7350236	—	—
	5/8	18	3.937	0.827	—	0.480	0.358	0.560	4	14.50	37/64	H5	—	—	7350228	7350245
3/4	10	10	4.921	1.181	—	0.590	0.439	0.690	4	16.50	21/32	H5	7350209	7350237	—	—
	3/4	16	4.331	0.906	—	0.590	0.439	0.690	4	17.50	11/16	H6	—	—	7350229	—
	3/4	16	4.331	0.906	—	0.590	0.439	0.690	4	17.50	11/16	H5	—	—	—	7350246
7/8	9	9	5.512	1.339	—	0.697	0.520	0.750	4	19.50	49/64	H6	7350220	7350238	—	—
	7/8	14	4.921	0.906	—	0.697	0.520	0.750	4	20.40	13/16	H6	—	—	7350230	7350247
1"	8	8	6.299	1.417	—	0.800	0.597	0.810	4	22.25	7/8	H6	7350221	7350239	—	—
	1"	12	5.512	1.063	—	0.800	0.597	0.810	4	23.25	59/64	H6	—	—	—	7350248

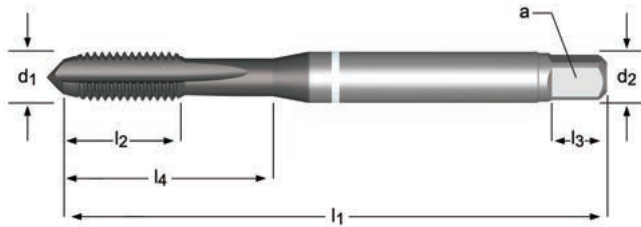
Note: Sizes up to 3/8" have male centers on both ends • Sizes over 3/8" have female centers on both ends

## DIN ANSI Machine Tap, White Shark for Cast Iron

**E630** **E770** Designed for semi-bottoming or through hole tapping in Cast Iron applications. Premium HSCo Powder Metal substrate with TiAlN-Top Coating combine to offer superior abrasion resistance, higher operating speeds, improved thread quality, reduced cycle times and longer tool life.

**E631** **E771** Coolant through design allows for higher tapping speeds and better tool life. This design eliminates the problems associated with inadequate coolant supply in some applications. Full Bottoming.

- 3.1 3.2 3.3 8.2
- 3.4 6.2 6.4 7.4



Pack Qty = 1 pc

M	MF	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>4</sub> mm	d <sub>2</sub> Ø Inch	□ a Inch	l <sub>3</sub> mm	No. of flutes	Flute width	Flute depth	Limits	E630	E631	E770	E771
5		0.80	70	13	25	0.194	0.150	6	4	4.20	N19	D4	7350249	—	—	—
6		1.00	80	15	25	0.255	0.189	8	4	5.00	N9	D5	—	7350265	—	—
6		1.00	80	15	30	0.255	0.189	8	4	5.00	N9	D5	7350250	—	—	—
	8	1.00	90	18	35	0.318	0.236	10	4	7.00	J	D5	—	—	7350259	—
8		1.25	90	18	35	0.318	0.236	10	4	6.80	H	D5	7350251	—	—	—
8		1.25	90	20	34	0.318	0.236	10	4	6.80	H	D5	—	7350266	—	—
	10	1.00	90	20	35	0.381	0.284	11	4	9.00	T	D6	—	—	7350260	—
	10	1.25	100	20	39	0.381	0.284	11	4	8.80	11/32	D6	—	—	7350261	7350274
10		1.50	100	20	39	0.381	0.284	11	4	8.50	Q	D6	7350252	7350267	—	—
	12	1.25	100	21	—	0.367	0.273	11	4	10.80	27/64	D6	—	—	7350262	7350275
	12	1.50	100	21	—	0.367	0.273	11	4	10.50	Z	D6	—	—	7350263	7350276
12		1.75	110	23	—	0.367	0.273	11	4	10.30	Y	D6	7350253	7350268	—	—
	14	1.50	100	21	—	0.429	0.320	13	4	12.50	31/64	D7	—	—	7350264	7350277
14		2.00	110	23	—	0.429	0.320	13	4	12.00	15/32	D7	7350254	7350269	—	—
16		2.00	110	23	—	0.480	0.358	14	4	14.00	35/64	D7	7350255	7350270	—	—
18		2.50	125	30	—	0.542	0.404	16	4	15.50	39/64	D7	7350256	7350271	—	—
20		2.50	140	30	—	0.652	0.487	18	4	17.50	11/16	D7	7350257	7350272	—	—
24		3.00	160	38	—	0.760	0.567	19	4	21.00	53/64	D8	7350258	7350273	—	—

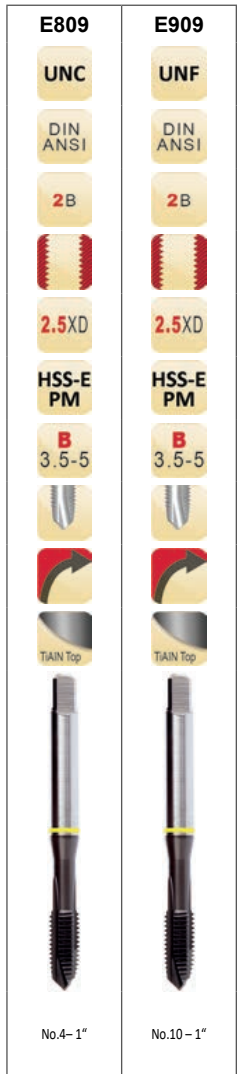
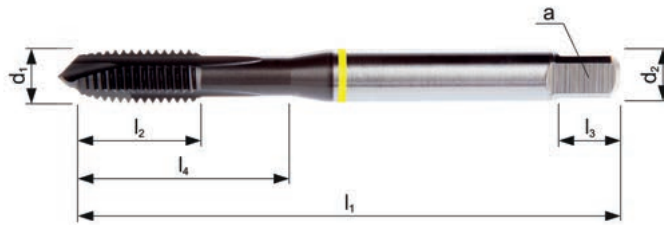
Note: Sizes up to M10 have male centers on both ends • Sizes over M10 have female centers on both ends.

E630	E631	E770	E771
M	M	MF	MF
DIN ANSI	DIN ANSI	DIN ANSI	DIN ANSI
6HX	6HX	6HX	6HX
2XD	2.5XD	2XD	2.5XD
HSS-E PM	HSS-E PM	HSS-E PM	HSS-E PM
C 2-3	E 1.5-2	C 2-3	E 1.5-2
M5—M24	M6—M24	M8—M14	M10—M14

## DIN ANSI Machine Tap, Yellow Shark for Low Alloy Steels

**E809** Designed for through hole tapping in low Alloy Steel applications.  
**E909** Premium HSCo Powder Metal substrate with TiAlN-Top Coating combine to offer superior abrasion resistance, higher operating speeds, improved thread quality, reduced cycle times and longer tool life.

- 1.1 1.2 1.3 6.1 6.3
- 1.4 1.5 6.2



Pack Qty = 1 pc

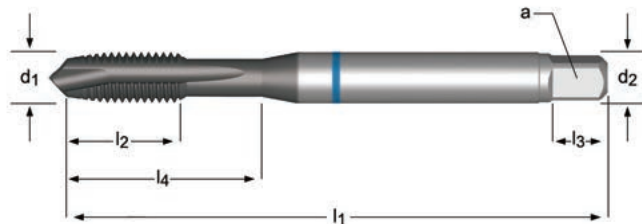
UNC	UNF	TPI	$l_1$ Inch	$l_2$ Inch	$l_4$ Inch	$d_2$ Inch	$a$ Inch	$l_3$ Inch	No. of flutes			Limits	E809	E909
4		40	2.205	0.354	0.709	0.141	0.108	0.190	3	2.35	N43	H2	7350469	—
6		32	2.205	0.433	0.787	0.141	0.108	0.190	3	2.85	N36	H2	7350470	—
8		32	2.480	0.512	0.827	0.168	0.129	0.250	3	3.50	N29	H3	7350471	—
10		24	2.756	0.551	1.102	0.194	0.150	0.250	3	3.90	N25	H3	7350472	—
	10	32	2.756	0.551	1.102	0.194	0.150	0.250	3	4.10	N21	H3	—	7350482
1/4		20	3.150	0.591	0.984	0.255	0.189	0.310	3	5.10	N7	H5	7350473	—
	1/4	28	3.150	0.591	0.984	0.255	0.189	0.310	3	5.50	N3	H4	—	7350483
5/16		18	3.543	0.709	1.339	0.318	0.236	0.380	3	6.60	F	H5	7350474	—
	5/16	24	3.543	0.709	1.339	0.318	0.236	0.380	3	6.90	I	H4	—	7350484
3/8		16	3.937	0.787	1.535	0.381	0.284	0.440	3	8.00	5/16	H4	7350475	—
	3/8	24	3.543	0.787	1.476	0.381	0.284	0.440	3	8.50	Q	H4	—	7350485
7/16		14	3.937	0.787	—	0.323	0.240	0.410	3	9.40	U	H5	7350476	—
	7/16	20	3.937	0.787	—	0.323	0.240	0.410	3	9.90	25/64	H5	—	7350486
1/2		13	4.331	0.906	—	0.367	0.273	0.440	3	10.80	27/64	H5	7350477	—
	1/2	20	3.937	0.827	—	0.367	0.273	0.440	3	11.50	29/64	H5	—	7350487
5/8		11	4.331	0.906	—	0.480	0.358	0.560	3	13.50	17/32	H5	7350478	—
	5/8	18	3.937	0.827	—	0.480	0.358	0.560	3	14.50	37/64	H5	—	7350488
3/4		10	4.921	1.181	—	0.590	0.439	0.690	3	16.50	21(32)	H5	7350479	—
	3/4	16	4.331	0.906	—	0.590	0.439	0.690	3	17.50	11/16	H5	—	7350489
7/8		9	5.512	1.339	—	0.697	0.520	0.750	4	19.50	49/64	H6	7350480	—
	7/8	14	4.921	0.906	—	0.697	0.520	0.750	4	20.40	13/16	H6	—	7350490
1"		8	6.299	1.417	—	0.800	0.597	0.810	4	22.25	7/8	H6	7350481	—
	1"	12	5.512	1.063	—	0.800	0.597	0.810	4	23.25	59/64	H6	—	7350491

Note: Sizes up to 3/8" have male centers on both ends • Sizes over 3/8" have female centers on both ends.

## DIN ANSI Machine Tap, Blue Shark for Stainless Steel

**E813** Designed for superior performance through hole tapping in a wide range of Stainless Steel types. Premium HSCo Powder Metal substrate with Super-B (TiAlN+WC/C) Coating combined with an additional edge treatment to offer improved thread quality and longer tool life. Available in both 2B and 3B Class of Fit to cover a wide range of applications.

- 2.1 2.2 2.3
- 1.2 1.3 1.4 1.5



<b>E813</b>	<b>E913</b>
UNC	UNF
DIN ANSI	DIN ANSI
2B 3B	2B 3B
2.5XD	2.5XD
HSS-E PM	HSS-E PM
B 3.5-5	B 3.5-5
Super B	Super B
No.4-1"	No.10-1"

Pack Qty = 1 pc

UNC	UNF	TPI	l <sub>1</sub> Inch	l <sub>2</sub> Inch	l <sub>4</sub> Inch	d <sub>2</sub> Ø Inch	a Inch	l <sub>3</sub> Inch	No. of flutes			Limits	E813	E913
4		40	2.205	0.354	0.709	0.141	0.108	0.190	3	2.35	N43	H2	7350278	—
6		32	2.205	0.433	0.787	0.141	0.108	0.190	3	2.85	N36	H3	7350279	—
8		32	2.480	0.512	0.827	0.168	0.129	0.250	3	3.50	N29	H3	7350280	—
10		24	2.756	0.551	1.102	0.194	0.150	0.250	3	3.90	N25	H3	7350281	—
	10	32	2.756	0.551	1.102	0.194	0.150	0.250	3	4.10	N21	H3	—	7350299
1/4		20	3.150	0.591	0.984	0.255	0.189	0.310	3	5.10	N7	H5	7350282	—
1/4		20	3.150	0.591	0.984	0.255	0.189	0.310	3	5.10	N7	H3	7350283	—
	1/4	28	3.150	0.591	0.984	0.255	0.189	0.310	3	5.50	N3	H5	—	7350300
	1/4	28	3.150	0.591	0.984	0.255	0.189	0.310	3	5.50	N3	H3	—	7350301
5/16		18	3.543	0.709	1.339	0.318	0.236	0.380	3	6.60	F	H5	7350284	—
5/16		18	3.543	0.709	1.339	0.318	0.236	0.380	3	6.60	F	H3	7350285	—
	5/16	24	3.543	0.709	1.339	0.318	0.236	0.380	3	6.90	I	H4	—	7350302
	5/16	24	3.543	0.709	1.339	0.318	0.236	0.380	3	6.90	I	H3	—	7350303
3/8		16	3.937	0.787	1.535	0.381	0.284	0.440	3	8.00	5/16	H3	7350287	—
3/8		16	3.937	0.787	1.535	0.381	0.284	0.440	3	8.00	5/16	H5	7350286	—
	3/8	24	3.543	0.787	1.476	0.381	0.284	0.440	3	8.50	Q	H4	—	7350304
	3/8	24	3.543	0.787	1.476	0.381	0.284	0.440	3	8.50	Q	H3	—	7350305
5/8		11	4.331	0.906	—	0.480	0.358	0.560	4	13.50	17/32	H5	7350291	—
5/8		11	4.331	0.906	—	0.480	0.358	0.560	4	13.50	17/32	H3	7350292	—
7/16		14	3.937	0.787	—	0.323	0.240	0.410	4	9.40	U	H5	7350288	—
	7/16	20	3.937	0.787	—	0.323	0.240	0.410	4	9.90	25/64	H5	—	7350306
1/2		13	4.331	0.906	—	0.367	0.273	0.440	4	10.80	27/64	H5	7350289	—
1/2		13	4.331	0.906	—	0.367	0.273	0.440	4	10.80	27/64	H3	7350290	—
	1/2	20	3.937	0.827	—	0.367	0.273	0.440	4	11.50	29/64	H5	—	7350307
	1/2	20	3.937	0.827	—	0.367	0.273	0.440	4	11.50	29/64	H3	—	7350308

Note: Sizes up to 3/8" have male centers on both ends • Sizes over 3/8" have female centers on both ends.

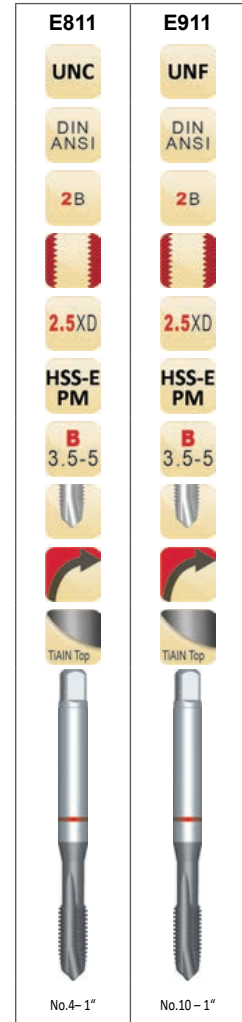
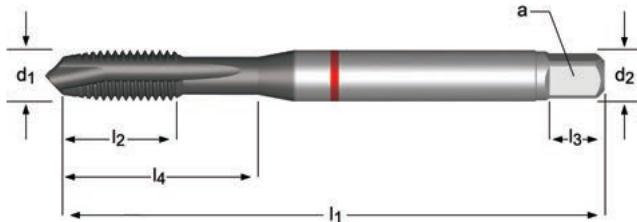
UNC	UNF	TPI	$l_1$ Inch	$l_2$ Inch	$l_4$ Inch	$d_2$ $\varnothing$ Inch	$\square$ a Inch	$l_3$ Inch	No. of flutes			Limits	E813	E913
	5/8	18	3.937	0.827	—	0.480	0.358	0.560	4	14.50	37/64	H5	—	7350309
	5/8	18	3.937	0.827	—	0.480	0.358	0.560	4	14.50	37/64	H3	—	7350310
	3/4	10	4.921	1.181	—	0.590	0.439	0.690	4	16.50	21/32	H5	7350293	—
	3/4	10	4.921	1.181	—	0.590	0.439	0.690	4	16.50	21/32	H3	7350294	—
	3/4	16	4.331	0.906	—	0.590	0.439	0.690	4	17.50	11/16	H5	—	7350311
	3/4	16	4.331	0.906	—	0.590	0.439	0.690	4	17.50	11/16	H3	—	7350312
	7/8	9	5.512	1.339	—	0.697	0.520	0.750	4	19.50	49/64	H6	7350295	—
	7/8	9	5.512	1.339	—	0.697	0.520	0.750	4	19.50	49/64	H4	7350296	—
	7/8	14	4.921	0.906	—	0.697	0.520	0.750	4	20.40	13/16	H6	—	7350313
	7/8	14	4.921	0.906	—	0.697	0.520	0.750	4	20.40	13/16	H4	—	7350314
	1"	8	6.299	1.417	—	0.800	0.597	0.810	4	22.25	7/8	H6	7350297	—
	1"	8	6.299	1.417	—	0.800	0.597	0.810	4	22.25	7/8	H4	7350298	—
	1"	12	5.512	1.063	—	0.800	0.597	0.810	4	23.25	59/64	H6	—	7350315
	1"	12	5.512	1.063	—	0.800	0.597	0.810	4	23.25	59/64	H4	—	7350316

Note: Sizes up to 3/8" have male centers on both ends • Sizes over 3/8" have female centers on both ends.

## DIN ANSI Machine Tap, Red Shark for Alloy Steels

**E811** Designed for high performance through hole tapping in most medium Alloy Steels. The TiAlN-Top Coating combined with an additional edge treatment provides excellent performance and consistency in high production applications.

- 1.4 1.5
- 1.6 4.2 5.2



Pack Qty = 1 pc

UNC	UNF	TPI	$l_1$ Inch	$l_2$ Inch	$l_4$ Inch	$d_2$ Ø Inch	$\square$ a Inch	$l_3$ Inch	No. of flutes			Limits	E811	E911
4		40	2.205	0.354	0.709	0.141	0.108	0.190	3	2.35	N43	H2	7350391	—
6		32	2.205	0.433	0.787	0.141	0.108	0.190	3	2.85	N36	H2	7350392	—
8		32	2.480	0.512	0.827	0.168	0.129	0.250	3	3.50	N29	H3	7350393	—
	10	32	2.756	0.551	1.102	0.194	0.150	0.250	3	4.10	N21	H3	—	7350404
10		24	2.756	0.551	1.102	0.194	0.150	0.250	3	3.90	N25	H3	7350394	—
	1/4	28	3.150	0.591	0.984	0.255	0.189	0.310	3	5.50	N3	H4	—	7350405
1/4		20	3.150	0.591	0.984	0.255	0.189	0.310	3	5.10	N7	H5	7350395	—
	5/16	24	3.543	0.709	1.339	0.318	0.236	0.380	3	6.90	I	H4	—	7350406
5/16		18	3.543	0.709	1.339	0.318	0.236	0.380	3	6.60	F	H5	7350396	—
	3/8	24	3.543	0.787	1.476	0.318	0.284	0.440	3	8.50	Q	H4	—	7350407
3/8		16	3.543	0.787	1.535	0.381	0.284	0.440	3	8.00	5/16	H4	7350397	—
	7/16	20	3.937	0.787	—	0.323	0.240	0.410	3	9.90	25/64	H5	—	7350408
7/16		14	3.937	0.787	—	0.323	0.240	0.410	3	9.40	U	H5	7350398	—
	1/2	20	3.937	0.827	—	0.367	0.273	0.440	3	11.50	29/64	H5	—	7350409
1/2		13	4.331	0.906	—	0.367	0.273	0.440	3	10.80	27/64	H5	7350399	—
	5/8	18	3.937	0.827	—	0.480	0.358	0.560	3	14.50	37/64	H5	—	7350410
5/8		11	4.331	0.906	—	0.480	0.358	0.560	3	13.50	17/32	H5	7350400	—
	3/4	16	4.331	0.906	—	0.590	0.439	0.690	4	17.50	11/16	H5	—	7350411
3/4		10	4.921	1.181	—	0.590	0.439	0.690	4	16.50	21/32	H5	7350401	—
	7/8	14	4.921	0.906	—	0.697	0.520	0.750	4	20.40	13/16	H6	—	7350412
7/8		9	5.512	1.339	—	0.697	0.520	0.750	4	19.50	49/64	H6	7350402	—
	1"	12	5.512	1.063	—	0.800	0.597	0.810	4	23.25	59/64	H6	—	7350413
1"		8	6.299	1.417	—	0.800	0.597	0.810	4	22.25	7/8	H6	7350403	—

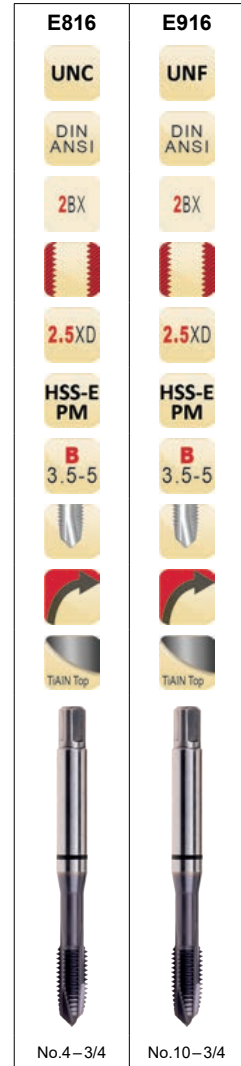
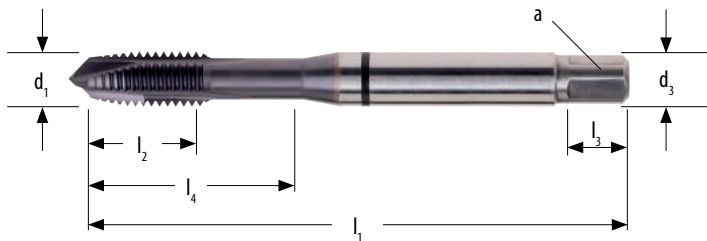
Note: Sizes up to 3/8" have male centers on both ends • Sizes over 3/8" have female centers on both ends.



## DIN-ANSI Machine Tap Black Shark for Hard Alloys, Plug Style

**E816** Designed for high performance through hole tapping in high strength and heat resistant work-materials with hardness up to 45HRC. The TiAIN-Top coating combined with geometry that significantly increases cutting edge strength, provides excellent performance and consistency in hard and difficult to machine materials.

- 1.6 4.3 5.3
- 1.5 1.7 4.2 5.2



Pack Qty = 1 pc

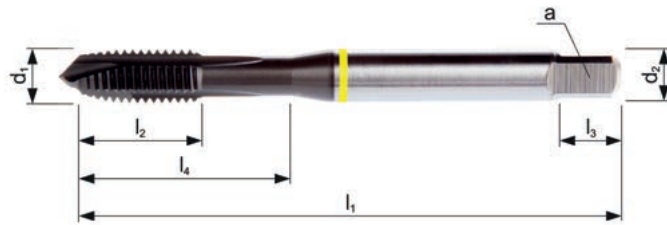
UNC	UNF	TPI	$l_1$ Inch	$l_2$ Inch	$l_4$ Inch	$d_2$ Ø Inch	$a$ Inch	$l_3$ Inch	No. of flutes			Limits	E816	E916
4		40	2.205	0.472	0.827	0.141	0.108	0.190	3	2.35	N43	H2	7812046	—
6		32	2.480	0.551	0.866	0.168	0.129	0.250	3	2.85	N36	H3	7812047	—
8		32	2.756	0.610	1.102	0.194	0.150	0.250	3	3.50	N29	H3	7812048	—
10		24	3.150	0.669	1.024	0.255	0.189	0.310	3	3.90	N25	H3	7812049	—
	10	32	3.150	0.669	1.024	0.255	0.189	0.310	3	4.10	N21	H3	—	7812107
1/4		20	3.543	0.807	1.378	0.318	0.236	0.380	3	5.10	N7	H5	7812100	—
	1/4	28	3.543	0.807	1.339	0.318	0.236	0.380	3	5.50	N3	H4	—	7812108
5/16		18	3.937	0.906	1.535	0.381	0.236	0.440	3	6.60	F	H5	7812101	—
	5/16	24	3.937	0.906	1.535	0.381	0.284	0.440	3	6.90	I	H4	—	7812109
3/8		16	3.937	0.787	1.535	0.381	0.236	0.440	3	8.00	5/16	H5	7812102	—
	3/8	24	3.937	0.787	1.535	0.381	0.284	0.440	3	8.50	Q	H4	—	7812110
7/16		14	3.937	0.787	—	0.323	0.240	0.410	4	9.40	U	H5	7812103	—
	7/16	20	3.937	0.787	—	0.323	0.240	0.440	4	9.90	25/64	H5	—	7812111
1/2		13	4.331	0.906	—	0.367	0.273	0.440	4	10.80	27/64	H5	7812104	—
	1/2	20	4.331	0.906	—	0.367	0.273	0.440	4	11.50	29/64	H5	—	7812112
5/8		11	4.331	0.906	—	0.480	0.358	0.560	4	13.50	17/32	H5	7812105	—
	5/8	18	4.331	0.906	—	0.480	0.358	0.560	4	14.50	37/64	H5	—	7812113
3/4		10	4.921	1.181	—	0.590	0.440	0.690	4	16.50	21/32	H5	7812106	—
	3/4	16	4.921	1.181	—	0.590	0.440	0.690	4	17.50	11/16	H5	—	7812114

Note: Sizes up to 3/8" have male centers on both ends • Sizes over 3/8" have female centers on both ends.

## DIN ANSI Machine Tap, Yellow Shark for Low Alloy Steels

**E625** Designed for through hole tapping in low Alloy Steel applications.  
**E765** Premium HSCo Powder Metal substrate with TiAIN-Top Coating combine to offer superior abrasion resistance, higher operating speeds, improved thread quality, reduced cycle times and longer tool life.

- 1.1 1.2 1.3 6.1 6.3
- 1.4 1.5 6.2



<b>E625</b>	<b>E765</b>
M	MF
DIN ANSI	DIN ANSI
6H	6H
2.5XD	2.5XD
HSS-E PM	HSS-E PM
B 3.5-5	B 3.5-5
M4 - M24	M8 - M18

Pack Qty = 1 pc

M	MF	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>4</sub> mm	d <sub>2</sub> Ø Inch	a Inch	l <sub>3</sub> mm	No. of flutes			Limits	E625	E765
4		0.70	63	12	21	0.168	0.129	6	3	3.30	N30	D4	7350492	—
5		0.80	70	13	25	0.194	0.150	6	3	4.20	N19	D4	7350493	—
6		1.00	80	15	30	0.255	0.189	8	3	5.00	N9	D5	7350494	—
	8	1.00	90	18	35	0.318	0.236	10	3	7.00	J	D5	—	7350503
8		1.25	90	18	35	0.318	0.236	10	3	6.80	H	D5	7350495	—
	10	1.25	100	20	39	0.381	0.284	11	3	8.80	11/32	D6	—	7350504
10		1.50	100	20	39	0.381	0.284	11	3	8.50	Q	D6	7350496	—
	12	1.25	100	21	—	0.367	0.273	11	3	10.80	27/64	D6	—	7350505
	12	1.50	100	21	—	0.367	0.273	11	3	10.50	Z	D6	—	7350506
12		1.75	110	23	—	0.367	0.273	11	3	10.30	Y	D6	7350497	—
	14	1.50	100	21	—	0.429	0.320	13	3	12.50	31/64	D7	—	7350507
14		2.00	110	23	—	0.429	0.320	13	3	12.00	15/32	D7	7350498	—
	16	1.50	100	21	—	0.480	0.358	14	3	14.50	9/16	D7	—	7350508
16		2.00	110	23	—	0.480	0.358	14	3	14.00	35/64	D7	7350499	—
	18	1.50	110	24	—	0.542	0.404	16	3	16.50	41/64	D7	—	7350509
18		2.50	125	30	—	0.542	0.404	16	3	15.50	39/64	D7	7350500	—
20		2.50	140	30	—	0.652	0.487	18	3	17.50	11/16	D7	7350501	—
24		3.00	160	38	—	0.760	0.567	19	4	21.00	53/64	D8	7350502	—

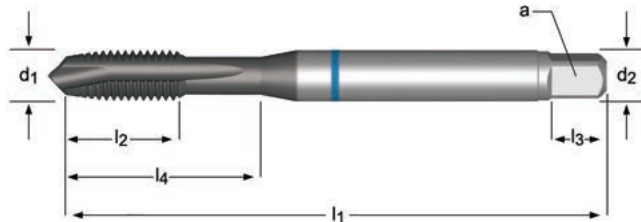
Note: Sizes up to M10 have male centers on both ends • Sizes over M10 have female centers on both ends.

## DIN ANSI Machine Tap, Blue Shark for Stainless Steel

**E629** Designed for superior performance through hole tapping in a wide range of Stainless Steel types. Premium HSCo Powder Metal substrate with Super-B (TiAlN+WC/C) Coating combined with an additional edge treatment to offer improved thread quality and longer tool life. Available in both 2B and 3B Class of Fit to cover a wide range of applications.

**E769**

- 2.1 2.2 2.3
- 1.2 1.3 1.4 1.5



<b>E629</b>	<b>E769</b>
<b>M</b>	<b>MF</b>
<b>DIN ANSI</b>	<b>DIN ANSI</b>
<b>6H</b>	<b>6H</b>
<b>2.5XD</b>	<b>2.5XD</b>
<b>HSS-E PM</b>	<b>HSS-E PM</b>
<b>B 3.5-5</b>	<b>B 3.5-5</b>
<b>Super B</b>	<b>Super B</b>
M4 - M24	M8 - M18

Pack Qty = 1 pc

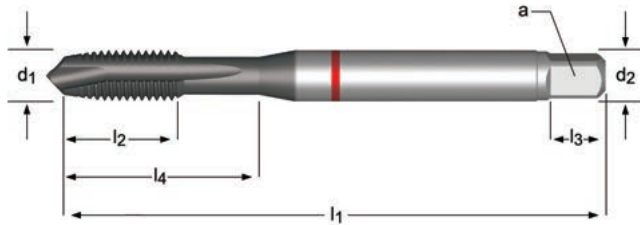
M	MF	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>4</sub> mm	d <sub>2</sub> Ø Inch	∠ a Inch	l <sub>3</sub> mm	No. of flutes			Limits	E629	E769
4		0.70	63	12	21	0.168	0.129	6	3	3.30	N30	D4	7350317	—
5		0.80	70	13	25	0.194	0.150	6	3	4.20	N19	D4	7350318	—
6		1.00	80	15	30	0.255	0.189	8	3	5.00	N9	D5	7350319	—
	8	1.00	90	18	35	0.318	0.236	10	3	7.00	J	D5	—	7350328
8		1.25	90	18	35	0.318	0.236	10	3	6.80	H	D5	7350320	—
	10	1.25	100	20	39	0.381	0.284	11	3	8.80	11/32	D6	—	7350329
10		1.50	100	20	39	0.381	0.284	11	3	8.50	Q	D6	7350321	—
	12	1.25	100	21	—	0.367	0.273	11	4	10.80	27/64	D6	—	7350330
	12	1.50	100	21	—	0.367	0.273	11	4	10.50	Z	D6	—	7350331
12		1.75	110	23	—	0.367	0.273	11	4	10.30	Y	D6	7350322	—
	14	1.50	100	21	—	0.429	0.320	13	4	12.50	31/64	D7	—	7350332
14		2.00	110	23	—	0.429	0.320	13	4	12.00	15/32	D7	7350323	—
	16	1.50	100	21	—	0.480	0.358	14	4	14.50	9/16	D7	—	7350333
16		2.00	110	23	—	0.480	0.358	14	4	14.00	35/64	D7	7350324	—
	18	1.50	110	24	—	0.542	0.404	16	4	16.50	41/64	D7	—	7350334
18		2.50	125	30	—	0.542	0.404	16	4	15.50	39/64	D7	7350325	—
20		2.50	140	30	—	0.652	0.487	18	4	17.50	11/16	D7	7350326	—
24		3.00	160	38	—	0.760	0.567	19	4	21.00	53/64	D8	7350327	—

Note: Sizes up to M10 have male centers on both ends • Sizes over M10 have female centers on both ends.

## DIN ANSI Machine Tap, Red Shark for Alloy Steels

**E627** Designed for high performance through hole tapping in most medium Alloy Steels. The TiAIN-Top Coating combined with an additional edge treatment provides excellent performance and consistency in high production applications.

- 1.4 1.5
- 1.6 4.2 5.2



<b>E627</b>	<b>E767</b>
<b>M</b>	<b>MF</b>
DIN ANSI	DIN ANSI
6H	6H
<b>2.5XD</b>	<b>2.5XD</b>
<b>HSS-E PM</b>	<b>HSS-E PM</b>
<b>B</b> 3.5-5	<b>B</b> 3.5-5
M3 - M24	M8 - M14

Pack Qty = 1 pc

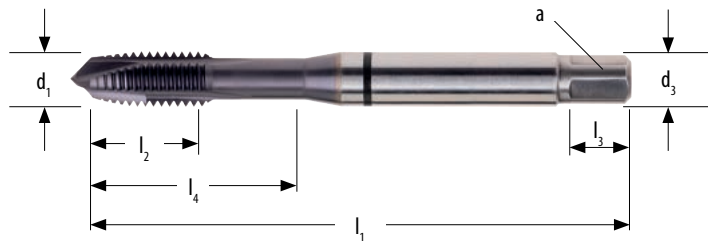
M	MF	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>4</sub> mm	d <sub>2</sub> Ø Inch	a Inch	l <sub>3</sub> mm	No. of flutes			Limits	E627	E767
3		0.50	56	9	18	0.141	0.108	5	3	2.50	N40	D3	7350414	—
4		0.70	63	12	21	0.168	0.129	6	3	3.30	N30	D4	7350415	—
5		0.80	70	13	25	0.194	0.150	6	3	4.20	N19	D4	7350416	—
6		1.00	80	15	30	0.255	0.189	8	3	5.00	N9	D5	7350417	—
	8	1.00	90	18	35	0.318	0.236	10	3	7.00	J	D5	—	7350426
8		1.25	90	18	35	0.318	0.236	10	3	6.80	H	D5	7350418	—
	10	1.25	100	20	39	0.381	0.284	11	3	8.80	11/32	D6	—	7350427
10		1.50	100	20	39	0.381	0.284	11	3	8.50	Q	D6	7350419	—
	12	1.50	100	21	—	0.367	0.273	11	3	10.50	Z	D6	—	7350428
12		1.75	110	23	—	0.367	0.273	11	3	10.30	Y	D6	7350420	—
	14	1.50	100	21	—	0.429	0.320	13	3	12.50	31/64	D7	—	7350429
14		2.00	110	23	—	0.429	0.320	13	3	12.00	15/32	D7	7350421	—
16		2.00	110	23	—	0.480	0.358	14	3	14.00	35/64	D7	7350422	—
18		2.50	125	30	—	0.542	0.404	16	4	15.50	39/64	D7	7350423	—
20		2.50	140	30	—	0.652	0.487	18	4	17.50	11/16	D7	7350424	—
24		3.00	160	38	—	0.760	0.567	19	4	21.00	53/64	D8	7350425	—

Note: Sizes up to M10 have male centers on both ends • Sizes over M10 have female centers on both ends.

## DIN-ANSI Machine Tap Black Shark for Hard Alloys, Plug Style

**E817** **E917** Designed for high performance through hole tapping in high strength and heat resistant work-materials with hardness up to 45HRC. The TiAlN-Top coating combined with geometry that significantly increases cutting edge strength, provides excellent performance and consistency in hard and difficult to machine materials.

- 1.6 4.3 5.3
- 1.5 1.7 4.2 5.2



E816	E916
M	MF
DIN ANSI	DIN ANSI
6H	6H
2.5XD	2.5XD
HSS-E PM	HSS-E PM
B 3.5-5	B 3.5-5
M3-M12	M8-M12

Pack Qty = 1 pc

M	MF	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>4</sub> mm	d <sub>2</sub> Ø Inch	∟ a Inch	l <sub>3</sub> mm	No. of flutes			Limits	E817	E917
3		0.50	63	15	22	0.168	0.129	6	3	2.50	N40	D3	7812115	—
4		0.70	70	16	28	0.194	0.150	6	3	3.30	N30	D4	7812116	—
5		0.80	80	17	26	0.255	0.189	8	3	4.20	N19	D4	7812117	—
6		1.00	90	21	35	0.318	0.236	10	3	5.00	N9	D5	7812118	—
8		1.25	100	23	39	0.381	0.284	11	3	6.80	H	D5	7812119	—
	8	1.00	100	23	39	0.381	0.284	11	3	7.00	J	D5	—	7812122
10		1.50	100	20	38	0.381	0.284	11	3	8.50	Q	D6	7812120	—
	10	1.25	100	20	38	0.381	0.284	11	3	8.80	11/32	D5	—	7812123
12		1.75	110	23	-	0.367	0.273	11	4	10.30	Y	D6	7812121	—
	12	1.25	110	23	-	0.367	0.273	11	4	10.80	27/64	D5	—	7812124
	12	1.50	110	23	-	0.367	0.273	11	4	10.50	Z	D5	—	7812125

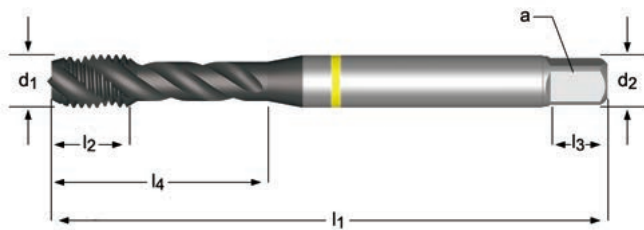
Note: Sizes up to M10 have male centers on both ends • Sizes over M10 have female centers on both ends.

## DIN ANSI Machine Tap, Yellow for Low Alloy Steels

**E808** Designed for blind hole tapping in low Alloy Steel applications. Premium HSCo Powder Metal substrate with TiAlN-Top Coating combined with a special 40° Spiral Flute geometry prevents nesting and reduces the risk of re-cutting chips on reversal allowing taps to operate at higher speeds while providing improved thread quality.

**E908**

- 1.1 1.2 1.3 6.1 6.3
- 1.4 1.5 6.2



<b>E808</b>	<b>E908</b>
UNC	UNF
DIN ANSI	DIN ANSI
2B	2B
2XD	2XD
HSS-E PM	HSS-E PM
C 2-3	C 2-3
No.4 - 1"	No.10 - 1"

Pack Qty = 1 pc

UNC	UNF	TPI	l <sub>1</sub> Inch	l <sub>2</sub> Inch	l <sub>4</sub> Inch	d <sub>2</sub> Ø Inch	a Inch	l <sub>3</sub> Inch	No. of flutes			Limits	E808	E908
4		40	2.205	0.256	0.709	0.141	0.108	0.236	3	2.35	N43	H2	7350510	—
6		32	2.205	0.256	0.787	0.141	0.108	0.190	3	2.85	N36	H2	7350511	—
8		32	2.480	0.276	0.827	0.168	0.129	0.250	3	3.50	N29	H3	7350512	—
10		24	2.756	0.315	1.102	0.194	0.150	0.250	3	3.90	N25	H3	7350513	—
	10	32	2.756	0.315	1.102	0.194	0.150	0.250	3	4.10	N21	H3	—	7350523
1/4		20	3.150	0.394	0.984	0.255	0.189	0.310	3	5.10	N7	H5	7350514	—
	1/4	28	3.150	0.394	0.984	0.255	0.189	0.310	3	5.50	N3	H4	—	7350524
5/16		18	3.543	0.472	1.339	0.318	0.236	0.380	3	6.60	F	H5	7350515	—
	5/16	24	3.543	0.472	1.339	0.318	0.236	0.380	3	6.90	I	H4	—	7350525
3/8		16	3.937	0.591	1.535	0.381	0.284	0.440	3	8.00	5/16	H4	7350516	—
	3/8	24	3.543	0.591	1.476	0.381	0.284	0.440	3	8.50	Q	H4	—	7350526
7/16		14	3.937	0.591	—	0.323	0.240	0.410	3	9.40	U	H5	7350517	—
	7/16	20	3.937	0.591	—	0.323	0.240	0.410	3	9.90	25/64	H5	—	7350527
1/2		13	4.331	0.709	—	0.367	0.273	0.440	3	10.80	27/64	H5	7350518	—
	1/2	20	3.937	0.709	—	0.367	0.273	0.440	3	11.50	29/64	H5	—	7350528
5/8		11	4.331	0.787	—	0.480	0.358	0.560	4	13.50	17/32	H5	7350519	—
	5/8	18	3.937	0.591	—	0.480	0.358	0.560	4	14.50	37/64	H5	—	7350529
3/4		10	4.921	0.984	—	0.590	0.439	0.690	4	16.50	21/32	H5	7350520	—
	3/4	16	4.331	0.984	—	0.590	0.439	0.690	4	17.50	11/16	H5	—	7350530
7/8		9	5.512	0.984	—	0.697	0.520	0.750	4	19.50	49/64	H6	7350521	—
	7/8	14	4.921	0.984	—	0.697	0.520	0.750	4	20.40	13/16	H6	—	7350531
1"		8	6.299	1.181	—	0.800	0.597	0.810	4	22.25	7/8	H6	7350522	—
	1"	12	5.512	1.063	—	0.800	0.597	0.810	4	23.25	59/64	H6	—	7350532

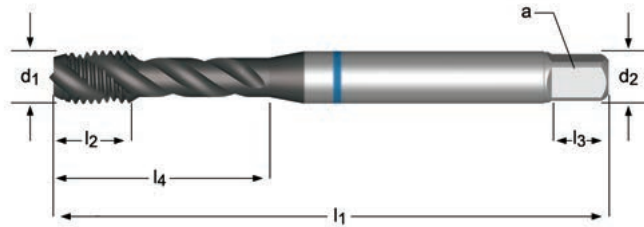
Note: Sizes up to 3/8" have male centers on both ends • Sizes over 3/8" have female centers on both ends.

## DIN ANSI Machine Tap, Blue Shark for Stainless Steel

**E812** Designed for superior performance blind hole tapping in a wide range of Stainless Steel types. Premium HSCo Powder Metal substrate with Super-B (TiAlN+WC/C) Coating combined with an additional edge treatment and a 40° Flute angle facilitates better chip evacuation offering improved thread quality and longer tool life. Available in both 2B and 3B Class of Fit to cover a wide range of applications.

**E912**

- **2.1 2.2 2.3**
- **1.2 1.3 1.4 1.5**



<b>E812</b>	<b>E912</b>
UNC	UNF
DIN ANSI	DIN ANSI
2B 3B	2B 3B
HSS-E PM	HSS-E PM
C 2-3	C 2-3
No.4-1"	No.10-1"

Pack Qty = 1 pc

UNC	UNF	TPI	l <sub>1</sub> Inch	l <sub>2</sub> Inch	l <sub>4</sub> Inch	d <sub>2</sub> ∅ Inch	a Inch	l <sub>3</sub> Inch	No. of flutes			Limits	E812	E912
4		40	2.205	0.256	0.709	0.141	0.108	0.236	3	2.35	N43	H2	7350335	—
6		32	2.205	0.256	0.787	0.141	0.108	0.190	3	2.80	N36	H3	7350336	—
8		32	2.480	0.276	0.827	0.168	0.129	0.250	3	3.50	N29	H3	7350337	—
10		24	2.756	0.315	1.102	0.194	0.150	0.250	3	3.90	N25	H3	7350338	—
	10	32	2.756	0.315	1.102	0.194	0.150	0.250	3	4.10	N21	H3	—	7350356
1/4		20	3.150	0.394	0.984	0.255	0.189	0.310	3	5.10	N7	H5	7350339	—
1/4		20	3.150	0.394	0.984	0.255	0.189	0.310	3	5.10	N7	H3	7350340	—
	1/4	28	3.150	0.394	0.984	0.255	0.189	0.310	3	5.50	N3	H5	—	7350357
	1/4	28	3.150	0.394	0.984	0.255	0.189	0.310	3	5.50	N3	H3	—	7350358
5/16		18	3.543	0.472	1.339	0.318	0.236	0.380	3	6.60	F	H5	7350341	—
5/16		18	3.543	0.472	1.339	0.318	0.236	0.380	3	6.60	F	H3	7350342	—
	5/16	24	3.543	0.472	1.339	0.318	0.236	0.380	3	6.90	I	H4	—	7350359
	5/16	24	3.543	0.472	1.339	0.318	0.236	0.380	3	6.90	I	H3	—	7350360
3/8		16	3.937	0.591	1.535	0.381	0.284	0.440	3	8.00	5/16	H5	7350343	—
3/8		16	3.937	0.591	1.535	0.381	0.284	0.440	3	8.00	5/16	H3	7350344	—
	3/8	24	3.543	0.591	1.476	0.318	0.284	0.440	3	8.50	Q	H4	—	7350361
	3/8	24	3.543	0.591	1.476	0.318	0.284	0.440	3	8.50	Q	H3	—	7350362
7/16		14	3.937	0.591	—	0.323	0.240	0.410	4	9.40	U	H5	7350345	—
	7/16	20	3.937	0.591	—	0.323	0.240	0.410	4	9.90	25/64	H5	—	7350363
1/2		13	4.331	0.709	—	0.367	0.273	0.440	4	10.70	27/64	H5	7350346	—
1/2		13	4.331	0.709	—	0.367	0.273	0.440	4	10.70	27/64	H3	7350347	—
	1/2	20	3.937	0.709	—	0.367	0.273	0.440	4	11.50	29/64	H5	—	7350364
	1/2	20	3.937	0.709	—	0.367	0.273	0.440	4	11.50	29/64	H3	—	7350365
5/8		11	4.331	0.787	—	0.480	0.358	0.560	4	13.50	17/32	H5	7350348	—
5/8		11	4.331	0.787	—	0.480	0.358	0.560	4	13.50	17/32	H3	7350349	—
	5/8	18	3.937	0.591	—	0.480	0.358	0.560	4	14.50	37/64	H5	—	7350366
	5/8	18	3.937	0.591	—	0.480	0.358	0.560	4	14.50	37/64	H3	—	7350367

UNC	UNF	TPI	$l_1$ Inch	$l_2$ Inch	$l_4$ Inch	$d_2$ Ø Inch	$\square$ a Inch	$l_3$ Inch	No. of flutes			Limits	E812	E912
3/4		10	4.921	0.984	—	0.590	0.439	0.690	4	16.50	21/32	H5	7350350	—
3/4		10	4.921	0.984	—	0.590	0.439	0.690	4	16.50	21/32	H3	7350351	—
	3/4	16	4.331	0.984	—	0.590	0.439	0.690	4	17.50	11/16	H5	—	7350368
	3/4	16	4.331	0.984	—	0.590	0.439	0.690	4	17.50	11/16	H3	—	7350369
7/8		9	5.512	0.984	—	0.697	0.520	0.750	4	19.50	49/64	H6	7350352	—
7/8		9	5.512	0.984	—	0.697	0.520	0.750	4	19.50	49/64	H4	7350353	—
	7/8	14	4.921	0.984	—	0.697	0.520	0.750	4	20.40	13/16	H6	—	7350370
	7/8	14	4.921	0.984	—	0.697	0.520	0.750	4	20.40	13/16	H4	—	7350371
1"		8	6.299	1.181	—	0.800	0.597	0.810	4	22.25	7/8	H6	7350354	—
1"		8	6.299	1.181	—	0.800	0.597	0.810	4	22.25	7/8	H4	7350355	—
	1"	12	5.512	1.063	—	0.800	0.597	0.810	4	23.25	59/64	H6	—	7350372
	1"	12	5.512	1.063	—	0.800	0.597	0.810	4	23.25	59/64	H4	—	7350373

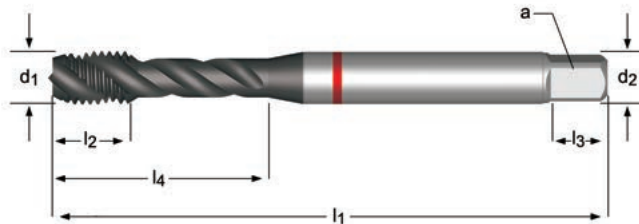
Note: Sizes up to 3/8" have male centers on both ends • Sizes over 3/8" have female centers on both ends.



## DIN ANSI Machine Tap, Red Shark for Alloy Steels

**E810** Designed for high performance blind hole tapping in most medium Alloy Steels.  
**E910** The TiAlN-Top Coating combined with a special 45° Flute Geometry and an additional edge treatment provides excellent performance and consistency in high production applications. The back taper built into this design further facilitates chip evacuation and reduces torque when the tap reverses. It is recommended to use a toolholder with minimal float or soft start.

- 1.4 1.5
- 1.6 4.2 5.2



<b>E810</b>	<b>E910</b>
UNC	UNF
DIN ANSI	DIN ANSI
2B	2B
2.5XD	2.5XD
HSS-E PM	HSS-E PM
C 2-3	C 2-3
No.4-1"	No.10-1"

Pack Qty = 1 pc

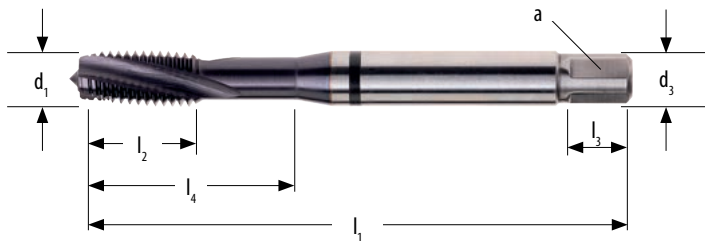
UNC	UNF	TPI	l <sub>1</sub> Inch	l <sub>2</sub> Inch	l <sub>4</sub> Inch	d <sub>2</sub> Ø Inch	∠ a Inch	l <sub>3</sub> Inch	No. of flutes			Limits	E810	E910
4		40	2.205	0.256	0.709	0.141	0.108	0.236	3	2.35	N43	H2	7350430	—
6		32	2.205	0.256	0.787	0.141	0.108	0.190	3	2.85	N36	H2	7350431	—
8		32	2.480	0.276	0.827	0.168	0.129	0.250	3	3.50	N29	H3	7350432	—
10		24	2.756	0.315	1.102	0.194	0.150	0.250	3	3.90	N25	H3	7350433	—
	10	32	2.756	0.315	1.102	0.194	0.150	0.250	3	4.10	N21	H3	—	7350443
1/4		20	3.150	0.394	0.984	0.255	0.189	0.310	3	5.10	N7	H5	7350434	—
	1/4	28	3.150	0.394	0.984	0.255	0.189	0.310	3	5.50	N3	H4	—	7350444
5/16		18	3.543	0.472	1.339	0.318	0.236	0.380	3	6.60	F	H5	7350435	—
	5/16	24	3.543	0.472	1.339	0.318	0.236	0.380	3	6.9	I	H4	—	7350445
3/8		16	3.937	0.591	1.535	0.381	0.284	0.440	3	8.00	5/16	H4	7350436	—
	3/8	24	3.543	0.591	1.476	0.381	0.284	0.440	3	8.50	Q	H4	—	7350446
7/16		14	3.937	0.591	—	0.323	0.240	0.410	3	9.40	U	H5	7350437	—
	7/16	20	3.937	0.591	—	0.323	0.240	0.410	3	9.90	25/64	H5	—	7350447
1/2		13	4.331	0.709	—	0.367	0.273	0.440	3	10.80	27/64	H5	7350438	—
	1/2	20	3.937	0.709	—	0.367	0.273	0.440	3	11.50	29/64	H5	—	7350448
5/8		11	4.331	0.787	—	0.480	0.358	0.560	4	13.50	17/32	H5	7350439	—
	5/8	18	3.937	0.591	—	0.480	0.358	0.560	4	14.50	37/64	H5	—	7350449
3/4		10	4.921	0.984	—	0.590	0.439	0.690	4	16.50	21/32	H5	7350440	—
	3/4	16	4.331	0.984	—	0.590	0.439	0.690	4	17.50	11/16	H5	—	7350450
7/8		9	5.512	0.984	—	0.697	0.520	0.750	4	19.50	49/64	H6	7350441	—
	7/8	14	4.921	0.984	—	0.697	0.520	0.750	4	20.40	13/16	H6	—	7350451
1"		8	6.299	1.181	—	0.800	0.597	0.810	4	22.25	7/8	H6	7350442	—
	1"	12	5.512	1.063	—	0.800	0.597	0.810	4	23.25	59/64	H6	—	7350452

Note: Sizes up to 3/8" have male centers on both ends • Sizes over 3/8" have female centers on both ends.

## DIN-ANSI Machine Tap Black Shark for Hard Alloys, Spiral Flute

**E805** Designed for high performance blind hole tapping in high strength and heat-resistant work-materials with hardness up to 45HRC. The TiAlN-Top coating combined with geometry what significantly increases cutting edge strength, provides excellent performance and consistency in hard and difficult to machine materials.

- 1.6 4.3 5.3
- 1.5 1.7 4.2 5.2



<b>E805</b>	<b>E905</b>
UNC	UNF
DIN ANSI	DIN ANSI
2BX	2BX
1.5XD	1.5XD
HSS-E PM	HSS-E PM
C 2-3	C 2-3
$\lambda 15^\circ$	$\lambda 15^\circ$
TiAlN Top	TiAlN Top
No.4-3/4	No.10-3/4

Pack Qty = 1 pc

UNC	UNF	TPI	$l_1$ Inch	$l_2$ Inch	$l_4$ Inch	$d_2$ Ø Inch	$\square$ a Inch	$l_3$ Inch	No. of flutes			Limits	E805	E905
4		40	2.205	0.472	0.827	0.141	0.108	0.190	3	2.35	N43	H2	7812126	—
6		32	2.480	0.551	0.866	0.168	0.129	0.250	3	2.85	N36	H2	7812127	—
8		32	2.756	0.610	1.102	0.194	0.150	0.250	3	3.50	N29	H3	7812128	—
10		24	3.150	0.669	1.024	0.255	0.189	0.310	3	3.90	N25	H3	7812129	—
	10	32	3.150	0.669	1.024	0.255	0.189	0.310	3	4.10	N21	H3	—	7812137
1/4		20	3.543	0.807	1.378	0.318	0.236	0.380	3	5.10	N7	H5	7812130	—
	1/4	28	3.543	0.807	1.339	0.318	0.236	0.380	3	5.50	N3	H4	—	7812138
5/16		18	3.937	0.906	1.535	0.381	0.236	0.440	3	6.60	F	H5	7812131	—
	5/16	24	3.937	0.906	1.535	0.381	0.284	0.440	3	6.90	I	H4	—	7812139
3/8		16	3.937	0.787	1.535	0.381	0.236	0.440	3	8.00	5/16	H5	7812132	—
	3/8	24	3.937	0.787	1.535	0.381	0.284	0.440	3	8.50	Q	H4	—	7812140
7/16		14	3.937	0.787	-	0.323	0.240	0.410	4	9.40	U	H5	7812133	—
	7/16	20	3.937	0.787	-	0.325	0.240	0.440	4	9.90	25/64	H5	—	7812140
1/2		13	4.331	0.906	-	0.367	0.273	0.440	4	10.80	27/64	H5	7812134	—
	1/2	20	4.331	0.906	-	0.367	0.273	0.440	4	11.50	29/64	H5	—	7812142
5/8		11	4.331	0.906	-	0.480	0.358	0.560	4	13.50	17/32	H5	7812135	—
	5/8	18	4.331	0.906	-	0.480	0.358	0.560	4	14.50	37/64	H5	—	7812143
3/4		10	4.921	1.181	-	0.590	0.440	0.690	4	16.50	21/32	H5	7812136	—
	3/4	16	4.921	1.181	-	0.590	0.440	0.690	4	17.50	11/16	H5	—	7812144

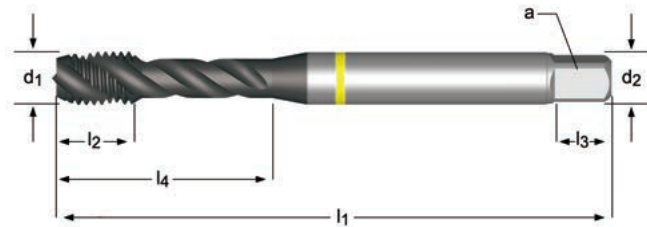
Note: Sizes up to 3/8" have male centers on both ends • Sizes over 3/8" have female centers on both ends.

## DIN ANSI Machine Tap, Yellow for Low Alloy Steels

**E624** Designed for blind hole tapping in low Alloy Steel applications. Premium HSCo Powder Metal substrate with TiAlN-Top Coating combined with a special 40° Spiral Flute geometry prevents nesting and reduces the risk of re-cutting chips on reversal allowing taps to operate at higher speeds while providing improved thread quality.

**E764**

- 1.1 1.2 1.3 6.1 6.3
- 1.4 1.5 6.2



E624	E764
M	MF
DIN ANSI	DIN ANSI
6H	6H
2XD	2XD
HSS-E PM	HSS-E PM
C 2-3	C 2-3
M4 - M24	M8 - M18

Pack Qty = 1 pc

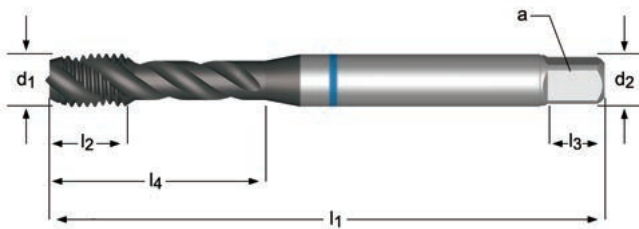
M	MF	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>4</sub> mm	d <sub>2</sub> ∅ Inch	a Inch	l <sub>3</sub> mm	No. of flutes			Limits	E624	E764
4		0.70	63	7	21	0.168	0.129	6	3	3.30	N30	D4	7350533	—
5		0.80	70	8	25	0.194	0.150	6	3	4.20	N19	D4	7350534	—
6		1.00	80	10	30	0.255	0.189	8	3	5.00	N9	D5	7350535	—
	8	1.00	90	13	35	0.318	0.236	10	3	7.00	J	D5	—	7350544
8		1.25	90	13	35	0.318	0.236	10	3	6.80	H	D5	7350536	—
	10	1.25	100	15	39	0.381	0.284	11	3	8.80	11/32	D6	—	7350545
10		1.50	100	15	39	0.381	0.284	11	3	8.50	Q	D6	7350537	—
	12	1.25	100	15	—	0.367	0.273	11	3	10.80	27/64	D6	—	7350546
	12	1.50	100	15	—	0.367	0.273	11	3	10.50	Z	D6	—	7350547
12		1.75	110	18	—	0.367	0.273	11	3	10.30	Y	D6	7350538	—
	14	1.50	100	15	—	0.429	0.320	13	3	12.50	31/64	D7	—	7350548
14		2.00	110	20	—	0.429	0.320	13	3	12.00	15/32	D7	7350539	—
	16	1.50	100	15	—	0.480	0.358	14	4	14.50	9/16	D7	—	7350549
16		2.00	110	20	—	0.480	0.358	14	4	14.00	35/64	D7	7350540	—
	18	1.50	110	17	—	0.542	0.404	16	4	16.50	41/64	D7	—	7350550
18		2.50	125	25	—	0.542	0.404	16	4	15.50	39/64	D7	7350541	—
20		2.50	140	25	—	0.652	0.487	18	4	17.50	11/16	D7	7350542	—
24		3.00	160	30	—	0.760	0.567	19	4	21.00	53/64	D8	7350543	—

Note: Sizes up to M10 have male centers on both ends • Sizes over M10 have female centers on both ends.

## DIN ANSI Machine Tap, Blue Shark for Stainless Steel

**E628** **E768** Designed for superior performance blind hole tapping in a wide range of Stainless Steel types. Premium HSCo Powder Metal substrate with Super-B (TiAlN+WC/C) Coating combined with an additional edge treatment and a 40° Flute angle facilitates better chip evacuation offering improved thread quality and longer tool life. Available in both 2B and 3B Class of Fit to cover a wide range of applications.

- 2.1 2.2 2.3
- 1.2 1.3 1.4 1.5



<b>E628</b>	<b>E768</b>
M	MF
DIN ANSI	DIN ANSI
6H	6H
2.5XD	2.5XD
HSS-E PM	HSS-E PM
C 2-3	C 2-3
M4 - M24	M8 - M18

Pack Qty = 1 pc

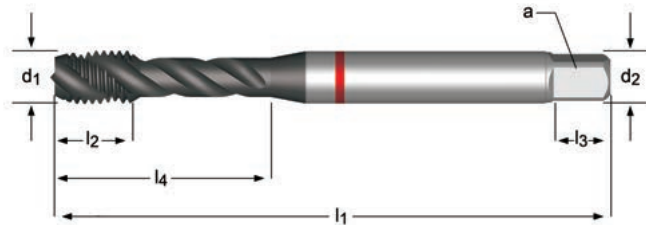
M	MF	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>4</sub> mm	d <sub>2</sub> Ø Inch	a Inch	l <sub>3</sub> mm	No. of flutes			Limits	E628	E768
4		0.70	63	7	21	0.168	0.129	6	3	3.30	N30	D4	7350374	—
5		0.80	70	8	25	0.194	0.150	6	3	4.20	N19	D4	7350375	—
6		1.00	80	10	30	0.255	0.189	8	3	5.00	N9	D5	7350376	—
	8	1.00	90	13	35	0.318	0.236	10	3	7.00	J	D5	—	7350385
8		1.25	90	13	35	0.318	0.236	10	3	6.80	H	D5	7350377	—
	10	1.25	100	15	39	0.381	0.284	11	3	8.80	11/32	D6	—	7350386
10		1.50	100	15	39	0.381	0.284	11	3	8.50	Q	D6	7350378	—
	12	1.50	100	15	—	0.367	0.273	11	4	10.50	Z	D6	—	7350387
12		1.75	110	18	—	0.367	0.273	11	4	10.30	Y	D6	7350379	—
	14	1.50	100	15	—	0.429	0.320	13	4	12.50	31/64	D7	—	7350388
14		2.00	110	20	—	0.429	0.320	13	4	12.00	15/32	D7	7350380	—
	16	1.50	100	15	—	0.480	0.358	14	4	14.50	9/16	D7	—	7350389
16		2.00	110	20	—	0.480	0.358	14	4	14.00	35/64	D7	7350381	—
	18	1.50	110	17	—	0.542	0.404	16	4	16.50	41/64	D7	—	7350390
18		2.50	125	25	—	0.542	0.404	16	4	15.50	39/64	D7	7350382	—
20		2.50	140	25	—	0.652	0.487	18	4	17.50	11/16	D7	7350383	—
24		3.00	160	30	—	0.760	0.567	19	4	21.00	53/64	D8	7350384	—

Note: Sizes up to M10 have male centers on both ends • Sizes over M10 have female centers on both ends.

## DIN ANSI Machine Tap, Red Shark for Alloy Steels

**E626** Designed for high performance blind hole tapping in most medium Alloy Steels.  
**E766** The TiAlN-Top Coating combined with a special 45° Flute Geometry and an additional edge treatment provides excellent performance and consistency in high production applications. The back taper built into this design further facilitates chip evacuation and reduces torque when the tap reverses. It is recommended to use a toolholder with minimal float or soft start.

- 1.4 1.5
- 1.6 4.2 5.2



<b>E626</b>	<b>E766</b>
M	MF
DIN ANSI	DIN ANSI
6H	6H
2.5XD	2.5XD
HSS-E PM	HSS-E PM
C 2-3	C 2-3
λ45°	λ45°
M3 - M24	M8 - M14

Pack Qty = 1 pc

M	MF	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>4</sub> mm	d <sub>2</sub> Ø Inch	a Inch	l <sub>3</sub> mm	No. of flutes			Limits	E626	E766
3		0.50	56	6	18	0.141	0.108	5	3	2.50	N40	D3	7350453	—
4		0.70	63	7	21	0.168	0.129	6	3	3.30	N30	D4	7350454	—
5		0.80	70	8	25	0.194	0.150	6	3	4.20	N19	D4	7350455	—
6		1.00	80	10	30	0.255	0.189	8	3	5.00	N9	D5	7350456	—
	8	1.00	90	13	35	0.318	0.236	10	3	7.00	J	D5	—	7350465
8		1.25	90	13	35	0.318	0.236	10	3	6.80	H	D5	7350457	—
	10	1.25	100	15	39	0.381	0.284	11	3	8.80	11/32	D6	—	7350466
10		1.50	100	15	39	0.381	0.284	11	3	8.50	Q	D6	7350458	—
	12	1.25	100	15	—	0.367	0.273	11	3	10.80	27/64	D6	—	7350467
12		1.75	110	18	—	0.367	0.273	11	3	10.30	Y	D6	7350459	—
	14	1.50	100	15	—	0.429	0.320	13	3	12.50	31/64	D7	—	7350468
14		2.00	110	20	—	0.429	0.320	13	3	12.00	15/32	D7	7350460	—
16		2.00	110	20	—	0.480	0.358	14	4	14.00	35/64	D7	7350461	—
18		2.50	125	25	—	0.542	0.404	16	4	15.50	39/64	D7	7350462	—
20		2.50	140	25	—	0.652	0.487	18	4	17.50	11/16	D7	7350463	—
24		3.00	160	30	—	0.760	0.567	19	4	21.00	53/64	D8	7350464	—

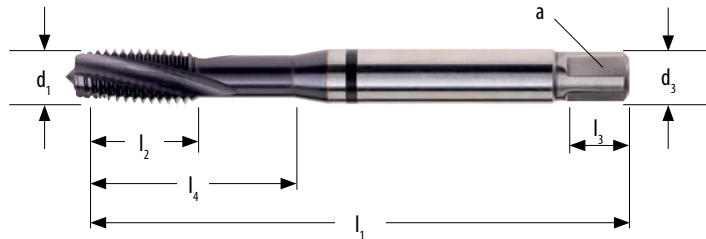
Note: Sizes up to M10 have male centers on both ends • Sizes over M10 have female centers on both ends.

## DIN-ANSI Machine Tap Black Shark for Hard Alloys, Plug Style

**E806** Designed for high performance blind hole tapping in high strength and heat-resistant work-materials with hardness up to 45HRC. The TiAlN-Top coating combined with geometry what significantly increases cutting edge strength, provides excellent performance and consistency in hard and difficult to machine materials.

**E906**

- 1.6 4.3 5.3
- 1.5 1.7 4.2 5.2



<b>E806</b>	<b>E906</b>
M	MF
DIN ANSI	DIN ANSI
6H	6H
1.5XD	1.5XD
HSS-E PM	HSS-E PM
C 2-3	C 2-3
λ 15°	λ 15°
M3-M12	M8-M12

Pack Qty = 1 pc

M	MF	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>4</sub> mm	d <sub>2</sub> Ø Inch	∠ a Inch	l <sub>3</sub> mm	No. of flutes			Limits	E806	E906
3		0.50	63	15	22	0.168	0.129	6	3	2.50	N40	D3	7812145	—
4		0.70	70	16	28	0.194	0.150	6	3	3.30	N30	D4	7812146	—
5		0.80	80	17	26	0.255	0.189	8	3	4.20	N19	D4	7812147	—
6		1.00	90	21	35	0.318	0.236	10	3	5.00	N9	D5	7812148	—
8		1.25	100	23	39	0.381	0.284	11	3	6.80	H	D5	7812149	—
	8	1.00	100	23	39	0.381	0.284	11	3	7.00	J	D5	—	7812152
10		1.50	100	20	38	0.381	0.284	11	3	8.50	Q	D6	7812150	—
12		1.75	110	23	-	0.367	0.273	11	4	10.30	Y	D6	7812151	—
	10	1.25	100	20	38	0.381	0.284	11	3	8.80	11/32	D5	—	7812153
	12	1.25	110	23	-	0.367	0.273	11	4	10.80	27/64	D5	—	7812155
	12	1.50	110	23	-	0.367	0.273	11	4	10.50	Z	D5	—	7812154

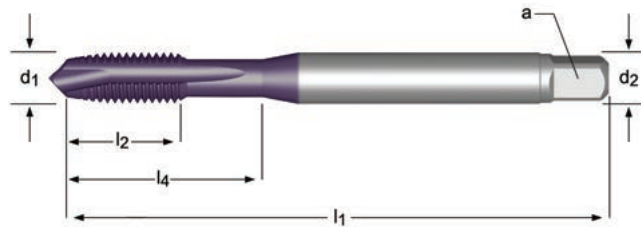
Note: Sizes up to M10 have male centers on both ends • Sizes over M10 have female centers on both ends.

## MXP Multi-Application, Plug Chamfer

**1672AP** Designed for through hole tapping in a variety of materials with a hardness up to 36 Rc. The premium substrate and TiCN coating combine to offer superior abrasion resistance, higher operating speeds, improved thread quality, reduced cycle times, and longer tool life.

**1674** Coolant thru design allows higher tapping speeds and eliminates the problems associated with inadequate coolant in horizontal or deep hole applications.

- 1.1 1.2 1.3 1.4 1.5 2.1 2.2 2.3 2.4 4.1 4.2 5.1 5.2 6.1 6.2  
6.3 7.1 7.2 7.3 7.4



1672AP		1674 Coolant Through	
UNC	UNF	UNC	UNF
DIN ANSI		DIN ANSI	
2B		2B	
HSS PM		HSS PM	
No.4 - 1"		1/4 - 1"	

UNC	UNF	TPI	$l_1$ Inch	$l_2$ Inch	$l_4$ Inch (Neck Length)	$d_2$ Ø Inch	$a$ Inch	# of Flutes	Limits	Pack Qty	1672AP	1674
4		40	2.205	0.433	0.709	0.141	0.110	2	H2	1	46204859	<sup>1)</sup> —
6		32	2.205	0.472	0.787	0.141	0.110	2	H3	1	46204864	<sup>1)</sup> —
8		32	2.480	0.512	0.827	0.168	0.131	3	H3	1	46204869	<sup>1)</sup> —
	10	32	2.756	0.512	0.984	0.194	0.152	3	H3	1	46204852	<sup>1)</sup> —
10		24	2.756	0.591	0.984	0.194	0.152	3	H3	1	46204851	<sup>1)</sup> —
	1/4	28	3.150	0.669	1.181	0.255	0.191	3	H4	1	46204850	<sup>1)</sup> 1716512 <sup>1)</sup>
1/4		20	3.150	0.669	1.181	0.255	0.191	3	H5	1	46204849	<sup>1)</sup> 1716510 <sup>1)</sup>
	5/16	24	3.543	0.669	1.378	0.318	0.238	3	H4	1	46204861	<sup>1)</sup> —
5/16		18	3.543	0.787	1.378	0.318	0.238	3	H5	1	46204860	<sup>1)</sup> 1716514 <sup>1)</sup>
	3/8	24	3.937	0.709	1.535	0.381	0.286	3	H4	1	46204858	<sup>1)</sup> —
3/8		16	3.937	0.866	1.535	0.381	0.286	3	H5	1	46204857	<sup>1)</sup> 1716518 <sup>1)</sup>
	7/16	20	3.937	0.866		0.323	0.242	3	H5	1	46204866	<sup>2)</sup> —
7/16		14	3.937	0.866		0.323	0.242	3	H5	1	46204865	<sup>2)</sup> —
	1/2	20	3.937	0.866		0.367	0.275	3	H5	1	—	—
	1/2	20	3.937	0.866		0.397	0.275	3	H5	1	46204848	<sup>2)</sup> —
1/2		13	4.331	0.984		0.367	0.275	3	H5	1	46204847	<sup>2)</sup> 1716534 <sup>2)</sup>
	5/8	18	3.937	0.866		0.480	0.360	4	H5	1	46204863	<sup>2)</sup> —
5/8		11	4.331	1.063		0.480	0.360	4	H5	1	46204862	<sup>2)</sup> 1716538 <sup>2)</sup>
	3/4	16	4.331	0.984		0.590	0.442	4	H5	1	46204856	<sup>2)</sup> —
3/4		10	4.921	1.181		0.590	0.442	4	H5	1	46204855	<sup>2)</sup> —
3/4		10	4.921	1.181		0.590	0.442	4	H5	1	—	1716542 <sup>2)</sup>
7/8		9	5.512	1.260		0.697	0.523	4	H6	1	46204868	<sup>2)</sup> —
1"		8	6.299	1.417		0.800	0.600	4	H6	1	46204854	<sup>2)</sup> — <sup>2)</sup>

<sup>1)</sup> Reinforced Shanks

<sup>2)</sup> Reduced Shanks

# SPIRAL POINT TAPS



## Multi-Application, Plug Chamfer

**E025 E035** Premium substrate for through hole tapping in tough or abrasive materials. Bronze oxide body and shank reduces rust and corrosion. Bright finish flutes improve chip flow in soft or non-ferrous materials.

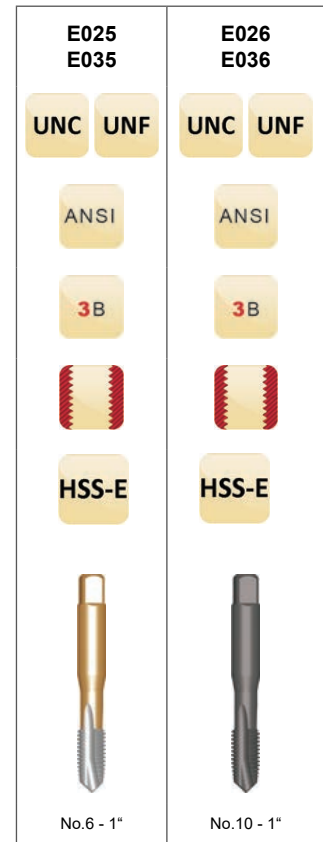
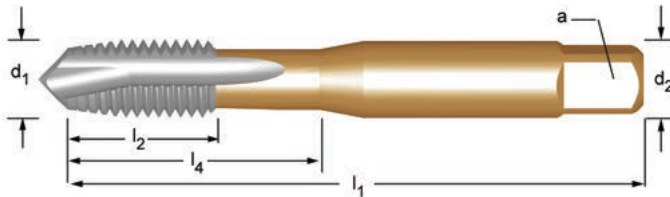
*E025 = UNC Sizes, E035 = UNF Sizes*

- 1.1 1.2 1.3 1.4 1.5 1.6 3.1 3.2 3.3 3.4 4.1 4.2 5.1 5.2 6.1  
6.2 6.3 7.1 7.2 7.3 7.4 8.1

**E026 E036** Premium substrate with steam oxide surface treatment reduces wear and prevents chip welding in abrasive or harder ferrous materials.

*E026 = UNC Sizes, E036 = UNF Sizes*

- 1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4





UNC		UNF		TPI	$l_1$ Inch	$l_2$ Inch	$d_2$ Inch	$a$ Inch	# of Flutes	Limits	$l_4$ Inch	Pack Qty	E025 E035	E026 E036
2		56	1.3/4	0.3140	0.1410	0.1100	2	H2	N50	1.80	0.3140	1	—	0583203 <sup>1)</sup>
4		40	1.7/8	0.6091	0.1410	0.1100	2	H2	N43	2.35	0.6091	1	—	0581254 <sup>1)</sup>
5		40	1.15/16	0.7404	0.1410	0.1100	2	H2	N38	2.65	0.7404	1	—	0581261 <sup>1)</sup>
	6	40	2"	0.2610	0.1410	0.1100	2	H2	N33	2.95	0.5938	1	0581957 <sup>1)</sup>	—
6		32	2"	0.2610	0.1410	0.1100	2	H2	N36	2.85	0.5938	1	0581070 <sup>1)</sup>	0581278 <sup>1)</sup>
	8	36	2.1/8	0.2484	0.1680	0.1310	2	H2	N29	3.50	0.6526	1	0581964	—
8		32	2.1/8	0.2484	0.1680	0.1310	2	H2	N29	3.50	0.6526	1	0581087 <sup>1)</sup>	0581285 <sup>1)</sup>
	10	32	2.3/8	0.4303	0.1940	0.1520	2	H2	N21	4.10	0.8434	1	0581971 <sup>1)</sup>	0582145 <sup>1)</sup>
10		24	2.3/8	0.4303	0.1940	0.1520	2	H3	N25	3.90	0.8434	1	0581094 <sup>1)</sup>	0581292 <sup>1)</sup>
	12	28	2.3/8	0.4173	0.2200	0.1650	2	H3	N14	4.70	0.8848	1	—	0582152 <sup>1)</sup>
12		24	2.3/8	0.4173	0.2200	0.1650	2	H3	N16	4.50	0.8848	1	0581100 <sup>1)</sup>	0581308 <sup>1)</sup>
	1/4	28	2.1/2	0.5075	0.2550	0.1910	2	H3	N3	5.50	1.0073	1	0581995 <sup>1)</sup>	0582169 <sup>1)</sup>
	1/4	28	2.1/2	0.5075	0.2550	0.1910	3	H3	N3	5.50	1.0073	1	0582008 <sup>1)</sup>	0582176 <sup>1)</sup>
1/4		20	2.1/2	0.5075	0.2550	0.1910	2	H3	N7	5.10	1.0073	1	0581117 <sup>1)</sup>	0581315 <sup>1)</sup>
1/4		20	2.1/2	0.5075	0.2550	0.1910	3	H3	N7	5.10	1.0073	1	0581124 <sup>1)</sup>	0581339 <sup>1)</sup>
1/4		20	2.1/2	0.5075	0.2550	0.1910	3	H11	N7	5.10	1.0073	1	—	0581322 <sup>13)</sup>
	5/16	24	2.23/32	0.5939	0.3180	0.2380	2	H3	I	6.90	1.1891	1	0582015 <sup>1)</sup>	0582183 <sup>1)</sup>
	5/16	24	2.23/32	0.5939	0.3180	0.2380	3	H3	I	6.90	1.1891	1	0582022 <sup>1)</sup>	0582190 <sup>1)</sup>
5/16		18	2.23/32	0.5939	0.3180	0.2380	2	H3	F	6.60	1.1891	1	0581131 <sup>1)</sup>	0581346 <sup>1)</sup>
5/16		18	2.23/32	0.5939	0.3180	0.2380	3	H3	F	6.60	1.1891	1	0581148 <sup>1)</sup>	0581360 <sup>1)</sup>
5/16		18	2.23/32	0.5939	0.3180	0.2380	3	H11	F	6.60	1.1891	1	—	0581353 <sup>13)</sup>
	3/8	24	2.15/16	0.6020	0.3810	0.2860	2	H3	Q	8.50	1.2915	1	0582039 <sup>1)</sup>	0582206 <sup>1)</sup>
	3/8	24	2.15/16	0.6020	0.3810	0.2860	3	H3	Q	8.50	1.2915	1	0582046 <sup>1)</sup>	0582213 <sup>1)</sup>
3/8		16	2.15/16	0.6020	0.3810	0.2860	2	H3	5/16	8.00	1.2915	1	0581155 <sup>1)</sup>	0581377 <sup>1)</sup>
3/8		16	2.15/16	0.6020	0.3810	0.2860	3	H3	5/16	8.00	1.2915	1	0581162 <sup>1)</sup>	0581391 <sup>1)</sup>
3/8		16	2.15/16	0.6020	0.3810	0.2860	3	H11	5/16	8.00	1.2915	1	—	0581384 <sup>13)</sup>
	7/16	20	3.5/32	0.9055	0.3230	0.2420	3	H3	25/64	9.90	—	1	0582053 <sup>2)</sup>	0582220 <sup>2)</sup>
7/16		14	3.5/32	0.9055	0.3230	0.2420	3	H3	U	9.40	—	1	0581179 <sup>2)</sup>	0581407 <sup>2)</sup>
	1/2	20	3.3/8	0.9055	0.3670	0.2750	2	H3	29/64	11.50	—	1	0582060 <sup>2)</sup>	0582237 <sup>2)</sup>

<sup>1)</sup> Reinforced Shanks

<sup>2)</sup> Reduced Shanks

<sup>3)</sup> Oversize +.005", not 3B



UNC	UNF	TPI	$l_1$ Inch	$l_2$ Inch	$d_2$ Ø Inch	$\square$ a Inch	# of Flutes	Limits			$l_4$ Inch	Pack Qty	E025 E035	E026 E036
	1/2	20	3.3/8	0.9055	0.3670	0.2750	3	H3	29/64	11.50	—	1	0582077 <sup>2)</sup>	0582244 <sup>2)</sup>
1/2		13	3.3/8	0.9055	0.3670	0.2750	2	H3	27/64	10.80	—	1	0581186 <sup>2)</sup>	0581414 <sup>2)</sup>
1/2		13	3.3/8	0.9055	0.3670	0.2750	3	H3	27/64	10.80	—	1	0581193 <sup>2)</sup>	0581438 <sup>2)</sup>
1/2		13	3.3/8	0.9055	0.3670	0.2750	3	H11	27/64	10.80	—	1	—	0581421 <sup>2)3)</sup>
	9/16	18	3.19/32	0.9843	0.4290	0.3220	3	H3	33/64	12.90	—	1	0582084 <sup>2)</sup>	0582251 <sup>2)</sup>
9/16		12	3.19/32	0.9843	0.4290	0.3220	3	H3	31/64	12.20	—	1	0581209 <sup>2)</sup>	0581445 <sup>2)</sup>
	5/8	18	3.13/16	0.9843	0.4800	0.3600	3	H3	37/64	14.50	—	1	0582091 <sup>2)</sup>	0582268 <sup>2)</sup>
5/8		11	3.13/16	0.9843	0.4800	0.3600	3	H3	17/32	13.50	—	1	0581216 <sup>2)</sup>	0581469 <sup>2)</sup>
5/8		11	3.13/16	0.9843	0.4800	0.3600	3	H11	17/32	13.50	—	1	—	0581452 <sup>2)3)</sup>
	3/4	16	4.1/4	1.1614	0.5900	0.4420	3	H3	11/16	17.50	—	1	0582107 <sup>2)</sup>	0582275 <sup>2)</sup>
3/4		10	4.1/4	1.1614	0.5900	0.4420	3	H4	21/32	16.50	—	1	0581223 <sup>2)</sup>	0581476 <sup>2)</sup>
	7/8	14	4.11/16	1.1614	0.6970	0.5230	3	H4	13/16	20.40	—	1	0582114 <sup>2)</sup>	0582282 <sup>2)</sup>
7/8		9	4.11/16	1.1614	0.6970	0.5230	3	H4	49/64	19.50	—	1	0581230 <sup>2)</sup>	0581483 <sup>2)</sup>
	1"	12	5.1/8	1.3976	0.8000	0.6000	3	H4	59/64	23.25	—	1	—	0582299 <sup>2)</sup>
	1"	14	5.1/8	1.3976	0.8000	0.6000	3	H4	59/64	23.50	—	1	0582138 <sup>2)</sup>	0582305 <sup>2)</sup>
1"		8	5.1/8	1.3976	0.8000	0.6000	3	H4	7/8	22.25	—	1	0581247 <sup>2)</sup>	0581490 <sup>2)</sup>

- <sup>1)</sup> Reinforced Shanks
- <sup>2)</sup> Reduced Shanks
- <sup>3)</sup> Oversize +.005", not 3B

# SPIRAL POINT TAPS



## Multi-Application, Plug Chamfer

**EP20/  
EP30** Premium substrate for through hole tapping in tough or abrasive materials. Bronze oxide body and shank reduces rust and corrosion. Bright finish flutes improve chip flow in soft or non-ferrous materials.

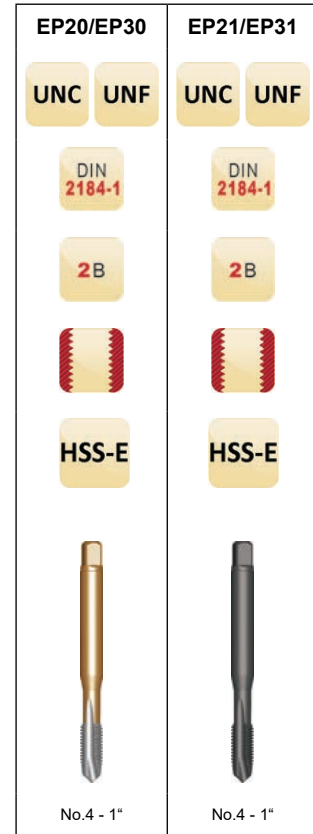
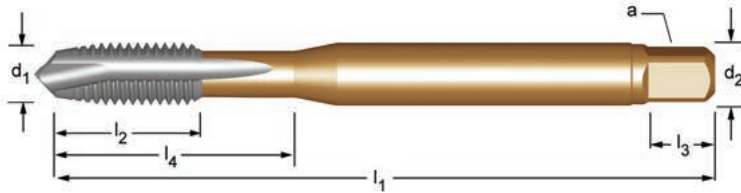
EP20 = UNC Sizes, EP30 = UNF Sizes

1.1 1.2 1.3 1.4 1.5 1.6 3.1 3.2 3.3 3.4 4.1 4.2 5.1 5.2 6.1  
6.2 6.3 7.1 7.2 7.3 7.4 8.1

**EP21/  
EP31** Premium substrate with steam oxide surface treatment reduces wear and chip welding in abrasive or harder ferrous materials.

EP21 = UNC Sizes, EP31 = UNF Sizes

1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4



UNC	UNF	TPI	d <sub>1</sub> nom mm	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> Ø mm	a mm	l <sub>3</sub> mm	# of Flutes	Flute Width	l <sub>4</sub> mm	Limits	Pack Qty	EP20/EP30	EP21/ EP31
4		40	2.845	56	9	3.5	2.7	6	3	2.35	18	H2	1	0138021	<sup>1)</sup> 0138175
5		40	3.175	56	10	3.5	2.7	6	3	2.65	18	H2	1	0138038	<sup>1)</sup> 0138182
6		32	3.505	56	11	4.0	3.0	6	3	2.85	20	H2	1	0138045	<sup>1)</sup> 0138199
	8	36	4.166	63	12	4.5	3.4	8	3	3.5	21	H3	1	0138366	<sup>1)</sup> 0138472
8		32	4.166	63	12	4.5	3.4	8	3	3.5	21	H3	1	0138052	<sup>1)</sup> 0138205
	10	32	4.826	70	13	6.0	4.9	8	3	4.1	25	H3	1	0138373	<sup>1)</sup> 0138489
10		24	4.826	70	13	6.0	4.9	8	3	3.9	25	H3	1	0138069	<sup>1)</sup> 0138212
12		24	5.486	80	15	6.0	4.9	8	3	4.5	30	H3	1	0138076	<sup>1)</sup> 0138229
	1/4	28	6.350	80	15	7.0	5.5	8	3	5.5	30	H4	1	0138380	<sup>1)</sup> 0138496
1/4		20	6.350	80	15	7.0	5.5	8	3	5.1	30	H5	1	0138083	<sup>1)</sup> 0138274
	5/16	24	7.938	90	18	8.0	6.2	9	3	6.9	35	H4	1	0138397	<sup>1)</sup> 0138502
5/16		18	7.938	90	18	8.0	6.2	9	3	6.6	35	H5	1	0138090	<sup>1)</sup> 0138281
	3/8	24	9.525	100	20	10.0	8.0	11	3	8.5	39	H4	1	0138403	<sup>1)</sup> 0138519
3/8		16	9.525	100	20	10.0	8.0	11	3	8	39	H5	1	0138106	<sup>1)</sup> 0138298
	7/16	20	11.112	100	20	8.0	6.2	9	3	9.9	-	H5	1	0138410	<sup>2)</sup> 0138526
7/16		14	11.112	100	20	8.0	6.2	9	3	9.4	-	H5	1	0138113	<sup>2)</sup> 0138304
	1/2	20	12.700	110	23	9.0	7.0	10	3	11.5	-	H5	1	0138427	<sup>2)</sup> 0138533
1/2		13	12.700	110	23	9.0	7.0	10	3	10.8	-	H5	1	0138120	<sup>2)</sup> 0138311
	5/8	18	15.875	110	25	12.0	9.0	12	3	14.5	-	H5	1	0138434	<sup>2)</sup> 0138540
5/8		11	15.875	110	25	12.0	9.0	12	3	13.5	-	H5	1	0138137	<sup>2)</sup> 0138328
	3/4	16	19.050	125	30	14.0	11.0	14	4	17.5	-	H5	1	0138441	<sup>2)</sup> 0138557
3/4		10	19.050	125	30	14.0	11.0	14	4	16.5	-	H5	1	0138144	<sup>2)</sup> 0138335
	7/8	14	22.225	140	34	18.0	14.5	17	4	20.4	-	H6	1	0138458	<sup>2)</sup> 0138564
7/8		9	22.225	140	34	18.0	14.5	17	4	19.5	-	H6	1	0138151	<sup>2)</sup> 0138342
	1"	12	25.400	160	38	18.0	14.5	17	4	23.25	-	H6	1	0138465	<sup>2)</sup> 0138571
1"		8	25.400	160	38	18.0	14.5	17	4	22.25	-	H6	1	0138168	<sup>2)</sup> 0138359

**Note: DIN shank and square dimensions will necessitate metric holders**

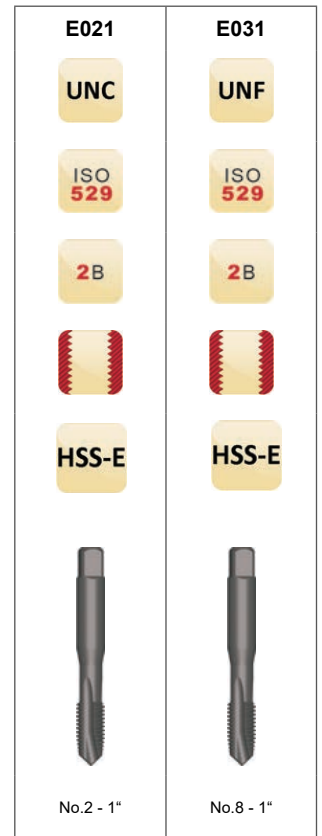
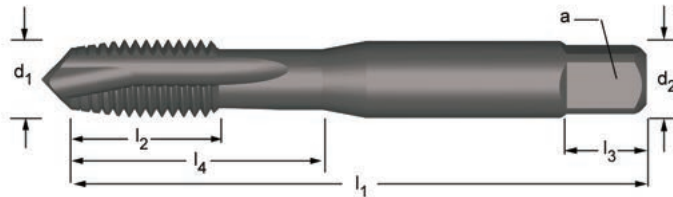
<sup>1)</sup> Reinforced Shanks

<sup>2)</sup> Reduced Shanks

## Multi-Application, PLUG CHAMFER

**E021** Premium substrate with steam oxide surface treatment reduces wear and prevents chip welding in abrasive or harder ferrous materials.  
**E031** *E021 = UNC Sizes, E031 = UNF Sizes*

1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4



UNC	UNF	TPI	d <sub>1</sub> nom mm	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> Ø mm	□ a mm	l <sub>3</sub> mm	# of Flutes	↔	l <sub>4</sub> mm	Limits	Pack Qty	E021	E031
2		56	2.184	44.5	9.5	2.80	2.24	5	2	1.85	9.5	H2	1	0010396 <sup>1)</sup>	—
4		40	2.845	48	14	3.15	2.50	5	3	2.35	14	H2	1	0569108 <sup>1)</sup>	—
5		40	3.175	48	12.5	3.15	2.50	5	3	2.65	12.5	H2	1	0010419 <sup>1)</sup>	—
6		32	3.505	50	16	3.55	2.80	5	3	2.85	16	H3	1	0569115 <sup>1)</sup>	—
	8	36	4.166	53	9.5	4.5	3.55	6	3	3.50	17	H3	1	—	0569641 <sup>1)</sup>
8		32	4.166	53	9.5	4.50	3.55	6	3	3.50	17	H3	1	0569122 <sup>1)</sup>	—
	10	32	4.826	58	11	5.0	4.00	7	3	4.10	20	H3	1	—	0569658 <sup>1)</sup>
10		24	4.826	58	11	5.00	4.00	7	3	3.90	20	H3	1	0569139 <sup>1)</sup>	—
12		24	5.486	62	12	5.60	4.50	7	3	4.50	21	H3	1	0569146 <sup>1)</sup>	—
	1/4	28	6.350	66	13	6.3	5.00	8	3	5.50	26	H4	1	—	0569665 <sup>1)</sup>
1/4		20	6.350	66	13	6.30	5.00	8	3	5.10	26	H5	1	0569153 <sup>1)</sup>	—
	5/16	24	7.938	72	16	8.0	6.30	9	3	6.90	29	H4	1	—	0569672 <sup>1)</sup>
5/16		18	7.938	72	16	8.00	6.30	9	3	6.60	29	H5	1	0569160 <sup>1)</sup>	—
	3/8	24	9.525	80	18	10.0	8.00	11	3	8.50	32	H4	1	—	0569689 <sup>1)</sup>
3/8		16	9.525	80	18	10.00	8.00	11	3	8.00	32	H5	1	0569177 <sup>1)</sup>	—
	7/16	20	11.112	85	19	8.0	6.30	9	3	9.90	-	H5	1	—	0569696 <sup>2)</sup>
7/16		14	11.112	85	19	8.00	6.30	9	3	9.40	-	H5	1	0569184 <sup>2)</sup>	—
	1/2	20	12.700	89	22	9.0	7.10	10	3	11.50	-	H5	1	—	0569702 <sup>2)</sup>
1/2		13	12.700	89	22	9.00	7.10	10	3	10.80	-	H5	1	0569191 <sup>2)</sup>	—
	9/16	18	14.288	95	24	11.2	9.00	12	3	12.90	-	H5	1	—	0569719 <sup>2)</sup>
	5/8	18	15.875	102	24	12.5	10.00	13	3	14.50	-	H5	1	—	0569726 <sup>2)</sup>
5/8		11	15.875	102	24	12.50	10.00	13	3	13.50	-	H5	1	0569207 <sup>2)</sup>	—
	3/4	16	19.050	112	29	14.0	11.20	14	4	17.50	-	H5	1	—	0569733 <sup>2)</sup>
3/4		10	19.050	112	29	14.00	11.20	14	4	16.50	-	H5	1	0569214 <sup>2)</sup>	—
	7/8	14	22.225	118	29	16.0	12.50	16	4	20.40	-	H6	1	—	0569740 <sup>2)</sup>
7/8		9	22.225	118	29	16.00	12.50	16	4	19.50	-	H6	1	0569221 <sup>2)</sup>	—
	1"	12	25.400	130	35	18.0	14.00	18	4	23.25	-	H6	1	—	0569757 <sup>2)</sup>
1"		8	25.400	130	35	18.00	14.00	18	4	22.25	-	H6	1	0569238 <sup>2)</sup>	—

**Note: ISO shank and square dimensions will necessitate metric holders**

<sup>1)</sup> Reinforced Shanks  
<sup>2)</sup> Reduced Shanks

# SPIRAL POINT TAPS

**UNION BUTTERFIELD®**

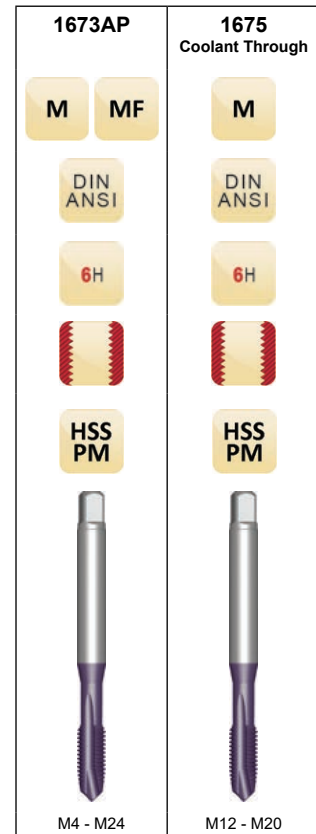
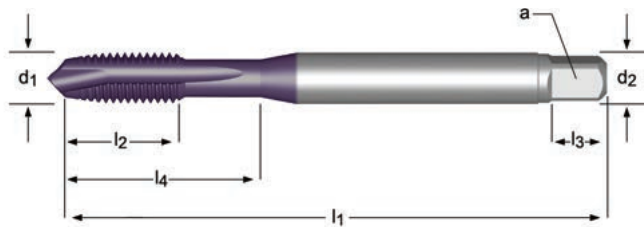
**APPLIX®**

## MXP Multi-Application, Plug Chamfer, Metric

**1673AP** Designed for through hole tapping in a variety of materials with a hardness up to 36 Rc. The premium substrate and TiCN coating combine to offer superior abrasion resistance, higher operating speeds, improved thread quality, reduced cycle times, and longer tool life.

**1675** Coolant thru design allows higher tapping speeds and eliminates the problems associated with inadequate coolant in horizontal or deep hole applications.

1.1 1.2 1.3 1.4 1.5 2.1 2.2 4.1 4.2 5.1 5.2 6.1 6.2 6.3  
7.1 7.2 7.3 7.4



M	MF	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>4</sub> Inch (Neck Length)	d <sub>2</sub> Ø Inch	∠ a Inch	# of Flutes	Limits	Pack Qty	1673AP	1675
4		0.70	63	13	21	0.168	0.131	3	D4	1	46204884	<sup>1)</sup> —
5		0.80	70	15	25	0.194	0.152	3	D4	1	46204885	<sup>1)</sup> —
6		1.00	80	17	30	0.255	0.191	3	D5	1	46204886	<sup>1)</sup> —
	8	1.00	90	17	35	0.318	0.238	3	D5	1	46205008	<sup>1)</sup> —
8		1.25	90	20	35	0.318	0.238	3	D5	1	46204887	<sup>1)</sup> —
	10	1.25	100	16	39	0.381	0.286	3	D6	1	46204870	<sup>1)</sup> —
10		1.50	100	22	39	0.381	0.286	3	D6	1	46204871	<sup>1)</sup> —
	12	1.25	100	21		0.367	0.275	3	D6	1	46205009	<sup>2)</sup> —
	12	1.50	100	22		0.367	0.275	3	D6	1	46204872	<sup>2)</sup> —
12		1.75	110	24		0.367	0.275	3	D6	1	46204873	<sup>2)</sup> 1716722 <sup>2)</sup>
	14	1.50	100	22		0.429	0.322	4	D7	1	46204874	<sup>2)</sup> —
14		2.00	110	26		0.429	0.322	4	D7	1	46204875	<sup>2)</sup> —
	16	1.50	100	22		0.480	0.360	4	D7	1	46204876	<sup>2)</sup> —
16		2.00	110	27		0.480	0.360	4	D7	1	46204877	<sup>2)</sup> 1716730 <sup>2)</sup>
	18	1.50	110	25		0.542	0.406	4	D7	1	46204878	<sup>2)</sup> —
20		2.50	140	32		0.652	0.489	4	D7	1	46204881	<sup>2)</sup> 1716738 <sup>2)</sup>
	24	2.00	140	27		0.760	0.570	4	D8	1	46204882	<sup>2)</sup> —
24		3.00	160	34		0.760	0.570	4	D8	1	46204883	<sup>2)</sup> —

<sup>1)</sup> Reinforced Shanks

<sup>2)</sup> Reduced Shanks

## Multi-Application, Plug Chamfer

**E005** Premium substrate for through hole tapping in tough or abrasive materials. Bronze oxide body and shank reduces rust and corrosion. Bright finish flutes improve chip flow in soft or non-ferrous materials.

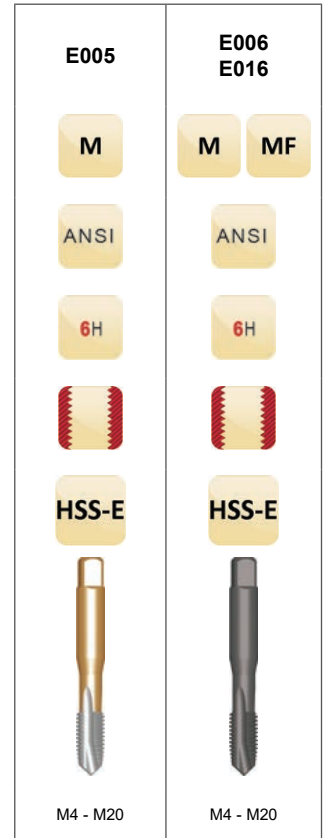
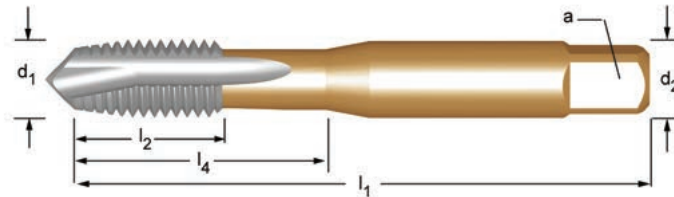
*E005 = Metric Coarse*

1.1 1.2 1.3 1.4 1.5 1.6 3.1 3.2 3.3 3.4 4.1 4.2 5.1 5.2 6.1  
6.2 6.3 7.1 7.2 7.3 7.4 8.1

**E006/  
E016** Premium substrate with steam oxide surface treatment reduces wear and prevents chip welding in abrasive or harder ferrous materials.

*E006 = Metric Coarse, E016 = Metric Fine*

1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4



M	MF	P	$l_1$	$l_2$	$d_2$	$a$	# of Flutes	$l_4$	Limits	Pack Qty	E005	E006 E016
		mm	Inch	Inch	Inch	Inch		Inch				
4		0.70	2.1/8	0.2484	0.1680	0.1310	2	0.6526	D4	1	0580301 <sup>1)</sup>	0580462 <sup>1)</sup>
4		0.70	2.1/8	0.2484	0.1680	0.1310	3	0.6526	D4	1	0580318 <sup>1)</sup>	0583180 <sup>1)</sup>
5		0.80	2.3/8	0.4303	0.1940	0.1520	2	0.8434	D4	1	0580325 <sup>1)</sup>	0580479 <sup>1)</sup>
5		0.80	2.3/8	0.4303	0.1940	0.1520	3	0.8434	D4	1	0580332 <sup>1)</sup>	0580486 <sup>1)</sup>
6		1.00	2.1/2	0.5075	0.2550	0.1910	2	1.0073	D5	1	0580349 <sup>1)</sup>	0580493 <sup>1)</sup>
6		1.00	2.1/2	0.5075	0.2550	0.1910	3	1.0073	D5	1	0580356 <sup>1)</sup>	0580509 <sup>1)</sup>
	8	1.00	2.23/32	0.5939	0.3180	0.2380	3	1.1891	D5	1	—	0580950 <sup>1)</sup>
8		1.25	2.23/32	0.5939	0.3180	0.2380	2	1.1891	D5	1	0580363 <sup>1)</sup>	0580516 <sup>1)</sup>
8		1.25	2.23/32	0.5939	0.3180	0.2380	3	1.1891	D5	1	0580370 <sup>1)</sup>	0583197 <sup>1)</sup>
	10	1.00	2.15/16	0.6020	0.3810	0.2860	3	1.2915	D6	1	—	0580967 <sup>1)</sup>
10		1.50	2.15/16	0.6020	0.3810	0.2860	2	1.2915	D6	1	0580387 <sup>1)</sup>	0580523 <sup>1)</sup>
10		1.50	2.15/16	0.6020	0.3810	0.2860	3	1.2915	D6	1	0580394 <sup>1)</sup>	0580530 <sup>1)</sup>
12		1.75	3.3/8	0.9055	0.3670	0.2750	2	1.1891	D6	1	0580400 <sup>2)</sup>	0580547 <sup>2)</sup>
12		1.75	3.3/8	0.9055	0.3670	0.2750	3	1.1891	D6	1	0580417 <sup>2)</sup>	0580554 <sup>2)</sup>
	14	1.50	3.19/32	0.9843	0.4290	0.3220	3	1.2915	D7	1	—	0580974 <sup>2)</sup>
14		2.00	3.19/32	0.9843	0.4290	0.3220	3	1.2915	D7	1	0580424 <sup>2)</sup>	0580561 <sup>2)</sup>
16		2.00	3.13/16	0.9843	0.4800	0.3600	3	1.2915	D7	1	0580431 <sup>2)</sup>	0580578 <sup>2)</sup>
18		2.50	4.1/32	1.1614	0.5420	0.4060	3	1.2915	D7	1	0580448 <sup>2)</sup>	0580585 <sup>2)</sup>
20		2.50	4.15/32	1.1614	0.6520	0.4890	3	1.2915	D7	1	0580455 <sup>2)</sup>	0580592 <sup>2)</sup>

<sup>1)</sup> Reinforced Shanks  
<sup>2)</sup> Reduced Shanks

# SPIRAL POINT TAPS



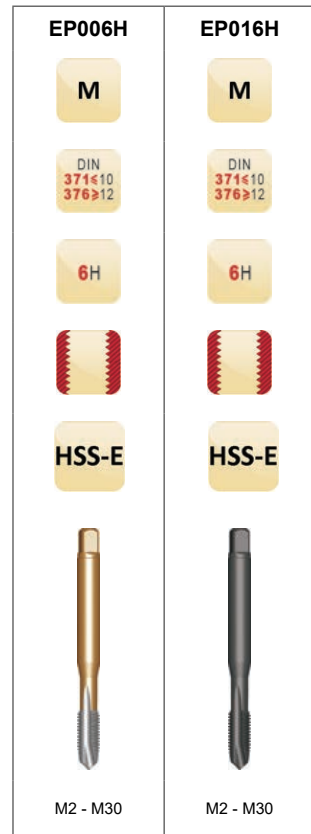
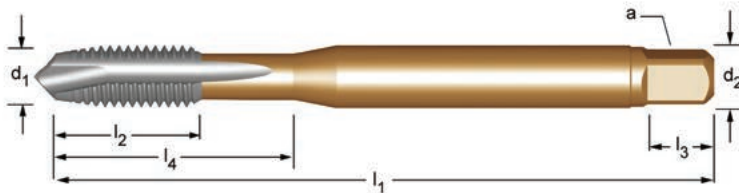
## Multi-Application, Plug Chamfer

**EP006H** Premium substrate for through hole tapping in tough or abrasive materials. Bronze oxide body and shank reduces rust and corrosion. Bright finish flutes improve chip flow in soft or non-ferrous materials.

1.1 1.2 1.3 1.4 1.5 1.6 3.1 3.2 3.3 3.4 4.1 4.2 5.1 5.2 6.1  
6.2 6.3 7.1 7.2 7.3 7.4 8.1

**EP016H** Premium substrate with steam oxide surface treatment reduces wear and prevents chip welding in abrasive or harder ferrous materials.

1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4



M	P mm	$l_1$ mm	$l_2$ mm	$d_2$ $\varnothing$ mm	$\square$ a mm	$l_3$ mm	# of Flutes	$l_4$ mm	Limits	Pack Qty	EP006H	EP016H
2	0.40	50	6	2.8	2.1	5	2	1.6	9	D3	1	0137239 <sup>1)</sup> 0137253 <sup>1)</sup>
2.5	0.45	50	8	2.8	2.1	5	2	2.1	12.5	D3	1	0137246 <sup>1)</sup> 0137291 <sup>1)</sup>
3	0.50	56	10	2.2	1.8	4	3	2.5	18	D3	1	0135716 <sup>2)</sup> 0136126 <sup>2)</sup>
3	0.50	56	9	3.5	2.7	6	3	2.5	18	D3	1	0135709 <sup>1)</sup> 0136119 <sup>1)</sup>
3.5	0.60	56	11	4.0	3.0	6	3	2.9	20	D4	1	0135723 <sup>1)</sup> 0136133 <sup>1)</sup>
4	0.70	63	12	2.8	2.1	5	3	3.3	21	D4	1	0135747 <sup>2)</sup> 0136157 <sup>2)</sup>
4	0.70	63	12	4.5	3.4	6	3	3.3	21	D4	1	0135730 <sup>1)</sup> 0136140 <sup>1)</sup>
4.5	0.75	70	13	6.0	4.9	8	3	3.8	25	D4	1	0135754 <sup>1)</sup> 0136164 <sup>1)</sup>
5	0.80	70	13	3.5	2.7	6	3	4.2	25	D4	1	0135853 <sup>2)</sup> 0136188 <sup>2)</sup>
5	0.80	70	13	6.0	4.9	8	3	4.2	25	D4	1	0135846 <sup>1)</sup> 0136171 <sup>1)</sup>
6	1.00	80	15	4.5	3.4	6	3	5	30	D5	1	0135877 <sup>2)</sup> 0136201 <sup>2)</sup>
6	1.00	80	15	6.0	4.9	8	3	5	30	D5	1	0135860 <sup>1)</sup> 0136195 <sup>1)</sup>
7	1.00	80	15	7.0	5.5	8	3	6	30	D5	1	0135884 <sup>1)</sup> 0136218 <sup>1)</sup>
8	1.25	90	18	6.0	4.9	8	3	6.8	35	D5	1	0135907 <sup>2)</sup> 0136232 <sup>2)</sup>
8	1.25	90	18	8.0	6.2	9	3	6.8	35	D5	1	0135891 <sup>1)</sup> 0136225 <sup>1)</sup>
10	1.50	100	20	7.0	5.5	8	3	8.5	-	D6	1	0135921 <sup>2)</sup> 0136256 <sup>2)</sup>
10	1.50	100	20	10.0	8.0	11	3	8.5	39	D6	1	0135914 <sup>1)</sup> 0136249 <sup>1)</sup>
12	1.75	110	23	9.0	7.0	10	3	10.3	-	D6	1	0135938 <sup>2)</sup> 0136263 <sup>2)</sup>
14	2.00	110	25	11.0	9.0	12	3	12	-	D7	1	0135945 <sup>2)</sup> 0136317 <sup>2)</sup>
16	2.00	110	25	12.0	9.0	12	3	14	-	D7	1	0135952 <sup>2)</sup> 0136324 <sup>2)</sup>
18	2.50	125	30	14.0	11.0	14	4	15.5	-	D7	1	0135969 <sup>2)</sup> 0136331 <sup>2)</sup>
20	2.50	140	30	16.0	12.0	15	4	17.5	-	D7	1	0135976 <sup>2)</sup> 0136348 <sup>2)</sup>
22	2.50	140	34	18.0	14.5	17	4	19.5	-	D8	1	0135983 <sup>2)</sup> 0136355 <sup>2)</sup>
24	3.00	160	38	18.0	14.5	17	4	21	-	D8	1	0135990 <sup>2)</sup> 0136362 <sup>2)</sup>
27	3.00	160	38	20.0	16.0	19	4	24	-	D8	1	0136003 <sup>2)</sup> 0136379 <sup>2)</sup>
30	3.50	180	45	22.0	18.0	21	4	26.5	-	D9	1	0136010 <sup>2)</sup> 0136386 <sup>2)</sup>

**Note: DIN shank and square dimensions will necessitate metric holders**

<sup>1)</sup> Reinforced Shanks (DIN 371)

<sup>2)</sup> Reduced Shanks (DIN 376)

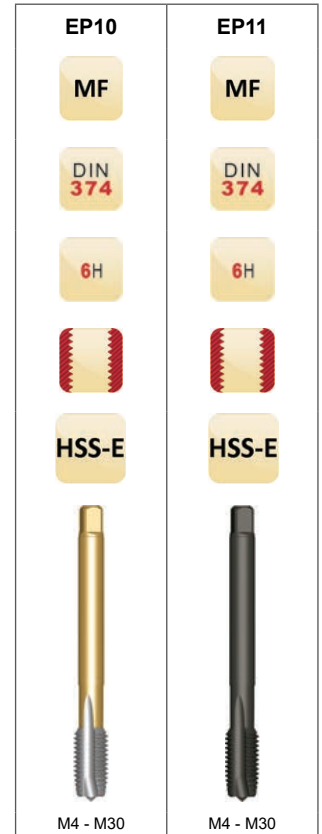
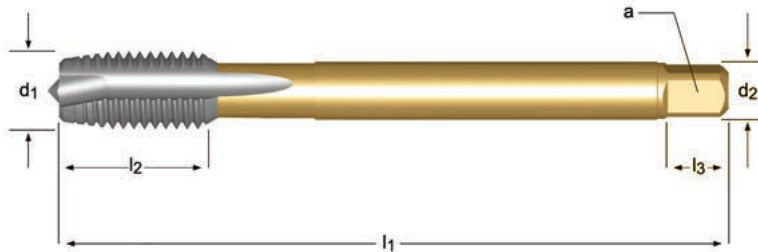
## Multi-Application, Plug Chamfer

**EP10** Premium substrate for through hole tapping in tough or abrasive materials. Bronze oxide body and shank reduces rust and corrosion. Bright finish flutes improve chip flow in soft or non-ferrous materials.

1.1 1.2 1.3 1.4 1.5 1.6 3.1 3.2 3.3 3.4 4.1 4.2 5.1 5.2 6.1  
6.2 6.3 7.1 7.2 7.3 7.4 8.1

**EP11** Premium substrate with steam oxide surface treatment reduces wear and prevents chip welding in abrasive or harder ferrous materials.

1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4



MF	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> Ø mm	□ a mm	l <sub>3</sub> mm	# of Flutes	↔	Limits	Pack Qty	EP10	EP11
4	0.50	63	12	2.8	2.1	5	3	3.5	D4	1	0137345	0137642
5	0.50	70	13	3.5	2.7	6	3	4.5	D4	1	0137352	0137659
6	0.75	80	15	4.5	3.4	6	3	5.3	D5	1	0137369	0137666
8	0.75	80	15	6.0	4.9	8	3	7.3	D5	1	0137376	0137673
8	1.00	90	18	6.0	4.9	8	3	7	D5	1	0137383	0137680
10	0.75	90	18	7.0	5.5	8	3	9.3	D6	1	0137390	0137697
10	1.00	90	18	7.0	5.5	8	3	9	D6	1	0137406	0137703
10	1.25	100	20	7.0	5.5	8	3	8.8	D6	1	0137413	0137710
12	1.00	100	21	9.0	7.0	10	3	11	D6	1	0137420	0137727
12	1.25	100	21	9.0	7.0	10	3	10.8	D6	1	0137437	0137819
12	1.50	100	21	9.0	7.0	10	3	10.5	D6	1	0137444	0137826
14	1.00	100	21	11.0	9.0	12	3	13	D7	1	0137451	0137833
14	1.25	100	21	11.0	9.0	12	3	13	D7	1	0137468	0137840
14	1.50	100	21	11.0	9.0	12	3	12.5	D7	1	0137475	0137857
16	1.00	100	21	12.0	9.0	12	3	15	D7	1	0137482	0137864
16	1.50	100	21	12.0	9.0	12	3	14.5	D7	1	0137499	0137871
18	1.00	110	24	14.0	11.0	14	4	17	D7	1	0137505	0137888
18	1.50	110	24	14.0	11.0	14	4	16.5	D7	1	0137512	0137895
20	1.00	125	24	16.0	12.0	15	4	19	D7	1	0137529	0137901
20	1.50	125	24	16.0	12.0	15	4	18.5	D7	1	0137536	0137918
22	1.50	125	25	18.0	14.5	17	4	20.5	D8	1	0137543	0137925
24	1.50	140	28	18.0	14.5	17	4	22.5	D8	1	0137550	0137932
24	2.00	140	28	18.0	14.5	17	4	22	D8	1	0137567	0137949
25	1.50	140	28	18.0	14.5	17	4	23.5	D8	1	0137574	0137956
26	1.50	140	28	18.0	14.5	17	4	24.5	D8	1	0137581	0137963
27	1.50	140	28	20.0	16.0	19	4	25.5	D8	1	0137598	0137970
27	2.00	140	28	20.0	16.0	19	4	25	D8	1	0137604	0137987
28	1.50	140	28	20.0	16.0	19	4	26.5	D9	1	0137611	0137994
30	1.50	150	28	22.0	18.0	21	4	28.5	D9	1	0137628	0138007
30	2.00	150	28	22.0	18.0	21	4	28	D9	1	0137635	0138014

Note: DIN shank and square dimensions will necessitate metric holders

# SPIRAL POINT TAPS



## Multi-Application, Plug Chamfer

**E000** Premium substrate for through hole tapping in tough or abrasive materials. Bronze oxide body and shank reduces rust and corrosion. Bright finish flutes improve chip flow in soft or non-ferrous materials.

*E000 = Metric Coarse, E000TIN = TiN Coated*

1.1 1.2 1.3 1.4 1.5 1.6 3.1 3.2 3.3 3.4 4.1 4.2 5.1 5.2 6.1  
6.2 6.3 7.1 7.2 7.3 7.4 8.1

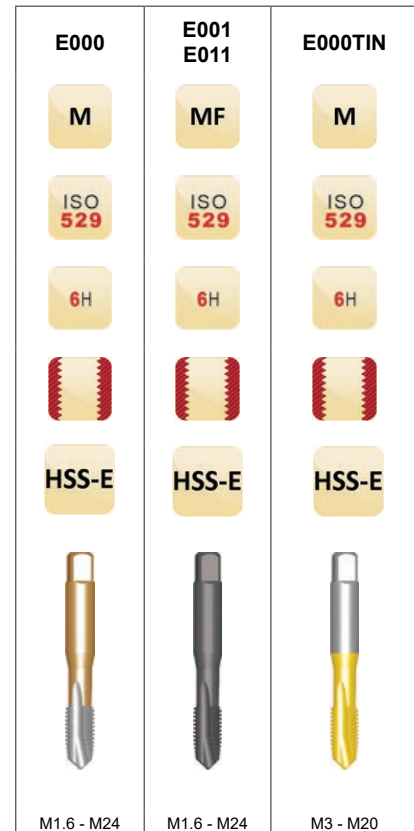
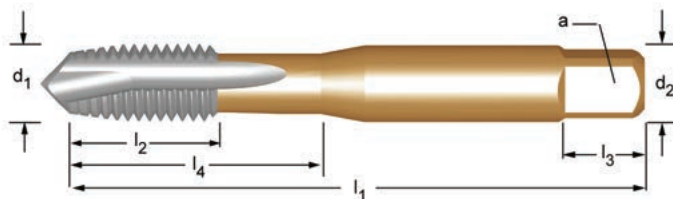
**E000TIN** E000 with a TiN coat

1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4 4.1 4.2  
5.1 5.2 6.1 6.2 6.3 7.3 7.4 8.2

**E001** Premium substrate with steam oxide surface treatment reduces wear and prevents chip welding in abrasive or harder ferrous materials.

*E001 = Metric Coarse, E011 = Metric Fine*

1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4




M	MF	P	l <sub>1</sub>	l <sub>2</sub>	d <sub>2</sub>	a	l <sub>3</sub>	# of Flutes	l <sub>4</sub>	Limits	Pack Qty	E000	E001 E011	E000TIN
1.6		0.35	41	7	2.50	2.00	4	2	1.25	7	D3	0168769	0168790	—
2		0.40	41	8	2.50	2.00	4	2	1.6	8	D3	0168776	0168806	—
2.5		0.45	44.5	9.5	2.80	2.24	5	2	2.05	9.5	D3	0168783	0168813	—
3		0.50	48	15	3.15	2.50	5	3	2.5	15	D3	0567586	0567722	46196635
3.5		0.60	50	16	3.55	2.80	5	3	2.9	16	D4	0567593	0567739	—
4		0.50	53	17	4.0	3.15	6	3	3.5	17	D4	—	0568385	—
4		0.70	53	17	4.00	3.15	6	3	3.3	17	D4	0567609	0567746	46196636
5		0.50	58	11	5.0	4.00	7	3	4.5	22	D4	—	0568392	—
5		0.80	58	11	5.00	4.00	7	3	4.2	22	D4	0567616	0567753	46196637
6		0.50	66	13	6.3	5.00	8	3	5.5	26	D5	—	0568408	—
6		0.75	66	13	6.3	5.00	8	3	5.3	26	D5	—	0568415	—
6		1.00	66	13	6.30	5.00	8	3	5.0	26	D5	0567623	0567760	46196638
8		0.75	72	16	8.0	6.30	9	3	7.3	29	D5	—	0568422	—
8		1.00	72	16	8.0	6.30	9	3	7.0	29	D5	—	0568439	—
8		1.25	72	16	8.00	6.30	9	3	6.8	29	D5	0567630	0567777	46196639
10		1.00	80	18	10.0	8.00	11	3	9.0	34	D6	—	0568446	—
10		1.25	80	18	10.0	8.00	11	3	8.8	34	D6	—	0568453	—
10		1.50	80	18	10.00	8.00	11	3	8.5	34	D6	0567647	0567784	46196690
12		1.00	89	22	9.0	7.10	10	3	11.0	-	D6	—	0568460	—
12		1.25	89	22	9.0	7.10	10	3	10.8	-	D6	—	0568477	—
12		1.50	89	22	9.0	7.10	10	3	10.5	-	D6	—	0568484	—
12		1.75	89	22	9.00	7.10	10	3	10.3	-	D6	0567654	0567791	46196691
14		1.00	95	24	11.2	9.00	12	3	13.0	-	D7	—	0568491	—
14		1.25	95	24	11.2	9.00	12	3	12.8	-	D7	—	0568507	—
14		1.50	95	24	11.2	9.00	12	3	12.5	-	D7	—	0568514	—
14		2.00	95	24	11.20	9.00	12	3	12.0	-	D7	0567661	0567807	—
16		1.00	102	24	12.5	10.00	13	3	15.0	-	D7	—	0568521	—
16		1.50	102	24	12.5	10.00	13	3	14.5	-	D7	—	0568538	—
16		2.00	102	24	12.50	10.00	13	3	14.0	-	D7	0567678	0567814	46196692

<sup>1)</sup> Reinforced Shanks

<sup>2)</sup> Reduced Shanks



M	MF	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> ∅ mm	a mm	l <sub>3</sub> mm	# of Flutes		l <sub>4</sub> mm	Limits	Pack Qty	E000	E001 E011	E000TIN
	18	1.00	112	29	14.0	11.20	14	4	17.0	-	D7	1	—	0568545 <sup>2)</sup>	—
	18	1.50	112	29	14.0	11.20	14	4	16.5	-	D7	1	—	0568552 <sup>2)</sup>	—
18		2.50	112	29	14.00	11.20	14	4	15.5	-	D7	1	0567685 <sup>2)</sup>	0567821 <sup>2)</sup>	—
	20	1.00	112	29	14.0	11.20	14	4	19.0	-	D7	1	—	0568569 <sup>2)</sup>	—
	20	1.50	112	29	14.0	11.20	14	4	18.5	-	D7	1	—	0568576 <sup>2)</sup>	—
	20	2.00	112	29	14.0	11.20	14	4	18.0	-	D7	1	—	0568583 <sup>2)</sup>	—
20		2.50	112	29	14.00	11.20	14	4	17.5	-	D7	1	0567692 <sup>2)</sup>	—	46196693 <sup>2)</sup>
	22	1.50	118	29	16.0	12.50	16	4	20.5	-	D8	1	—	0568590 <sup>2)</sup>	—
22		2.50	118	29	16.00	12.50	16	4	19.5	-	D8	1	0567708 <sup>2)</sup>	0567845 <sup>2)</sup>	—
	24	1.50	130	35	18.0	14.00	18	4	22.5	-	D8	1	—	0568606 <sup>2)</sup>	—
	24	2.00	130	35	18.0	14.00	18	4	22.0	-	D8	1	—	0568613 <sup>2)</sup>	—
24		3.00	130	35	18.00	14.00	18	4	21.0	-	D8	1	0567715 <sup>2)</sup>	0567852 <sup>2)</sup>	—

<sup>1)</sup> Reinforced Shanks

<sup>2)</sup> Reduced Shanks

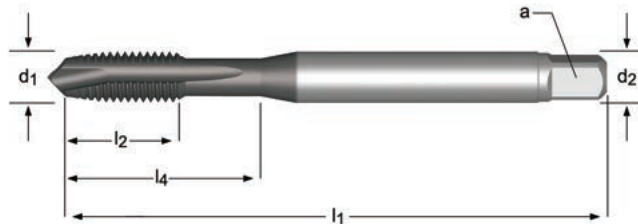
# SPIRAL POINT TAPS

## HMD Hard Materials / Cast Iron, Plug Chamfer



**1629AP** Designed for through hole tapping materials with a hardness of >38 Rc. Premium substrate provides superior abrasion resistance and edge strength. TiAlN-Top coating lowers the coefficient of friction, improves thread quality, affords higher operating speeds, and longer tool life.

1.5 1.6 2.4 3.1 3.2 3.3 3.4 4.3 5.3 6.4



**1629AP**

UNF UNC

DIN ANSI

2B

HSS PM

No.4 - 1"

UNC	UNF	TPI	$l_1$ Inch	$l_2$ Inch	$l_4$ Inch (Neck Length)	$d_2$ Ø Inch	$\square$ a Inch	# of Flutes	Limits	Pack Qty	1629AP
4		40	2.205	0.472	0.709	0.141	0.110	2	H2	1	46204796 <sup>1)</sup>
6		32	2.205	0.472	0.787	0.141	0.110	3	H3	1	46204801 <sup>1)</sup>
8		32	2.480	0.512	0.827	0.168	0.131	3	H3	1	46204805 <sup>1)</sup>
	10	32	2.756	0.512	0.984	0.194	0.152	3	H3	1	46204759 <sup>1)</sup>
10		24	2.756	0.591	0.984	0.194	0.152	3	H3	1	46204758 <sup>1)</sup>
	1/4	28	3.150	0.669	1.181	0.255	0.191	3	H4	1	46204757 <sup>1)</sup>
1/4		20	3.150	0.669	1.181	0.255	0.191	3	H5	1	46204756 <sup>1)</sup>
	5/16	24	3.543	0.669	1.378	0.318	0.238	3	H4	1	46204798 <sup>1)</sup>
5/16		18	3.543	0.787	1.378	0.318	0.238	3	H5	1	46204797 <sup>1)</sup>
	3/8	24	3.937	0.709	1.535	0.381	0.286	3	H4	1	46204795 <sup>1)</sup>
3/8		16	3.937	0.866	1.535	0.381	0.286	3	H5	1	46204794 <sup>1)</sup>
	1/2	20	3.937	0.866		0.367	0.275	3	H5	1	46204755 <sup>1)</sup>
1/2		13	4.331	0.984		0.367	0.275	3	H5	1	46204754 <sup>2)</sup>
	5/8	18	3.937	0.866		0.480	0.360	3	H5	1	46204800 <sup>2)</sup>
5/8		11	4.331	1.063		0.480	0.360	3	H5	1	46204799 <sup>2)</sup>
3/4		10	4.921	1.181		0.590	0.442	3	H5	1	46204792 <sup>2)</sup>
7/8		9	5.512	1.260		0.697	0.523	3	H6	1	46204804 <sup>2)</sup>
1"		8	6.299	1.417		0.800	0.600	3	H6	1	46204791 <sup>2)</sup>

<sup>1)</sup> Reinforced Shanks

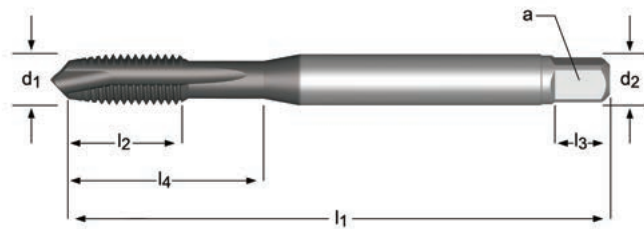
<sup>2)</sup> Reduced Shanks

**HMD Hard Materials / Cast Iron, Plug Chamfer**



**1659AP** Designed for through hole tapping materials with a hardness of >38 Rc. Premium substrate provides superior abrasion resistance and edge strength. TiAlN-Top coating lowers the coefficient of friction, improves thread quality, affords higher operating speeds, and longer tool life.

1.5 1.6 2.4 3.1 3.2 3.3 3.4 4.3 5.3 6.4



1659AP(MF)

- M
- DIN ANSI
- 6H
- HSS PM



M3 - M12

M	P mm	$l_1$ mm	$l_2$ mm	$l_4$ Inch (Neck Length)	$d_2$ Ø Inch	$a$ Inch	# of Flutes	Limits	Pack Qty	1659AP
3	0.50	56	11	18	0.141	0.110	3	D3	1	46204832
4	0.70	63	13	21	0.168	0.131	3	D4	1	46204833 <sup>1)</sup>
5	0.80	70	15	25	0.194	0.152	3	D4	1	46204834 <sup>1)</sup>
6	1.00	80	17	30	0.255	0.191	3	D5	1	46204835 <sup>1)</sup>
8	1.25	90	20	35	0.318	0.238	3	D5	1	46204837 <sup>1)</sup>
10	1.50	100	22	39	0.381	0.286	3	D6	1	46204829 <sup>1)</sup>
12	1.75	110	24		0.367	0.275	3	D6	1	46204831 <sup>2)</sup>

<sup>1)</sup> Reinforced Shanks

<sup>2)</sup> Reduced Shanks

# STRAIGHT FLUTE TAPS

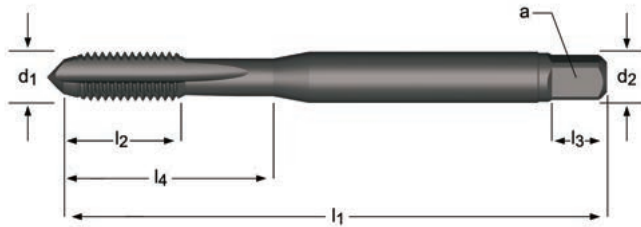


## For Cast Iron, Plug Chamfer

**E201** Designed for through or blind hole tapping with a specific geometry for cast iron and those materials producing broken, powdery chips. Also ideal for non-metallics, cast brass, and other brass materials. Nitride and steam oxide coating reduces wear and chip welding in abrasive materials.

**E252**

3.1 3.2 3.3 3.4 6.2 6.4 7.4 8.2



E201	E252
M	M
DIN 371	DIN 376
6HX	6HX
HSS PM	HSS PM
M3 - M10	M8 - M24

M	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> Ø mm	□ a mm	l <sub>3</sub> mm	# of Flutes	l <sub>4</sub> mm	Limits	Pack Qty	E201	E252	
3	0.50	56	9	3.5	2.7	6	3	2.5	18	D3	1	0165607 <sup>1)</sup>	—
4	0.70	63	12	4.5	3.4	6	4	3.3	21	D4	1	0085196 <sup>1)</sup>	—
5	0.80	70	13	6.0	4.9	8	4	4.2	25	D4	1	0085202 <sup>1)</sup>	—
6	1.00	80	15	6.0	4.9	8	4	5.0	30	D5	1	0085219 <sup>1)</sup>	—
8	1.25	90	18	6.0	4.9	8	4	6.8		D5	1	—	0087343 <sup>1)</sup>
8	1.25	90	18	8.0	6.2	9	4	6.8	35	D5	1	0085226 <sup>1)</sup>	—
10	1.50	100	20	10.0	8.0	11	4	8.5	39	D6	1	0085189 <sup>1)</sup>	—
10	1.50	100	20	7.0	5.5	8	4	8.5		D6	1	—	0087268 <sup>2)</sup>
12	1.75	110	23	9.0	7.0	10	4	10.3		D6	1	—	0087275 <sup>2)</sup>
14	2.00	110	25	11.0	9.0	12	4	12.0		D7	1	—	0087282 <sup>2)</sup>
16	2.00	110	25	12.0	9.0	12	4	14.0		D7	1	—	0087299 <sup>2)</sup>
18	2.50	125	30	14.0	11.0	14	4	15.5		D7	1	—	0087305 <sup>2)</sup>
20	2.50	140	30	16.0	12.0	15	4	17.5		D7	1	—	0087312 <sup>2)</sup>
22	2.50	140	34	18.0	14.5	17	4	19.5		D8	1	—	0087329 <sup>2)</sup>
24	3.00	160	38	18.0	14.5	17	4	21.0		D8	1	—	0087336 <sup>2)</sup>

Note: DIN shank and square dimensions will necessitate metric holders

<sup>1)</sup> Reinforced Shanks

<sup>2)</sup> Reduced Shanks

## DDX, High Hook, Plug Chamfer

**1985** Type DDX taps feature a special O.D. and P.D. relief and increased back taper. Intended for use in through hole applications where a free cutting action is desirable. Designed to produce a class 2B fit. Sizes No.4 - 3/8" are 'necked' to allow for use in deep hole applications. Steam oxide reduces wear and prevents chip welding when through hole tapping in abrasive or harder ferrous materials.

1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 4.1 4.2 4.3 5.1 5.2 5.3



1985

UNC UNF

ANSI

2B

HSS

No.4 - 1"

UNC	UNF	TPI	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch	a Inch	l <sub>3</sub> Inch	# of Flutes	l <sub>4</sub> Inch	Pack Qty	1985
4	4	48	1.7/8	9/16	0.1410	0.1100	3/16	2	0.69	1	1013038 <sup>1)</sup>
4		40	1.7/8	9/16	0.1410	0.1100	3/16	2	0.69	1	1013037 <sup>1)</sup>
	5	44	1.15/16	5/8	0.1410	0.1100	3/16	2	0.75	1	1013040 <sup>1)</sup>
5		40	1.15/16	5/8	0.1410	0.1100	3/16	2	0.75	1	1013039 <sup>1)</sup>
	6	40	2"	11/16	0.1410	0.1100	3/16	2	0.78	1	1013042 <sup>1)</sup>
6		32	2"	11/16	0.1410	0.1100	3/16	2	0.78	1	1013041 <sup>1)</sup>
	8	36	2.1/8	3/4	0.1680	0.1310	1/4	2	0.81	1	1013044 <sup>1)</sup>
8		32	2.1/8	3/4	0.1680	0.1310	1/4	2	0.81	1	1013043 <sup>1)</sup>
	10	32	2.3/8	7/8	0.1940	0.1520	1/4	2	0.94	1	1013046 <sup>1)</sup>
10		24	2.3/8	7/8	0.1940	0.1520	1/4	2	0.94	1	1013045 <sup>1)</sup>
	1/4	28	2.1/2	1"	0.2550	0.1910	5/16	2	1.19	1	1013050 <sup>1)</sup>
1/4		20	2.1/2	1"	0.2550	0.1910	5/16	2	1.19	1	1013049 <sup>1)</sup>
	5/16	24	2.23/32	1.1/8	0.3180	0.2380	3/8	3	1.31	1	1013052 <sup>1)</sup>
5/16		18	2.23/32	1.1/8	0.3180	0.2380	3/8	3	1.31	1	1013051 <sup>1)</sup>
	3/8	24	2.15/16	1.1/4	0.3810	0.2860	7/16	3	1.44	1	1013054 <sup>1)</sup>
3/8		16	2.15/16	1.1/4	0.3810	0.2860	7/16	3	1.44	1	1013053 <sup>1)</sup>
	7/16	20	3.5/32	1.7/16	0.3230	0.2420	13/32	3	-	1	1013056 <sup>2)</sup>
7/16		14	3.5/32	1.7/16	0.3230	0.2420	13/32	3	-	1	1013055 <sup>2)</sup>
	1/2	20	3.3/8	1.21/32	0.3670	0.2750	7/16	3	-	1	1013058 <sup>2)</sup>
1/2		13	3.3/8	1.21/32	0.3670	0.2750	7/16	3	-	1	1013057 <sup>2)</sup>
	9/16	18	3.19/32	1.21/32	0.4290	0.3220	1/2	3	-	1	1013060 <sup>2)</sup>
9/16		12	3.19/32	1.21/32	0.4290	0.3220	1/2	3	-	1	1013059 <sup>2)</sup>
	5/8	18	3.13/16	1.13/16	0.4800	0.3600	9/16	3	-	1	1013062 <sup>2)</sup>
5/8		11	3.13/16	1.13/16	0.4800	0.3600	9/16	3	-	1	1013061 <sup>2)</sup>
	3/4	16	4.1/4	2"	0.5900	0.4420	11/16	3	-	1	1013066 <sup>2)</sup>
3/4		10	4.1/4	2"	0.5900	0.4420	11/16	3	-	1	1013065 <sup>2)</sup>
	7/8	14	4.11/16	2.7/32	0.6970	0.5230	3/4	4	-	1	1013068 <sup>2)</sup>
7/8		9	4.11/16	2.7/32	0.6970	0.5230	3/4	4	-	1	1013067 <sup>2)</sup>
1"		8	5.1/8	2.1/2	0.8000	0.6000	13/16	4	-	1	1013069 <sup>2)</sup>

<sup>1)</sup> Reinforced Shanks

<sup>2)</sup> Reduced Shanks

# APPLIX SPIRAL FLUTE TAP (48°-52°)

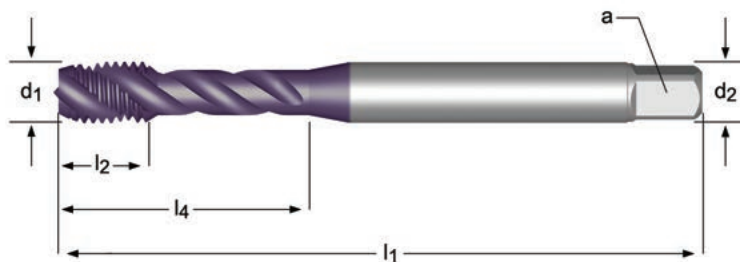


## MXL Multi-Application, Semi-Bottoming

**1676AP** Designed for blind hole tapping in a variety of materials with a hardness up to 36 Rc. The premium substrate and TiCN coating combine to offer superior abrasion resistance, higher operating speeds, improved thread quality, reduced cycle times, and longer tool life.

**1678** Coolant thru design allows higher tapping speeds and eliminates the problems associated with inadequate coolant in horizontal or deep hole applications.

- 1.1 1.2 1.3 1.4 1.5 2.1 2.2 2.3 4.1 4.2 5.1 5.2 6.1 6.2 6.3  
7.1 7.2 7.3 7.4



1676AP(UNF)		1678(UNF)	
UNC	UNF	UNC	UNF
DIN ANSI		DIN ANSI	
2B		2B	
HSS PM		HSS PM	
No.4 - 1"		1/4 - 1"	

UNC	UNF	TPI	$l_1$ Inch	$l_2$ Inch	$l_4$ Inch (Neck Length)	$d_2$ Ø Inch	$\square$ a Inch	# of Flutes	Limits	Pack Qty	1676AP	1678
4		40	2.205	0.236	0.709	0.141	0.110	3	H2	1	46204902	<sup>1)</sup> —
6		32	2.205	0.236	0.787	0.141	0.110	3	H2	1	46204907	<sup>1)</sup> —
8		32	2.480	0.236	0.827	0.168	0.131	3	H3	1	46204912	<sup>1)</sup> —
	10	32	2.756	0.354	0.984	0.194	0.152	3	H3	1	46204895	<sup>1)</sup> —
10		24	2.756	0.354	0.984	0.194	0.152	3	H3	1	46204894	<sup>1)</sup> —
	1/4	28	3.150	0.433	1.181	0.255	0.191	3	H4	1	46204893	<sup>1)</sup> 1717512 <sup>1)</sup>
1/4		20	3.150	0.433	1.181	0.255	0.191	3	H5	1	46204892	<sup>1)</sup> 1717510 <sup>1)</sup>
	5/16	24	3.543	0.472	1.378	0.318	0.238	3	H4	1	46204904	<sup>1)</sup> —
5/16		18	3.543	0.472	1.378	0.318	0.238	3	H5	1	46204903	<sup>1)</sup> 1717514 <sup>1)</sup>
	3/8	24	3.937	0.551	1.535	0.381	0.286	3	H4	1	46204901	<sup>1)</sup> —
3/8		16	3.937	0.551	1.535	0.381	0.286	3	H5	1	46204900	<sup>1)</sup> 1717518 <sup>1)</sup>
	7/16	20	3.937	0.591		0.323	0.242	3	H5	1	46204909	<sup>2)</sup> 1717532 <sup>2)</sup>
7/16		14	3.937	0.591		0.323	0.242	3	H5	1	46204908	<sup>2)</sup> 1717530 <sup>2)</sup>
	1/2	20	3.937	0.630		0.367	0.275	3	H5	1	46204891	<sup>2)</sup> —
1/2		13	4.331	0.630		0.367	0.275	3	H5	1	46204890	<sup>2)</sup> 1717534 <sup>2)</sup>
	5/8	18	3.937	0.745		0.480	0.360	3	H5	1	46204906	<sup>2)</sup> —
5/8		11	4.331	0.745		0.480	0.360	3	H5	1	46204905	<sup>2)</sup> 1717538 <sup>2)</sup>
	3/4	16	4.331	0.820		0.590	0.442	3	H5	1	46204899	<sup>2)</sup> —
3/4		10	4.921	0.820		0.590	0.442	3	H5	1	46204898	<sup>2)</sup> 1717542 <sup>2)</sup>
	7/8	14	4.921	0.910		0.697	0.523	4	H6	1	46204910	<sup>2)</sup> —
7/8		9	5.512	0.910		0.697	0.523	4	H6	1	46204911	<sup>2)</sup> 46204932 <sup>2)</sup>
1"		8	6.299	1.025		0.800	0.600	4	H6	1	46204897	<sup>2)</sup> 1717546 <sup>2)</sup>

<sup>1)</sup> Reinforced Shanks

<sup>2)</sup> Reduced Shanks

## Multi-Application, Semi-Bottoming

**E027**  
**E037**

Premium substrate for blind hole tapping in tough or abrasive materials. Bronze oxide body and shank reduces rust and corrosion. Bright finish flutes improve chip flow in soft and non-ferrous materials.

*E027 = UNC Sizes, E037 = UNF Sizes*

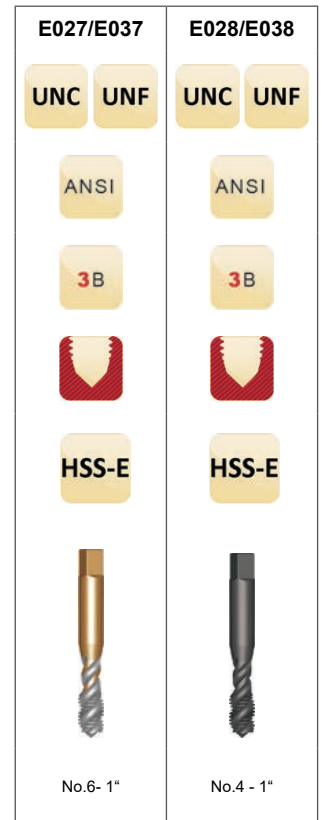
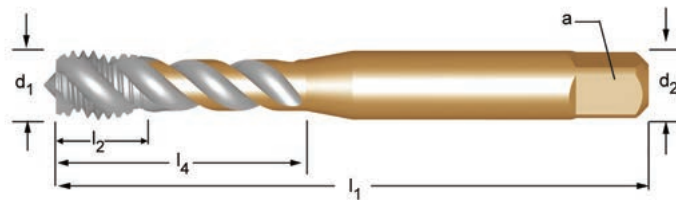
1.1 1.2 1.3 1.4 1.5 4.1 4.2 5.1 5.2 6.1 6.2 6.3 7.1 7.2 7.3  
7.4 8.1

**E028**  
**E038**

Premium substrate with Steam Oxide surface treatment reduces wear and prevents chip welding in abrasive or harder ferrous materials.

*E028 = UNC Sizes, E038 = UNF Sizes*

1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3



UNC	UNF	TPI	$l_1$ Inch	$l_2$ Inch	$d_2$ Ø Inch	$a$ Inch	# of Flutes	Limits			$l_4$ Inch	Pack Qty	E027 E037	E028 E038
4		40	1.7/8	0.6091	0.1410	0.1100	3	H2	N43	2.35	0.6091	1	—	0581643 <sup>1)</sup>
5		40	1.15/16	0.7404	0.1410	0.1100	3	H2	N38	2.65	0.7404	1	—	0581650 <sup>1)</sup>
6		32	2"	0.2610	0.1410	0.1100	3	H2	N36	2.85	0.5938	1	0581506	0581667 <sup>1)</sup>
8		32	2.1/8	0.2484	0.1680	0.1310	3	H2	N29	3.50	0.6526	1	0581513	0581674 <sup>1)</sup>
	10	32	2.3/8	0.2650	0.1940	0.1520	3	H2	N21	4.10	0.8434	1	0582312	0582435 <sup>1)</sup>
10		24	2.3/8	0.2650	0.1940	0.1520	3	H3	N25	3.90	0.8434	1	0581520	0581681 <sup>1)</sup>
12		24	2.3/8	0.2520	0.2200	0.1650	3	H3	N16	4.50	0.8848	1	0581537	0581698 <sup>1)</sup>
	1/4	28	2.1/2	0.3937	0.2550	0.1910	3	H3	N3	5.50	1.0993	1	0582329	0582442 <sup>1)</sup>
1/4		20	2.1/2	0.3937	0.2550	0.1910	3	H3	N7	5.10	1.0993	1	0581544	0581704 <sup>1)</sup>
	5/16	24	2.23/32	0.4567	0.3180	0.2380	3	H3	I	6.90	1.3094	1	0582336	0582459 <sup>1)</sup>
5/16		18	2.23/32	0.4567	0.3180	0.2380	3	H3	F	6.60	1.3094	1	0581551	0581711 <sup>1)</sup>
	3/8	24	2.15/16	0.5315	0.3810	0.2860	3	H3	Q	8.50	1.4415	1	0582343	0582466 <sup>1)</sup>
3/8		16	2.15/16	0.5315	0.3810	0.2860	3	H3	5/16	8.00	1.4415	1	0581568	0581728 <sup>1)</sup>
3/8		16	2.15/16	0.5315	0.3810	0.2860	3	H5	5/16	8.00	1.4415	1	—	0581735 <sup>1)3)</sup>
	7/16	20	3.5/32	0.6299	0.3230	0.2420	3	H3	25/64	9.90	-	1	0582350	0582473 <sup>2)</sup>
7/16		14	3.5/32	0.6299	0.3230	0.2420	3	H3	U	9.40	-	1	0581575	0581742 <sup>2)</sup>
	1/2	20	3.3/8	0.6890	0.3670	0.2750	3	H3	29/64	11.50	-	1	0582367	0582480 <sup>2)</sup>
1/2		13	3.3/8	0.6890	0.3670	0.2750	3	H3	27/64	10.80	-	1	0581582	0581759 <sup>2)</sup>
	9/16	18	3.19/32	0.7087	0.4290	0.3220	3	H3	33/64	12.90	-	1	0582374	0582497 <sup>2)</sup>
9/16		12	3.19/32	0.7087	0.4290	0.3220	3	H3	31/64	12.20	-	1	0581599	0581766 <sup>2)</sup>
	5/8	18	3.13/16	0.7087	0.4800	0.3600	3	H3	37/64	14.50	-	1	0582381	0582503 <sup>2)</sup>
5/8		11	3.13/16	0.7087	0.4800	0.3600	3	H3	17/32	13.50	-	1	0581605	0581773 <sup>2)</sup>
	3/4	16	4.1/4	0.8858	0.5900	0.4420	3	H3	11/16	17.50	-	1	0582398	0582510 <sup>2)</sup>
3/4		10	4.1/4	0.8858	0.5900	0.4420	3	H4	21/32	16.50	-	1	0581612	0581780 <sup>2)</sup>
	7/8	14	4.11/16	0.9843	0.6970	0.5230	3	H4	13/16	20.40	-	1	0582404	0582527 <sup>2)</sup>
7/8		9	4.11/16	0.9843	0.6970	0.5230	3	H4	49/64	19.50	-	1	0581629	0581797 <sup>2)</sup>
	1"	14	5.1/8	1.1811	0.8000	0.6000	3	H4	59/64	23.50	-	1	0582428	0582541 <sup>2)</sup>
1"		8	5.1/8	1.1811	0.8000	0.6000	3	H4	7/8	22.25	-	1	0581636	0581803 <sup>2)</sup>

<sup>1)</sup> Reinforced Shanks

<sup>2)</sup> Reduced Shanks

<sup>3)</sup> Class of fit: 2B

# SPIRAL FLUTE TAPS (45°)



## Multi-Application, Semi-Bottoming

**EX20** Premium substrate for blind hole tapping in tough or abrasive materials. Bronze oxide body and shank reduces rust and corrosion. Bright finish flutes improve chip flow in soft and non-ferrous materials.

**EX30**

EX20 = UNC Sizes, EX30 = UNF Sizes

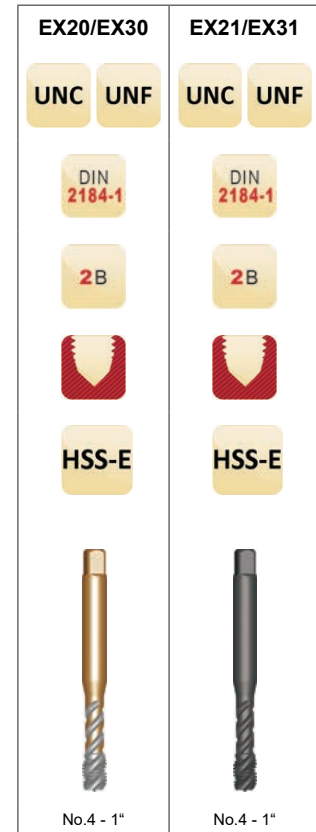
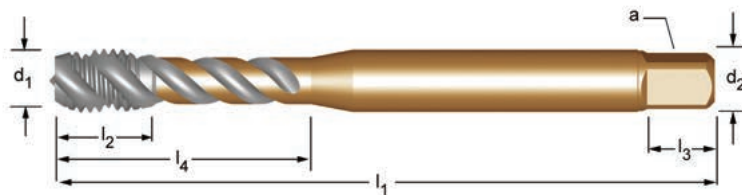
1.1 1.2 1.3 1.4 1.5 4.1 4.2 5.1 5.2 7.1 7.2 7.3 7.4

**EX21** Premium substrate with Steam Oxide surface treatment reduces wear and prevents chip welding in abrasive or harder ferrous materials.

**EX31**

EX21 = UNC Sizes, EX31 = UNF Sizes

1.1 1.2 1.3 1.4 1.5 2.1 2.2 2.3



UNC	UNF	TPI	d <sub>1</sub> nom mm	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> Ø mm	□ a mm	l <sub>3</sub> mm	# of Flutes	↔	Limits	l <sub>4</sub> mm	Pack Qty	EX20 EX30	EX21 EX31
4		40	2.845	56	6	3.5	2.7	6	3	2.35	H2	18	1	0150269 <sup>1)</sup>	0150412 <sup>1)</sup>
5		40	3.175	56	6	3.5	2.7	6	3	2.65	H2	18	1	0150276 <sup>1)</sup>	0150429 <sup>1)</sup>
6		32	3.505	56	7	4.0	3.0	6	3	2.85	H2	20	1	0150283 <sup>1)</sup>	0150436 <sup>1)</sup>
	8	36	4.166	63	7	4.5	3.4	8	3	3.5	H3	21	1	0168325 <sup>1)</sup>	0168431 <sup>1)</sup>
8		32	4.166	63	7	4.5	3.4	8	3	3.5	H3	21	1	0150290 <sup>1)</sup>	0150443 <sup>1)</sup>
	10	32	4.826	70	8	6.0	4.9	8	3	4.1	H3	25	1	0168332 <sup>1)</sup>	0168448 <sup>1)</sup>
10		24	4.826	70	8	6.0	4.9	8	3	3.9	H3	25	1	0150306 <sup>1)</sup>	0150450 <sup>1)</sup>
12		24	5.486	80	10	6.0	4.9	8	3	4.5	H3	30	1	0150313 <sup>1)</sup>	0150467 <sup>1)</sup>
	1/4	28	6.350	80	10	7.0	5.5	8	3	5.5	H4	30	1	0168349 <sup>1)</sup>	0168455 <sup>1)</sup>
1/4		20	6.350	80	10	7.0	5.5	8	3	5.1	H5	30	1	0150320 <sup>1)</sup>	0150474 <sup>1)</sup>
	5/16	24	7.938	90	12	8.0	6.2	9	3	6.9	H4	35	1	0168356 <sup>1)</sup>	0168462 <sup>1)</sup>
5/16		18	7.938	90	12	8.0	6.2	9	3	6.6	H5	35	1	0150337 <sup>1)</sup>	0150627 <sup>1)</sup>
	3/8	24	9.525	100	15	10.0	8.0	11	3	8.5	H4	39	1	0168363 <sup>1)</sup>	0168479 <sup>1)</sup>
3/8		16	9.525	100	15	10.0	8.0	11	3	8	H5	39	1	0150344 <sup>1)</sup>	0151945 <sup>1)</sup>
	7/16	20	11.112	100	15	8.0	6.2	9	3	9.9	H5	-	1	0168370 <sup>2)</sup>	0168486 <sup>2)</sup>
7/16		14	11.112	100	15	8.0	6.2	9	3	9.4	H5	-	1	0150351 <sup>2)</sup>	0159507 <sup>2)</sup>
	1/2	20	12.700	110	18	9.0	7.0	10	3	11.5	H5	-	1	0168387 <sup>2)</sup>	0168493 <sup>2)</sup>
1/2		13	12.700	110	18	9.0	7.0	10	3	10.8	H5	-	1	0150368 <sup>2)</sup>	0159514 <sup>2)</sup>
	5/8	18	15.875	110	20	12.0	9.0	12	4	14.5	H5	-	1	0168394 <sup>2)</sup>	0168509 <sup>2)</sup>
5/8		11	15.875	110	20	12.0	9.0	12	4	13.5	H5	-	1	0150375 <sup>2)</sup>	0159552 <sup>2)</sup>
	3/4	16	19.050	125	25	14.0	11.0	14	4	17.5	H5	-	1	0168400 <sup>2)</sup>	0168516 <sup>2)</sup>
3/4		10	19.050	125	25	14.0	11.0	14	4	16.5	H5	-	1	0150382 <sup>2)</sup>	0159576 <sup>2)</sup>
	7/8	14	22.225	140	25	18.0	14.5	17	4	20.4	H6	-	1	0168417 <sup>2)</sup>	0168523 <sup>2)</sup>
7/8		9	22.225	140	25	18.0	14.5	17	4	19.5	H6	-	1	0150399 <sup>2)</sup>	0159590 <sup>2)</sup>
	1"	12	25.400	160	30	18.0	14.5	17	4	23.25	H6	-	1	0168424 <sup>2)</sup>	0168530 <sup>2)</sup>
1"		8	25.400	160	30	18.0	14.5	17	4	22.25	H6	-	1	0150405 <sup>2)</sup>	0168318 <sup>2)</sup>

**Note: DIN shank and square dimensions will necessitate metric holders**

<sup>1)</sup> Reinforced Shanks

<sup>2)</sup> Reduced Shanks

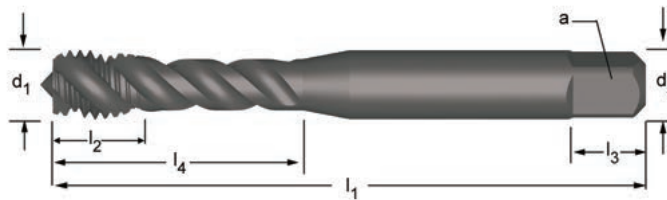


## Multi-Application, Semi-Bottoming

**E023** Premium substrate with Steam Oxide surface treatment  
**E033** reduces wear and prevents chip welding in abrasive or harder ferrous materials.

*E023 = UNC Sizes, E033 = UNF Sizes*

**1.1 1.2 1.3 1.4 1.5 2.1 2.2 2.3**



E023/E033

UNC UNF

ISO  
529

2B



HSS-E



No.2 - 1"

UNC	UNF	TPI	d <sub>1</sub> nom mm	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> Ø mm	□ a mm	l <sub>3</sub> mm	# of Flutes	↔	l <sub>4</sub> mm	Limits	Pack Qty	E023 E033
2		56	2.184	44.5	9.5	2.80	2.24	5	2	1.85	9.5	H2	1	0010440 <sup>1)</sup>
4		40	2.845	48	6	3.15	2.50	5	3	2.35	14	H2	1	0569382 <sup>1)</sup>
5		40	3.175	48	6	3.15	2.50	5	3	2.65	12.5	H2	1	0010471 <sup>1)</sup>
6		32	3.505	50	6	3.55	2.80	5	3	2.85	16	H2	1	0569399 <sup>1)</sup>
	8	36	4.166	53	7	4.5	3.55	6	3	3.50	17	H3	1	0570081 <sup>1)</sup>
8		32	4.166	53	7	4.50	3.55	6	3	3.50	17	H3	1	0569405 <sup>1)</sup>
	10	32	4.826	58	8	5.0	4.00	7	3	4.10	20	H3	1	0570098 <sup>1)</sup>
10		24	4.826	58	8	5.00	4.00	7	3	3.90	20	HH3	1	0569412 <sup>1)</sup>
12		24	5.486	62	12	5.60	4.50	7	3	4.50	21	H3	1	0569429 <sup>1)</sup>
	1/4	28	6.350	66	10	6.3	5.00	8	3	5.50	28	H4	1	0570104 <sup>1)</sup>
1/4		20	6.350	66	10	6.30	5.00	8	3	5.10	28	H5	1	0569436 <sup>1)</sup>
	5/16	24	7.938	72	12	8.0	6.30	9	3	6.90	31	H4	1	0570111 <sup>1)</sup>
5/16		18	7.938	72	12	8.00	6.30	9	3	6.60	31	H5	1	0569443 <sup>1)</sup>
	3/8	24	9.525	80	15	10.0	8.00	11	3	8.50	34	H4	1	0570128 <sup>1)</sup>
3/8		16	9.525	80	15	10.00	8.00	11	3	8.00	34	H5	1	0569450 <sup>1)</sup>
	7/16	20	11.112	85	19	8.0	6.30	9	3	9.90	-	H5	1	0570135 <sup>2)</sup>
7/16		14	11.112	85	19	8.00	6.30	9	3	9.40	-	H5	1	0569467 <sup>2)</sup>
	1/2	20	12.700	89	22	9.0	7.10	10	3	11.50	-	H5	1	0570142 <sup>2)</sup>
1/2		13	12.700	89	19	9.00	7.10	10	3	10.80	-	H5	1	0569474 <sup>2)</sup>
	9/16	18	14.288	95	24	11.2	9.00	12	3	12.90	-	H5	1	0570159 <sup>2)</sup>
	5/8	18	15.875	102	24	12.5	10.00	13	4	14.50	-	H5	1	0570166 <sup>2)</sup>
5/8		11	15.875	102	24	12.50	10.00	13	4	13.50	-	H5	1	0569481 <sup>2)</sup>
	3/4	16	19.050	112	29	14.0	11.20	14	4	17.50	-	H5	1	0570173 <sup>2)</sup>
3/4		10	19.050	112	29	14.00	11.20	14	4	16.50	-	H5	1	0569498 <sup>2)</sup>
	7/8	14	22.225	118	29	16.0	12.50	16	4	20.40	-	H6	1	0570180 <sup>2)</sup>
7/8		9	22.225	118	29	16.00	12.50	16	4	19.50	-	H6	1	0569504 <sup>2)</sup>
	1"	12	25.400	130	35	18.0	14.00	18	4	23.25	-	H6	1	0570197 <sup>2)</sup>
1"		8	25.400	130	35	18.00	14.00	18	4	22.25	-	H6	1	0569511 <sup>2)</sup>

**Note: ISO shank and square dimensions will necessitate metric holders**

<sup>1)</sup> Reinforced Shanks

<sup>2)</sup> Reduced Shanks

# SPIRAL FLUTE TAP (48°-52°)

**UNION  
BUTTERFIELD**

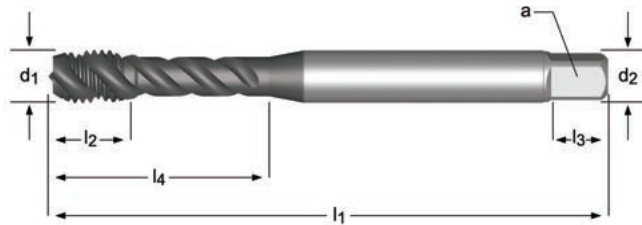
**APPLIX**

## MXL Multi-Application, Semi-Bottoming

**1677AP** Designed for blind hole tapping in a variety of materials with a hardness up to 36 Rc. The premium substrate and TiCN coating combine to offer superior abrasion resistance, higher operating speeds, improved thread quality, reduced cycle times, and longer tool life.

**1679** Coolant thru design allows higher tapping speeds and eliminates the problems associated with inadequate coolant in horizontal or deep hole applications.

1.1 1.2 1.3 1.4 1.5 2.1 2.2 2.3 4.1 4.2 5.1 5.2 6.1 6.2 6.3  
7.1 7.2 7.3 7.4



1677AP(M)		1679(M)	
M	MF	M	MF
DIN ANSI		DIN ANSI	
6H		6H	
HSS PM		HSS PM	
M4 - M24		M6 - M24	

M	MF	TPI	$l_1$ mm	$l_2$ mm	$l_4$ Inch (Neck Length)	Limits	$d_2$ Inch	$\square$ a Inch	# of Flutes	Pack Qty	1677AP	1679(M)
4		0.70	63	6	21	D4	0.168	0.131	3	1	46204927	<sup>1)</sup> —
5		0.80	70	9	25	D4	0.194	0.152	3	1	46204928	<sup>1)</sup> —
6		1.00	80	11	30	D5	0.255	0.191	3	1	46204929	<sup>1)</sup> 1717704 <sup>1)</sup>
	8	1.00	90	12	35	D5	0.318	0.238	3	1	46205010	<sup>1)</sup> —
8		1.25	90	12	35	D5	0.318	0.238	3	1	46204930	<sup>1)</sup> 1717706 <sup>1)</sup>
	10	1.25	100	14	39	D6	0.381	0.286	3	1	46204913	<sup>1)</sup> 1717708
10		1.50	100	14	39	D6	0.381	0.286	3	1	46204914	<sup>1)</sup> 1717710 <sup>1)</sup>
	12	1.50	100	16		D6	0.367	0.275	3	1	46204915	<sup>2)</sup> —
12		1.75	110	16		D6	0.367	0.275	3	1	46204916	<sup>2)</sup> 1717722 <sup>2)</sup>
	14	1.50	100	18		D7	0.429	0.322	3	1	46204917	<sup>2)</sup> —
14		2.00	110	18		D7	0.429	0.322	3	1	46204918	<sup>2)</sup> 1717726 <sup>2)</sup>
16		2.00	110	19		D7	0.480	0.360	3	1	46204920	<sup>2)</sup> 1717730 <sup>2)</sup>
	18	1.50	110	21		D7	0.542	0.406	3	1	46204921	<sup>2)</sup> —
18		2.50	125	21		D7	0.542	0.406	3	1	46204922	<sup>2)</sup> 1717734 <sup>2)</sup>
	20	1.50	125	21		D7	0.652	0.489	3	1	46204923	<sup>2)</sup> —
20		2.50	140	21		D7	0.652	0.489	3	1	46204924	<sup>2)</sup> 1717738 <sup>2)</sup>
24		3.00	160	26		D8	0.760	0.570	4	1	46204926	<sup>2)</sup> 1717742 <sup>2)</sup>

<sup>1)</sup> Reinforced Shanks

<sup>2)</sup> Reduced Shanks

## Multi-Application, Semi-Bottoming

**E007** Premium substrate for blind hole tapping in tough or abrasive materials. Bronze oxide body and shank reduces rust and corrosion. Bright finish flutes improve chip flow in soft and non-ferrous materials.

*E007 = Metric Coarse, E017 = Metric Fine*

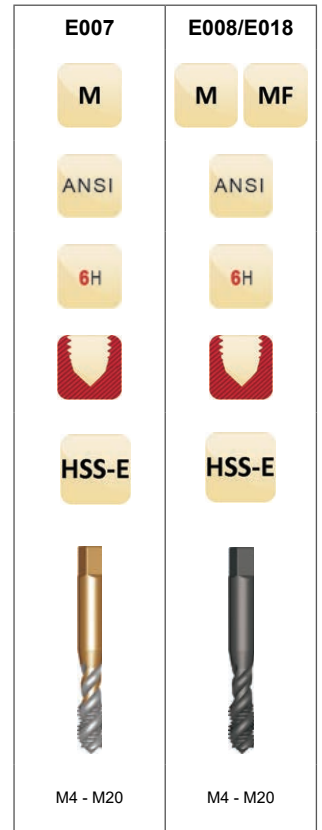
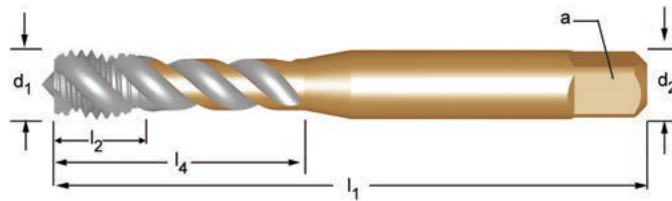
1.1 1.2 1.3 1.4 1.5 4.1 4.2 5.1 5.2 7.1 7.2 7.3 7.4

**E008** Premium substrate with Steam Oxide surface treatment reduces wear and prevents chip welding in abrasive or harder ferrous materials.

**E018**

*E008 = Metric Coarse, E018 = Metric Fine*

1.1 1.2 1.3 1.4 1.5 2.1 2.2 2.3



M	MF	P mm	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch	□ a Inch	# of flutes	Limits		l <sub>4</sub> Inch	Pack Qty	E007	E008 E018	
4		0.70	2.1/8	0.2484	0.1680	0.1310	3	D4	3.30	N30	0.6526	1	0580608 <sup>1)</sup>	0580707 <sup>1)</sup>
5		0.80	2.3/8	0.2650	0.1940	0.1520	3	D4	4.20	N19	0.8434	1	0580615 <sup>1)</sup>	0580714 <sup>1)</sup>
6		1.00	2.1/2	0.3937	0.2550	0.1910	3	D5	5.00	N9	1.0993	1	0580622 <sup>1)</sup>	0580721 <sup>1)</sup>
	8	1.00	2.23/32	0.4567	0.3180	0.2380	3	D5	7.00	J	1.3094	1	—	0581032 <sup>1)</sup>
8		1.25	2.23/32	0.4567	0.3180	0.2380	3	D5	6.80	H	1.3094	1	0580639 <sup>1)</sup>	0580738 <sup>1)</sup>
	10	1.00	2.15/16	0.5315	0.3810	0.2860	3	D6	9.00	T	1.4415	1	—	0581049 <sup>1)</sup>
10		1.50	2.15/16	0.5315	0.3810	0.2860	3	D6	8.50	Q	1.4415	1	0580646 <sup>1)</sup>	0580745 <sup>1)</sup>
12		1.75	3.3/8	0.6890	0.3670	0.2750	3	D6	10.30	Y		1	0580653 <sup>2)</sup>	0580752 <sup>2)</sup>
	14	1.50	3.19/32	0.7087	0.4290	0.3220	3	D7	12.50	31/64		1	—	0581056 <sup>2)</sup>
14		2.00	3.19/32	0.7087	0.4290	0.3220	3	D7	12.00	15/32		1	—	0580769 <sup>2)</sup>
16		2.00	3.13/16	0.7087	0.4800	0.3600	3	D7	14.00	35/64		1	0580677 <sup>2)</sup>	0580776 <sup>2)</sup>
20		2.50	4.15/32	0.8858	0.6520	0.4890	3	D7	17.50	11/16		1	—	0580790 <sup>2)</sup>

<sup>1)</sup> Reinforced Shanks

<sup>2)</sup> Reduced Shanks

# SPIRAL FLUTE TAPS (45°)



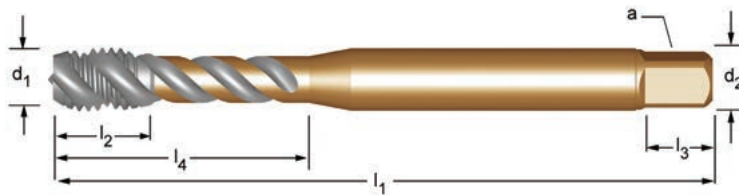
## Multi-Application, Semi-Bottoming

**EX006H** Premium substrate for blind hole tapping in tough or abrasive materials. Bronze oxide body and shank reduces rust and corrosion. Bright finish flutes improve chip flow in soft and non-ferrous materials.

1.1 1.2 1.3 1.4 1.5 4.1 4.2 5.1 5.2 7.1 7.2 7.3 7.4

**EX016H** Premium substrate with Steam Oxide surface treatment reduces wear and prevents chip welding in abrasive or harder ferrous materials.

1.1 1.2 1.3 1.4 1.5 2.1 2.2 2.3



M	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> Ø mm	a mm	l <sub>3</sub> mm	# of Flutes	Flute Width	l <sub>4</sub> mm	Limits	Pack Qty	EX006H	EX016H
2	0.40	45	4	2.8	2.1	5	3	1.6	9	D3	1	0137307 <sup>1)</sup>	0137321 <sup>1)</sup>
2.5	0.45	50	4	2.8	2.1	5	3	2.05	12.5	D3	1	0137314 <sup>1)</sup>	0137338 <sup>1)</sup>
3	0.50	56	6	3.5	2.7	6	3	2.5	18	D3	1	0136591 <sup>1)</sup>	0136942 <sup>1)</sup>
3.5	0.60	56	7	4.0	3.0	6	3	2.9	20	D4	1	0136607 <sup>1)</sup>	0136966 <sup>1)</sup>
4	0.70	63	7	4.5	3.4	6	3	3.3	21	D4	1	0136614 <sup>1)</sup>	0136973 <sup>1)</sup>
5	0.80	70	8	6.0	4.9	8	3	4.2	25	D4	1	0136621 <sup>1)</sup>	0136980 <sup>1)</sup>
6	1.00	80	10	4.5	3.4	6	3	5	31	D5	1	0136645 <sup>2)</sup>	0137000 <sup>2)</sup>
6	1.00	80	10	6.0	4.9	8	3	5	31	D5	1	0136638 <sup>1)</sup>	0136997 <sup>1)</sup>
7	1.00	80	10	7.0	5.5	8	3	6	31	D5	1	0136652 <sup>1)</sup>	0137017 <sup>1)</sup>
8	1.25	90	13	6.0	4.9	8	3	6.8	35	D5	1	0136676 <sup>2)</sup>	0137031 <sup>2)</sup>
8	1.25	90	12	8.0	6.2	9	3	6.8	35	D5	1	0136669 <sup>1)</sup>	0137024 <sup>1)</sup>
10	1.50	100	15	7.0	5.5	8	3	8.5	39	D6	1	0136690 <sup>2)</sup>	0137055 <sup>2)</sup>
10	1.50	100	15	10.0	8.0	11	3	8.5	39	D6	1	0136683 <sup>1)</sup>	0137048 <sup>1)</sup>
12	1.75	110	16	9.0	7.0	10	3	10.3	-	D6	1	0136706 <sup>2)</sup>	0137062 <sup>2)</sup>
14	2.00	110	20	11.0	9.0	12	3	12	-	D7	1	0136713 <sup>2)</sup>	0137079 <sup>2)</sup>
16	2.00	110	20	12.0	9.0	12	4	14	-	D7	1	0136720 <sup>2)</sup>	0137086 <sup>2)</sup>
18	2.50	125	25	14.0	11.0	14	4	15.5	-	D7	1	0136737 <sup>2)</sup>	0137093 <sup>2)</sup>
20	2.50	140	25	16.0	12.0	15	4	17.5	-	D7	1	0136744 <sup>2)</sup>	0137109 <sup>2)</sup>
22	2.50	140	25	18.0	14.5	17	4	19.5	-	D8	1	0136829 <sup>2)</sup>	0137116 <sup>2)</sup>
24	3.00	160	30	18.0	14.5	17	4	21	-	D8	1	0136836 <sup>2)</sup>	0137123 <sup>2)</sup>
27	3.00	160	30	20.0	16.0	19	4	24	-	D8	1	0136843 <sup>2)</sup>	0137130 <sup>2)</sup>
30	3.50	180	36	22.0	18.0	21	4	26.5	-	D9	1	0136850 <sup>2)</sup>	0137147 <sup>2)</sup>
33	3.50	180	36	25.0	20.0	23	4	29.5	-	D9	1	0136867 <sup>2)</sup>	0137154 <sup>2)</sup>
36	4.00	200	40	28.0	22.0	25	4	32	-	D9	1	0136874 <sup>2)</sup>	0137161 <sup>2)</sup>
39	4.00	200	40	32.0	24.0	27	4	35	-	D9	1	0136881 <sup>2)</sup>	0137178 <sup>2)</sup>
42	4.50	200	45	32.0	24.0	27	4	37.5	-	D10	1	0136898 <sup>2)</sup>	0137185 <sup>2)</sup>
48	5.00	250	50	36.0	29.0	32	4	43	-	D11	1	0136904 <sup>2)</sup>	0137192 <sup>2)</sup>
52	5.00	250	50	40.0	32.0	35	5	47	-	D11	1	0136911 <sup>2)</sup>	0137208 <sup>2)</sup>
56	5.50	250	55	40.0	32.0	35	5	50.5	-	D11	1	0136928 <sup>2)</sup>	0137215 <sup>2)</sup>
64	6.00	315	60	50.0	39.0	42	6	58	-	D12	1	0136935 <sup>2)</sup>	0137222 <sup>2)</sup>

**Note: DIN shank and square dimensions will necessitate metric holders**

<sup>1)</sup> Reinforced Shanks (DIN 371)

<sup>2)</sup> Reduced Shanks (DIN 376)

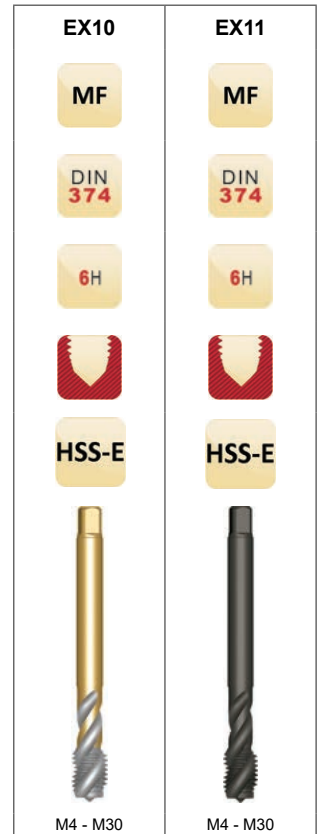
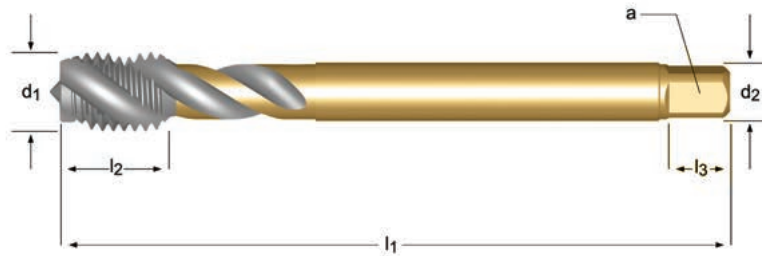
## Multi-Application, Semi-Bottoming

**EX10** Premium substrate for blind hole tapping in tough or abrasive materials. Bronze oxide body and shank reduces rust and corrosion. Bright finish flutes improve chip flow in soft and non-ferrous materials.

1.1 1.2 1.3 1.4 1.5 4.1 4.2 5.1 5.2 7.1 7.2 7.3 7.4

**EX11** Premium substrate with Steam Oxide surface treatment reduces wear and prevents chip welding in abrasive or harder ferrous materials.

1.1 1.2 1.3 1.4 1.5 2.1 2.2 2.3



MF	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> Ø mm	□ a mm	l <sub>3</sub> mm	# of Flutes	Limits	Pack Qty	EX10	EX11	
4	0.50	63	7	2.8	2.1	5	3	3.5	D4	1	0149669	0149966
5	0.50	70	8	3.5	2.7	6	3	4.5	D4	1	0149676	0149973
6	0.75	80	10	4.5	3.4	6	3	5.3	D5	1	0149683	0149980
8	0.75	80	13	6.0	4.9	8	3	7.3	D5	1	0149690	0149997
8	1.00	90	13	6.0	4.9	8	3	7	D5	1	0149706	0150009
10	0.75	90	13	7.0	5.5	8	3	9.3	D6	1	0149713	0150016
10	1.00	90	13	7.0	5.5	8	3	9	D6	1	0149720	0150023
10	1.25	100	15	7.0	5.5	8	3	8.8	D6	1	0149737	0150030
12	1.00	100	15	9.0	7.0	10	3	11	D6	1	0149744	0150047
12	1.25	100	15	9.0	7.0	10	3	10.8	D6	1	0149751	0150054
12	1.50	100	15	9.0	7.0	10	3	10.5	D6	1	0149768	0150061
14	1.00	100	15	11.0	9.0	12	3	13	D7	1	0149775	0150078
14	1.25	100	15	11.0	9.0	12	3	12.8	D7	1	0149782	0150085
14	1.50	100	15	11.0	9.0	12	3	12.5	D7	1	0149799	0150092
16	1.00	100	15	12.0	9.0	12	4	15	D7	1	0149805	0150108
16	1.50	100	15	12.0	9.0	12	4	14.5	D7	1	0149812	0150115
18	1.00	110	17	14.0	11.0	14	4	17	D7	1	0149829	0150122
18	1.50	110	17	14.0	11.0	14	4	16.5	D7	1	0149836	0150139
20	1.00	125	17	16.0	12.0	15	4	19	D7	1	0149843	0150146
20	1.50	125	17	16.0	12.0	15	4	18.5	D7	1	0149850	0150153
22	1.50	125	17	18.0	14.5	17	4	20.5	D8	1	0149867	0150160
24	1.50	140	20	18.0	14.5	17	4	22.5	D8	1	0149874	0150177
24	2.00	140	20	18.0	14.5	17	4	22	D8	1	0149881	0150184
25	1.50	140	20	18.0	14.5	17	4	23.5	D8	1	0149898	0150191
26	1.50	140	20	18.0	14.5	17	4	24.5	D8	1	0149904	0150207
27	1.50	140	20	20.0	16.0	19	4	25.5	D8	1	0149911	0150214
27	2.00	140	20	20.0	16.0	19	4	25	D8	1	0149928	0150221
28	1.50	140	20	20.0	16.0	19	4	26.5	D9	1	0149935	0150238
30	1.50	150	20	22.0	18.0	21	4	28.5	D9	1	0149942	0150245
30	2.00	150	20	22.0	18.0	21	4	28	D9	1	0149959	0150252

Note: DIN shank and square dimensions will necessitate metric holders

# SPIRAL FLUTE TAPS (45°)



## Multi-Application, Semi-Bottoming

**E002** Premium substrate for blind hole tapping in tough or abrasive materials. Bronze oxide body and shank reduces rust and corrosion. Bright finish flutes improve chip flow in soft and non-ferrous materials.

*E002 = Metric Coarse*

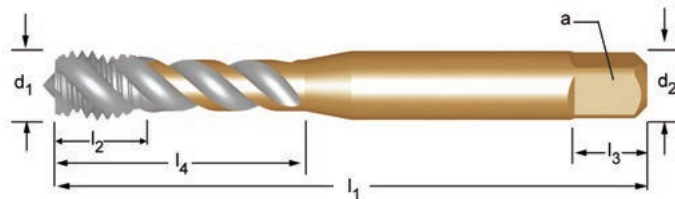
1.1 1.2 1.3 1.4 1.5 4.1 4.2 5.1 5.2 7.1 7.2 7.3 7.4

**E003** Premium substrate with Steam Oxide surface treatment reduces wear and prevents chip welding in abrasive or harder ferrous materials.

**E013**

*E003 = Metric Coarse, E013 = Metric Fine*

1.1 1.2 1.3 1.4 1.5 2.1 2.2 2.3



E002	E003 / E013
M	M MF
ISO 529	ISO 529
6H	6H
HSS-E	HSS-E
M2 - M24	M2 - M24

Note: ISO shank and square dimensions will necessitate metric holders

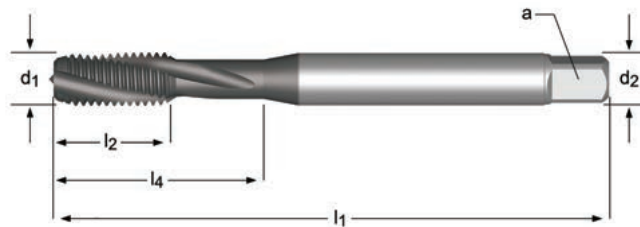
M	MF	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> ∅ mm	a mm	l <sub>3</sub> mm	# of Flutes	Limits		l <sub>4</sub> mm	Pack Qty	E002	E003 E013
2		0.40	41	8	2.50	2.00	4	2	D3	1.6	8	1	0168820 <sup>1)</sup>	0168844 <sup>1)</sup>
2.5		0.45	44.5	9.5	2.80	2.24	5	2	D3	2.05	9.5	1	0168837 <sup>1)</sup>	0168851 <sup>1)</sup>
3		0.50	48	6	3.15	2.50	5	3	D3	2.5	12.5	1	0567869 <sup>1)</sup>	0568002 <sup>1)</sup>
	4	0.50	53	7	4.0	3.15	6	3	D4	3.5	19	1	—	0568798 <sup>1)</sup>
4		0.70	53	7	4.00	3.15	6	3	D4	3.3	19	1	0567883 <sup>1)</sup>	0568026 <sup>1)</sup>
	5	0.50	58	8	5.0	4.0	7	3	D4	4.5	22	1	—	0568804 <sup>1)</sup>
5		0.80	58	8	5.00	4.00	7	3	D4	4.2	22	1	0567890 <sup>1)</sup>	0568033 <sup>1)</sup>
	6	0.50	66	10	6.3	5.0	8	3	D5	5.5	27	1	—	0568811 <sup>1)</sup>
	6	0.75	66	10	6.3	5.0	8	3	D5	5.3	27	1	—	0568828 <sup>1)</sup>
6		1.00	66	10	6.30	5.00	8	3	D5	5.0	27	1	0567906 <sup>1)</sup>	0568040 <sup>1)</sup>
	8	0.75	72	12	8.0	6.3	9	3	D5	7.3	31	1	—	0568835 <sup>1)</sup>
	8	1.00	72	12	8.0	6.3	9	3	D5	7.0	31	1	—	0568842 <sup>1)</sup>
8		1.25	72	12	8.00	6.30	9	3	D5	6.8	31	1	0567913 <sup>1)</sup>	0568057 <sup>1)</sup>
	10	1.00	80	15	10.0	8.0	11	3	D6	9.0	35	1	—	0568859 <sup>1)</sup>
	10	1.25	80	15	10.0	8.0	11	3	D6	8.8	35	1	—	0568866 <sup>1)</sup>
10		1.50	80	15	10.00	8.00	11	3	D6	8.5	35	1	0567920 <sup>1)</sup>	0568064 <sup>1)</sup>
	12	1.00	89	16	9.0	7.1	10	3	D6	11.0	-	1	—	0568873 <sup>2)</sup>
	12	1.25	89	16	9.0	7.1	10	3	D6	10.8	-	1	—	0568880 <sup>2)</sup>
	12	1.50	89	16	9.0	7.1	10	3	D6	10.5	-	1	—	0568897 <sup>2)</sup>
12		1.75	89	16	9.00	7.10	10	3	D6	10.3	-	1	0567937 <sup>2)</sup>	0568071 <sup>2)</sup>
	14	1.50	95	18	11.2	9.0	12	3	D7	12.5	-	1	—	0568903 <sup>2)</sup>
14		2.00	95	18	11.20	9.00	12	3	D7	12.0	-	1	0567944 <sup>2)</sup>	0568088 <sup>2)</sup>
	16	1.00	102	18	12.5	10.0	13	4	D7	15.0	-	1	—	0568910 <sup>2)</sup>
	16	1.50	102	18	12.5	10.0	13	4	D7	14.5	-	1	—	0568927 <sup>2)</sup>
16		2.00	102	18	12.50	10.00	13	4	D7	14.0	-	1	0567951 <sup>2)</sup>	0568095 <sup>2)</sup>
	18	1.50	112	29	14.0	11.2	14	4	D7	16.5	-	1	—	0568934 <sup>2)</sup>
18		2.50	112	29	14.00	11.20	14	4	D7	15.5	-	1	0567968 <sup>2)</sup>	0568101 <sup>2)</sup>
	20	1.50	112	29	14.0	11.2	14	4	D7	18.5	-	1	—	0568941 <sup>2)</sup>
20		2.50	112	29	14.00	11.20	14	4	D7	17.5	-	1	0567975 <sup>2)</sup>	0568118 <sup>2)</sup>
	22	1.50	118	29	16.0	12.5	16	4	D8	20.5	-	1	—	0568958 <sup>2)</sup>
22		2.50	118	29	16.00	12.50	16	4	D8	19.5	-	1	0567982 <sup>2)</sup>	0568125 <sup>2)</sup>
24		3.00	130	35	18.00	14.00	18	4	D8	21.0	-	1	0567999 <sup>2)</sup>	0568132 <sup>2)</sup>

<sup>1)</sup> Reinforced Shanks, <sup>2)</sup> Reduced Shanks

## HMD Hard Materials / Cast Iron, Semi-Bottoming

**1630AP** Designed for blind hole tapping materials with a hardness of >38 Rc. Premium substrate provides superior abrasion resistance and edge strength. TiAlN-Top coating lowers the coefficient of friction, improves thread quality, affords higher operating speeds, and longer tool life.

1.5 1.6 2.4 3.1 3.2 3.3 3.4 4.3 5.3 6.4



1630AP

UNC UNF

DIN  
ANSI

2B



HSS  
PM



No.4 - 1"

UNC	UNF	TPI	$l_1$ Inch	$l_2$ Inch	$l_4$ Inch (Neck Length)	Limits	$d_2$ Ø Inch	$\square$ a Inch	# of Flutes	Pack Qty	1630AP
4		40	2.205	0.236	0.709	H2	0.141	0.110	2	1	46204818 <sup>1)</sup>
6		32	2.205	0.236	0.787	H2	0.141	0.110	2	1	46204823 <sup>1)</sup>
8		32	2.480	0.236	0.827	H3	0.168	0.131	2	1	46204828 <sup>1)</sup>
	10	32	2.756	0.354	0.984	H3	0.194	0.152	3	1	46204811 <sup>1)</sup>
10		24	2.756	0.354	0.984	H3	0.194	0.152	3	1	46204810 <sup>1)</sup>
	1/4	28	3.150	0.433	1.181	H4	0.255	0.191	3	1	46204809 <sup>1)</sup>
1/4		20	3.150	0.433	1.181	H5	0.255	0.191	3	1	46204808 <sup>1)</sup>
	5/16	24	3.543	0.472	1.378	H4	0.318	0.238	3	1	46204820 <sup>1)</sup>
5/16		18	3.543	0.472	1.378	H5	0.318	0.238	3	1	46204819 <sup>1)</sup>
	3/8	24	3.937	0.551	1.535	H4	0.381	0.286	3	1	46204817 <sup>1)</sup>
3/8		16	3.937	0.551	1.535	H5	0.381	0.286	3	1	46204816 <sup>1)</sup>
	7/16	20	3.937	0.591	—	H5	0.323	0.242	3	1	46204825 <sup>2)</sup>
7/16		14	3.937	0.591	—	H5	0.323	0.242	3	1	46204824 <sup>2)</sup>
	1/2	20	3.937	0.630	—	H5	0.367	0.275	3	1	46204807 <sup>2)</sup>
1/2		13	4.331	0.630	—	H5	0.367	0.275	3	1	46204806 <sup>2)</sup>
	5/8	18	3.937	0.745	—	H5	0.480	0.360	4	1	46204822 <sup>2)</sup>
5/8		11	4.331	0.745	—	H5	0.480	0.360	4	1	46204821 <sup>2)</sup>
	3/4	16	4.331	0.820	—	H5	0.590	0.442	4	1	46204815 <sup>2)</sup>
3/4		10	4.921	0.820	—	H5	0.590	0.442	4	1	46204814 <sup>2)</sup>
	7/8	14	4.921	0.910	—	H6	0.697	0.523	4	1	46204826 <sup>2)</sup>
7/8		9	5.512	0.910	—	H6	0.697	0.523	4	1	46204827 <sup>2)</sup>
1"		8	6.299	1.025	—	H6	0.800	0.600	4	1	46204813 <sup>2)</sup>

<sup>1)</sup> Reinforced Shanks

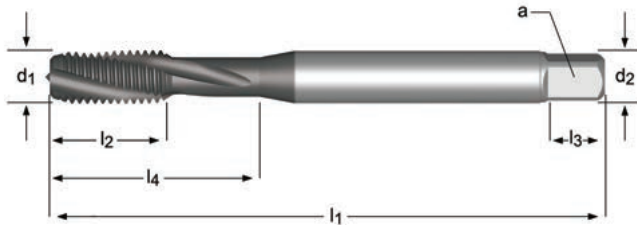
<sup>2)</sup> Reduced Shanks

# SPIRAL FLUTE TAP (16°-19°)

## HMD Hard Materials / Cast Iron, Semi-Bottoming

**1660AP** Designed for blind hole tapping materials with a hardness of >38 Rc. Premium substrate provides superior abrasion resistance and edge strength. TiAlN-Top coating lowers the coefficient of friction, improves thread quality, affords higher operating speeds, and longer tool life.

1.5 1.6 2.4 3.1 3.2 3.3 3.4 4.3 5.3 6.4



1660AP(M)

M

DIN  
ANSI

6H



HSS  
PM



M3 - M12

M	P mm	$l_1$ mm	$l_2$ mm	$l_4$ Inch (Neck Length)	$d_2$ Ø Inch	$\square$ a Inch	# of Flutes	Limits	Pack Qty	1660AP(M)
3	0.50	56	8	18	0.141	0.110	3	D3	1	46204841
4	0.70	63	6	21	0.168	0.131	3	D4	1	46204842 <sup>1)</sup>
5	0.80	70	9	25	0.194	0.152	3	D4	1	46204843 <sup>1)</sup>
6	1.00	80	11	30	0.255	0.191	3	D5	1	46204844 <sup>1)</sup>
8	1.25	90	12	35	0.318	0.238	3	D5	1	46204846 <sup>1)</sup>
10	1.50	100	14	39	0.381	0.286	3	D6	1	46204838 <sup>1)</sup>
12	1.75	110	16		0.367	0.275	3	D6	1	46204840 <sup>2)</sup>

<sup>1)</sup> Reinforced Shanks  
<sup>2)</sup> Reduced Shanks



## Multi-Application / Lube Grooves, Full-Bottoming

**1641** Premium PM substrate provides superior abrasion resistance and edge strength. Multiple Lube Groove design assures lubrication in the forming zone and eliminates the build up of hydraulic pressure in blind holes. TiN coated for enhanced performance. The hard, smooth coating provides a greater lubricity, increases tool life, and improves thread flank finish.

The entry taper is full bottoming style (1-2 thread chamfer) for blind hole tapping.

1.1 1.2 1.3 1.4 1.5 2.1 2.2 2.3 4.1 5.1 6.1 6.2 6.3 7.1 7.2  
7.3



1641(UNC)	1641(UNF)
UNC	UNF
ANSI	ANSI
2B 3B	2B 3B
HSS PM	HSS PM
No.4 - 1/2	No.10 - 3/8

UNC	UNF	TPI	$l_1$ Inch	$l_2$ Inch	$l_4$ Inch (Neck Length)	$l_3$ Inch	$d_2$ Ø Inch	$\square$ a Inch	Limits	Pack Qty	1641(UNC)	1641(UNF)
4		40	1.7/8	5/16	9/16	3/16	0.141	0.110	H3	1	1712221	—
4		40	1.7/8	5/16	9/16	3/16	0.141	0.110	H5	1	1712223	—
6		32	2"	3/8	11/16	3/16	0.141	0.110	H3	1	1712233	—
6		32	2"	3/8	11/16	3/16	0.141	0.110	H5	1	1712235	—
8		32	2.1/8	3/8	3/4	1/4	0.141	0.110	H3	1	1712239	—
8		32	2.1/8	3/8	3/4	1/4	0.141	0.110	H5	1	1712241	—
	10	32	2.3/8	1/2	7/8	1/4	0.194	0.152	H4	1	—	1712258
	10	32	2.3/8	1/2	7/8	1/4	0.194	0.152	H6	1	—	1712260
10		24	2.3/8	1/2	7/8	1/4	0.194	0.152	H6	1	1712254	—
	1/4	28	2.1/2	5/8	1"	5/16	0.255	0.191	H4	1	—	1712270
	1/4	28	2.1/2	5/8	1"	5/16	0.255	0.191	H6	1	—	1712272
1/4		20	2.1/2	5/8	1"	5/16	0.255	0.191	H4	1	1712264	—
1/4		20	2.1/2	5/8	1"	5/16	0.255	0.191	H6	1	1712266	—
	5/16	24	2.23/32	11/16	1.1/8	3/8	0.318	0.238	H7	1	—	1712285
5/16		18	2.23/32	11/16	1.1/8	3/8	0.318	0.238	H5	1	1712277	—
5/16		18	2.23/32	11/16	1.1/8	3/8	0.318	0.238	H7	1	1712279	—
	3/8	24	2.15/16	3/4	1.1/4	7/16	0.381	0.286	H7	1	—	1712297
3/8		16	2.15/16	3/4	1.1/4	7/16	0.381	0.286	H5	1	1712289	—
3/8		16	2.15/16	3/4	1.1/4	7/16	0.381	0.286	H7	1	1712291	—
1/2		13	3.3/8	15/16	1.21/32	7/16	0.367	0.275	H5	1	1712301	—
1/2		13	3.3/8	15/16	1.21/32	7/16	0.367	0.275	H8	1	1712304	—

# THREAD FORMING TAPS

## Multi-Application / Lube Grooves, Full-Bottoming

**1671** Premium PM substrate provides superior abrasion resistance and edge strength. Multiple Lube Groove design assures lubrication in the forming zone and eliminates the build up of hydraulic pressure in blind holes. TiN coated for enhanced performance. The hard, smooth coating provides a greater lubricity, increases tool life, and improves thread flank finish.

The entry taper is full bottoming style for blind hole tapping.

1.1 1.2 1.3 1.4 1.5 2.1 2.2 2.3 4.1 5.1 6.1 6.2 6.3 7.1 7.2  
7.3



1671(M)

M

ANSI

6H



HSS  
PM



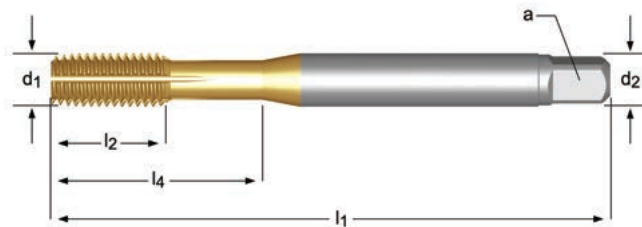
M3 - M10

M	P mm	$l_1$ Inch	$l_2$ Inch	$l_4$ Inch (Neck Length)	$l_3$ Inch	$d_2$ Ø Inch	□ a Inch	Limits	Pack Qty	1671(M)
3	0.50	1.15/16	5/16	1/2	3/16	0.141	0.110	D5	1	1713051
4	0.70	2.1/8	3/8	3/4	1/4	0.168	0.131	D6	1	1713052
5	0.80	2.3/8	1/2	7/8	1/4	0.194	0.152	D7	1	1713053
6	1.00	2.1/2	5/8	1"	5/16	0.255	0.191	D8	1	1713054
8	1.00	2.23/32	11/16	1.1/8	3/8	0.318	0.238	D9	1	1713055
8	1.25	2.23/32	11/16	1.1/8	3/8	0.318	0.238	D9	1	1713056
10	1.50	2.15/16	3/4	1.1/4	7/16	0.381	0.286	D10	1	1713057

## MXR Multi-Application / Lube Grooves, Semi-Bottoming

**1681AP** Premium PM substrate provides superior abrasion resistance and edge strength. Multiple Lube Groove design assures lubrication in the forming zone and eliminates the build up of hydraulic pressure in blind holes. The TiN-Top coating process reduces friction, prevents chip welding and improves chip flow.

1.1 1.2 1.3 1.4 1.5 2.1 2.2 2.3 4.1 5.1 6.1 6.2 6.3 7.1 7.2  
7.3



1681AP(UNC)	1681AP(UNF)
UNC	UNF
DIN ANSI	DIN ANSI
2B	2B
HSS PM	HSS PM
No.4 - 1"	No.10 - 7/8

UNC	UNF	TPI	$l_1$ Inch	$l_2$ Inch	$l_4$ Inch (Neck Length)	Limits	$d_2$ Ø Inch	$a$ Inch	Pack Qty	1681AP (UNC)	1681AP (UNF)
4		40	2.205	0.433	0.709	H5	0.141	0.110	1	46204945 <sup>1)</sup>	—
6		32	2.205	0.472	0.787	H5	0.141	0.110	1	46204950 <sup>1)</sup>	—
8		32	2.480	0.512	0.827	H5	0.168	0.131	1	46204955 <sup>1)</sup>	—
	10	32	2.756	0.512	0.984	H6	0.194	0.152	1	—	46204938 <sup>1)</sup>
10		24	2.756	0.591	0.984	H6	0.194	0.152	1	46204937 <sup>1)</sup>	—
12		24	3.150	0.630	1.142	H6	0.220	0.165	1	46371643 <sup>1)</sup>	—
	1/4	28	3.150	0.669	1.181	H6	0.255	0.191	1	—	46204936 <sup>1)</sup>
1/4		20	3.150	0.669	1.181	H6	0.255	0.191	1	46204935 <sup>1)</sup>	—
	5/16	24	3.543	0.669	1.378	H7	0.318	0.238	1	—	46204947 <sup>1)</sup>
5/16		18	3.546	0.787	1.378	H7	0.318	0.238	1	46204946 <sup>1)</sup>	—
	3/8	24	3.937	0.709	1.535	H7	0.381	0.286	1	—	46204944 <sup>1)</sup>
3/8		16	3.937	0.866	1.535	H7	0.381	0.286	1	46204943 <sup>1)</sup>	—
	7/16	20	3.937	0.866	—	H8	0.323	0.242	1	—	46204952 <sup>2)</sup>
7/16		14	3.937	0.866	—	H8	0.323	0.242	1	46204951 <sup>2)</sup>	—
	1/2	20	3.937	0.866	—	H8	0.397	0.275	1	—	46204934 <sup>2)</sup>
1/2		13	4.331	0.984	—	H8	0.367	0.275	1	46204933 <sup>2)</sup>	—
5/8		11	4.331	1.063	—	H8	0.480	0.360	1	46204948 <sup>2)</sup>	—
	3/4	16	4.331	0.984	—	H8	0.590	0.442	1	—	46204942 <sup>2)</sup>
3/4		10	4.921	1.181	—	H8	0.590	0.442	1	46204941 <sup>2)</sup>	—
	7/8	14	4.921	1.024	—	H9	0.697	0.523	1	—	46204953 <sup>2)</sup>
7/8		9	5.512	1.260	—	H9	0.697	0.523	1	46204954 <sup>2)</sup>	—
1"		8	6.299	1.417	—	H9	0.800	0.600	1	46204940 <sup>2)</sup>	—

<sup>1)</sup> Reinforced Shanks

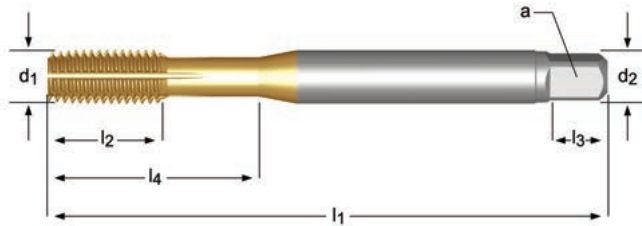
<sup>2)</sup> Reduced Shanks

# THREAD FORMING TAPS

## MXR Multi-Application / Lube Grooves, Semi-Bottoming

**1691AP** Coolant thru premium PM substrate allows higher tapping speeds in soft ferrous or non-ferrous materials. The TiN-Top coating process reduces friction, prevents chip welding and improves chip flow.

1.1 1.2 1.3 1.4 1.5 2.1 2.2 2.3 4.1 5.1 6.1 6.2 6.3 7.1 7.2  
7.3



1691AP(UNC)	1691AP(UNF)
UNC	UNF
DIN ANSI	DIN ANSI
2B	2B
HSS PM	HSS PM
1/4 - 1"	5/16 - 1/2

UNC	UNF	TPI	$l_1$ Inch	$l_2$ Inch	$l_4$ Inch (Neck Length)	Limits	$d_2$ $\varnothing$ Inch	$a$ Inch	Pack Qty	1691AP (UNC)	1691AP (UNF)
1/4		20	3.150	0.669	1.181	H6	0.255	0.191	1	46204976 <sup>1)</sup>	—
	5/16	24	3.543	0.669	1.378	H7	0.318	0.238	1	—	46204985 <sup>1)</sup>
5/16		18	3.546	0.787	1.378	H7	0.318	0.238	1	46204984 <sup>1)</sup>	—
	3/8	24	3.937	0.709	1.535	H7	0.381	0.286	1	—	46204983 <sup>1)</sup>
3/8		16	3.937	0.866	1.535	H7	0.381	0.286	1	46204982 <sup>1)</sup>	—
	7/16	20	3.937	0.866	—	H8	0.323	0.242	1	—	46204989 <sup>2)</sup>
	1/2	20	3.937	0.866	—	H8	0.397	0.275	1	—	46204975 <sup>2)</sup>
1/2		13	4.331	0.984	—	H8	0.367	0.275	1	46204974 <sup>2)</sup>	—
5/8		11	4.331	1.063	—	H8	0.480	0.360	1	46204986 <sup>2)</sup>	—
3/4		10	4.921	1.181	—	H8	0.590	0.442	1	46204980 <sup>2)</sup>	—
1"		8	6.299	1.417	—	H9	0.800	0.600	1	46204979 <sup>2)</sup>	—

<sup>1)</sup> Reinforced Shanks

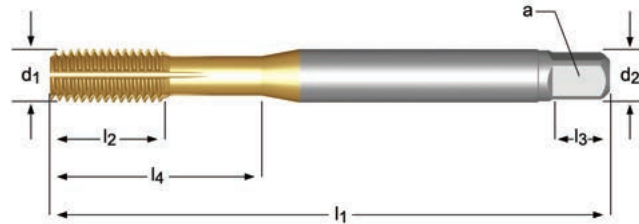
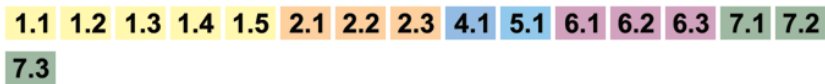
<sup>2)</sup> Reduced Shanks

## MXR Multi-Application / Lube Grooves, Semi-Bottoming



**1687AP** Premium PM substrate provides superior abrasion resistance and edge strength. Multiple Lube Groove design assures lubrication in the forming zone and eliminates the build up of hydraulic pressure in blind holes. The TiN-Top coating process reduces friction, prevents chip welding and improves chip flow. Features a semi-bottoming lead for improved performance and longer tool life. Can be used for through or blind holes.

**1697AP** Coolant thru premium PM substrate allows higher tapping speeds in soft ferrous or non-ferrous materials. The TiN-Top coating process reduces friction, prevents chip welding and improves chip flow.



1687AP		1697AP	
M	MF	M	
DIN ANSI		DIN ANSI	
6H		6H	
HSS PM		HSS PM	
M4 - M20		M6 - M20	

M	MF	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>2</sub> Inch	l <sub>4</sub> Inch (Neck Length)	Limits	d <sub>2</sub> Ø Inch	∠ a Inch	Pack Qty	1687AP	1697AP
4		0.70	63	13		21	D6	0.168	0.131	1	46204970	<sup>1)</sup> —
5		0.80	70	15		25	D7	0.194	0.152	1	46204971	<sup>1)</sup> —
6		1.00	80	17		30	D8	0.255	0.191	1	46204972	<sup>1)</sup> 46205004
8		1.25	90	20		25	D9	0.318	0.238	1	46204973	<sup>1)</sup> —
8		1.25	90	20		35	D9	0.318	0.238	1	—	46205005
	10	1.25	100	16		39	D10	0.381	0.286	1	46204956	<sup>1)</sup> —
10		1.50	100	22		39	D10	0.381	0.286	1	46204957	<sup>1)</sup> 46204991
	12	1.50	100	22			D11	0.367	0.275	1	46204958	<sup>2)</sup> —
12		1.75	110	24			D11	0.367	0.275	1	46204959	<sup>2)</sup> 46204993
	14	1.50	100	22			D10	0.429	0.322	1	46204960	<sup>2)</sup> —
14		2.00	110	26			D11	0.429	0.322	1	46204961	<sup>2)</sup> —
	16	1.50	100	22			D10	0.480	0.360	1	46204962	<sup>2)</sup> —
16		2.00	110	27			D11	0.480	0.360	1	46204963	<sup>2)</sup> 46204997
	20	1.50	125		25		D11	0.652	0.489	1	—	46205000
20		2.50	140	32			D12	0.652	0.489	1	46204967	<sup>2)</sup> —

<sup>1)</sup> Reinforced Shanks  
<sup>2)</sup> Reduced Shanks

# PIPE TAPS, STRAIGHT FLUTE



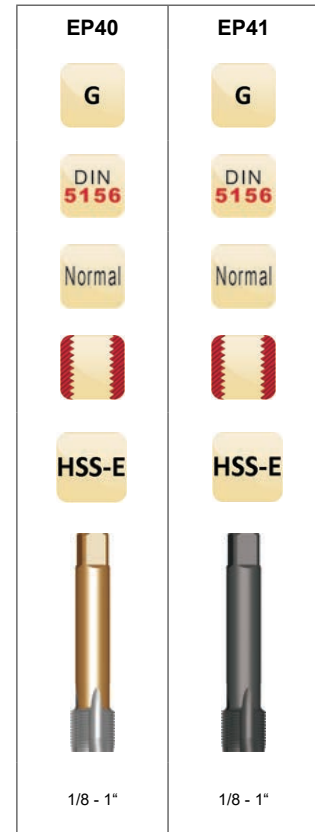
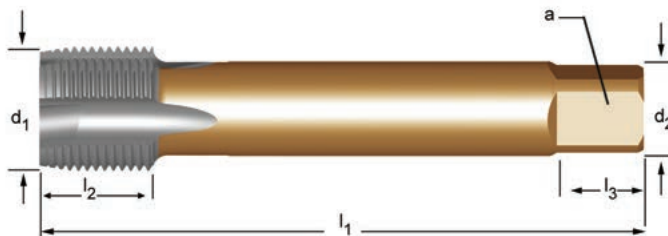
## Parallel Thread, G (BSP), Plug Style

**EP40** Bronze oxide body and shank reduces rust and corrosion. Bright flutes improve chip flow in soft or non-ferrous materials.

1.1 1.2 1.3 1.4 1.5 1.6 3.1 3.2 3.3 3.4 4.1 4.2 5.1 5.2 6.1  
6.2 6.3 7.1 7.2 7.3 7.4 8.1

**EP41** Steam oxide surface treatment reduces wear and chip welding in abrasive or harder ferrous materials.

1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4



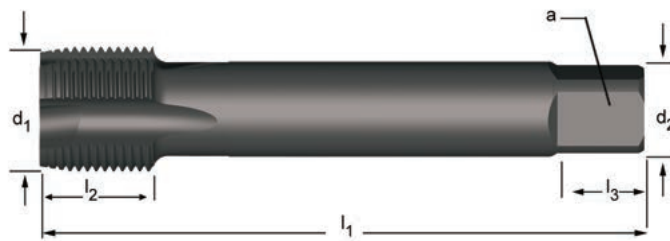
G(BSP)	TPI	d <sub>1</sub> nom mm	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> Ø mm	□ a mm	l <sub>3</sub> mm	# of flutes	↔	Pack Qty	EP40	EP41
1/8	28	9.728	90	18	7.0	5.5	8	3	8.8	1	0138588	0138663
1/4	19	13.157	100	21	11.0	9.0	12	3	11.8	1	0138595	0138670
3/8	19	16.662	100	21	12.0	9.0	12	4	15.25	1	0138601	0138687
1/2	14	20.955	125	24	16.0	12.0	15	4	19	1	0138618	0138694
5/8	14	22.911	125	24	18.0	14.5	17	4	21	1	0138625	0138700
3/4	14	26.441	140	28	20.0	16.0	19	4	24.5	1	0138632	0147054
7/8	14	30.201	150	28	22.0	18.0	21	4	28.25	1	0138649	0149645
1"	11	33.249	160	30	25.0	20.0	23	4	30.75	1	0138656	0149652

**Note:** DIN shank and square dimensions will necessitate metric holders

## Parallel Thread, G(BSP), Plug Style

**E041** Steam oxide surface treatment reduces wear and chip welding in abrasive or harder ferrous materials.

1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4



**E041**

G

DORMER ISO

Normal

HSS-E

1/8 - 3/4

G(BSP)	TPI	d <sub>1</sub> nom mm	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> Ø mm	□ a mm	l <sub>3</sub> mm	# of Flutes		Pack Qty	E041
1/8	28	9.728	90	15	8.0	6.3	9	3	8.80	1	0569818
1/4	19	13.157	100	19	10.0	8.0	11	3	11.80	1	0569825
3/8	19	16.662	100	21	12.5	10.0	13	3	15.25	1	0569832
1/2	14	20.955	125	26	16.0	12.5	16	4	19.00	1	0569849
3/4	14	26.441	140	28	20.0	16.0	20	4	24.50	1	0569856

**Note:** ISO shank and square dimensions will necessitate metric holders

# PIPE TAPS, SPIRAL FLUTE



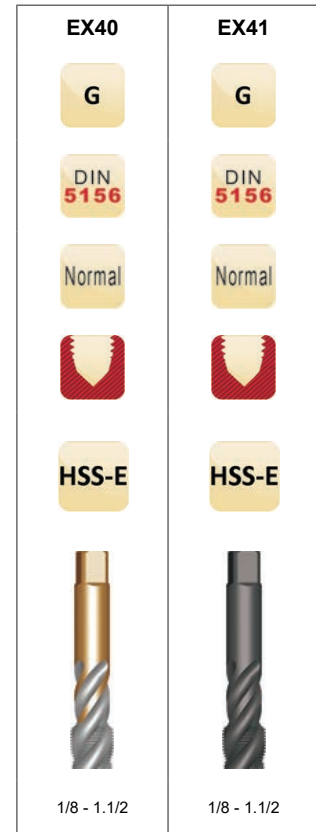
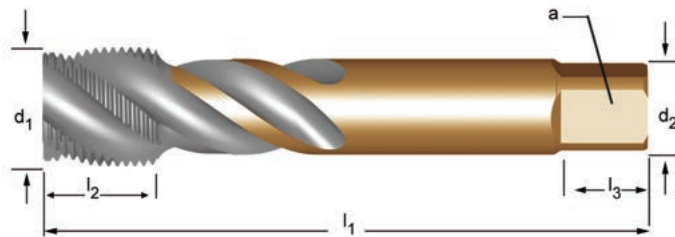
## Parallel Thread, G(BSP), Semi- Bottoming

**EX40** Bronze oxide body and shank reduces rust and corrosion. Bright flutes improve chip flow in soft or non-ferrous materials.

1.1 1.2 1.3 1.4 1.5 4.1 4.2 5.1 5.2 7.1 7.2 7.3 7.4 8.1

**EX41** Steam oxide surface treatment reduces wear and chip welding in abrasive or harder ferrous materials.

1.1 1.2 1.3 1.4 1.5 2.1 2.2 2.3



G(BSP)	TPI	d <sub>1</sub> nom mm	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> Ø mm	□ a mm	l <sub>3</sub> mm	# of flutes	↔	Pack Qty	EX40	EX41
1/8	28	9.728	90	13	7.0	5.5	8	3	8.8	1	0168547	0168653
1/4	19	13.157	100	15	11.0	9.0	12	3	11.8	1	0168554	0168660
3/8	19	16.662	100	15	12.0	9.0	12	4	15.25	1	0168561	0168677
1/2	14	20.955	125	18	16.0	12.0	15	4	19	1	0168578	0168684
5/8	14	22.911	125	18	18.0	14.5	17	4	21	1	0168585	0168691
3/4	14	26.441	140	20	20.0	16.0	19	4	24.5	1	0168592	0168707
7/8	14	30.201	150	20	22.0	18.0	21	4	28.25	1	0168608	0168714
1"	11	33.249	160	22	25.0	20.0	23	4	30.75	1	0168615	0168721
1.1/8	11	37.897	170	22	28.0	22.0	25	4	35	1	0168622	0168738
1.1/4	11	41.910	170	22	32.0	24.0	27	4	39.5	1	0168639	0168745
1.1/2	11	47.803	190	23	36.0	29.0	32	4	45	1	0168646	0168752

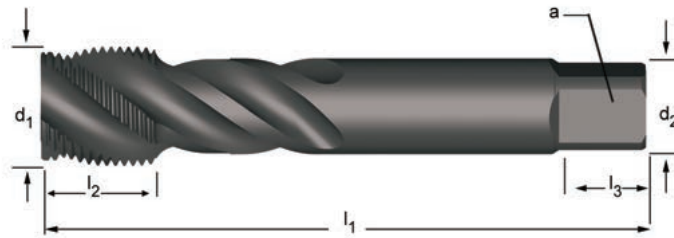
**Note: DIN shank and square dimensions will necessitate metric holders**



## Parallel Thread, G(BSP), Semi-Bottoming

**E043** Steam oxide surface treatment reduces wear and chip welding in abrasive or harder ferrous materials.

1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3



E043

G

DORMER  
ISO

Normal



HSS-E



1/8 - 3/4

G(BSP)	TPI	d <sub>1</sub> nom mm	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> ∅ mm	□ a mm	l <sub>3</sub> mm	# of flutes		Pack Qty	E043
1/8	28	9.728	90	15	8.0	6.3	9	3	8.80	1	0569917
1/4	19	13.157	100	19	10.0	8.0	11	3	11.80	1	0569924
3/8	19	16.662	100	21	12.5	10.0	13	4	15.25	1	0569931
1/2	14	20.955	125	26	16.0	12.5	16	4	19.00	1	0569948
3/4	14	26.441	140	28	20.0	16.0	20	4	24.50	1	0569955

**Note:** ISO shank and square dimensions will necessitate metric holders

# HAND TAPS

## General Purpose

**1500**  
**1500S**  
**1528**  
**1528S**

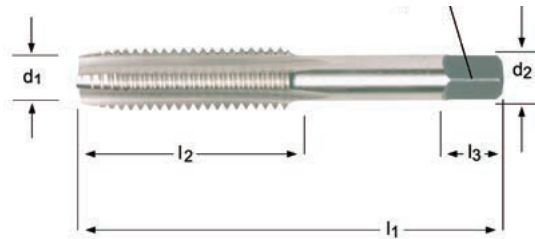
The most versatile taps for hand use or machine tapping in a wide variety of materials in through or blind hole applications. Available in 3 chamfer lengths - taper, plug, and bottoming.

Taper - 7-10 pitch chamfer length  
 Plug - 3-5 pitch chamfer length  
 Bottoming - 1-2 pitch chamfer length

1500 - Fractional sizes

1528 - Machine screw sizes

1500S / 1528S - Sets include 1 of each tap (Taper, Plug, and Bottoming)



- Sizes 0 thru 3/8 have male centers on thread end
- Sizes larger than 3/8 all have female centers / flat ends

**1500/1528**

UNC
UNF
UNS

ANSI

2B  
3B

HSS

1/4 - 1.1/2

Nominal d <sub>1</sub>	TPI UNC	TPI UNF	TPI UNS	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch /	□ a Inch	l <sub>3</sub> Inch	# of Flutes	Limits	Pack Qty	Taper	Plug	Bottoming	Sets
0		80		1.5/8	5/16	0.1410	0.1100	3/16	2	H1	1	1010593	1010594	1010596	1010999
0		80		1.5/8	5/16	0.1410	0.1100	3/16	2	H2	1	—	1010595	1010597	—
1	64			1.11/16	3/8	0.1410	0.1100	3/16	2	H1	1	1010598	1010599	1010601	1011000
1		72		1.11/16	3/8	0.1410	0.1100	3/16	2	H1	1	1010603	1010604	1010606	1011001
2	56			1.3/4	7/16	0.1410	0.1100	3/16	2	H2	1	—	1010615	1010617	—
2	56			1.3/4	7/16	0.1410	0.1100	3/16	3	H1	1	1010608	1010610	1010612	—
2	56			1.3/4	7/16	0.1410	0.1100	3/16	3	H2	1	1010609	1010611	1010613	1011003
2		64		1.3/4	7/16	0.1410	0.1100	3/16	3	H2	1	—	—	—	1011073
3	48			1.13/16	1/2	0.1410	0.1100	3/16	2	H2	1	—	1010631	—	—
3	48			1.13/16	1/2	0.1410	0.1100	3/16	3	H2	1	1010625	1010627	1010629	1011005
3		56		1.13/16	1/2	0.1410	0.1100	3/16	3	H2	1	1010634	1010636	1010637	1011074
4	40			1.7/8	9/16	0.1410	0.1100	3/16	2	H2	1	—	1010650	1010652	—
4	40			1.7/8	9/16	0.1410	0.1100	3/16	3	H1	1	1010643	1010645	1010647	—
4	40			1.7/8	9/16	0.1410	0.1100	3/16	3	H2	1	1010644	1010646	1010648	1011008
4		48		1.7/8	9/16	0.1410	0.1100	3/16	3	H2	1	1010653	1010655	1010656	1011075
4			36	1.7/8	9/16	0.1410	0.1100	3/16	3	H2	1	—	—	—	1011006
5	40			1.15/16	5/8	0.1410	0.1100	3/16	3	H2	1	1010660	1010662	1010664	1011010
5		44		1.15/16	5/8	0.1410	0.1100	3/16	3	H2	1	1010669	1010671	1010672	1011076
6	32			2"	11/16	0.1410	0.1100	3/16	2	H2	1	—	1010685	1010688	—
6	32			2"	11/16	0.1410	0.1100	3/16	2	H3	1	—	1010686	1010689	—
6	32			2"	11/16	0.1410	0.1100	3/16	3	H1	1	1010675	1010678	1010681	—
6	32			2"	11/16	0.1410	0.1100	3/16	3	H2	1	1010676	1010679	1010682	1011012
6	32			2"	11/16	0.1410	0.1100	3/16	3	H3	1	1010677	1010680	1010683	1011013
6		40		2"	11/16	0.1410	0.1100	3/16	3	H2	1	1010690	1010692	1010693	1011014

# HAND TAPS

Nominal d <sub>1</sub>	TPI UNC	TPI UNF	TPI UNS	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch /	□ a Inch	l <sub>3</sub> Inch	# of Flutes	Limits	Pack Qty	Taper	Plug	Bottoming	Sets
8	32			2.1/8	3/4	0.1680	0.1310	1/4	2	H2	1	—	1010706	1010709	—
8	32			2.1/8	3/4	0.1680	0.1310	1/4	2	H3	1	—	1010707	1010710	—
8	32			2.1/8	3/4	0.1680	0.1310	1/4	3	H2	1	—	1010712	1010715	—
8	32			2.1/8	3/4	0.1680	0.1310	1/4	3	H3	1	—	1010713	1010716	—
8	32			2.1/8	3/4	0.1680	0.1310	1/4	4	H1	1	—	1010699	—	—
8	32			2.1/8	3/4	0.1680	0.1310	1/4	4	H2	1	1010697	1010700	1010703	1011016
<b>8</b>	<b>32</b>			<b>2.1/8</b>	<b>3/4</b>	<b>0.1680</b>	<b>0.1310</b>	<b>1/4</b>	<b>4</b>	<b>H3</b>	<b>1</b>	<b>1010698</b>	<b>1010701</b>	<b>1010704</b>	<b>1011017</b>
<b>8</b>		<b>36</b>		<b>2.1/8</b>	<b>3/4</b>	<b>0.1680</b>	<b>0.1310</b>	<b>1/4</b>	<b>4</b>	<b>H2</b>	<b>1</b>	<b>1010717</b>	<b>1010719</b>	<b>1010720</b>	<b>1011018</b>
10	24			2.3/8	7/8	0.1940	0.1520	1/4	2	H2	1	—	1010733	1010736	—
10	24			2.3/8	7/8	0.1940	0.1520	1/4	2	H3	1	—	1010734	1010737	—
10	24			2.3/8	7/8	0.1940	0.1520	1/4	3	H2	1	—	1010739	—	—
10	24			2.3/8	7/8	0.1940	0.1520	1/4	3	H3	1	—	1010740	1010743	—
10	24			2.3/8	7/8	0.1940	0.1520	1/4	4	H1	1	—	1010726	—	—
10	24			2.3/8	7/8	0.1940	0.1520	1/4	4	H2	1	1010724	1010727	1010730	1011020
<b>10</b>	<b>24</b>			<b>2.3/8</b>	<b>7/8</b>	<b>0.1940</b>	<b>0.1520</b>	<b>1/4</b>	<b>4</b>	<b>H3</b>	<b>1</b>	<b>1010725</b>	<b>1010728</b>	<b>1010731</b>	<b>1011021</b>
10		32		2.3/8	7/8	0.1940	0.1520	1/4	2	H2	1	—	1010754	1010757	—
10		32		2.3/8	7/8	0.1940	0.1520	1/4	2	H3	1	—	1010755	1010758	—
10		32		2.3/8	7/8	0.1940	0.1520	1/4	3	H2	1	—	1010760	1010763	—
10		32		2.3/8	7/8	0.1940	0.1520	1/4	3	H3	1	—	1010761	1010764	—
10		32		2.3/8	7/8	0.1940	0.1520	1/4	4	H2	1	1010745	1010748	1010751	1011023
<b>10</b>	<b>32</b>			<b>2.3/8</b>	<b>7/8</b>	<b>0.1940</b>	<b>0.1520</b>	<b>1/4</b>	<b>4</b>	<b>H3</b>	<b>1</b>	<b>1010746</b>	<b>1010749</b>	<b>1010752</b>	<b>1011024</b>
<b>12</b>	<b>24</b>			<b>2.3/8</b>	<b>15/16</b>	<b>0.2200</b>	<b>0.1650</b>	<b>9/32</b>	<b>4</b>	<b>H3</b>	<b>1</b>	<b>1010765</b>	<b>1010767</b>	<b>1010768</b>	<b>1011025</b>
<b>12</b>		<b>28</b>		<b>2.3/8</b>	<b>15/16</b>	<b>0.2200</b>	<b>0.1650</b>	<b>9/32</b>	<b>4</b>	<b>H3</b>	<b>1</b>	<b>1010769</b>	<b>1010771</b>	<b>1010772</b>	<b>1011026</b>
1/4	20			2.1/2	1"	0.2550	0.1910	5/16	4	H1	1	1010001	1010004	1010008	—
1/4	20			2.1/2	1"	0.2550	0.1910	5/16	4	H2	1	1010002	1010005	1010009	—
<b>1/4</b>	<b>20</b>			<b>2.1/2</b>	<b>1"</b>	<b>0.2550</b>	<b>0.1910</b>	<b>5/16</b>	<b>4</b>	<b>H3</b>	<b>1</b>	<b>1010003</b>	<b>1010006</b>	<b>1010010</b>	<b>1011029</b>
1/4	20			2.1/2	1"	0.2550	0.1910	5/16	4	H5	1	—	1010007	1010011	—
1/4		28		2.1/2	1"	0.2550	0.1910	5/16	4	H2	1	—	1010016	1010020	—
<b>1/4</b>		<b>28</b>		<b>2.1/2</b>	<b>1"</b>	<b>0.2550</b>	<b>0.1910</b>	<b>5/16</b>	<b>4</b>	<b>H3</b>	<b>1</b>	<b>1010014</b>	<b>1010017</b>	<b>1010021</b>	<b>1011032</b>
1/4		28		2.1/2	1"	0.2550	0.1910	5/16	4	H4	1	—	1010018	1010022	—
5/16	18			2.23/32	1.1/8	0.3180	0.2380	3/8	4	H2	1	1010024	1010027	1010031	—
<b>5/16</b>	<b>18</b>			<b>2.23/32</b>	<b>1.1/8</b>	<b>0.3180</b>	<b>0.2380</b>	<b>3/8</b>	<b>4</b>	<b>H3</b>	<b>1</b>	<b>1010025</b>	<b>1010028</b>	<b>1010032</b>	<b>1011035</b>
<b>5/16</b>		<b>24</b>		<b>2.23/32</b>	<b>1.1/8</b>	<b>0.3180</b>	<b>0.2380</b>	<b>3/8</b>	<b>4</b>	<b>H3</b>	<b>1</b>	<b>1010036</b>	<b>1010039</b>	<b>1010043</b>	<b>1011038</b>
3/8	16			2.15/16	1.1/4	0.3810	0.2860	7/16	4	H2	1	1010046	1010049	1010053	—
<b>3/8</b>	<b>16</b>			<b>2.15/16</b>	<b>1.1/4</b>	<b>0.3810</b>	<b>0.2860</b>	<b>7/16</b>	<b>4</b>	<b>H3</b>	<b>1</b>	<b>1010047</b>	<b>1010050</b>	<b>1010054</b>	<b>1011041</b>
3/8	16			2.15/16	1.1/4	0.3810	0.2860	7/16	4	H5	1	—	1010051	1010055	—
<b>3/8</b>		<b>24</b>		<b>2.15/16</b>	<b>1.1/4</b>	<b>0.3810</b>	<b>0.2860</b>	<b>7/16</b>	<b>4</b>	<b>H3</b>	<b>1</b>	<b>1010058</b>	<b>1010061</b>	<b>1010065</b>	<b>1011044</b>
<b>7/16</b>	<b>14</b>			<b>3.5/32</b>	<b>1.7/16</b>	<b>0.3230</b>	<b>0.2420</b>	<b>13/32</b>	<b>4</b>	<b>H3</b>	<b>1</b>	<b>1010067</b>	<b>1010070</b>	<b>1010074</b>	<b>1011045</b>
<b>7/16</b>		<b>20</b>		<b>3.5/32</b>	<b>1.7/16</b>	<b>0.3230</b>	<b>0.2420</b>	<b>13/32</b>	<b>4</b>	<b>H3</b>	<b>1</b>	<b>1010076</b>	<b>1010079</b>	<b>1010083</b>	<b>1011046</b>
1/2	13			3.3/8	1.21/32	0.3670	0.2750	7/16	4	H2	1	—	1010087	1010091	—
<b>1/2</b>	<b>13</b>			<b>3.3/8</b>	<b>1.21/32</b>	<b>0.3670</b>	<b>0.2750</b>	<b>7/16</b>	<b>4</b>	<b>H3</b>	<b>1</b>	<b>1010085</b>	<b>1010088</b>	<b>1010092</b>	<b>1011047</b>
1/2	13			3.3/8	1.21/32	0.3670	0.2750	7/16	4	H5	1	—	1010089	1010093	—
<b>1/2</b>		<b>20</b>		<b>3.3/8</b>	<b>1.21/32</b>	<b>0.3670</b>	<b>0.2750</b>	<b>7/16</b>	<b>4</b>	<b>H3</b>	<b>1</b>	<b>1010094</b>	<b>1010097</b>	<b>1010101</b>	<b>1011048</b>
<b>9/16</b>	<b>12</b>			<b>3.19/32</b>	<b>1.21/32</b>	<b>0.4290</b>	<b>0.3220</b>	<b>1/2</b>	<b>4</b>	<b>H3</b>	<b>1</b>	<b>1010103</b>	<b>1010106</b>	<b>1010108</b>	<b>1011049</b>
<b>9/16</b>		<b>18</b>		<b>3.19/32</b>	<b>1.21/32</b>	<b>0.4290</b>	<b>0.3220</b>	<b>1/2</b>	<b>4</b>	<b>H3</b>	<b>1</b>	<b>1010110</b>	<b>1010113</b>	<b>1010116</b>	<b>1011050</b>
5/8	11			3.13/16	1.13/16	0.4800	0.3600	9/16	4	H3	1	1010118	1010121	1010123	1011051
5/8		18		3.13/16	1.13/16	0.4800	0.3600	9/16	4	H3	1	1010125	1010128	1010131	1011052
11/16			11	4.1/32	1.13/16	0.5420	0.4060	5/8	4	H3	1	—	—	—	1011053
11/16			16	4.1/32	1.13/16	0.5420	0.4060	5/8	4	H3	1	—	—	—	1011054
3/4	10			4.1/4	2"	0.5900	0.4420	11/16	4	H3	1	1010139	1010142	1010144	1011055
3/4		16		4.1/4	2"	0.5900	0.4420	11/16	4	H3	1	1010146	1010149	1010152	1011056
7/8	9			4.11/16	2.7/32	0.6970	0.5230	3/4	4	H4	1	1010154	1010157	1010159	1011057
7/8		14		4.11/16	2.7/32	0.6970	0.5230	3/4	4	H4	1	1010160	1010163	1010166	1011058

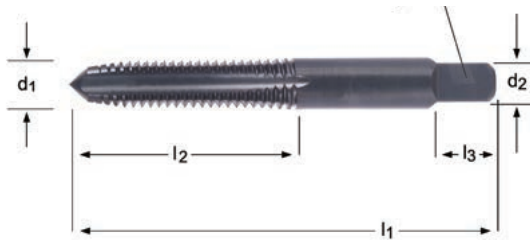
# HAND TAPS



Nominal d <sub>1</sub>	TPI UNC	TPI UNF	TPI UNS	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch /	□ a Inch	l <sub>3</sub> Inch	# of Flutes	Limits	Pack Qty	Taper	Plug	Bottoming	Sets
1"	8			5.1/8	2.1/2	0.8000	0.6000	13/16	4	H4	1	1010167	1010170	1010172	1011059
1"		12		5.1/8	2.1/2	0.8000	0.6000	13/16	4	H4	1	1010173	1010174	1010175	1011060
1"			14	5.1/8	2.1/2	0.8000	0.6000	13/16	4	H4	1	1010176	1010178	1010181	1011061
1.1/8	7			5.7/16	2.9/16	0.8960	0.6720	7/8	4	H4	1	1010182	1010183	1010184	1011062
1.1/8		12		5.7/16	2.9/16	0.8960	0.6720	7/8	4	H4	1	1010185	1010186	1010187	1011063
1.1/4	7			5.3/4	2.9/16	1.0210	0.7660	1"	4	H4	1	1010188	1010189	1010190	1011064
1.1/4		12		5.3/4	2.9/16	1.0210	0.7660	1"	6	H4	1	1010191	1010192	1010193	1011065
1.3/8	6			6.1/16	3"	1.1000	0.8310	1.1/16	4	H4	1	1010194	1010195	1010196	1011066
1.3/8		12		6.1/16	3"	1.1000	0.8310	1.1/16	6	H4	1	1010197	1010198	1010199	1011067
1.1/2	6			6.3/8	3"	1.2300	0.9250	1.1/8	4	H4	1	1010200	1010201	1010202	1011068
1.1/2		12		6.3/8	3"	1.2300	0.9250	1.1/8	6	H4	1	1010203	1010204	1010205	1011069

## General Purpose

**1500A** Similar in design to the standard 1500 series, but steam oxide treated to reduce wear and chip welding in harder ferrous materials. Not recommended for non-ferrous applications. For through or blind hole tapping.



<sup>1)</sup> Male centers on thread end

<sup>2)</sup> Female centers / flat ends

**1500A**

UNC
UNF

ANSI

3B

HSS

1/4 - 1"

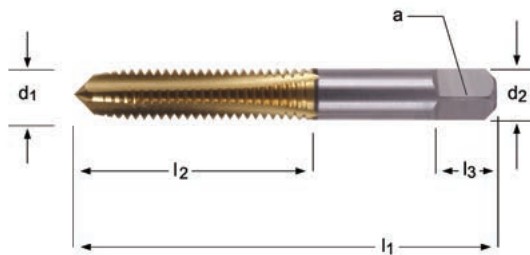
UNC	UNF	TPI	$l_1$ Inch	$l_2$ Inch	$d_2$ Ø Inch	$\square$ a Inch	$l_3$ Inch	# of Flutes	Limits	Chamfer	Pack Qty	1500A
1/4		20	2.1/2	1.000	0.2550	0.1910	5/16	4	H3	Plug	1	1050006 <sup>1)</sup>
	1/4	28	2.1/2	1.000	0.2550	0.1910	5/16	4	H3	Bottoming	1	1050021 <sup>1)</sup>
	5/16	24	2.23/32	1.1/8	0.3180	0.2380	3/8	4	H3	Plug	1	1050039 <sup>1)</sup>
5/16		18	2.23/32	1.1/8	0.3180	0.2380	3/8	4	H3	Plug	1	1050028 <sup>1)</sup>
	3/8	24	2.15/16	1.1/4	0.3810	0.2860	7/16	4	H3	Plug	1	1050061 <sup>1)</sup>
3/8		16	2.15/16	1.1/4	0.3810	0.2860	7/16	4	H3	Plug	1	1050050 <sup>1)</sup>
	7/16	20	3.5/32	1.7/16	0.3230	0.2420	13/32	4	H3	Plug	1	1050079 <sup>2)</sup>
7/16		14	3.5/32	1.7/16	0.3230	0.2420	13/32	4	H3	Plug	1	1050070 <sup>2)</sup>
	1/2	20	3.3/8	1.21/32	0.3670	0.2750	7/16	4	H3	Plug	1	1050097 <sup>2)</sup>
1/2		13	3.3/8	1.21/32	0.3670	0.2750	7/16	4	H3	Plug	1	1050088 <sup>2)</sup>
	9/16	18	3.19/32	1.21/32	0.4290	0.3220	1/2	4	H3	Plug	1	1050113 <sup>2)</sup>
9/16		12	3.19/32	1.21/32	0.4290	0.3220	1/2	4	H3	Plug	1	1050106 <sup>2)</sup>
	5/8	18	3.13/16	1.13/16	0.4800	0.3600	9/16	4	H3	Plug	1	1050128 <sup>2)</sup>
5/8		11	3.13/16	1.13/16	0.4800	0.3600	9/16	4	H3	Plug	1	1050121 <sup>2)</sup>
	3/4	16	4.1/4	2"	0.5900	0.4420	11/16	4	H3	Plug	1	1050149 <sup>2)</sup>
3/4		10	4.1/4	2"	0.5900	0.4420	11/16	4	H3	Plug	1	1050142 <sup>2)</sup>
	7/8	14	4.11/16	2.7/32	0.6970	0.5230	3/4	4	H4	Plug	1	1050163 <sup>2)</sup>
7/8		9	4.11/16	2.7/32	0.6970	0.5230	3/4	4	H4	Plug	1	1050157 <sup>2)</sup>
1"		8	5.1/8	2.1/2	0.8000	0.6000	13/16	4	H4	Plug	1	1050170 <sup>2)</sup>

# HAND TAPS

## General Purpose

### TN1500

Similar in design to the 1500 series but TiN coated for enhanced performance. The hard, smooth finish provides greater lubricity, increases tool life, improves thread flank finish, and allows higher tapping speeds. For through or blind hole tapping.



<sup>1)</sup> Male centers on thread end

<sup>2)</sup> Female centers / flat ends

**TN1500**

UNC
UNF

ANSI

3B

HSS

1/4 - 7/8

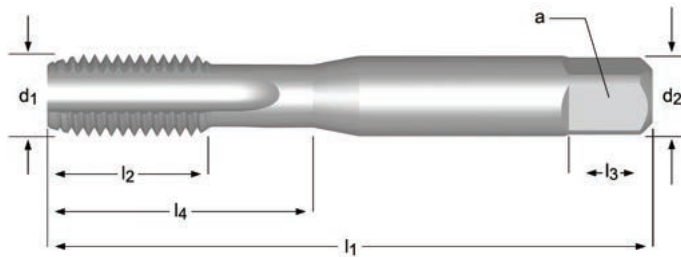
UNC	UNF	TPI	$l_1$ Inch	$l_2$ Inch	$d_2$ Ø Inch	$\square$ a Inch	$l_3$ Inch	# of Flutes	Limits	Chamfer	Pack Qty	TN1500
	1/4	28	2.1/2	1.0000	0.2550	0.1910	5/16	4	H3	Plug	1	1060017 <sup>1)</sup>
1/4		20	2.1/2	1.0000	0.2550	0.1910	5/16	4	H3	Plug	1	1060006 <sup>1)</sup>
	5/16	24	2.23/32	1.1/8	0.3180	0.2380	3/8	4	H3	Plug	1	1060039 <sup>1)</sup>
5/16		18	2.23/32	1.1/8	0.3180	0.2380	3/8	4	H3	Plug	1	1060028 <sup>1)</sup>
	3/8	24	2.15/16	1.1/4	0.3810	0.2860	7/16	4	H3	Plug	1	1060061 <sup>1)</sup>
3/8		16	2.15/16	1.1/4	0.3810	0.2860	7/16	4	H3	Plug	1	1060050 <sup>1)</sup>
	7/16	20	3.5/32	1.7/16	0.3230	0.2420	13/32	4	H3	Plug	1	1060079 <sup>2)</sup>
7/16		14	3.5/32	1.7/16	0.3230	0.2420	13/32	4	H3	Plug	1	1060070 <sup>2)</sup>
	1/2	20	3.3/8	1.21/32	0.3670	0.2750	7/16	4	H3	Plug	1	1060097 <sup>2)</sup>
1/2		13	3.3/8	1.21/32	0.3670	0.2750	7/16	4	H3	Plug	1	1060088 <sup>2)</sup>
1/2		13	3.3/8	1.21/32	0.3670	0.2750	7/16	4	H3	Bottoming	1	1060092 <sup>2)</sup>
5/8		11	3.13/16	1.13/16	0.4800	0.3600	9/16	4	H3	Plug	1	1060121 <sup>2)</sup>
	5/8	18	3.13/16	1.13/16	0.4800	0.3600	9/16	4	H3	Bottoming	1	1060131 <sup>2)</sup>
5/8		11	3.13/16	1.13/16	0.4800	0.3600	9/16	4	H3	Bottoming	1	1060123 <sup>2)</sup>
	3/4	16	4.1/4	2"	0.5900	0.4420	11/16	4	H3	Bottoming	1	1060152 <sup>2)</sup>
3/4		10	4.1/4	2"	0.5900	0.4420	11/16	4	H3	Bottoming	1	1060144 <sup>2)</sup>
7/8		9	4.11/16	2.7/32	0.6970	0.5230	3/4	4	H4	Plug	1	1060157 <sup>2)</sup>

## General Purpose

**E500** The most versatile taps for hand use or machine tapping in a wide variety of materials in through or blind hole applications. Available in 3 chamfer lengths - taper, plug, and semi-bottoming.

- Taper - 7-10 pitch chamfer length
- Plug - 3-5 pitch chamfer length
- Semi-Bottoming - 1-2 pitch chamfer length

Sets include 1 of each tap (Taper, Plug, and Bottoming)



E500

M

ISO  
529

6H



HSS




M1 - M56

**Note: ISO shank and square dimensions will necessitate metric holders**

Nominal d <sub>1</sub>	Pitch M	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> Ø mm	□ a mm	l <sub>3</sub> mm	# of Flutes	Flute width mm	l <sub>4</sub> mm	Pack Qty	Taper	Plug	Semi - Bottoming	Sets
1	0.25	38	4.5	2.50	2.00	4	2	0.75	4.5	1	0160152	0160169	0122464	—
1.2	0.25	38	4.5	2.50	2.00	4	2	0.95	4.5	1	0160176	0160183	0122471	—
1.4	0.30	40	6	2.50	2.00	4	2	0.95	6	1	0160190	0160206	0122488	—
1.6	0.35	41	8	2.50	2.00	4	2	1.25	8	1	0155035	0139950	0093900	0155028
1.7	0.35	41	8	2.50	2.00	4	2	1.35	8	1	0155004	0093924	0093931	0154991
1.8	0.35	41	8	2.50	2.00	4	2	1.45	8	1	0154960	0093948	0093955	—
2	0.40	41	8	2.50	2.00	4	3	1.6	8	1	0094259	0094266	0094273	0154939
2	0.45	41	8	2.50	2.00	4	3	1.55	8	1	0160244	0160251	0160268	—
2.2	0.45	44.5	9.5	2.80	2.24	5	3	1.75	9.5	1	0154915	0094167	0094174	—
2.3	0.45	44.5	9.5	2.80	2.24	5	3	1.85	9.5	1	0154885	0094198	0094204	—
2.5	0.45	44.5	9.5	2.80	2.24	5	3	2.05	9.5	1	0154854	0094228	0094235	0154847
2.6	0.45	44.5	9.5	2.80	2.24	5	3	2.15	9.5	1	0156735	0156742	0122440	—
3	0.50	48	12.5	3.15	2.50	5	3	2.5	12.5	1	0154823	0094440	0094457	0094464
3	0.60	48	12.5	3.15	2.50	5	3	2.4	12.5	1	0159927	0159934	0159941	—
3.5	0.60	50	14	3.55	2.80	5	3	2.9	14	1	0094402	0094419	0094426	0154809
4	0.70	53	14	4.00	3.15	6	3	3.3	14	1	0154786	0094648	0094655	0094662
4	0.75	53	14	4.00	3.15	6	3	3.25	14	1	0160213	0160220	0160237	—
4.5	0.75	53	9.5	4.50	3.55	6	3	3.8	18	1	0154762	0094617	0094624	0154755
5	0.80	58	11	5.00	4.00	7	3	4.2	22	1	0154731	0094761	0094778	0154724
5	0.90	58	11	5.00	4.00	7	3	4.1	22	1	0159958	0159965	0159972	—
5.5	0.90	62	12	5.60	4.50	7	3	4.6	21	1	0159996	0160008	0160015	—
6	1.00	66	13	6.30	5.00	8	3	5	26	1	0094808	0094815	0094822	0154700
7	1.00	66	13	7.10	5.60	8	3	6	26	1	0154687	0139967	0094846	0094853
8	1.25	72	16	8.00	6.30	9	3	6.8	29	1	0154663	0094877	0094884	0094891
9	1.25	72	16	9.00	7.10	10	3	7.8	29	1	0154649	0152119	0094914	0154632
10	1.50	80	18	10.00	8.00	11	3	8.5	34	1	0153246	0093979	0093986	0154618
11	1.50	85	19	8.00	6.30	9	3	9.5		1	0154595	0094006	0094013	0154588
12	1.75	89	22	9.00	7.10	10	3	10.3		1	0154564	0094037	0094044	0094051
14	2.00	95	24	11.20	9.00	12	4	12		1	0152980	0094075	0094082	0154540
16	2.00	102	24	12.50	10.00	13	4	14		1	0154526	0094105	0094112	0154519
18	2.50	112	29	14.00	11.20	14	4	15.5		1	0154496	0094136	0094143	0154489
20	2.50	112	29	14.00	11.20	14	4	17.5		1	0154465	0150719	0094297	0154458

# HAND TAPS



Nominal d <sub>1</sub>	Pitch M	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> Ø mm	□ a mm	l <sub>3</sub> mm	# of Flutes	 mm	l <sub>4</sub> mm	Pack Qty	Taper	Plug	Semi - Bottoming	Sets
22	2.50	118	29	16.00	12.50	16	4	19.5		1	0154434	0094310	0094327	0154427
24	3.00	130	35	18.00	14.00	18	4	21		1	0154403	0094341	0094358	0154397
27	3.00	135	35	20.00	16.00	20	4	24		1	0154366	0094365	0094372	—
30	3.50	138	41	20.00	16.00	20	4	26.5		1	0154359	0094488	0094495	—
33	3.50	151	41	22.40	18.00	22	4	29.5		1	0154342	0152225	0094525	—
36	4.00	162	47	25.00	20.00	24	4	32		1	0154335	0094549	0094556	—
39	4.00	170	47	28.00	22.40	26	4	35		1	0154328	0152232	0094587	—
42	4.50	170	53	28.00	22.40	26	6	37.5		1	0154311	0152249	0094686	—
45	4.50	187	54	31.50	25.00	28	6	40.5		1	0154304	0152256	0094709	—
48	5.00	187	60	31.50	25.00	28	6	43		1	0154298	0152263	0094730	—
52	5.00	200	60	35.50	28.00	31	6	47		1	—	—	0094792	—
56	5.50	200	60	35.50	28.00	31	6	50.5		1	—	—	0122457	—

**Note: ISO shank and square dimensions will necessitate metric holders**



## General Purpose

**E513** The most versatile taps for hand use or machine tapping in a wide variety of materials in through or blind hole applications. Available in 3 chamfer lengths - taper, plug, and semi-bottoming.

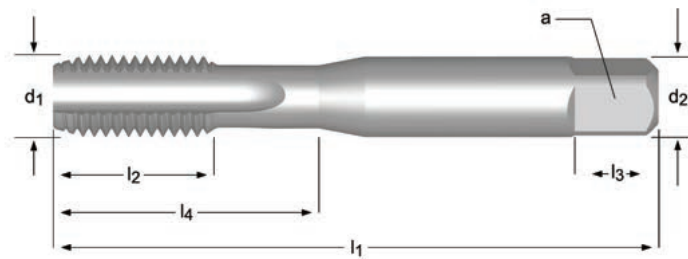
Taper - 7-10 pitch chamfer length

Plug - 3-5 pitch chamfer length

Semi-Bottoming - 1-2 pitch chamfer length

3 pc.(No.6) sets include 1 of each tap (Taper, Plug and Bottoming)

2 pc.(No.7) sets include 1 of each tap (Plug and Bottoming)



E513

MF

ISO  
529

6H



HSS




M3 - M50

Note: ISO shank and square dimensions will necessitate metric holders

Nominal d <sub>1</sub>	Pitch MF	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> Ø mm	□ a mm	# of Flutes	l <sub>3</sub> mm	↔	l <sub>4</sub> mm	Pack Qty	Taper	Plug	Semi - Bottoming	2 Pc Sets	3 Pc Sets
3	0.35	48	12.5	3.15	2.50	3	5	2.65	12.5	1	0160039	0160046	0096567	—	—
3.5	0.35	48	12.5	3.15	2.50	3	5	3.2	12.5	1	—	—	0343111	—	—
4	0.50	53	14	4.00	3.15	3	6	3.5	14	1	0156766	0152454	0096680	0155561	—
5	0.50	58	11	5.00	4.00	3	7	4.5	22	1	0156728	0096727	0096734	0096741	—
5	0.75	58	11	5.00	4.00	3	7	4.3	22	1	0157046	0156773	0123027	—	—
6	0.50	66	13	6.30	5.00	3	8	5.5	26	1	0156780	0156797	0123034	—	—
6	0.75	66	13	6.30	5.00	3	8	5.3	26	1	0156803	0152461	0096765	0096772	—
7	0.75	66	13	7.10	5.60	3	8	6.3	26	1	0160053	0096789	0096796	—	—
8	0.50	72	16	8.00	6.30	3	9	7.5	29	1	0160060	0160077	0123058	—	—
8	0.75	72	16	8.00	6.30	3	9	7.3	29	1	0157053	0152478	0096802	0096819	—
8	1.00	72	16	8.00	6.30	3	9	7	29	1	0157060	0152485	0096826	0155554	—
9	0.75	72	16	9.00	7.10	3	10	8.3	29	1	—	—	0343128	—	—
9	1.00	72	16	9.00	7.10	3	10	8	29	1	0159644	0155752	0096833	—	—
10	0.50	80	18	10.00	8.00	3	11	9.5	34	1	—	—	0343135	—	—
10	0.75	80	18	10.00	8.00	3	11	9.3	34	1	0160084	0160091	0123065	—	—
10	1.00	80	18	10.00	8.00	3	11	9	34	1	0157077	0152492	0096086	0155547	0157084
10	1.25	80	18	10.00	8.00	3	11	8.8	34	1	0157091	0152508	0096079	0155530	0157107
11	0.75	85	19	8.00	6.30	3	9	10.3	—	1	0160107	0160114	0123072	—	—
11	1.00	85	19	8.00	6.30	3	9	10	—	1	0159651	0096093	0096109	—	—
11	1.25	85	19	8.00	6.30	3	9	9.8	—	1	—	—	0343142	—	—
12	0.75	89	22	9.00	7.10	3	10	11.3	—	1	—	—	0343166	—	—
12	1.00	89	22	9.00	7.10	3	10	11	—	1	0157114	0152515	0096154	0155523	—
12	1.25	89	22	9.00	7.10	3	10	10.8	—	1	0157121	0152522	0096116	0096123	0157138
12	1.50	89	22	9.00	7.10	3	10	10.5	—	1	0157145	0096130	0096147	0155516	0157152
13	1.50	89	22	9.00	7.10	3	10	11.5	—	1	—	—	0343173	—	—
14	1.00	95	24	11.20	9.00	4	12	13	—	1	0156810	0152539	0096185	0155509	—
14	1.25	95	24	11.20	9.00	4	12	12.8	—	1	0156827	0152546	0096161	—	0156834
14	1.50	95	24	11.20	9.00	4	12	12.5	—	1	0156841	0152553	0096178	0155486	0156858
15	1.50	95	24	11.20	9.00	4	12	13.5	—	1	—	0096192	0096208	—	—
16	1.00	102	24	12.50	10.00	4	13	15	—	1	0156865	0152560	0096246	0096253	—
16	1.25	102	24	12.50	10.00	4	13	14.8	—	1	—	—	0343203	—	—
16	1.50	102	24	12.50	10.00	4	13	14.5	—	1	0156872	0152577	0096222	0096239	0156889

# HAND TAPS

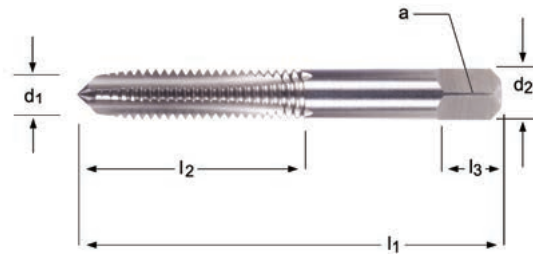


Nominal d <sub>1</sub>	Pitch MF	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> Ø mm	□ a mm	# of Flutes	l <sub>3</sub> mm	 mm	l <sub>4</sub> mm	Pack Qty	Taper	Plug	Semi - Bottoming	2 Pc Sets	3 Pc Sets
18	1.00	112	29	14.00	11.20	4	14	17		1	0156896	0096277	0096284	0096291	—
18	1.50	112	29	14.00	11.20	4	14	16.5		1	0156902	0152584	0096260	0155479	0156919
18	2.00	112	29	14.00	11.20	4	14	16		1	0156926	0096307	0096314	0096321	—
20	1.00	112	29	14.00	11.20	4	14	19		1	0156933	0096345	0096352	0096369	—
20	1.50	112	29	14.00	11.20	4	14	18.5		1	0156940	0152591	0096338	0155462	0156957
20	2.00	112	29	14.00	11.20	4	14	18		1	0156964	0096376	0096383	0155455	—
22	1.00	118	29	16.00	12.50	4	16	21		1	—	0096406	0096413	0155448	—
22	1.50	118	29	16.00	12.50	4	16	20.5		1	0156971	0152607	0096390	0155431	—
22	2.00	118	29	16.00	12.50	4	16	20		1	0156988	0096420	0096437	0096444	—
24	1.00	130	35	18.00	14.00	4	18	23		1	—	0096475	0096482	—	—
24	1.50	130	35	18.00	14.00	4	18	22.5		1	0156995	0152614	0096451	0096468	—
24	2.00	130	35	18.00	14.00	4	18	22		1	0157008	0096499	0096505	0155745	—
25	1.50	130	35	18.00	14.00	4	18	23.5		1	0157015	0152621	0096512	0150740	0157022
26	1.50	130	35	18.00	14.00	4	18	24.5		1	—	0096529	0096536	—	—
27	1.50	135	35	20.00	16.00	4	20	25.5		1	—	0155738	0123010	—	—
27	2.00	135	35	20.00	16.00	4	20	25		1	—	—	0123041	—	—
28	1.50	138	35	20.00	16.00	4	20	26.5		1	—	0096543	0096550	—	—
30	1.50	138	41	20.00	16.00	4	20	28.5		1	—	0096574	0096581	—	—
30	2.00	138	41	20.00	16.00	4	20	28		1	—	0155721	0123003	—	—
32	1.50	151	41	22.40	18.00	4	22	30.5		1	0157039	0155578	0096598	—	—
33	2.00	151	41	22.40	18.00	4	22	31		1	—	0096604	0096611	—	—
35	1.50	162	47	25.00	20.00	4	24	33.5		1	—	0096628	0096635	—	—
36	1.50	162	47	25.00	20.00	4	24	34.5		1	—	—	0343302	—	—
36	2.00	162	47	25.00	20.00	4	24	34		1	—	0152638	0096642	—	—
36	3.00	162	47	25.00	20.00	4	24	33		1	—	0096659	0096666	—	—
39	3.00	170	47	28.00	22.40	4	26	36		1	—	0152645	0096673	—	—
40	1.50	170	53	28.00	22.40	6	26	38.5		1	—	0155691	0096697	—	—
42	1.50	170	53	28.00	22.40	6	26	40.5		1	—	0155684	0096703	—	—
42	3.00	170	53	28.00	22.40	6	26	39		1	—	—	0343319	—	—
45	1.50	187	54	31.50	25.00	6	28	43.5		1	—	0155677	0096710	—	—
48	1.50	187	60	31.50	25.00	6	28	46.5		1	—	—	0343333	—	—
48	2.00	187	60	31.50	25.00	6	28	46		1	—	—	0343340	—	—
48	3.00	187	60	31.50	25.00	6	28	45		1	—	—	0343357	—	—
50	1.50	187	60	31.50	25.00	6	28	48.5		1	—	0155660	0096758	—	—

Note: ISO shank and square dimensions will necessitate metric holders

## General Purpose, Left Hand

**1500L** Left Hand. Similar in design to the standard 1500 series but finished with left hand threads, which when viewed axially, wind in a counter-clockwise and receding direction. Available in plug chamfer. For through or blind hole applications.



**1500L**

UNC
UNF
UNS

ANSI

3B

HSS

1/4 - 1"

			$l_1$	$l_2$	$d_2$	$\square$	$l_3$				Pack Qty	1500L	
UNC	UNF	UNS	TPI	Inch	Inch	Inch	Inch	Inch	# of Flutes	Limits	Chamfer		
	1/4		28	2.1/2	1"	0.2550	0.1910	5/16	4	H3	Plug	1	1011775
1/4			20	2.1/2	1"	0.2550	0.1910	5/16	4	H3	Plug	1	1011772
	5/16		24	2.23/32	1.1/8	0.3180	0.2380	3/8	4	H3	Plug	1	1011781
5/16			18	2.23/32	1.1/8	0.3180	0.2380	3/8	4	H3	Plug	1	1011778
	3/8		24	2.15/16	1.1/4	0.3810	0.2860	7/16	4	H3	Plug	1	1011787
3/8			16	2.15/16	1.1/4	0.3810	0.2860	7/16	4	H3	Plug	1	1011784
	7/16		20	3.5/32	1.7/16	0.3230	0.2420	13/32	4	H3	Plug	1	1011793
7/16			14	3.5/32	1.7/16	0.3230	0.2420	13/32	4	H3	Plug	1	1011790
	1/2		20	3.3/8	1.21/32	0.3670	0.2750	7/16	4	H3	Plug	1	1011799
1/2			13	3.3/8	1.21/32	0.3670	0.2750	7/16	4	H3	Plug	1	1011796
	9/16		18	3.19/32	1.21/32	0.4290	0.3220	1/2	4	H3	Plug	1	1011805
9/16			12	3.19/32	1.21/32	0.4290	0.3220	1/2	4	H3	Plug	1	1011802
	5/8		18	3.13/16	1.13/16	0.4800	0.3600	9/16	4	H3	Plug	1	1011811
5/8			11	3.13/16	1.13/16	0.4800	0.3600	9/16	4	H3	Plug	1	1011808
	3/4		16	4.1/4	2"	0.5900	0.4420	11/16	4	H3	Plug	1	1011823
3/4			10	4.1/4	2"	0.5900	0.4420	11/16	4	H3	Plug	1	1011820
	7/8		14	4.11/16	2.7/32	0.6970	0.5230	3/4	4	H4	Plug	1	1011829
7/8			9	4.11/16	2.7/32	0.6970	0.5230	3/4	4	H4	Plug	1	1011826
	1"		14	5.1/8	2.1/2	0.8000	0.6000	13/16	4	H4	Plug	1	1011838
1"			12	5.1/8	2.1/2	0.8000	0.6000	13/16	4	H4	Plug	1	1011835
	1"		8	5.1/8	2.1/2	0.8000	0.6000	13/16	4	H4	Plug	1	1011832

# HAND TAPS



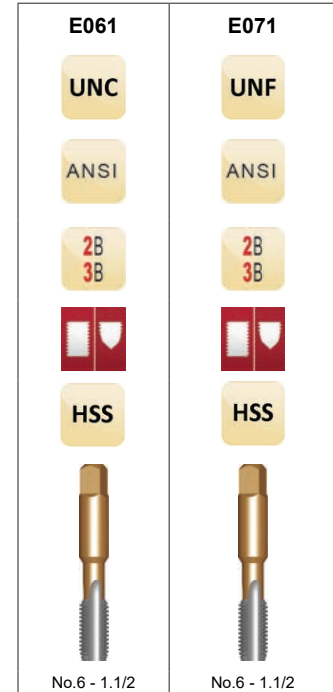
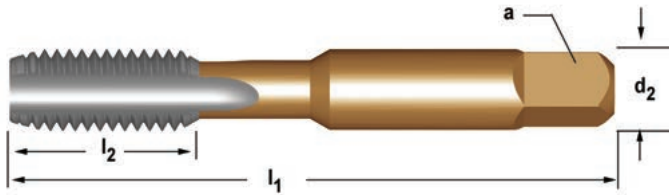
## General Purpose

**E061** The most versatile taps for hand use or machine tapping in a wide variety of materials in through or blind hole applications.  
**E071** Available in 3 chamfer lengths - taper, plug, and semi-bottoming.

Taper - 7-10 pitch chamfer length  
 Plug - 3-5 pitch chamfer length  
 Semi-Bottoming - 1-2 pitch chamfer length

Premium substrate with bronze oxide body and shank reduces rust and corrosion. Bright finish flutes improve chip flow in soft or non-ferrous materials.

*E061 = UNC Sizes, E071 = UNF Sizes*



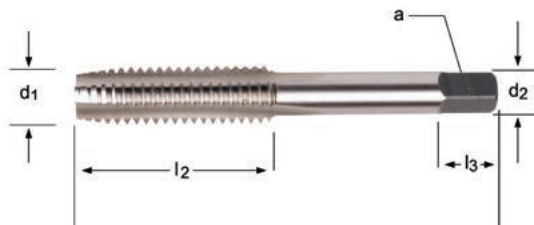
Nominal d <sub>1</sub>	TP UNC UNF	TPI UNC UNF	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch /	a Inch	# of Flutes	Limits	Flute		l <sub>4</sub> Inch	Pack Qty	Taper	Plug	Semi - Bottoming	Sets
									↔	↔						
6	32	2"	0.5800	0.1410	0.1100	3	H3	36	2.85	0.5800	1	0348291	0348307	0348314	0348321	
6	40	2"	0.5800	0.1410	0.1100	3	H2	33	2.90	0.5800	1	0349427	0349434	0349441	0349458	
8	32	2.1/8	0.6500	0.1680	0.1310	4	H3	29	3.50	0.6500	1	0348284	0348338	0348345	0348352	
8	36	2.1/8	0.6500	0.1680	0.1310	4	H2	29	3.50	0.6500	1	0349465	0349472	0349489	0349496	
10	24	2.3/8	0.7600	0.1940	0.1520	4	H3	25	3.90	0.7600	1	0348369	0348376	0348383	0348390	
10	32	2.3/8	0.7600	0.1940	0.1520	4	H3	21	4.10	0.7600	1	0349502	0349519	0349526	0349533	
12	24	2.3/8	0.8100	0.2200	0.1650	4	H3	16	4.50	0.8100	1	0348406	0348413	0348420	0348437	
12	28	2.3/8	0.8100	0.2200	0.1650	4	H3	15	4.70	0.8100	1	0349540	0349557	0349564	0349571	
1/4	20	2.1/2	0.6500	0.2550	0.1910	4	H3	7	5.10	1.0630	1	0348444	0348451	0348468	0348475	
1/4	28	2.1/2	0.6500	0.2550	0.1910	4	H3	3	5.50	1.0630	1	0349588	0349595	0349601	0349618	
5/16	18	2.23/32	0.7700	0.3180	0.2380	4	H3	F	6.60	1.2598	1	0348482	0348499	0348505	0348512	
5/16	24	2.23/32	0.7700	0.3180	0.2380	4	H3	I	6.90	1.2598	1	0349625	0349632	0349649	0349656	
3/8	16	2.15/16	0.8100	0.3810	0.2860	4	H3	5/16	8.00	1.3780	1	0348529	0348536	0348543	0348550	
3/8	24	2.15/16	0.8100	0.3810	0.2860	4	H3	Q	8.50	1.3780	1	0349663	0349670	0349687	0349694	
7/16	14	3.5/32	0.9055	0.3230	0.2420	4	H3	U	9.40		1	0348567	0348574	0348581	0348598	
7/16	20	3.5/32	0.9055	0.3230	0.2420	4	H3	25/64	9.90		1	0349700	0349717	0349724	0349731	
1/2	13	3.3/8	0.9055	0.3670	0.2750	4	H3	27/64	10.80		1	0348604	0348611	0348628	0348635	
1/2	20	3.3/8	0.9055	0.3670	0.2750	4	H3	29/64	11.50		1	0349748	0349755	0349762	0349779	
9/16	12	3.19/32	0.9843	0.4290	0.3220	4	H3	27/64	12.20		1	0351833	0348642	0348659	0348666	
9/16	18	3.19/32	0.9843	0.4290	0.3220	4	H3	33/64	12.90		1	0349786	0349793	0349809	0349816	
5/8	11	3.13/16	0.9843	0.4800	0.3600	4	H3	17/32	13.50		1	0348673	0348680	0348697	0348703	
5/8	18	3.13/16	0.9843	0.4800	0.3600	4	H3	37/64	14.50		1	0349823	0349830	0349847	0349854	
3/4	10	4.1/4	1.1811	0.5900	0.4420	4	H3	21/32	16.50		1	0348710	0348727	0348734	0348741	
3/4	16	4.1/4	1.1811	0.5900	0.4420	4	H3	11/16	17.50		1	0349861	0349878	0349885	0351932	
7/8	9	4.11/16	1.1811	0.6970	0.5230	4	H4	49/64	19.50		1	0348758	0348765	0348772	0348789	
7/8	14	4.11/16	1.1811	0.6970	0.5230	4	H4	13/16	20.40		1	0349892	0349908	0349915	0349922	
1"	8	5.1/8	1.4173	0.8000	0.6000	4	H4	7/8	22.25		1	0348796	<sup>1)</sup> 0348802	<sup>1)</sup> 0348819	<sup>1)</sup> 0348826	
1"	12	5.1/8	1.4173	0.8000	0.6000	4	H4	59/64	23.25		1	0349939	<sup>1)</sup> 0349946	<sup>1)</sup> 0349953	<sup>1)</sup> 0349960	
1"	14	5.1/8	1.4173	0.8000	0.6000	4	H4	59/64	23.25		1	0349977	<sup>1)</sup> 0349984	<sup>1)</sup> 0349991	<sup>1)</sup> 0350003	
1.1/8	7	5.7/16	1.3976	0.8950	0.6710	4	H4	63/64	25.00		1	0388112	<sup>1)</sup> 0388129	<sup>1)</sup> 0388136	<sup>1)</sup> 0259719	
1.1/8	12	5.7/16	1.3976	0.8950	0.6710	4	H4	1.3/64	26.50		1	0388235	<sup>1)</sup> 0388242	<sup>1)</sup> 0388259	<sup>1)</sup> —	
1.1/4	7	5.3/4	1.6338	1.0210	0.7650	4	H4	1.7/64	28.00		1	0388143	<sup>1)</sup> 0388150	<sup>1)</sup> 0388167	<sup>1)</sup> 0259702	
1.1/4	12	5.3/4	1.6338	1.0210	0.7650	6	H4	1.5/32	29.50		1	0388266	<sup>1)</sup> 0388273	<sup>1)</sup> 0388280	<sup>1)</sup> —	
1.3/8	6	6.1/16	1.8700	1.1090	0.8300	4	H4	1.7/32	30.75		1	0388174	<sup>1)</sup> 0388181	<sup>1)</sup> 0388198	<sup>1)</sup> —	
1.3/8	12	6.1/16	1.8700	1.1090	0.8300	6	H4	1.9/32	32.75		1	0388297	<sup>1)</sup> 0388303	<sup>1)</sup> 0388310	<sup>1)</sup> —	
1.1/2	6	6.3/8	1.8700	1.2330	0.9520	4	H4	1.11/32	34.00		1	0388204	<sup>1)</sup> 0388211	<sup>1)</sup> 0388228	<sup>1)</sup> 0259696	
1.1/2	12	6.3/8	1.8700	1.2330	0.9520	6	H4	1.27/64	36.00		1	0388327	<sup>1)</sup> 0388334	<sup>1)</sup> 0388341	<sup>1)</sup> —	

## General Purpose, Optional Flutes

**1508** - *Optional 3 Flute*

**1595** - *Optional 2 Flute*

Fewer flutes than standard, providing more space for chip evacuation and particularly when tapping holes greater than 1.5 tap diameters in depth. For through or blind hole applications.



1508 (UNC)	1508 (UNF)	1595
UNC	UNF	UNF UNC
ANSI	ANSI	ANSI
3B	2B 3B	3B
HSS	HSS	HSS
1/4 - 1/2	1/4 - 5/16	1/4 - 5/16

		$l_1$	$l_2$	$d_2$	$\square$	$l_3$	# of		Pack	1508(UNC)	1508(UNF)	1595
UNC	UNF TPI	Inch	Inch	Inch	Inch	Inch	Flutes	Limits	Qty			
	1/4 28	2.1/2	1"	0.2550	0.1910	5/16	3	H3	1	—	1010223	—
	1/4 28	2.1/2	1"	0.2550	0.1910	5/16	2	H3	1	—	—	1010208
1/4	20	2.1/2	1"	0.2550	0.1910	5/16	3	H3	1	1010216	—	—
1/4	20	2.1/2	1"	0.2550	0.1910	5/16	2	H3	1	—	—	1010206
	1/4 28	2.1/2	1"	0.2550	0.1910	5/16	3	H3	1	—	—	—
	1/4 28	2.1/2	1"	0.2550	0.1910	5/16	2	H3	1	—	—	1010209
1/4	20	2.1/2	1"	0.2550	0.1910	5/16	3	H3	1	1010219	—	—
1/4	20	2.1/2	1"	0.2550	0.1910	5/16	2	H3	1	—	—	1010207
	5/16 24	2.23/32	1.1/8	0.3180	0.2380	3/8	3	H3	1	—	1010236	—
	5/16 18	2.23/32	1.1/8	0.3180	0.2380	3/8	3	H3	1	1010230	—	—
5/16	18	2.23/32	1.1/8	0.3180	0.2380	3/8	2	H3	1	—	—	1010210
	5/16 24	2.23/32	1.1/8	0.3180	0.2380	3/8	3	H3	1	—	1010237	—
5/16	18	2.23/32	1.1/8	0.3180	0.2380	3/8	3	H3	1	1010233	—	—
5/16	18	2.23/32	1.1/8	0.3180	0.2380	3/8	2	H3	1	—	—	1010211
	3/8 24	2.15/16	1.1/4	0.3810	0.2860	7/16	3	H3	1	—	1010246	—
3/8	16	2.15/16	1.1/4	0.3810	0.2860	7/16	3	H3	1	1010240	—	—
	3/8 24	2.15/16	1.1/4	0.3810	0.2860	7/16	3	H3	1	—	1010247	—
3/8	16	2.15/16	1.1/4	0.3810	0.2860	7/16	3	H3	1	1010243	—	—
	7/16 20	3.5/32	1.7/16	0.3230	0.2420	13/32	3	H3	1	—	1010250	—
7/16	14	3.5/32	1.7/16	0.3230	0.2420	13/32	3	H3	1	1010248	—	—
	1/2 20	3.3/8	1.21/32	0.3670	0.2750	7/16	3	H3	1	—	1010254	—
1/2	13	3.3/8	1.21/32	0.3670	0.2750	7/16	3	H3	1	1010252	—	—
1/2	13	3.3/8	1.21/32	0.3670	0.2750	7/16	3	H3	1	1010253	—	—

# HAND TAPS



## General Purpose

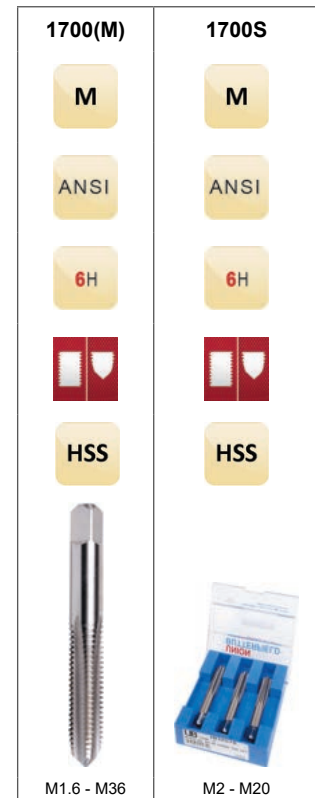
**1700(M)** The most versatile taps for hand use or machine tapping in a wide variety of materials in through or blind hole applications. Available in 3 chamfer lengths - taper, plug, and bottoming.

Taper - 7-10 pitch chamfer length

Plug - 3-5 pitch chamfer length

Bottoming - 1-2 pitch chamfer length

**1700S** Sets include 1 of each tap (Taper, Plug, and Bottoming).

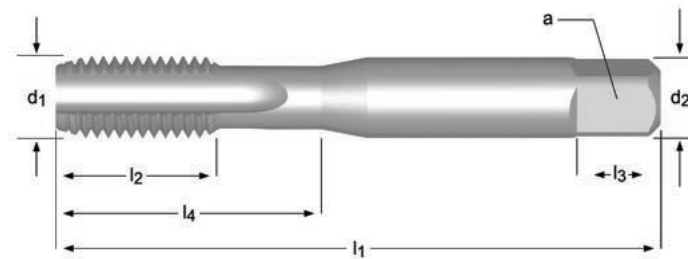


Nominal d <sub>1</sub>	Pitch M	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch /	l <sub>3</sub> Inch	∠ a Inch	# of Flutes	Limits	Pack Qty	Taper	Plug	Bottoming	Sets
M1.6	0.35	1.5/8	5/16	0.1410	3/16	0.1100	2	D3	1	1012408	1012409	1012410	—
M1.8	0.35	1.11/16	3/8	0.1410	3/16	0.1100	2	D3	1	1012411	1012412	—	—
M2	0.40	1.3/4	7/16	0.1410	3/16	0.1100	3	D3	1	1012414	1012415	1012416	1012558
M2.3	0.40	1.3/4	7/16	0.1410	3/16	0.1100	3	D3	1	—	1012421	1012422	—
M2.5	0.45	1.13/16	1/2	0.1410	3/16	0.1100	3	D3	1	1012423	1012424	1012425	1012560
M2.6	0.45	1.13/16	1/2	0.1410	3/16	0.1100	3	D3	1	1012426	1012427	—	—
M3	0.50	1.15/16	5/8	0.1410	3/16	0.1100	3	D3	1	1012432	1012433	1012434	1012561
M3.5	0.60	2"	11/16	0.1410	3/16	0.1100	3	D4	1	1012435	1012436	1012437	1012562
M4	0.70	2.1/8	3/4	0.1680	1/4	0.1310	4	D4	1	1012441	1012442	1012443	1012563
M4.5	0.75	2.3/8	7/8	0.1940	1/4	0.1520	4	D4	1	1012444	1012445	—	—
M5	0.80	2.3/8	7/8	0.1940	1/4	0.1520	4	D4	1	1012453	1012454	1012455	1012564
M6	1.00	2.1/2	1"	0.2550	5/16	0.1910	4	D5	1	1012459	1012460	1012461	1012565
M7	1.00	2.23/32	1.1/8	0.3180	3/8	0.2380	4	D5	1	1012465	1012466	1012467	1012576
M8	1.00	2.23/32	1.1/8	0.3180	3/8	0.2380	4	D5	1	1012468	1012469	1012470	1012577
M8	1.25	2.23/32	1.1/8	0.3180	3/8	0.2380	4	D5	1	1012471	1012472	1012473	1012566
M9	1.25	2.15/16	1.1/4	0.3810	7/16	0.2860	4	D5	1	—	1012478	1012479	—
M10	1.25	2.15/16	1.1/4	0.3810	7/16	0.2860	4	D5	1	1012480	1012481	1012482	1012578
M10	1.50	2.15/16	1.1/4	0.3810	7/16	0.2860	4	D6	1	1012483	1012484	1012485	1012567
M11	1.50	3.5/32	1.7/16	0.3230	13/32	0.2420	4	D6	1	—	1012493	1012494	—
M12	1.25	3.3/8	1.21/32	0.3670	7/16	0.2750	4	D5	1	1012498	1012499	1012500	1012579
M12	1.75	3.3/8	1.21/32	0.3670	7/16	0.2750	4	D6	1	1012495	1012496	1012497	1012568
M14	1.50	3.19/32	1.21/32	0.4290	1/2	0.3220	4	D6	1	1012501	1012502	1012503	—
M14	2.00	3.19/32	1.21/32	0.4290	1/2	0.3220	4	D7	1	1012504	1012505	1012506	1012580
M16	1.50	3.13/16	1.13/16	0.4800	9/16	0.3600	4	D6	1	1012513	1012514	1012515	—
M16	2.00	3.13/16	1.13/16	0.4800	9/16	0.3600	4	D7	1	1012516	1012517	1012518	1012581
M18	1.50	4.1/32	1.13/16	0.5420	5/8	0.4060	4	D6	1	1012522	1012523	1012524	—
M18	2.50	4.1/32	1.13/16	0.5420	5/8	0.4060	4	D7	1	1012525	1012526	1012527	1012582
M20	1.50	4.15/32	2"	0.6520	11/16	0.4890	4	D6	1	1012534	1012535	1012536	—
M20	2.50	4.15/32	2"	0.6520	11/16	0.4890	4	D7	1	1012537	1012538	1012539	1012583
M22	1.50	4.11/16	2.7/32	0.6970	3/4	0.5230	4	D6	1	1012540	1012541	1012542	—
M22	2.50	4.11/16	2.7/32	0.6970	3/4	0.5230	4	D7	1	1012543	1012544	1012545	—
M24	2.00	4.29/32	2.7/32	0.7600	3/4	0.5700	4	D7	1	1012546	1012547	1012548	—
M24	3.00	4.29/32	2.7/32	0.7600	3/4	0.5700	4	D8	1	1012555	1012556	1012557	—
M30	3.50	5.7/16	2.9/16	1.0210	1"	0.7660	4	D9	1	1012570	1012571	1012572	—
M36	4.00	6.1/16	3"	1.2330	1.1/8	0.9250	4	D9	1	—	1012574	1012575	—

## General Purpose, Left Hand

### E501

Left Hand. Similar in design to the standard E500 series but finished with left hand threads, which when viewed axially, wind in a counter-clockwise and receding direction. Available in taper, plug, and semi-bottoming chamfer. For through or blind hole applications.



E501

M

ISO  
529

6H



HSS



M3 - M24

Nominal $d_1$	Pitch M	$l_1$ mm	$l_2$ mm	$d_2$ Ø mm	$a$ mm	$l_3$ mm	# of Flutes	$l_4$ mm	Limits	Pack Qty	Taper	Plug	Semi - Bottoming	
3	0.50	48	12.5	3.15	2.50	5	3	2.5	12.5	D3	1	0159828	0095058	0095065
4	0.70	53	14	4.00	3.15	6	3	3.3	14	D4	1	0159835	0095072	0095089
5	0.80	58	11	5.00	4.00	7	3	4.2	22	D4	1	—	0095096	0095102
6	1.00	66	13	6.30	5.00	8	3	5	26	D5	1	0159859	0095119	0095126
8	1.25	72	16	8.00	6.30	9	3	6.8	29	D5	1	0159866	0095133	0095140
10	1.50	80	18	10.00	8.00	11	3	8.5	34	D6	1	0159873	0094938	0094945
12	1.75	89	22	9.00	7.10	10	3	10.3		D6	1	0159880	0094952	0094969
14	2.00	95	24	11.20	9.00	12	4	12		D7	1	0159897	0094976	0094983
16	2.00	102	24	12.50	10.00	13	4	14		D7	1	0159903	0094990	0095003
18	2.50	112	29	14.00	11.20	14	4	15.5		D7	1	—	—	0095010
20	2.50	112	29	14.00	11.20	14	4	17.5		D7	1	0159910	0095027	0095034
22	2.50	118	29	16.00	12.50	16	4	19.5		D7	1	—	—	0122495
24	3.00	130	35	18.00	14.00	18	4	21		D8	1	—	0152447	0095041

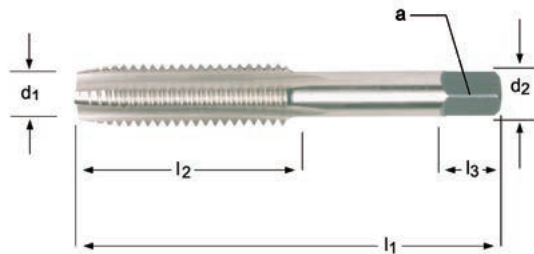
Note: ISO shank and square dimensions will necessitate metric holders

# HAND TAPS

## General Purpose, Oversize

### 1500OV(UNC)

0.005" oversize. Similar in design to the standard 1500 series, but with a pitch diameter which is 0.0050" to 0.0055" larger than the basic pitch diameter. Used primarily where a part will be plated or treated after tapping. Available as a standard with a plug chamfer. Oversize P.D. limits are equivalent to H11. For through or blind hole applications.



1500OV(UNC)

UNC

ANSI



HSS



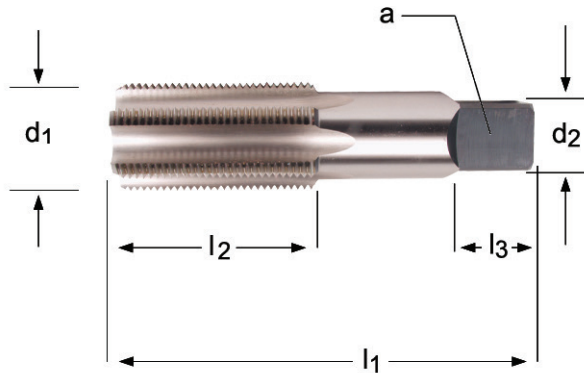
1/4 - 5/8

UNC	TPI	$l_1$ Inch	$l_2$ Inch	$d_2$ Ø Inch	$\square$ a Inch	$l_3$ Inch	# of Flutes	Limits	Chamfer	Pack Qty	1500OV(UNC)
1/4	20	2.1/2	1.000	0.2550	0.1910	5/16	4	H11	Plug	1	1011748
5/16	18	2.23/32	1.1/8	0.3180	0.2380	3/8	4	H11	Plug	1	1011749
3/8	16	2.15/16	1.1/4	0.3810	0.2860	7/16	4	H11	Plug	1	1011750
1/2	13	3.3/8	1.21/32	0.3670	0.2750	7/16	4	H11	Plug	1	1011752
5/8	11	3.13/16	1.13/16	0.4800	0.3600	9/16	4	H11	Plug	1	1011753



## General Purpose, 8-Pitch

**1505** Proven performers for manufacturers of oil field equipment, large valves, electric utilities, power generation machinery, and general construction. For through or blind hole applications.



1505(UNS)

UNS

ANSI

2B



HSS



1.1/8 - 2"

Nominal $d_1$	TPI UNS	$l_1$ Inch	$l_2$ Inch	$d_2$ $\varnothing$ Inch /	$\square$ a Inch	$l_3$ Inch	# of Flutes	Limits	Pack Qty	Taper	Plug	Bottoming
1.1/8	8	5.7/16	2.9/16	0.8960	0.6720	7/8	4	H5	1	1013310	1013311	1013312
1.1/4	8	5.3/4	2.9/16	1.0210	0.7660	1"	4	H5	1	1013313	1013314	1013315
1.3/8	8	6.1/16	3"	1.1080	0.8310	1.1/16	4	H5	1	1013316	1013317	1013318
1.1/2	8	6.3/8	3"	1.2330	0.9250	1.1/8	6	H5	1	1013319	1013320	1013321
1.5/8	8	6.11/16	3.3/16	1.3050	0.9780	1.1/8	6	H6	1	1013322	1013323	1013324
1.3/4	8	7"	3.3/16	1.4300	1.0720	1.1/4	6	H6	1	1013325	1013326	1013327
1.7/8	8	7.5/16	3.9/16	1.5190	1.1390	1.1/4	6	H6	1	1013328	1013329	1013330
2"	8	7.5/8	3.9/16	1.6440	1.2330	1.3/8	6	H6	1	1013331	1013332	1013333

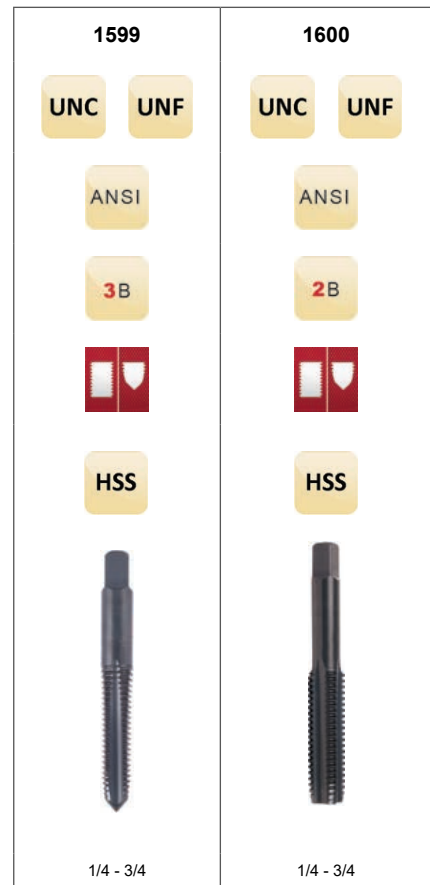
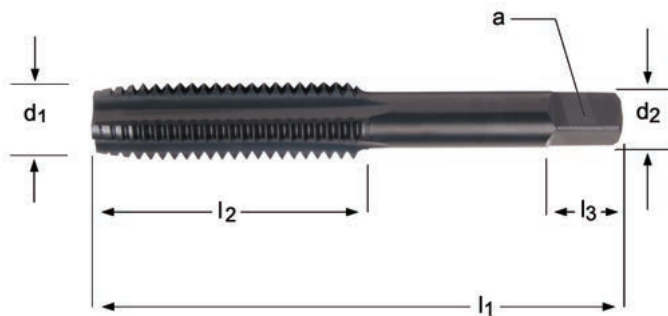
# HAND TAPS

## For Cast Iron

**1599** Designed for through or blind hole tapping with a specific cutting geometry for gray cast irons and those materials producing broken, powdery chips. Also ideal for non-metallics, cast brass, and other brass materials producing broken powdery chips. Nitride and steam oxide coating reduces wear and chip welding in abrasive materials. For through or blind hole applications.

**1600**

1599 - H3  
1600 - H5

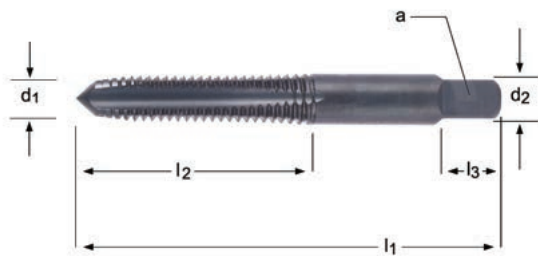


Nominal d <sub>1</sub>	TPI UNC	TPI UNF	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch /	□ a Inch	l <sub>3</sub> Inch	# of Flutes	Limits	Pack Qty	1599 Plug	1599 Bottoming	1600 Plug	1600 Bottoming
1/4	20		2.1/2	1"	0.2550	0.1910	5/16	4	H3	1	1010256	1010257	—	—
1/4	20		2.1/2	1"	0.2550	0.1910	5/16	4	H5	1	—	—	1011256	1011257
1/4		28	2.1/2	1"	0.2550	0.1910	5/16	4	H5	1	—	—	1011258	1011259
5/16	18		2.23/32	1.1/8	0.3180	0.2380	3/8	4	H3	1	1010260	1010261	—	—
5/16	18		2.23/32	1.1/8	0.3180	0.2380	3/8	4	H5	1	—	—	—	1011261
5/16		24	2.23/32	1.1/8	0.3180	0.2380	3/8	4	H3	1	—	1010263	—	—
5/16		24	2.23/32	1.1/8	0.3180	0.2380	3/8	4	H5	1	—	—	1011262	1011263
3/8	16		2.15/16	1.1/4	0.3810	0.2860	7/16	4	H3	1	1010264	1010265	—	—
3/8	16		2.15/16	1.1/4	0.3810	0.2860	7/16	4	H5	1	—	—	1011264	1011265
3/8		24	2.15/16	1.1/4	0.3810	0.2860	7/16	4	H3	1	1010266	1010267	—	—
3/8		24	2.15/16	1.1/4	0.3810	0.2860	7/16	4	H5	1	—	—	1011266	1011267
7/16	14		3.5/32	1.7/16	0.3230	0.2420	13/32	4	H5	1	—	—	1011268	1011269
7/16		20	3.5/32	1.7/16	0.3230	0.2420	13/32	4	H3	1	—	1010271	—	—
7/16		20	3.5/32	1.7/16	0.3230	0.2420	13/32	4	H5	1	—	—	1011270	1011271
1/2	13		3.3/8	1.21/32	0.3670	0.2750	7/16	4	H3	1	1010272	1010273	—	—
1/2	13		3.3/8	1.21/32	0.3670	0.2750	7/16	4	H5	1	—	—	—	1011273
1/2		20	3.3/8	1.21/32	0.3670	0.2750	7/16	4	H3	1	1010274	1010275	—	—
1/2		20	3.3/8	1.21/32	0.3670	0.2750	7/16	4	H5	1	—	—	1011274	1011275
9/16	12		3.19/32	1.21/32	0.4290	0.3220	1/2	4	H5	1	—	—	1011276	1011277
9/16		18	3.19/32	1.21/32	0.4290	0.3220	1/2	4	H3	1	—	1010279	—	—
9/16		18	3.19/32	1.21/32	0.4290	0.3220	1/2	4	H5	1	—	—	—	1011279
5/8	11		3.13/16	1.13/16	0.4800	0.3600	9/16	4	H3	1	1010280	1010281	—	—
5/8	11		3.13/16	1.13/16	0.4800	0.3600	9/16	4	H5	1	—	—	1011280	1011281
3/4	10		4.1/4	2"	0.5900	0.4420	11/16	4	H3	1	—	1010285	—	—
3/4	10		4.1/4	2"	0.5900	0.4420	11/16	4	H5	1	—	—	—	1011285
3/4		16	4.1/4	2"	0.5900	0.4420	11/16	4	H3	1	1010286	1010287	—	—
3/4		16	4.1/4	2"	0.5900	0.4420	11/16	4	H5	1	—	—	—	1011287

## For Cast Iron

**1599(M)**      Designed for through or blind hole tapping with a specific cutting geometry for gray cast irons and those materials producing broken chips. Also ideal for non-metallics, cast brass, and other brass materials producing broken powdery chips. Nitride and steam oxide coating reduces wear and chip welding in abrasive materials. For through or blind hole applications.

**1599SB(M)**



1599(M)	1599SB(M)
M	M
ANSI	ANSI
6H	6H
HSS	HSS
M6 - M14	M6 - M12

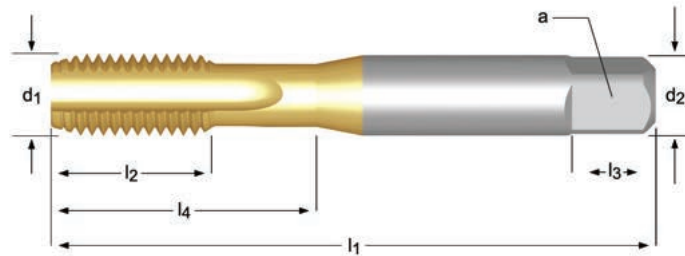
Nominal d <sub>1</sub>	Pitch M	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch /	□ a Inch	l <sub>3</sub> Inch	# of Flutes	Limits	Pack Qty	1599M Plug	1599M Bottoming	1599SB Semi- Bottoming
M6	1.00	2.1/2	1"	0.2550	0.1910	5/16	4	D5	1	1012256	1012266	1012276
M8	1.25	2.23/32	1.1/8	0.3180	0.2380	3/8	4	D5	1	1012258	1012268	1012278
M10	1.50	2.15/16	1.1/4	0.3810	0.2860	7/16	4	D6	1	1012260	1012270	1012280
M12	1.75	3.3/8	1.21/32	0.3670	0.2750	7/16	4	D6	1	1012262	1012272	1012282
M14	1.25	3.19/32	1.21/32	0.4290	0.3220	1/2	4	D4	1	1010288	—	—

# HAND TAPS



## For Cast Iron, Semi-Bottoming

**E504** Designed for through or blind hole tapping with a specific cutting geometry for gray cast irons and those materials producing broken chips. Also ideal for non-metallics, cast brass, and other brass materials producing broken powdery chips. TiN coating increases the surface hardness and improves tool life.



E504

M

ISO  
529


6H



HSS



M3 - M24

M	P mm	$l_1$ mm	$l_2$ mm	$d_2$ Ø mm	$a$ mm	$l_3$ mm	# of Flutes		$l_4$ mm	Limits	Pack Qty	E504
3	0.50	48	12.5	3.15	2.50	5	3	2.5	12.5	D3	1	0122563
4	0.70	53	14	4.00	3.15	6	3	3.3	14	D4	1	0122556
5	0.80	58	11	5.00	4.00	7	3	4.2	22	D4	1	0122501
6	1.00	66	13	6.30	5.00	8	3	5	26	D5	1	0122518
8	1.25	72	16	8.00	6.30	9	3	6.8	29	D5	1	0122525
10	1.50	80	18	10.00	8.00	11	3	8.5	34	D6	1	0122532

**Note:** ISO shank and square dimensions will necessitate metric holders

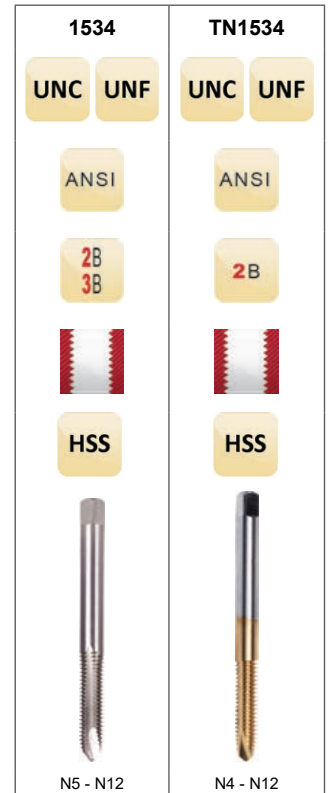
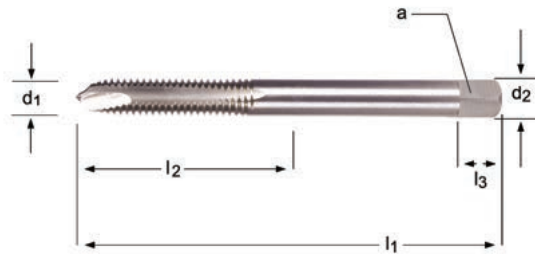
## Relieved Style, Machine Screw Sizes

### 1534 TN1534

Spiral point taps are designed to solve the problem of tap breakage in through hole applications in a variety of materials. The angular flutes in the cutting face propel the chips ahead of the cutting zone, thus reducing loading and clogging in the flutes.

The 1534 style features eccentrically relieved threads with full pitch diameter relief. These taps are extremely free cutting, resulting in longer tool life. The use of rigid tapping equipment is highly recommended with this style of tap.

Bright finish - improves chip flow in soft or non-ferrous materials.  
TiN Coating - increases surface hardness and improves tool life.



UNC		UNF		$l_1$	$l_2$	$d_2$ Ø	$\square$ a	$l_3$	# of Flutes	Limits	Chamfer	Pack Qty	1534	TN1534
4		40	1.7/8	9/16	0.1410	0.1100	3/16	2	H2	Plug		1	—	1060805
	5	44	1.15/16	5/8	0.1410	0.1100	3/16	2	H2	Plug		1	1012358	—
5		40	1.15/16	5/8	0.1410	0.1100	3/16	2	H2	Plug		1	1012356	—
	6	40	2"	11/16	0.1410	0.1100	3/16	2	H2	Bottoming		1	1012357	—
6		32	2"	11/16	0.1410	0.1100	3/16	2	H2	Plug		1	1012366	—
	6	40	2"	11/16	0.1410	0.1100	3/16	2	H1	Plug		1	1012359	—
6		32	2"	11/16	0.1410	0.1100	3/16	2	H2	Plug		1	1012360	—
	6	40	2"	11/16	0.1410	0.1100	3/16	2	H3	Plug		1	1012361	1062361
6		32	2"	11/16	0.1410	0.1100	3/16	2	H2	Bottoming		1	1012367	—
	8	36	2.1/8	3/4	0.1680	0.1310	1/4	2	H2	Bottoming		1	1012363	—
6		32	2"	11/16	0.1410	0.1100	3/16	2	H3	Bottoming		1	1012364	—
8		32	2.1/8	3/4	0.1680	0.1310	1/4	2	H2	Plug		1	1012375	—
	8	32	2.1/8	3/4	0.1680	0.1310	1/4	2	H1	Plug		1	1012375	—
8		32	2.1/8	3/4	0.1680	0.1310	1/4	2	H2	Plug		1	1012368	—
	8	32	2.1/8	3/4	0.1680	0.1310	1/4	2	H3	Plug		1	1012369	—
8		32	2.1/8	3/4	0.1680	0.1310	1/4	2	H2	Plug		1	1012370	1062370
	8	32	2.1/8	3/4	0.1680	0.1310	1/4	2	H3	Bottoming		1	1012372	—
8		32	2.1/8	3/4	0.1680	0.1310	1/4	2	H2	Bottoming		1	1012373	—
	10	32	2.3/8	7/8	0.1940	0.1520	1/4	2	H3	Bottoming		1	1012373	—
	10	32	2.3/8	7/8	0.1940	0.1520	1/4	2	H1	Plug		1	1012381	—
	10	32	2.3/8	7/8	0.1940	0.1520	1/4	2	H2	Plug		1	1012382	—
	10	32	2.3/8	7/8	0.1940	0.1520	1/4	2	H3	Plug		1	1012383	1062383
10		24	2.3/8	7/8	0.1940	0.1520	1/4	2	H2	Plug		1	1012377	—
	10	24	2.3/8	7/8	0.1940	0.1520	1/4	2	H3	Plug		1	1012378	1062378
	10	32	2.3/8	7/8	0.1940	0.1520	1/4	2	H2	Bottoming		1	1012385	—
	10	32	2.3/8	7/8	0.1940	0.1520	1/4	2	H3	Bottoming		1	1012386	—
10		24	2.3/8	7/8	0.1940	0.1520	1/4	2	H2	Bottoming		1	1012379	—
	12	28	2.3/8	15/16	0.2200	0.1650	9/32	2	H3	Bottoming		1	1012380	—
10		24	2.3/8	7/8	0.1940	0.1520	1/4	2	H3	Bottoming		1	1012388	—
	12	28	2.3/8	15/16	0.2200	0.1650	9/32	2	H3	Plug		1	1012388	—
12		24	2.3/8	15/16	0.2200	0.1650	9/32	2	H3	Plug		1	1012389	1062389
	12	24	2.3/8	15/16	0.2200	0.1650	9/32	2	H3	Bottoming		1	1012699	—

# SPIRAL POINT TAPS



## Relieved Style, Fractional Sizes

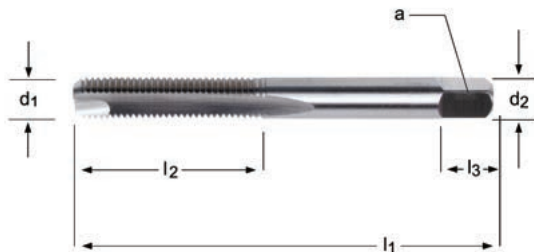
- 1585** Spiral point taps are designed to solve the problem of tap breakage in through hole applications in a variety of materials.
- 1585A** The angular flutes in the cutting face propel the chips ahead of the cutting zone, thus reducing loading and clogging in the flutes.
- TN1585**

The 1585 style features eccentrically relieved threads with full pitch diameter relief. These taps are extremely free cutting, resulting in longer tool life. The use of rigid tapping equipment is highly recommended with this style of tap.

Bright Finish - improves chip flow in soft or non-ferrous materials.

Steam Oxide - reduces wear and prevents chip welding in harder ferrous materials.

TiN Coating - increases surface hardness and improves tool life.



		$l_1$	$l_2$	$d_2$	$l_3$	$\square$				Pack Qty	1585	1585A	TN1585
UNC	UNF	TPI	Inch	Inch	Inch	Inch	# of Flutes	Limits	Chamfer				
1/4	20	2.1/2	1"	0.2550	5/16	0.1910	2	H1	Plug	1	1010290	—	—
1/4	20	2.1/2	1"	0.2550	5/16	0.1910	2	H2	Plug	1	1010291	—	—
1/4	20	2.1/2	1"	0.2550	5/16	0.1910	2	H3	Plug	1	1010292	1050292	1060292
1/4	20	2.1/2	1"	0.2550	5/16	0.1910	3	H3	Plug	1	1010295	—	1060295
1/4	20	2.1/2	1"	0.2550	5/16	0.1910	3	H5	Plug	1	1010296	—	1060296
1/4	20	2.1/2	1"	0.2550	5/16	0.1910	2	H5	Plug	1	1010293	—	1060293
1/4	20	2.1/2	1"	0.2550	5/16	0.1910	2	H3	Bottoming	1	1010294	—	—
1/4	28	2.1/2	1"	0.2550	5/16	0.1910	2	H2	Plug	1	1010298	—	—
1/4	28	2.1/2	1"	0.2550	5/16	0.1910	3	H2	Plug	1	1010302	—	—
1/4	28	2.1/2	1"	0.2550	5/16	0.1910	2	H3	Plug	1	1010299	1050299	1060299
1/4	28	2.1/2	1"	0.2550	5/16	0.1910	2	H4	Plug	1	1010300	—	—
1/4	28	2.1/2	1"	0.2550	5/16	0.1910	3	H4	Plug	1	1010303	—	—
1/4	28	2.1/2	1"	0.2550	5/16	0.1910	2	H3	Bottoming	1	1010301	—	—
5/16	18	2.23/32	1.1/8	0.3180	3/8	0.2380	2	H1	Plug	1	1010304	—	—
5/16	18	2.23/32	1.1/8	0.3180	3/8	0.2380	2	H2	Plug	1	1010305	—	—
5/16	18	2.23/32	1.1/8	0.3180	3/8	0.2380	2	H3	Plug	1	1010306	1050306	1060306
5/16	18	2.23/32	1.1/8	0.3180	3/8	0.2380	3	H3	Plug	1	1010309	—	1060309
5/16	18	2.23/32	1.1/8	0.3180	3/8	0.2380	3	H5	Plug	1	1010310	—	1060310
5/16	18	2.23/32	1.1/8	0.3180	3/8	0.2380	2	H5	Plug	1	1010307	—	—
5/16	18	2.23/32	1.1/8	0.3180	3/8	0.2380	2	H3	Bottoming	1	1010308	—	—
5/16	24	2.23/32	1.1/8	0.3180	3/8	0.2380	3	H2	Plug	1	1010316	—	—
5/16	24	2.23/32	1.1/8	0.3180	3/8	0.2380	2	H3	Plug	1	1010313	1050313	1060313
5/16	24	2.23/32	1.1/8	0.3180	3/8	0.2380	3	H4	Plug	1	1010317	—	—
5/16	24	2.23/32	1.1/8	0.3180	3/8	0.2380	2	H3	Bottoming	1	1010315	—	—
3/8	16	2.15/16	1.1/4	0.3810	7/16	0.2860	3	H1	Plug	1	1010318	—	—
3/8	16	2.15/16	1.1/4	0.3810	7/16	0.2860	3	H3	Plug	1	1010320	1050320	1060320
3/8	16	2.15/16	1.1/4	0.3810	7/16	0.2860	3	H2	Plug	1	1010319	—	—
3/8	16	2.15/16	1.1/4	0.3810	7/16	0.2860	3	H5	Plug	1	1010321	—	1060321
3/8	24	2.15/16	1.1/4	0.3810	7/16	0.2860	3	H3	Plug	1	1010324	1050324	1060324
3/8	24	2.15/16	1.1/4	0.3810	7/16	0.2860	3	H4	Plug	1	1010325	—	—

# SPIRAL POINT TAPS

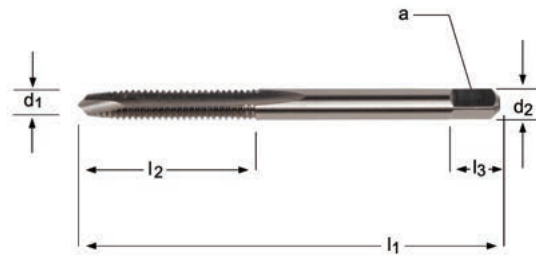
UNC	UNF	TPI	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch	l <sub>3</sub> Inch	□ a Inch	# of Flutes	Limits	Chamfer	Pack Qty	1585	1585A	TN1585
7/16		14	3.5/32	1.7/16	0.3230	13/32	0.2420	3	H2	Plug	1	1010327	—	—
7/16		14	3.5/32	1.7/16	0.3230	13/32	0.2420	3	H3	Plug	1	1010328	1050328	1060328
7/16		14	3.5/32	1.7/16	0.3230	13/32	0.2420	3	H5	Plug	1	1010329	—	—
	7/16	20	3.5/32	1.7/16	0.3230	13/32	0.2420	3	H2	Plug	1	1010331	—	—
	7/16	20	3.5/32	1.7/16	0.3230	13/32	0.2420	3	H3	Plug	1	1010332	1050332	1060332
1/2		13	3.3/8	1.21/32	0.3670	7/16	0.2750	3	H1	Plug	1	1010334	—	—
1/2		13	3.3/8	1.21/32	0.3670	7/16	0.2750	3	H2	Plug	1	1010335	—	—
1/2		13	3.3/8	1.21/32	0.3670	7/16	0.2750	3	H3	Plug	1	1010336	1050336	1060336
1/2		13	3.3/8	1.21/32	0.3670	7/16	0.2750	3	H5	Plug	1	1010337	—	—
	1/2	20	3.3/8	1.21/32	0.3670	7/16	0.2750	3	H1	Plug	1	1010338	—	—
	1/2	20	3.3/8	1.21/32	0.3670	7/16	0.2750	3	H2	Plug	1	1010339	—	—
	1/2	20	3.3/8	1.21/32	0.3670	7/16	0.2750	3	H3	Plug	1	1010340	1050340	1060340
	1/2	20	3.3/8	1.21/32	0.3670	7/16	0.2750	3	H5	Plug	1	1010341	—	—
5/8		11	3.13/16	1.13/16	0.4800	9/16	0.3600	3	H3	Plug	1	1010342	1050342	—
5/8		11	3.13/16	1.13/16	0.4800	9/16	0.3600	3	H5	Plug	1	1010343	—	—
	5/8	18	3.13/16	1.13/16	0.4800	9/16	0.3600	3	H3	Plug	1	1012774	—	—
3/4		10	4.1/2	2"	0.5900	11/16	0.4420	3	H3	Plug	1	—	1050344	—
3/4		10	4.1/4	2"	0.5900	11/16	0.4420	3	H3	Plug	1	1010344	—	—
3/4		10	4.1/4	2"	0.5900	11/16	0.4420	3	H5	Plug	1	1010345	—	—
	3/4	16	4.1/2	2"	0.5900	11/16	0.4420	3	H3	Plug	1	—	1052775	—
	3/4	16	4.1/4	2"	0.5900	11/16	0.4420	3	H3	Plug	1	1012775	—	—

# SPIRAL POINT TAPS

## Relieved Style, Machine Screw Sizes

**1634**

Premium Cobalt substrate. Designed for tough jobs in high temperature alloys, stainless steel, cast iron, abrasive non-ferrous materials and other similar materials. Due to their premium steel content and special design, this range will effectively increase productivity through longer tool life. Ideally suited for through hole tapping.



1634(UNF)

UNC UNF

ANSI

3B

HSS-E

N4 - N10

UNC	UNF	TPI	$l_1$ Inch	$l_2$ Inch	$d_2$ Ø Inch	$\square$ a Inch	$l_3$ Inch	# of Flutes	Limits	Chamfer	Pack Qty	1634
4		40	1.7/8	9/16	0.1410	0.1100	3/16	2	H2	Plug	1	1011102
6		32	2"	11/16	0.1410	0.1100	3/16	2	H2	Plug	1	1011104
8		32	2.1/8	3/4	0.1680	0.1310	1/4	2	H2	Plug	1	1011105
	10	32	2.3/8	7/8	0.1940	0.1520	1/4	2	H2	Plug	1	1011106



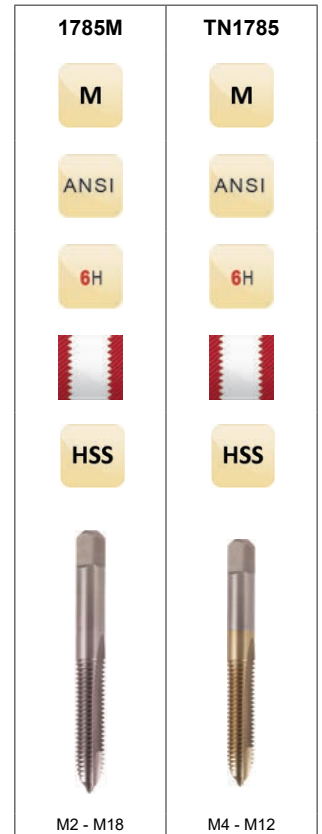
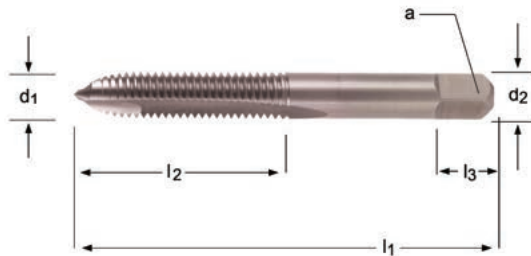
## Relieved Style, Metric

### 1785M TN1785

Spiral point taps are designed to solve the problem of tap breakage in through hole applications in a variety of materials. The angular flutes in the cutting face propel the chips ahead of the cutting zone, thus reducing loading and clogging in the flutes.

The 1785M style features eccentrically relieved threads with full pitch diameter relief. These taps are extremely free cutting, resulting in longer tool life. The use of rigid tapping equipment is highly recommended with this style of tap.

Bright Finish - improves chip flow in soft or non-ferrous materials.  
TiN Coating - increases surface hardness and improves tool life.



M	P mm	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch	l <sub>3</sub> Inch	□ a Inch	# of Flutes	Limits	Chamfer	Pack Qty	1785M	TN1785
M2	0.40	1.3/4	7/16	0.1410	3/16	0.1100	2	D3	Plug	1	1012659	—
M2.5	0.45	1.13/16	1/2	0.1410	3/16	0.1100	2	D3	Plug	1	1012662	—
M3	0.50	1.15/16	5/8	0.1410	3/16	0.1100	2	D3	Plug	1	1012664	—
M3.5	0.60	2"	11/16	0.1410	3/16	0.1100	2	D4	Plug	1	1012666	—
M4	0.70	2.1/8	3/4	0.1680	1/4	0.1310	2	D4	Plug	1	—	1062668
M4	0.70	2.1/8	3/4	0.1680	1/4	0.1310	2	D4	Plug	1	1012668	—
M4.5	0.75	2.3/8	7/8	0.1940	1/4	0.1520	2	D4	Plug	1	1012669	—
M5	0.80	2.3/8	7/8	0.1940	1/4	0.1520	2	D4	Plug	1	—	1062672
M5	0.80	2.3/8	7/8	0.1940	1/4	0.1520	2	D4	Plug	1	1012672	—
M6	1.00	2.1/2	1"	0.2550	5/16	0.1910	2	D5	Plug	1	—	1062674
M6	1.00	2.1/2	1"	0.2550	5/16	0.1910	2	D5	Plug	1	1012674	—
M7	1.00	2.23/32	1.1/8	0.3180	3/8	0.2380	2	D5	Plug	1	1012676	—
M8	1.25	2.23/32	1.1/8	0.3180	3/8	0.2380	2	D5	Plug	1	—	1062678
M8	1.25	2.23/32	1.1/8	0.3180	3/8	0.2380	2	D5	Plug	1	1012678	—
M9	1.25	2.15/16	1.1/4	0.3810	7/16	0.2860	3	D5	Plug	1	1012680	—
M10	1.50	2.15/16	1.1/4	0.3810	7/16	0.2860	3	D6	Plug	1	—	1062682
M10	1.50	2.15/16	1.1/4	0.3810	7/16	0.2860	3	D6	Plug	1	1012682	—
M11	1.50	3.5/32	1.7/16	0.3230	13/32	0.2420	3	D6	Plug	1	1012685	—
M12	1.75	3.3/8	1.21/32	0.3670	7/16	0.2750	3	D6	Plug	1	—	1062686
M12	1.75	3.3/8	1.21/32	0.3670	7/16	0.2750	3	D6	Plug	1	1012686	—
M14	2.00	3.19/32	1.21/32	0.4290	1/2	0.3220	3	D7	Plug	1	1012689	—
M16	2.00	3.13/16	1.13/16	0.4800	9/16	0.3600	3	D7	Plug	1	1012693	—
M18	2.50	4.1/32	1.13/16	0.5420	5/8	0.4060	3	D7	Plug	1	1012696	—

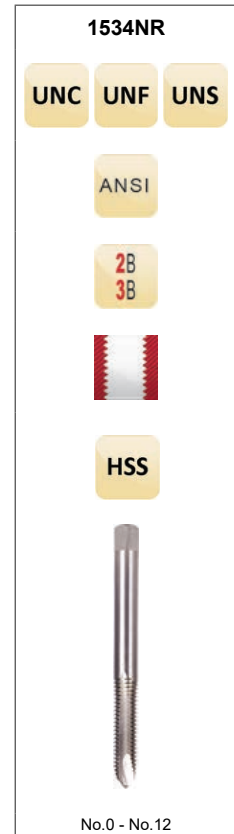
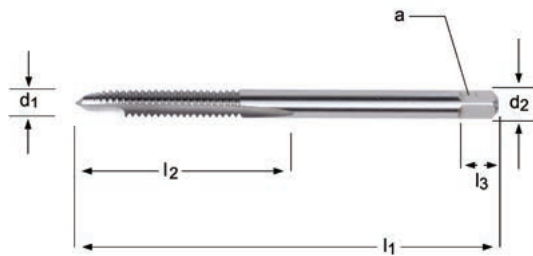
# SPIRAL POINT TAPS

## Non-Relieved Style, Machine Screw Sizes

### 1534NR

Feature concentric threads with no pitch diameter relief. These taps are particularly recommended for applications requiring close gauging fits and in older equipment that is not sufficiently rigid to accommodate the free cutting action of the 1534/1585 series. For through hole applications.

Sizes in bold font indicate the most commonly used flute and 'H' limit for that size.



UNC	UNF	UNS	TPI	<b><i>l<sub>1</sub></i></b>	<b><i>l<sub>2</sub></i></b>	<b><i>d<sub>2</sub></i></b>	<b><i>a</i></b>	<b><i>l<sub>3</sub></i></b>	# of Flutes	Limits	Chamfer	Pack Qty	1534NR
				Inch	Inch	Ø Inch	□ Inch	Inch					
	0		80	1.5/8	5/16	0.1410	0.1100	3/16	2	H1	Plug	1	1010775
	0		80	1.5/8	5/16	0.1410	0.1100	3/16	2	H2	Plug	1	1010776
	0		80	1.5/8	5/16	0.1410	0.1100	3/16	2	H2	Bottoming	1	1010778
	1		72	1.11/16	3/8	0.1410	0.1100	3/16	2	H1	Plug	1	1010783
	1		72	1.11/16	3/8	0.1410	0.1100	3/16	2	H2	Plug	1	1010784
<b>1</b>			64	1.11/16	3/8	0.1410	0.1100	3/16	2	H1	Plug	1	1010779
<b>1</b>			64	1.11/16	3/8	0.1410	0.1100	3/16	2	H2	Plug	1	1010780
	2		64	1.3/4	7/16	0.1410	0.1100	3/16	2	H1	Plug	1	1010791
	2		64	1.3/4	7/16	0.1410	0.1100	3/16	2	H2	Plug	1	1010792
2			56	1.3/4	7/16	0.1410	0.1100	3/16	2	H1	Plug	1	1010787
2			56	1.3/4	7/16	0.1410	0.1100	3/16	2	H2	Plug	1	1010788
2			56	1.3/4	7/16	0.1410	0.1100	3/16	2	H2	Bottoming	1	1010790
	3		56	1.13/16	1/2	0.1410	0.1100	3/16	2	H1	Plug	1	1010799
	3		56	1.13/16	1/2	0.1410	0.1100	3/16	2	H2	Plug	1	1010800
3			48	1.13/16	1/2	0.1410	0.1100	3/16	2	H2	Plug	1	1010796
3			48	1.13/16	1/2	0.1410	0.1100	3/16	2	H2	Bottoming	1	1010798
		<b>4</b>	36	1.7/8	9/16	0.1410	0.1100	3/16	2	H2	Plug	1	1010803
	4		48	1.7/8	9/16	0.1410	0.1100	3/16	2	H2	Plug	1	1010809
4			40	1.7/8	9/16	0.1410	0.1100	3/16	2	H1	Plug	1	1010804
4			40	1.7/8	9/16	0.1410	0.1100	3/16	2	H2	Plug	1	1010805
	4		48	1.7/8	9/16	0.1410	0.1100	3/16	2	H2	Bottoming	1	1010811
4			40	1.7/8	9/16	0.1410	0.1100	3/16	2	H2	Bottoming	1	1010807
	5		44	1.15/16	5/8	0.1410	0.1100	3/16	2	H2	Plug	1	1010817
5			40	1.15/16	5/8	0.1410	0.1100	3/16	2	H2	Plug	1	1010813
5			40	1.15/16	5/8	0.1410	0.1100	3/16	2	H2	Bottoming	1	1010815
	6		40	2"	11/16	0.1410	0.1100	3/16	2	H2	Plug	1	1010825
6			32	2"	11/16	0.1410	0.1100	3/16	2	H1	Plug	1	1010818
6			32	2"	11/16	0.1410	0.1100	3/16	2	H2	Plug	1	1010819
6			32	2"	11/16	0.1410	0.1100	3/16	2	H3	Plug	1	1010820
	6		40	2"	11/16	0.1410	0.1100	3/16	2	H2	Bottoming	1	1010827
6			32	2"	11/16	0.1410	0.1100	3/16	2	H2	Bottoming	1	1010822
6			32	2"	11/16	0.1410	0.1100	3/16	2	H3	Bottoming	1	1010823

# SPIRAL POINT TAPS

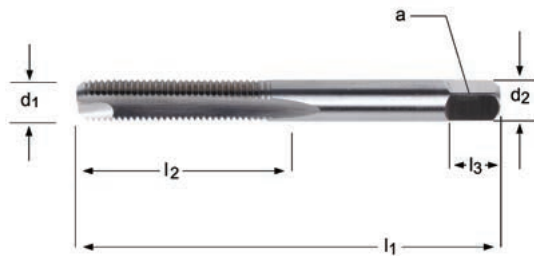
UNC	UNF	UNS	TPI	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch	□ a Inch	l <sub>3</sub> Inch	# of Flutes	Limits	Chamfer	Pack Qty	1534NR
	8		36	2.1/8	3/4	0.1680	0.1310	1/4	2	H2	Plug	1	1010835
8			32	2.1/8	3/4	0.1680	0.1310	1/4	2	H1	Plug	1	1010828
8			32	2.1/8	3/4	0.1680	0.1310	1/4	2	H2	Plug	1	1010829
8			32	2.1/8	3/4	0.1680	0.1310	1/4	2	H3	Plug	1	1010830
8			32	2.1/8	3/4	0.1680	0.1310	1/4	2	H2	Bottoming	1	1010832
8			32	2.1/8	3/4	0.1680	0.1310	1/4	2	H3	Bottoming	1	1010833
	10		32	2.3/8	7/8	0.1940	0.1520	1/4	2	H1	Plug	1	1010843
	10		32	2.3/8	7/8	0.1940	0.1520	1/4	2	H2	Plug	1	1010844
	10		32	2.3/8	7/8	0.1940	0.1520	1/4	2	H3	Plug	1	1010845
	10		32	2.3/8	7/8	0.1940	0.1520	1/4	2	H2	Bottoming	1	1010847
	10		32	2.3/8	7/8	0.1940	0.1520	1/4	2	H3	Bottoming	1	1010848
10			24	2.3/8	7/8	0.1940	0.1520	1/4	2	H1	Plug	1	1010837
10			24	2.3/8	7/8	0.1940	0.1520	1/4	2	H2	Plug	1	1010838
10			24	2.3/8	7/8	0.1940	0.1520	1/4	2	H3	Plug	1	1010839
10			24	2.3/8	7/8	0.1940	0.1520	1/4	2	H2	Bottoming	1	1010841
10			24	2.3/8	7/8	0.1940	0.1520	1/4	2	H3	Bottoming	1	1010842
	12		28	2.3/8	15/16	0.2200	0.1650	9/32	2	H3	Plug	1	1010853
12			24	2.3/8	15/16	0.2200	0.1650	9/32	2	H3	Plug	1	1011071
12			24	2.3/8	15/16	0.2200	0.1650	9/32	2	H3	Bottoming	1	1011072

# SPIRAL POINT TAPS

## Non-Relieved Style, Fractional Sizes

### 1585NR

Feature concentric threads with no pitch diameter relief. These taps are particularly recommended for applications requiring close gauging fits and in older equipment that is not sufficiently rigid to accommodate the free cutting action of the regular 1534/1585 series. For through hole applications. Sizes in bold font indicate the most commonly used flute and 'H' limit for that size.



1585NR

UNC UNF

ANSI

2B  
3B

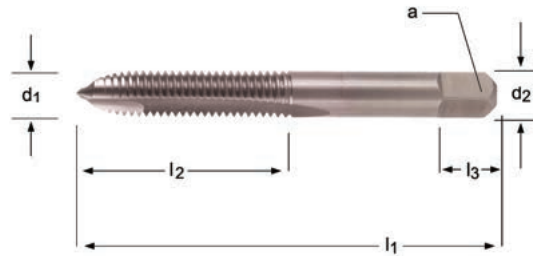
HSS

1/4 - 3/4

Nominal d <sub>1</sub>	TPI UNC	TPI UNF	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch /	∠ a Inch	l <sub>3</sub> Inch	# of Flutes	Limits	Pack Qty	Plug	Bottoming
1/4	20		2.1/2	1"	0.2550	0.1910	5/16	2	H1	1	1012813	—
1/4	20		2.1/2	1"	0.2550	0.1910	5/16	2	H2	1	1012814	—
<b>1/4</b>	<b>20</b>		<b>2.1/2</b>	<b>1"</b>	<b>0.2550</b>	<b>0.1910</b>	<b>5/16</b>	<b>2</b>	<b>H3</b>	<b>1</b>	<b>1012815</b>	<b>1012817</b>
1/4	20		2.1/2	1"	0.2550	0.1910	5/16	2	H5	1	1012816	—
<b>1/4</b>	<b>20</b>		<b>2.1/2</b>	<b>1"</b>	<b>0.2550</b>	<b>0.1910</b>	<b>5/16</b>	<b>3</b>	<b>H3</b>	<b>1</b>	<b>1012818</b>	—
1/4		28	2.1/2	1"	0.2550	0.1910	5/16	2	H1	1	1012820	—
1/4		28	2.1/2	1"	0.2550	0.1910	5/16	2	H2	1	1012821	—
<b>1/4</b>		<b>28</b>	<b>2.1/2</b>	<b>1"</b>	<b>0.2550</b>	<b>0.1910</b>	<b>5/16</b>	<b>2</b>	<b>H3</b>	<b>1</b>	<b>1012822</b>	<b>1012824</b>
5/16	18		2.23/32	1.1/8	0.3180	0.2380	3/8	2	H2	1	1012828	—
<b>5/16</b>	<b>18</b>		<b>2.23/32</b>	<b>1.1/8</b>	<b>0.3180</b>	<b>0.2380</b>	<b>3/8</b>	<b>2</b>	<b>H3</b>	<b>1</b>	<b>1012829</b>	<b>47197820</b>
5/16	18		2.23/32	1.1/8	0.3180	0.2380	3/8	2	H5	1	1012830	—
<b>5/16</b>	<b>18</b>		<b>2.23/32</b>	<b>1.1/8</b>	<b>0.3180</b>	<b>0.2380</b>	<b>3/8</b>	<b>3</b>	<b>H3</b>	<b>1</b>	<b>1012832</b>	<b>1012831</b>
<b>5/16</b>		<b>24</b>	<b>2.23/32</b>	<b>1.1/8</b>	<b>0.3180</b>	<b>0.2380</b>	<b>3/8</b>	<b>2</b>	<b>H3</b>	<b>1</b>	<b>1012836</b>	—
3/8	16		2.15/16	1.1/4	0.3810	0.2860	7/16	3	H2	1	1012842	—
<b>3/8</b>	<b>16</b>		<b>2.15/16</b>	<b>1.1/4</b>	<b>0.3810</b>	<b>0.2860</b>	<b>7/16</b>	<b>3</b>	<b>H3</b>	<b>1</b>	<b>1012843</b>	—
3/8	16		2.15/16	1.1/4	0.3810	0.2860	7/16	3	H5	1	1012844	—
<b>3/8</b>		<b>24</b>	<b>2.15/16</b>	<b>1.1/4</b>	<b>0.3810</b>	<b>0.2860</b>	<b>7/16</b>	<b>3</b>	<b>H3</b>	<b>1</b>	<b>1012847</b>	—
7/16	14		3.5/32	1.7/16	0.3230	0.2420	13/32	3	H2	1	1012849	—
<b>7/16</b>	<b>14</b>		<b>3.5/32</b>	<b>1.7/16</b>	<b>0.3230</b>	<b>0.2420</b>	<b>13/32</b>	<b>3</b>	<b>H3</b>	<b>1</b>	<b>1012850</b>	—
7/16	14		3.5/32	1.7/16	0.3230	0.2420	13/32	3	H5	1	1012851	—
<b>7/16</b>		<b>20</b>	<b>3.5/32</b>	<b>1.7/16</b>	<b>0.3230</b>	<b>0.2420</b>	<b>13/32</b>	<b>3</b>	<b>H3</b>	<b>1</b>	<b>1012853</b>	—
1/2	13		3.3/8	1.21/32	0.3670	0.2750	7/16	3	H2	1	1012856	—
<b>1/2</b>	<b>13</b>		<b>3.3/8</b>	<b>1.21/32</b>	<b>0.3670</b>	<b>0.2750</b>	<b>7/16</b>	<b>3</b>	<b>H3</b>	<b>1</b>	<b>1012857</b>	—
1/2	13		3.3/8	1.21/32	0.3670	0.2750	7/16	3	H5	1	1012858	—
<b>1/2</b>		<b>20</b>	<b>3.3/8</b>	<b>1.21/32</b>	<b>0.3670</b>	<b>0.2750</b>	<b>7/16</b>	<b>3</b>	<b>H3</b>	<b>1</b>	<b>1012861</b>	—
5/8	11		3.13/16	1.13/16	0.4800	0.3600	9/16	3	H3	1	1012863	—
5/8	11		3.13/16	1.13/16	0.4800	0.3600	9/16	3	H5	1	1012864	—
5/8		18	3.13/16	1.13/16	0.4800	0.3600	9/16	3	H3	1	1012867	—
3/4	10		4.1/2	2"	0.5900	0.4420	11/16	3	H3	1	1012865	—
3/4	10		4.1/2	2"	0.5900	0.4420	11/16	3	H5	1	1012866	—
<b>3/4</b>		<b>16</b>	<b>4.1/2</b>	<b>2"</b>	<b>0.5900</b>	<b>0.4420</b>	<b>11/16</b>	<b>3</b>	<b>H3</b>	<b>1</b>	<b>1012868</b>	—

## Non-Relieved, Metric Sizes

**1785NR** Feature concentric threads with no pitch diameter relief. These taps are particularly recommended for applications requiring close gauging fits and in older equipment that is not sufficiently rigid to accommodate the free cutting action of the regular 1785 series. For through hole applications.



**1785NR**

M

ANSI

6H



HSS



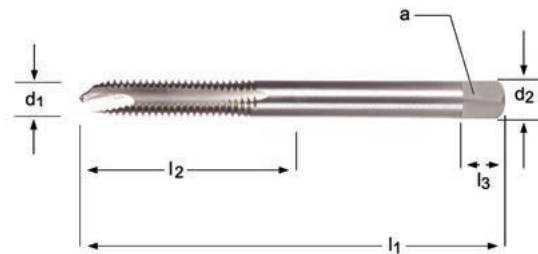
M1.6 - M20

M	P mm	$l_1$ Inch	$l_2$ Inch	$l_3$ Inch	$d_2$ Ø Inch	$\square$ a Inch	# of Flutes	Limits	Chamfer	Pack Qty	1785NR
1.6	0.35	1.5/8	5/16	0.1410	0.1100	3/16	2	D3	Plug	1	1012890
2	0.40	1.3/4	7/16	0.1410	0.1100	3/16	2	D3	Plug	1	1012891
2.5	0.45	1.13/16	1/2	0.1410	0.1100	3/16	2	D3	Plug	1	1012893
3	0.50	1.15/16	5/8	0.1410	0.1100	3/16	2	D3	Plug	1	1012896
3.5	0.60	2"	11/16	0.1410	0.1100	3/16	2	D4	Plug	1	1012897
4	0.70	2.1/8	3/4	0.1680	0.1310	1/4	2	D4	Plug	1	1012898
4.5	0.75	2.3/8	7/8	0.1940	0.1520	1/4	2	D4	Plug	1	1012899
5	0.80	2.3/8	7/8	0.1940	0.1520	1/4	2	D4	Plug	1	1012900
6	1.00	2.1/2	1"	0.2550	0.1910	5/16	2	D5	Plug	1	1012901
7	1.00	2.23/32	1.1/8	0.3180	0.2380	3/8	2	D5	Plug	1	1012902
8	1.25	2.23/32	1.1/8	0.3180	0.2380	3/8	2	D5	Plug	1	1012903
10	1.50	2.15/16	1.1/4	0.3810	0.2860	7/16	3	D6	Plug	1	1012904
12	1.75	3.3/8	1.21/32	0.3670	0.2750	7/16	3	D6	Plug	1	1012905
14	2.00	3.19/32	1.21/32	0.4290	0.3220	1/2	3	D7	Plug	1	1012906
16	2.00	3.13/16	1.13/16	0.4800	0.3600	9/16	3	D7	Plug	1	1012907
20	2.50	4.15/32	2"	0.6520	0.4890	11/16	3	D7	Plug	1	1012909

# SPIRAL POINT TAPS

## Extension / Non-Relieved Style

**1534NE** Similar in design and thread geometries to the standard 1534NR series, but with a longer shank length. Bright finish improves chip flow in soft or non-ferrous materials. For through hole applications.



1534NE(UNC)

UNC UNF

ANSI

3B



HSS



No.4 - 1/2

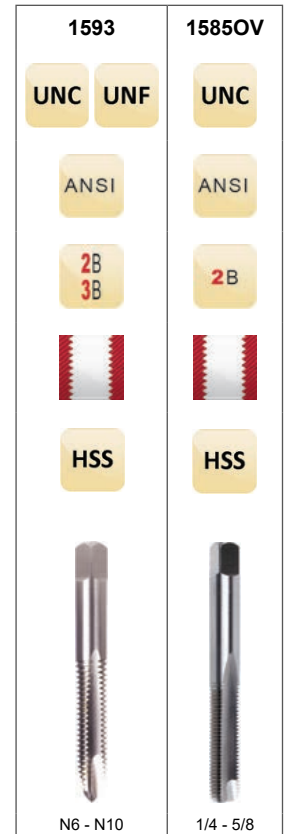
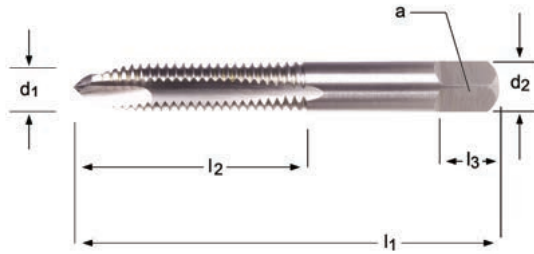
UNC	UNF	TPI	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch	∠ a Inch	l <sub>3</sub> Inch	# of Flutes	Limits	Pack Qty	Chamfer	1534NE
4		40	4"	9/16	0.1410	0.1100	3/16	2	H2	1	Plug	1020002
6		32	4"	11/16	0.1410	0.1100	3/16	2	H3	1	Plug	1020004
6		32	6"	11/16	0.1410	0.1100	3/16	2	H3	1	Plug	1020006
8		32	4"	3/4	0.1680	0.1310	1/4	2	H3	1	Plug	1020008
8		32	6"	3/4	0.1680	0.1310	1/4	2	H3	1	Plug	1020010
	10	32	4"	7/8	0.1940	0.1520	1/4	2	H3	1	Plug	1020016
	10	32	6"	7/8	0.1940	0.1520	1/4	2	H3	1	Plug	1020018
10		24	4"	7/8	0.1940	0.1520	1/4	2	H3	1	Plug	1020012
10		24	6"	7/8	0.1940	0.1520	1/4	2	H3	1	Plug	1020014
	1/4	28	4"	1"	0.2550	0.1910	5/16	2	H3	1	Plug	1020024
	1/4	28	6"	1"	0.2550	0.1910	5/16	2	H3	1	Plug	1020026
1/4		20	4"	1"	0.2550	0.1910	5/16	2	H3	1	Plug	1020020
1/4		20	6"	1"	0.2550	0.1910	5/16	2	H3	1	Plug	1020022
	5/16	24	4"	1.1/8	0.3180	0.2380	3/8	2	H3	1	Plug	1020032
	5/16	24	6"	1.1/8	0.3180	0.2380	3/8	2	H3	1	Plug	1020034
5/16		18	4"	1.1/8	0.3180	0.2380	3/8	2	H3	1	Plug	1020028
5/16		18	6"	1.1/8	0.3180	0.2380	3/8	2	H3	1	Plug	1020030
	3/8	24	4"	1.1/4	0.3810	0.2860	7/16	3	H3	1	Plug	1020040
	3/8	24	6"	1.1/4	0.3810	0.2860	7/16	3	H3	1	Plug	1020042
3/8		16	4"	1.1/4	0.3810	0.2860	7/16	3	H3	1	Plug	1020036
3/8		16	6"	1.1/4	0.3810	0.2860	7/16	3	H3	1	Plug	1020038
	7/16	20	6"	1.7/16	0.3230	0.2420	13/32	3	H3	1	Plug	1020046
7/16		14	6"	1.7/16	0.3230	0.2420	13/32	3	H3	1	Plug	1020044
	1/2	20	6"	1.21/32	0.3670	0.2750	7/16	3	H3	1	Plug	1020050
1/2		13	6"	1.21/32	0.3670	0.2750	7/16	3	H3	1	Plug	1020048

## Oversize / Relieved Style

**1593** Similar in design to the standard 1534/1585 series  
**1585OV** but with a pitch diameter larger than the basic pitch diameter. Used primarily where a part will be plated or treated after tapping. For through hole applications.

1593: 0.003" - 0.0035" Oversize

1585OV: 0.005" Oversize



UNC	UNF	TPI	$l_1$ Inch	$l_2$ Inch	$d_2$ Ø Inch	$a$ Inch	$l_3$ Inch	# of Flutes	Limits	Chamfer	Pack Qty	1593	1585OV
6		32	2"	11/16	0.1410	0.1100	3/16	2	H7	Plug	1	1010877	—
8		32	2.1/8	3/4	0.1680	0.1310	1/4	2	H7	Plug	1	1010879	—
	10	32	2.3/8	7/8	0.1940	0.1520	1/4	2	H7	Plug	1	1010883	—
10		24	2.3/8	7/8	0.1940	0.1520	1/4	2	H7	Plug	1	1010881	—
1/4		20	2.1/2	1"	0.2550	0.1910	5/16	2	H11	Plug	1	—	1011754
5/16		18	2.23/32	1.1/8	0.3180	0.2380	3/8	2	H11	Plug	1	—	1011755
3/8		16	2.15/16	1.1/4	0.3810	0.2860	7/16	3	H11	Plug	1	—	1011756
7/16		14	3.5/32	1.7/16	0.3230	0.2420	13/32	3	H11	Plug	1	—	1011757
1/2		13	3.3/8	1.21/32	0.3670	0.2750	7/16	3	H11	Plug	1	—	1011758
5/8		11	3.13/16	1.13/16	0.4800	0.3600	9/16	3	H11	Plug	1	—	1011759

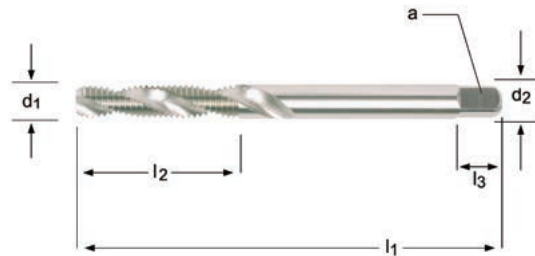
# SPIRAL FLUTE TAPS

## Regular Spiral 30°

**1582** - Machine Screw Sizes

**1586** - Fractional Sizes

Generally used where chip disposal is a problem. The spiral flute design effectively draws chips out of the hole. Recommended for use when tapping blind or through holes in a variety of materials. Excellent choice for non-ferrous applications.



1582 / 1586

UNC UNF

ANSI

3B



HSS



No.4 - 1/2

Nominal d <sub>1</sub>	TPI UNC	TPI UNF	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch /	□ a Inch	l <sub>3</sub> Inch	# of Flutes	Limits	Pack Qty	Plug	Bottoming
4	40		1.7/8	9/16	0.1410	0.1100	3/16	2	H2	1	1010905	1010906
6	32		2"	11/16	0.1410	0.1100	3/16	2	H3	1	1010909	1010910
8	32		2.1/8	3/4	0.1680	0.1310	1/4	2	H3	1	1010913	1010914
10	24		2.3/8	7/8	0.1940	0.1520	1/4	2	H3	1	1010915	1010916
10		32	2.3/8	7/8	0.1940	0.1520	1/4	2	H3	1	1010917	1010918
1/4	20		2.1/2	1"	0.2550	0.1910	5/16	2	H3	1	1010346	1010347
1/4	20		2.1/2	1"	0.2550	0.1910	5/16	3	H3	1	1010348	1010349
1/4		28	2.1/2	1"	0.2550	0.1910	5/16	2	H3	1	1010350	1010351
1/4		28	2.1/2	1"	0.2550	0.1910	5/16	3	H3	1	1010352	1010353
5/16	18		2.23/32	1.1/8	0.3180	0.2380	3/8	3	H3	1	1010354	1010355
5/16		24	2.23/32	1.1/8	0.3180	0.2380	3/8	3	H3	1	1010356	1010357
3/8	16		2.15/16	1.1/4	0.3810	0.2860	7/16	3	H3	1	1010358	1010359
3/8		24	2.15/16	1.1/4	0.3810	0.2860	7/16	3	H3	1	1010360	1010361
7/16	14		3.5/32	1.7/16	0.3230	0.2420	13/32	3	H3	1	1010362	1010363
1/2	13		3.3/8	1.21/32	0.3670	0.2750	7/16	3	H3	1	1010366	1010367
1/2		20	3.3/8	1.21/32	0.3670	0.2750	7/16	3	H3	1	1010368	1010369



## High Spiral Helicut 52°

**1587** - Machine Screw Sizes

**1588** - Fractional Sizes

Similar to the regular spiral flute design of 1582/1586 except that the faster spiral improves the chip drawing action and permits the bridging of larger gaps inside a hole. For blind or through hole applications. Excellent choice for non-ferrous applications.



1587 / 1588

UNC UNF

ANSI

2B  
3B



HSS



N4 - 1/2

Nominal d <sub>1</sub>	TPI UNC	TPI UNF	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch /	∟ a Inch	l <sub>3</sub> Inch	# of Flutes	Limits	Pack Qty	Plug	Bottoming
4	40		1.7/8	9/16	0.1410	0.1100	3/16	2	H2	1	1010887	1010888
6	32		2"	11/16	0.1410	0.1100	3/16	2	H3	1	1010891	1010892
8	32		2.1/8	3/4	0.1680	0.1310	1/4	3	H3	1	1010895	1010896
10	24		2.3/8	7/8	0.1940	0.1520	1/4	3	H3	1	1010897	1010898
10		32	2.3/8	7/8	0.1940	0.1520	1/4	3	H3	1	1010899	1010900
1/4	20		2.1/2	1.000	0.2550	0.1910	5/16	3	H3	1	1010398	1010399
1/4		28	2.1/2	1.000	0.2550	0.1910	5/16	3	H3	1	1010400	1010401
5/16	18		2.23/32	1.1/8	0.3180	0.2380	3/8	3	H3	1	1010402	1010403
5/16		24	2.23/32	1.1/8	0.3180	0.2380	3/8	3	H3	1	1010404	1010405
3/8	16		2.15/16	1.1/4	0.3810	0.2860	7/16	3	H3	1	1010406	1010407
3/8		24	2.15/16	1.1/4	0.3810	0.2860	7/16	3	H3	1	1010408	1010409
7/16	14		3.5/32	1.7/16	0.3230	0.2420	13/32	3	H3	1	1010410	1010411
7/16		20	3.5/32	1.7/16	0.3230	0.2420	13/32	3	H3	1	1010412	1010413
1/2	13		3.3/8	1.21/32	0.3670	0.2750	7/16	3	H3	1	1010414	1010415
1/2		20	3.3/8	1.21/32	0.3670	0.2750	7/16	3	H3	1	1010416	1010417

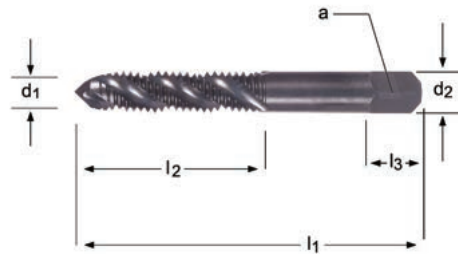
# SPIRAL FLUTE TAPS

## Heavy Duty Spiral 40°

**1590** - Machine Screw Sizes

**1591** - Fractional Sizes

A slower helix angle, larger core diameter, three flutes and wider throat dimensions than the regular 1587/1588 series. Designed for tough blind or through hole tapping. Chip ejection is more efficient and problems such as chipping and breakage are largely eliminated. A steam oxide finish makes this tap ideal for use in ferrous materials and higher strength alloys.



1590 / 1591

UNC UNF

ANSI

3B



HSS

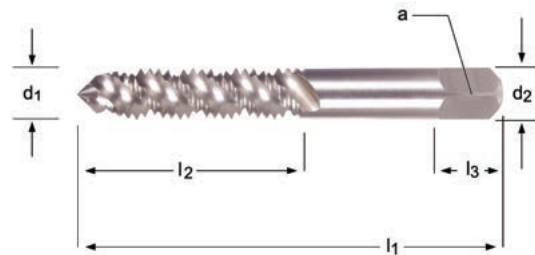


N6 - 1/2

Nominal $d_1$	TPI UNC	TPI UNF	$l_1$ Inch	$l_2$ Inch	$d_2$ Ø Inch /	$\square$ a Inch	$l_3$ Inch	# of Flutes	Limits	Pack Qty	Plug	Bottoming
6	32		2"	11/16	0.1410	0.1100	3/16	2	H3	1	1010937	1010938
6		40	2"	11/16	0.1410	0.1100	3/16	2	H3	1	—	1010940
10	24		2.3/8	7/8	0.1940	0.1520	1/4	3	H3	1	1010945	1010946
10		32	2.3/8	7/8	0.1940	0.1520	1/4	3	H3	1	1010947	1010948
1/4	20		2.1/2	1"	0.2550	0.1910	5/16	3	H3	1	1010953	1010954
1/4		28	2.1/2	1"	0.2550	0.1910	5/16	3	H3	1	1010955	1010956
5/16	18		2.23/32	1.1/8	0.3180	0.2380	3/8	3	H3	1	1010957	1010958
3/8	16		2.5/16	1.1.4	0.3810	0.2860	7/16	3	H3	1	1010961	1010962
7/16	14		3.5/32	1.7/16	0.3230	0.2420	13/32	3	H3	1	1010965	1010966
1/2	13		3.3/8	1.21/32	0.3670	0.2750	7/16	3	H3	1	1010969	1010970

## High Spiral Helicut 52°, Metric

**1788(M)** Similar to the regular spiral flute design of 1582/1586 except that the faster spiral improves the chip drawing action and permits the bridging of larger gaps inside a hole. For blind or through hole applications. Excellent choice for non-ferrous applications.



1788(M)

M

ANSI

6H



HSS



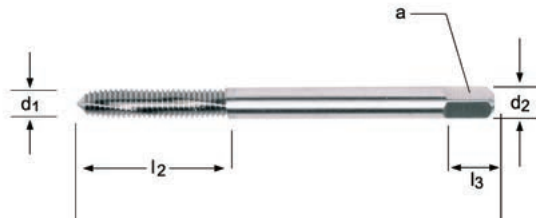
M3 - M12

Nominal d <sub>1</sub>	Pitch M	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch /	∟ a Inch	l <sub>3</sub> Inch	No. of Flutes	Limits	Pack Qty	Plug	Bottoming
M3	0.50	1.15/16	5/8	0.1410	0.1100	3/16	2	D3	1	1012920	1012940
M4	0.70	2.1/8	3/4	0.1680	0.1310	1/4	3	D4	1	1012923	1012943
M5	0.80	2.3/8	7/8	0.1940	0.1520	1/4	3	D4	1	1012925	1012945
M6	1.00	2.1/2	1"	0.2550	0.1910	5/16	3	D5	1	1012926	1012946
M8	1.25	2.23/32	1.1/8	0.3180	0.2380	3/8	3	D5	1	1012928	1012948
M10	1.50	2.15/16	1.1/4	0.3810	0.2860	7/16	3	D6	1	1012930	1012950
M12	1.75	3.3/8	1.21/32	0.3670	0.2750	7/16	3	D6	1	1012932	1012952

# THREAD FORMING TAPS

## Rol-Rite / Spiral Lobe

**1580** The Rol-Rite style has a spiral lobe pattern and no oil or lubrication grooves. It is designed for general purpose applications and is particularly suited for through holes in thin sections and for interrupted holes. For through or blind hole applications.



1580

UNC UNF

ANSI

2B  
3B



HSS

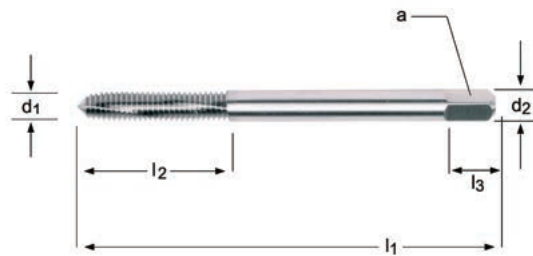


N2 - 3/8

Nominal $d_1$	TPI UNC	TPI UNF	$l_1$ Inch	$l_2$ Inch	$d_2$ $\varnothing$ Inch /	$\square$ a Inch	$l_3$ Inch	Limits	Pack Qty	Plug	Bottoming
2	56		1.3/4	7/16	0.1410	0.1100	3/16	H2	1	—	1310004
2	56		1.3/4	7/16	0.1410	0.1100	3/16	H3	1	—	1310005
4	40		1.7/8	9/16	0.1410	0.1100	3/16	H3	1	1310012	1310014
4	40		1.7/8	9/16	0.1410	0.1100	3/16	H5	1	—	1310015
5	40		1.15/16	5/8	0.1410	0.1100	3/16	H3	1	—	1310022
6	32		2"	11/16	0.1410	0.1100	3/16	H3	1	1310028	1310031
6	32		2"	11/16	0.1410	0.1100	3/16	H5	1	1310029	—
8	32		2.1/8	3/4	0.1680	0.1310	1/4	H3	1	1310038	1310041
8	32		2.1/8	3/4	0.1680	0.1310	1/4	H5	1	1310039	1310042
10	24		2.3/8	7/8	0.1940	0.1520	1/4	H4	1	1310048	1310051
10		32	2.3/8	7/8	0.1940	0.1520	1/4	H4	1	—	1310057
10		32	2.3/8	7/8	0.1940	0.1520	1/4	H6	1	1310055	1310058
1/4	20		2.1/2	1"	0.2550	0.1910	5/16	H4	1	1310068	1310071
1/4	20		2.1/2	1"	0.2550	0.1910	5/16	H6	1	1310069	—
1/4		28	2.1/2	1"	0.2550	0.1910	5/16	H4	1	1310074	1310076
5/16	18		2.23/32	1.1/8	0.3180	0.2380	7/16	H5	1	1310078	1310080
5/16	18		2.23/32	1.1/8	0.3180	0.2380	7/16	H7	1	—	1310081
5/16		24	2.23/32	1.1/8	0.3180	0.2380	7/16	H5	1	1310082	—
3/8	16		2.15/16	1.1/4	0.3810	0.2860	1/2	H5	1	1310086	1310088
3/8		24	2.15/16	1.1/4	0.3810	0.2860	1/2	H5	1	—	1310092

## Rol-Rite, Spiral Lobe

**1580(M)** The Rol-Rite style has a spiral lobe pattern and no oil or lubrication grooves. It is designed for general purpose applications and is particularly suited for through holes in thin sections and for interrupted holes.



1580(M)

M

ANSI

6H



HSS



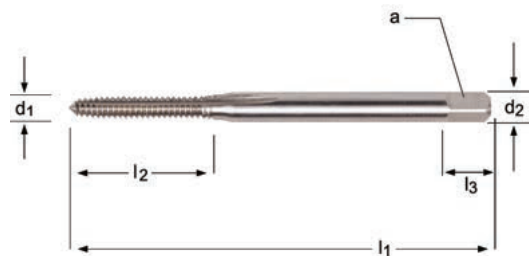
M3 - M12

Nominal $d_1$	Pitch M	$l_1$ Inch	$l_2$ Inch	$d_2$ $\varnothing$ Inch /	$\square$ a Inch	$l_3$ Inch	Limits	Pack Qty	Plug	Bottoming
M3	0.50	1.15/16	5/8	0.1410	0.1100	3/16	D5	1	1310400	1310401
M4	0.70	2.1/8	3/4	0.1680	0.1310	1/4	D6	1	1310402	1310403
M5	0.80	2.3/8	7/8	0.1940	0.1520	1/4	D7	1	1310404	1310405
M6	1.00	2.1/2	1"	0.2550	0.1910	5/16	D8	1	1310406	1310407
M8	1.25	2.23/32	1.1/8	0.3180	0.2380	3/8	D9	1	1310408	1310409
M10	1.50	2.15/16	1.1/4	0.3810	0.2860	7/16	D10	1	1310410	1310411
M12	1.75	3.3/8	1.21/32	0.3670	0.2750	7/16	D11	1	1310412	1310413

# THREAD FORMING TAPS

## Rol-Form / Lube Grooves

**3300** The Rol-Form style has 2-4 grooves (depending on size) extending the full length of thread to assure lubrication in the forming zone and to eliminate build up of the hydraulic pressure in blind holes. They are particularly suited to blind holes in thin walled die castings.



3300

UNC UNF

ANSI

2B  
3B



HSS



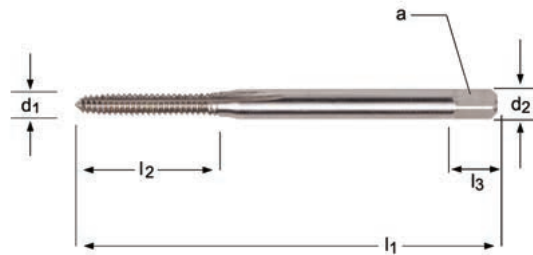
NO - 1/2

Nominal $d_1$	TPI UNC	TPI UNF	$l_1$ Inch	$l_2$ Inch	$d_2$ $\varnothing$ Inch /	$\square$ a Inch	$l_3$ Inch	Limits	Pack Qty	Plug	Bottoming
0		80	1.5/8	5/16	0.1410	0.1100	3/16	H2	1	—	1310110
1	64		1.11/16	3/8	0.1410	0.1100	3/16	H2	1	—	1310111
1		72	1.11/16	3/8	0.1410	0.1100	3/16	H2	1	—	1310112
2	56		1.3/4	7/16	0.1410	0.1100	3/16	H2	1	—	1310113
2	56		1.3/4	7/16	0.1410	0.1100	3/16	H3	1	—	1310114
4	40		1.7/8	9/16	0.1410	0.1100	3/16	H3	1	1310121	1310123
4	40		1.7/8	9/16	0.1410	0.1100	3/16	H5	1	1310122	—
5	40		1.15/16	5/8	0.1410	0.1100	3/16	H3	1	—	1310131
5	40		1.15/16	5/8	0.1410	0.1100	3/16	H5	1	—	1310132
6	32		2"	11/16	0.1410	0.1100	3/16	H3	1	1310137	1310140
6	32		2"	11/16	0.1410	0.1100	3/16	H5	1	1310138	1310141
8	32		2.1/8	3/4	0.1680	0.1310	1/4	H3	1	1310147	1310150
8	32		2.1/8	3/4	0.1680	0.1310	1/4	H5	1	1310148	1310151
10	24		2.3/8	7/8	0.1940	0.1520	1/4	H4	1	1310157	1310160
10	24		2.3/8	7/8	0.1940	0.1520	1/4	H6	1	1310158	1310161
10		32	2.3/8	7/8	0.1940	0.1520	1/4	H4	1	1310163	1310166
10		32	2.3/8	7/8	0.1940	0.1520	1/4	H6	1	1310164	1310167
12	24		2.3/8	15/16	0.2200	0.1650	9/32	H4	1	1310169	—
1/4	20		2.1/2	1"	0.2550	0.1910	5/16	H4	1	1310177	1310180
1/4	20		2.1/2	1"	0.2550	0.1910	5/16	H6	1	1310178	1310181
1/4		28	2.1/2	1"	0.2550	0.1910	5/16	H4	1	1310183	1310185
5/16	18		2.23/32	1.1/8	0.3180	0.2380	7/16	H5	1	1310187	1310189
5/16	18		2.23/32	1.1/8	0.3180	0.2380	7/16	H7	1	1310188	1310190
3/8	16		2.15/16	1.1/4	0.3810	0.2860	1/2	H5	1	1310195	1310197
3/8	16		2.15/16	1.1/4	0.3810	0.2860	1/2	H7	1	1310196	1310198
3/8		24	2.15/16	1.1/4	0.3810	0.2860	1/2	H7	1	1310200	1310202
1/2	13		3.3/8	1.21/32	0.3670	0.2750	23/32	H5	1	1310211	—

## Rol-Form, Lube Grooves

### 3300(M)

The Rol-Form style has 1-2 lube grooves (depending on size) extending the full length of thread to assure lubrication in the forming zone and to eliminate build up of the hydraulic pressure in blind holes. They are particularly suited to blind holes in thin walled die castings.



3300(M)

M

ANSI

6H



HSS



M3 - M10

Nominal $d_1$	Pitch M	$l_1$ Inch	$l_2$ Inch	$d_2$ $\varnothing$ Inch /	$\square$ a Inch	$l_3$ Inch	Limits	Grooves	Pack Qty	Plug	Bottoming
M3	0.50	1.15/16	5/8	0.1410	0.1100	3/16	D5	1	1	1310500	1310501
M4	0.70	2.1/8	3/4	0.1680	0.1310	1/4	D6	1	1	1310502	1310503
M5	0.80	2.3/8	7/8	0.1940	0.1520	1/4	D7	1	1	1310504	1310505
M6	1.00	2.1/2	1"	0.2550	0.1910	5/16	D8	2	1	1310506	1310507
M8	1.25	2.23/32	1.1/8	0.3180	0.2380	3/8	D9	2	1	1310508	1310509
M10	1.50	2.15/16	1.1/4	0.3810	0.2860	7/16	D10	2	1	1310510	1310511

# THREAD FORMING TAPS

## Extension Rol-Form / Lube Grooves

**3306E** Similar in design and thread geometries to the standard 3300 series but with longer shank lengths than standard.



3306E(UNF)

UNC UNF

ANSI

2B



HSS



N4 - 5/16

UNC	UNF	TPI	$l_1$ Inch	$l_2$ Inch	$d_2$ Ø Inch	$\square$ a Inch	$l_3$ Inch	Limits	Chamfer	Pack Qty	3306E
4		40	4"	9/16	0.1410	0.1100	3/16	H3	Bottoming	1	1321002
4		40	4"	9/16	0.1410	0.1100	3/16	H5	Bottoming	1	1321004
6		32	4"	11/16	0.1410	0.1100	3/16	H3	Bottoming	1	1321006
8		32	4"	3/4	0.1680	0.1310	1/4	H3	Bottoming	1	1321014
	10	32	4"	7/8	0.1940	0.1520	1/4	H4	Bottoming	1	1321030
10		24	4"	7/8	0.1940	0.1520	1/4	H4	Bottoming	1	1321022
1/4		20	4"	1"	0.2550	0.1910	5/16	H4	Bottoming	1	1321038
5/16		18	4"	1.1/8	0.3180	0.2380	3/8	H5	Bottoming	1	1321062



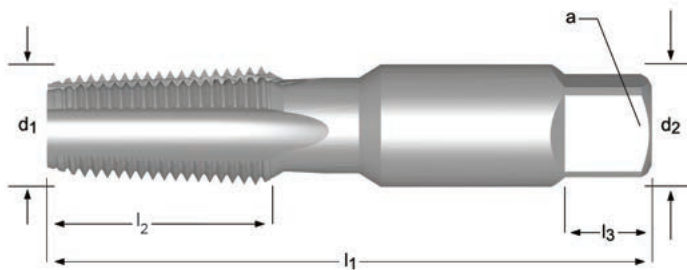
## General Purpose, Medium Hook, NPT

**1541**      Straight Flute. Medium hook for multi-material tapping. Generally used for pipe fittings and couplings in most ferrous and non-ferrous materials. The nominal size of a pipe tap is that of the pipe fitting to be tapped and not the actual size of the tap. NPT threads require the use of a 'sealant' such as teflon tape or pipe compound to ensure a tight joint.

**TN1541**

TiN coating increases surface hardness and improves tool life.

Made to Metal Cutting Tool Institute Standards, table 311



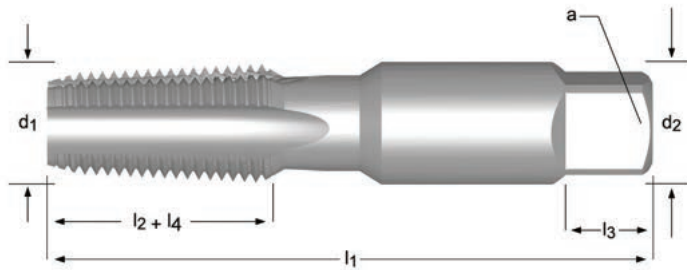
1541(NPT)	TN1541
1/16 - 2"	1/8 - 3/4

Nominal d <sub>1</sub>	TPI	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch /	□ a Inch	l <sub>3</sub> Inch	# of Flutes	Pack Qty	1541	TN1541
1/16	27	2.1/8	11/16	0.3130	0.2340	3/8	4	1	1010518	—
1/8	27	2.1/8	3/4	0.3130	0.2340	3/8	4	1	1010528	—
1/8	27	2.1/8	3/4	0.4380	0.3280	3/8	4	1	1010519	1060519
1/4	18	2.7/16	1.1/16	0.5630	0.4210	7/16	4	1	1010520	1060520
3/8	18	2.9/16	1.1/16	0.7000	0.5310	1/2	4	1	1010521	1060521
1/2	14	3.1/8	1.3/8	0.6880	0.5150	5/8	4	1	1010522	1060522
3/4	14	3.1/4	1.3/8	0.9060	0.6790	11/16	5	1	1010523	1060523
1"	11.5	3.3/4	1.3/4	1.1250	0.8430	13/16	5	1	1010524	—
1.1/4	11.5	4"	1.3/4	1.3130	0.9840	15/16	5	1	1010525	—
1.1/2	11.5	4.1/4	1.3/4	1.5000	1.1250	1"	7	1	1010526	—
2"	11.5	4.1/2	1.3/4	1.8750	1.4060	1.1/8	7	1	1010527	—

## General Purpose, Medium Hook, NPT

- E710** Straight Flute. Medium hook for multi-material tapping.
- E721** Generally used for pipe fittings and couplings in most ferrous and non-ferrous materials. The nominal size of a pipe tap is that of the pipe fitting to be tapped and not the actual size of the tap. NPT threads require the use of a 'sealant' such as teflon tape or pipe compound to ensure a tight joint.

TiN coating increases surface hardness and improves tool life.



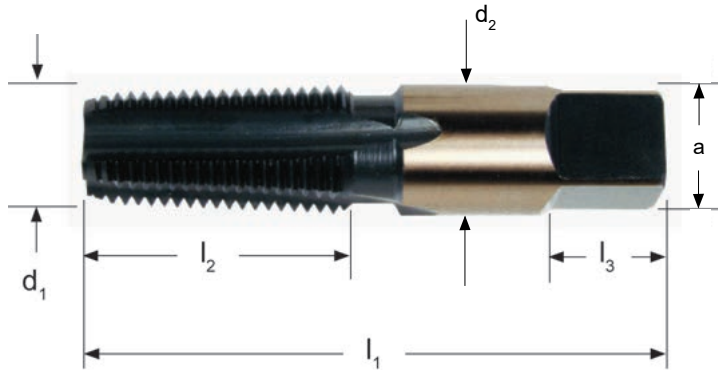
E710	E721
NPT	NPT
ANSI B94.9	ANSI B94.9
Normal	Normal
HSS	HSS
1/16 - 2"	1/8 - 1"

Nominal d <sub>1</sub>	TPI	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> Ø mm	□ a mm	l <sub>3</sub> mm		# of Flutes	l <sub>4</sub> mm	Pack Qty	E710	E721
1/16	27	65	17	7.9	5.9	8	6.3	4	11.7	1	0159491	—
1/8	27	70	19	11.1	8.3	10	8.5	4	11.9	1	0099889	0161463
1/8	27	70	19	11.1	8.3	10	8.5	4	11.9	Set of 2	0210314 <sup>1)</sup>	—
1/4	18	75	27	14.3	10.7	11	11	4	17.6	1	0099872	0161470
1/4	18	75	27	14.3	10.7	11	11	4	17.6	Set of 2	0210321 <sup>1)</sup>	—
3/8	18	80	27	17.8	13.5	13	14.5	4	19.5	1	0099919	0161487
3/8	18	80	27	17.8	13.5	13	14.5	4	19.5	Set of 2	0210338 <sup>1)</sup>	—
1/2	14	100	35	17.5	13.1	16	18	4	22.7	1	0099865	0161494
1/2	14	100	35	17.5	13.1	16	18	4	22.7	Set of 2	0210345 <sup>1)</sup>	—
3/4	14	105	35	23.0	17.2	17	23	5	24.4	1	0099902	0161500
3/4	14	105	35	23.0	17.2	17	23	5	24.4	Set of 2	0210352 <sup>1)</sup>	—
1"	11.5	115	43	28.6	21.4	21	29	5	29.4	1	0099834	0161517
1.1/4	11.5	125	43	33.3	25.0	24	38	5	27.7	1	0099858	—
1.1/2	11.5	135	43	38.1	28.6	25	44	7	28.9	1	0099841	—
2"	11.5	145	43	47.6	35.7	29	56	7	26.6	1	0099896	—

<sup>1)</sup> Sets (No.7) include: 1pc. semi-bottoming + 1 pc. semi-bottoming (truncated)

## General Purpose / Work-Rite, NPT

**6541** Straight Flute. Medium hook for multi-material tapping.  
Generally used for pipe fittings and couplings in most ferrous and non-ferrous materials.  
The nominal size of a pipe tap is that of the pipe fitting to be tapped and not the actual size of the tap. NPT threads require the use of a 'sealant' such as teflon tape or pipe compound to ensure a tight joint.



**6541**

**NPT**

ANSI  
**B94.9**

Normal

1/8 - 2"

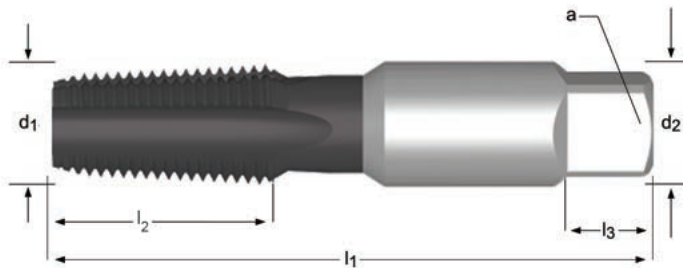
NPT	TPI	$l_1$ Inch	$l_2$ Inch	$d_2$ Ø Inch	$\square$ a Inch	$l_3$ Inch	# of Flutes	Pack Qty	<b>6541</b>
1/8	27	2.1/8	3/4	0.4380	0.3280	3/8	4	1	8110601
1/4	18	2.7/16	1.1/16	0.5630	0.4210	7/16	4	1	8110602
3/8	18	2.9/16	1.1/16	0.7000	0.5310	1/2	4	1	8110603
1/2	14	3.1/8	1.3/8	0.6880	0.5150	5/8	4	1	8110604
3/4	14	3.1/4	1.3/8	0.9060	0.6790	11/16	5	1	8110605
1"	11.5	3.3/4	1.3/4	1.1250	0.8430	13/16	5	1	8110606
1.1/4	11.5	4"	1.3/4	1.3130	0.9840	15/16	5	1	8110607
1.1/2	11.5	4.1/4	1.3/4	1.5000	1.1250	1	7	1	8110608
2"	11.5	4.1/2	1.3/4	1.8750	1.4060	1.1/8	7	1	8110609

# PIPE TAPS

## Low Rake for Cast Iron, NPT

**1544**

Straight Flute. Low rake heavy-duty for cast iron and heat treated alloy steels. Nitride surface treatment reduces wear and chip welding. Manufactured with a cutting geometry specifically for gray cast irons producing broken chips. The design makes these taps also appropriate for non-metallics, cast brass and other brass materials producing broken, powdery chips.



1544

NPT

ANSI  
B94.9

Normal



HSS



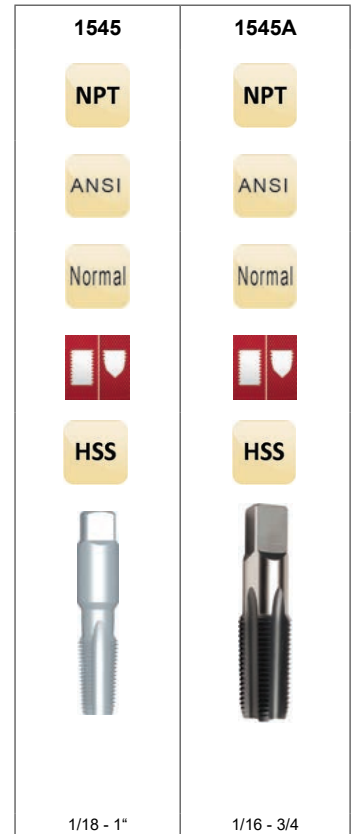
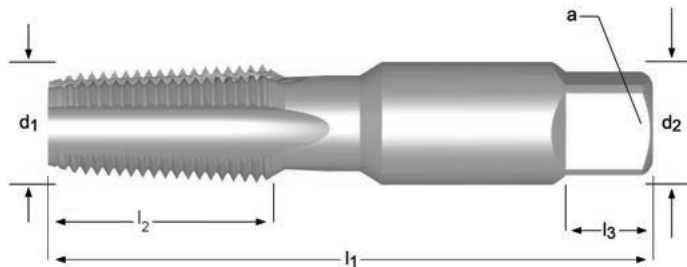
1/16 - 1.1/4

		$l_1$	$l_2$	$d_2$	$\square$	$l_3$	# of Flutes	Pack Qty	1544
NPT	TPI	Inch	Inch	Ø Inch	a Inch	Inch			
1/16	27	2.1/8	11/16	0.3130	0.2340	3/8	4	1	1011760
1/8	27	2.1/8	3/4	0.4380	0.3280	3/8	4	1	1011761
1/4	18	2.7/16	1.1/16	0.5630	0.4210	7/16	4	1	1011762
3/8	18	2.9/16	1.1/16	0.7000	0.5310	1/2	4	1	1011763
1/2	14	3.1/8	1.3/8	0.6880	0.5150	5/8	4	1	1011764
3/4	14	3.1/4	1.3/8	0.9060	0.6790	11/16	5	1	1011765
1"	11.5	3.3/4	1.3/4	1.1250	0.8430	13/16	5	1	1011766
1.1/4	11.5	4"	1.3/4	1.3130	0.9840	15/16	5	1	1011767

## High Hook, NPT

**1545** Designed with a high hook and deep flutes to handle the tough curly chips of free cutting materials such as low carbon and leaded steels, boiler plate, aluminum and die castings.

**1545A** Identical to the 1545 series but with steam oxide surface treatment to prevent galling and chipping.



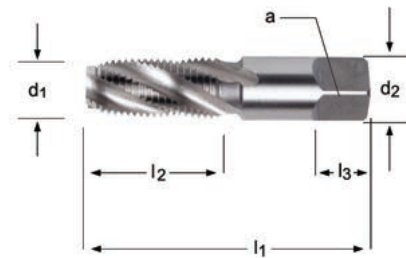
		$l_1$	$l_2$	$d_2$	$\square$	$l_3$	# of Flutes	Pack Qty	<b>1545</b>	<b>1545A</b>
<b>NPT</b>	<b>TPI</b>	<b>Inch</b>	<b>Inch</b>	<b>Inch</b>	<b>Inch</b>	<b>Inch</b>				
1/16	27	2.1/8	11/16	0.3130	0.2340	3/8	4	1	—	1052869
1/8	27	2.1/8	3/4	0.3130	0.2340	3/8	4	1	1012879	—
1/8	27	2.1/8	3/4	0.4380	0.3280	3/8	4	1	1012870	1052870
1/4	18	2.7/16	1.1/16	0.5630	0.4210	7/16	4	1	1012871	1052871
3/8	18	2.9/16	1.1/16	0.7000	0.5310	1/2	4	1	1012872	1052872
1/2	14	3.1/8	1.3/8	0.6880	0.5150	5/8	4	1	1012873	1052873
3/4	14	3.1/4	1.3/8	0.9060	0.6790	11/16	5	1	1012874	1052874
1"	11.5	3.3/4	1.3/4	1.1250	0.8430	13/16	5	1	1012875	—

# PIPE TAPS

## Spiral Flute, 30°, NPT

**1548**

Designed with a medium hook. Most effective when used in applications that produce, long, stringy chips. The spiral flute design effectively draws the chips from the hole being tapped.



1548

NPT

ANSI

Normal



HSS



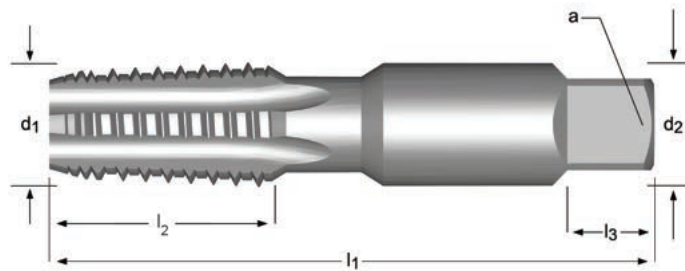
1/16 - 1"

		$l_1$	$l_2$	$d_2$	$\square$	$l_3$	# of Flutes	Pack Qty	1548
NPT	TPI	Inch	Inch	$\varnothing$ Inch	a Inch	Inch			
1/16	27	2.1/8	11/16	0.3130	0.2340	3/8	4	1	1010920
1/8	27	2.1/8	3/4	0.3130	0.2340	3/8	4	1	1010924
1/8	27	2.1/8	3/4	0.4380	0.3280	3/8	4	1	1010922
1/4	18	2.7/16	1.1/16	0.5630	0.4210	7/16	4	1	1010926
3/8	18	2.9/16	1.1/16	0.7000	0.5310	1/2	4	1	1010928
1/2	14	3.1/8	1.3/8	0.6880	0.5150	5/8	4	1	1010930
3/4	14	3.1/4	1.3/8	0.9060	0.6790	11/16	5	1	1010932
1"	11.5	3.3/4	1.3/4	1.1250	0.8430	13/16	5	1	1010934

## Interrupted Thread, NPT

**1568**

Interrupted thread design for chip evacuation. Removal of every other thread allows more coolant deeper into the hole. Helps to eliminate torn threads and re-cutting of chips. Ideal for use in soft, ductile materials or those producing long, continuous chips.



**1568**

**NPT**

ANSI

Normal



**HSS**

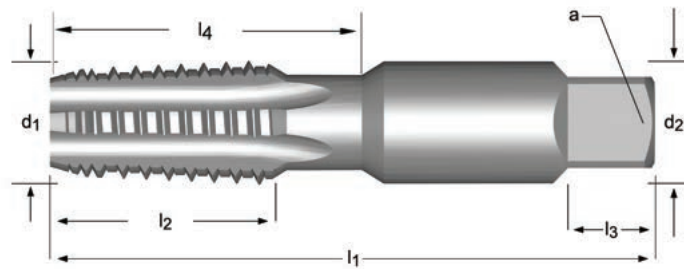


1/8 - 1.1/2

NPT	TPI	$l_1$ Inch	$l_2$ Inch	$d_2$ Ø Inch	$\square$ a Inch	$l_3$ Inch	# of Flutes	Pack Qty	<b>1568</b>
1/8	27	2.1/8	3/4	0.3130	0.2340	3/8	5	1	1010560
1/8	27	2.1/8	3/4	0.4380	0.3280	3/8	5	1	1010551
1/4	18	2.7/16	1.1/16	0.5630	0.4210	7/16	5	1	1010552
3/8	18	2.9/16	1.1/16	0.7000	0.5310	1/2	5	1	1010553
1/2	14	3.1/8	1.3/8	0.6880	0.5150	5/8	5	1	1010554
3/4	14	3.1/4	1.3/8	0.9060	0.6790	11/16	5	1	1010555
1"	11.5	3.3/4	1.3/4	1.1250	0.8430	13/16	5	1	1010556
1.1/4	11.5	4"	1.3/4	1.3130	0.9840	15/16	5	1	1010557
1.1/2	11.5	4.1/4	1.3/4	1.5000	1.1250	1"	7	1	1010558

## Interrupted Thread, NPT

**E711** Interrupted thread design for chip evacuation. Removal of every other thread allows more coolant deeper into the hole. Helps to eliminate torn threads and re-cutting of chips. Ideal for use in soft, ductile materials or those producing long, continuous chips.



E711

NPT

ANSI  
B94.9

Normal



HSS



1/8 - 1.1/2

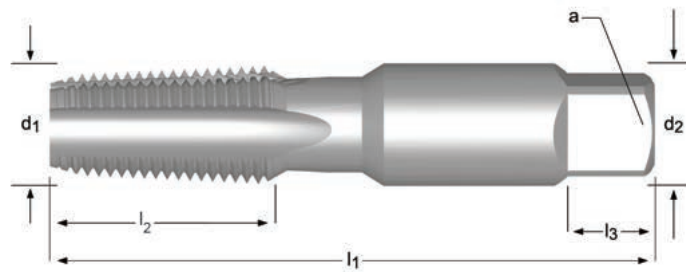
NPT	TPI	d <sub>1</sub> nom mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>4</sub> mm	d <sub>2</sub> Ø mm	□ a mm	l <sub>3</sub> mm	# of Flutes	↔	Pack Qty	E711
1/8	27	10.29	70	19	309	11.1	8.3	10	5	8.5	1	0099957
1/4	18	13.72	75	27	44.6	14.3	10.7	11	5	11.0	1	0099940
3/8	18	17.15	80	27	46.5	17.8	13.5	13	5	14.5	1	0099971
1/2	14	21.33	100	35	57.7	17.5	13.1	16	5	18.0	1	0099933
3/4	14	26.67	105	35	59.4	23.0	17.2	17	5	23.0	1	0099964
1"	11.5	33.40	115	43	72.4	28.6	21.4	21	5	29.0	1	0099926
1.1/2	11.5	48.26	135	43	71.9	38.1	28.6	25	7	44.0	1	0124079



## Dryseal, NPTF, Medium Hook

**1543** Similar in design to the 1541 series but manufactured to Dryseal American National Standard Taper Pipe Thread (NPTF) specifications. Used where a leak proof pressure tight joint is required without the use of a sealing compound.

**TN1543** TiN coated option increases surface hardness and improves tool life.



1543(NPTF)	TN1543
1/16 - 1"	1/8 - 3/4

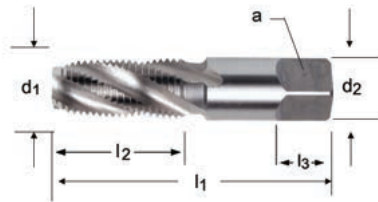
NPTF	TPI	$l_1$ Inch	$l_2$ Inch	$d_2$ Ø Inch	$\square$ a Inch	$l_3$ Inch	# of Flutes	Pack Qty	1543(NPTF)	TN1543
1/16	27	2.1/8	11/16	0.3130	0.2340	3/8	4	1	1010529	—
1/8	27	2.1/8	3/4	0.4380	0.3280	3/8	4	1	—	1060530
1/8	27	2.1/8	3/4	0.3130	0.2340	3/8	4	1	1010539	—
1/8	27	2.1/8	3/4	0.4380	0.3280	3/8	4	1	1010530	—
1/4	18	2.7/16	1.1/16	0.5630	0.4210	7/16	4	1	—	1060531
1/4	18	2.7/16	1.1/16	0.5630	0.4210	7/16	4	1	1010531	—
3/8	18	2.9/16	1.1/16	0.7000	0.5310	1/2	4	1	—	1060532
3/8	18	2.9/16	1.1/16	0.7000	0.5310	1/2	4	1	1010532	—
1/2	14	3.1/8	1.3/8	0.6880	0.5150	5/8	4	1	—	1060533
1/2	14	3.1/8	1.3/8	0.6880	0.5150	5/8	4	1	1010533	—
3/4	14	3.1/4	1.3/8	0.9060	0.6790	11/16	5	1	—	1060534
3/4	14	3.1/4	1.3/8	0.9060	0.6790	11/16	5	1	1010534	—
1"	11.5	3.3/4	1.3/4	1.1250	0.8430	13/16	5	1	1010535	—

# PIPE TAPS

## Spiral Flute, Dryseal, NPTF

**1549**

Spiral Flute 30°. Medium hook for evacuation of long, stringy chips. Similar in design to the 1548 series but manufactured to Dryseal American National Standard Taper Pipe Thread (NPTF) specifications. Used where a leak proof pressure tight joint is required without the use of a sealing compound.



**1549**

**NPTF**

ANSI

Normal



**HSS**



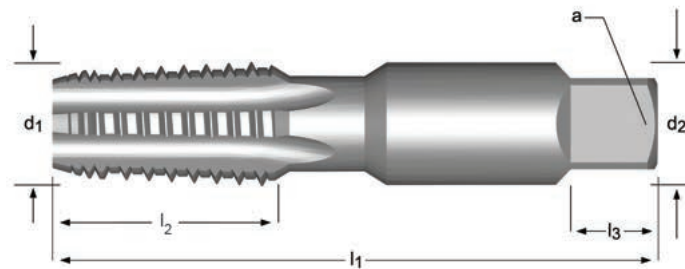
1/16 - 3/4

		$l_1$	$l_2$	$d_2$	$\square$	$l_3$	# of Flutes	Pack Qty	<b>1549</b>
<b>NPTF</b>	<b>TPI</b>	<b>Inch</b>	<b>Inch</b>	<b>Inch</b>	<b>Inch</b>	<b>Inch</b>			
1/16	27	2.1/8	11/16	0.3130	0.2340	3/8	4	1	1010921
1/8	27	2.1/8	3/4	0.3130	0.2340	3/8	4	1	1010925
1/8	27	2.1/8	3/4	0.4380	0.3280	3/8	4	1	1010923
1/4	18	2.7/16	1.1/16	0.5630	0.4210	7/16	4	1	1010927
3/8	18	2.9/16	1.1/16	0.7000	0.5310	1/2	4	1	1010929
1/2	14	3.1/8	1.3/8	0.6880	0.5150	5/8	4	1	1010931
3/4	14	3.1/4	1.3/8	0.9060	0.6790	11/16	5	1	1010933

## Interrupted Thread, Dryseal, NPTF

**1567** Interrupted thread design for chip evacuation. Removal of every other thread allows more coolant deeper into the hole. Helps to eliminate torn threads and re-cutting of chips.

Similar in design to the 1568 series but manufactured to Dryseal American National Standard Taper Pipe Thread (NPTF) specifications. Used where a leak proof pressure tight joint is required without the use of a sealing compound.



1567

NPTF

ANSI

Normal



HSS

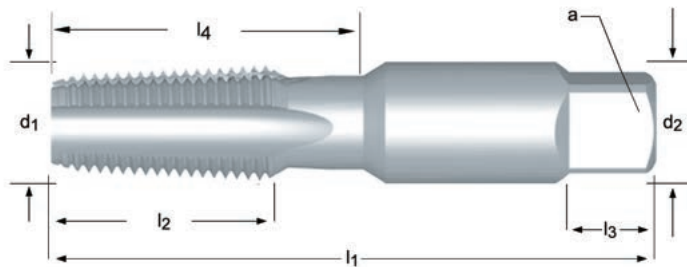


1/8 - 1"

NPTF	TPI	$l_1$ Inch	$l_2$ Inch	$d_2$ Ø Inch	$\square$ a Inch	$l_3$ Inch	# of Flutes	Pack Qty	1567
1/8	27	2.1/8	3/4	0.3130	0.2340	3/8	5	1	1010570
1/8	27	2.1/8	3/4	0.4380	0.3280	3/8	5	1	1010561
1/4	18	2.7/16	1.1/16	0.5630	0.4210	7/16	5	1	1010562
3/8	18	2.9/16	1.1/16	0.7000	0.5310	1/2	5	1	1010563
1/2	14	3.1/8	1.3/8	0.6880	0.5150	5/8	5	1	1010564
3/4	14	3.1/4	1.3/8	0.9060	0.6790	11/16	5	1	1010565
1"	11.5	3.3/4	1.3/4	1.1250	0.8430	13/16	5	1	1010566

## General Purpose, Medium Hook, Dryseal, NPTF

**E712** Medium hook for multi-material tapping. Similar in design to the E710 series but manufactured to Dryseal American National Standard Taper Pipe Thread (NPTF) specifications. Used where a leak proof pressure tight joint is required without the use of a sealing compound.



E712

NPTF

ANSI  
B94.9

Normal



HSS



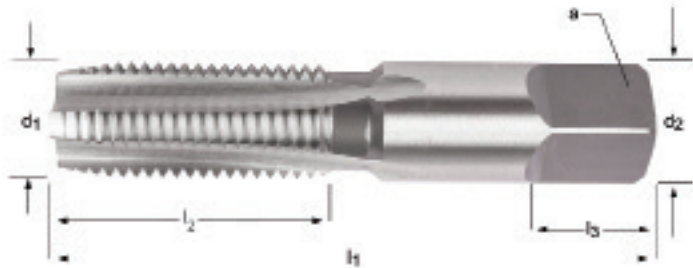
1/16 - 1.1/4

NPTF	TPI	d <sub>1</sub> nom mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>4</sub> mm	d <sub>2</sub> Ø mm	□ a mm	l <sub>3</sub> mm	# of Flutes	↔	Pack Qty	E712
1/16	27	7.94	65	17	11.7	8.1	6.0	8	4	6.20	1	0100004
1/8	27	10.29	70	19	11.9	11.1	8.3	10	4	8.40	1	0100035
1/4	18	13.72	75	27	17.6	14.3	10.7	11	4	10.90	1	0100028
3/8	18	17.15	80	27	19.5	17.8	13.5	13	4	14.25	1	0100059
1/2	14	21.34	100	35	22.7	17.5	13.1	16	4	17.75	1	0100011
3/4	14	26.67	105	35	24.4	23.0	17.2	17	5	23.00	1	0100042
1"	11.5	33.40	115	43	29.4	28.6	21.4	21	5	29.00	1	0099988
1.1/4	11.5	42.16	125	43	27.7	33.4	24.9	23	5	37.75	1	0099995

## Straight Pipe Taps, NPS & NPSF

**1542** NPSM (Mechanical) - Suitable for tapping holes for low pressure work, and then assemble with either taper threaded or straight threaded pipe or fitting and secure a tight joint with lubricant or sealer.

**1592** NPSF (Dryseal) - Similar in design to the 1542 series but manufactured to Dryseal American National Standard Pipe Thread NPSF specifications. Intended for low pressure work where a sealer is not used such as fuel and oil lines. When assembling with a dryseal taper-threaded part there will not be any clearance between the crest and roof of the threads.

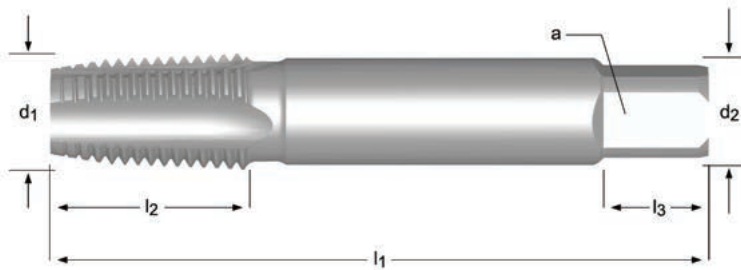


<b>1542</b>	<b>1592</b>
<b>NPSM</b>	<b>NPSF</b>
ANSI	ANSI
Normal	Normal
<b>HSS</b>	<b>HSS</b>
1/8 - 1"	1/8 - 3/4"

Nominal d <sub>1</sub>	TPI	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch /	□ a Inch	l <sub>3</sub> Inch	# of Flutes	Pack Qty	1542	1592
1/8	27	2.1/8	3/4	0.3130	0.2340	3/8	4	1	1010587	1010592
1/8	27	2.1/8	3/4	0.4380	0.3280	3/8	4	1	1010581	1010588
1/4	18	2.7/16	1.1/16	0.5630	0.4210	7/16	4	1	1010582	1010589
3/8	18	2.9/16	1.1/16	0.7000	0.5310	1/2	4	1	1010583	1010590
1/2	14	3.1/8	1.3/8	0.6880	0.5150	5/8	4	1	1010584	1010591
3/4	14	3.1/4	1.3/8	0.9060	0.6790	11/16	5	1	1010585	1011070
1"	11.5	3.3/4	1.3/4	1.1250	0.8430	13/16	5	1	1010586	—

## Taper Pipe Taps, British Standard

**E550** Similar to the E710 but manufactured to British Standard Taper Pipe Thread specification (BSPT).



E550

Rc

ISO  
2284

Normal



HSS



1/8 - 2"

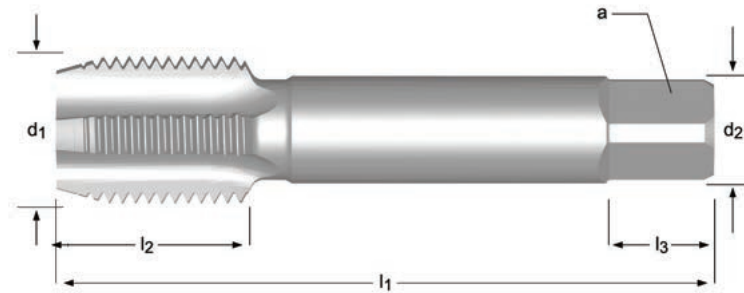
Rc	TPI	d <sub>1</sub> nom mm	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> Ø mm	□ a mm	l <sub>3</sub> mm	# of Flutes		Pack Qty	E550
1/8	28	9.728	59	15	8.0	6.3	9	3	8.4	1	0099490
1/8	28	9.728	59	15	8.0	6.3	9	3	8.4	Set of 2	0159408 <sup>1)</sup>
1/4	19	13.157	67	19	10.0	8.0	11	3	11.2	1	0099483
1/4	19	13.157	67	19	10.0	8.0	11	3	11.2	Set of 2	0159422 <sup>1)</sup>
3/8	19	16.662	75	21	12.5	10.0	13	3	14.75	1	0099520
3/8	19	16.662	75	21	12.5	10.0	13	3	14.75	Set of 2	0159446 <sup>1)</sup>
1/2	14	20.955	87	26	16.0	12.5	16	5	18.25	1	0099476
1/2	14	20.955	87	26	16.0	12.5	16	5	18.25	Set of 2	0159460 <sup>1)</sup>
3/4	14	26.441	96	28	20.0	16.0	20	5	23.75	1	0099513
3/4	14	26.441	96	28	20.0	16.0	20	5	23.75	Set of 2	0159484 <sup>1)</sup>
1"	11	33.249	109	33	25.0	20.0	24	5	30	1	0099445
1.1/4	11	41.910	119	36	31.5	25.0	28	5	38.5	1	0099469
1.1/2	11	47.803	125	37	35.5	28.0	31	7	44.5	1	0099452
2"	11	59.614	140	41	40.0	31.5	34	7	56	1	0099506

**Note: ISO shank and square dimensions will necessitate metric holders**

<sup>1)</sup> Sets (No.7) include: 1pc. semi-bottoming + 1 pc. semi-bottoming (truncated)

## Straight Pipe Taps, British Standard

**E547** Similar to the NPS pipe taps, but manufactured to British Standard Parallel Pipe Thread specifications (BSPP).



**E547**

**G**

**ISO 2284**

Normal

**HSS**

1/8 - 2"

Nominal d <sub>1</sub>	TPI	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> Ø mm	□ a mm	l <sub>3</sub> mm	# of Flutes		Pack Qty	Taper	Plug	Bottoming
1/8	28	59	15	8.0	8.0	9	4	8.8	1	0157169	0157176	0099285
1/4	19	67	19	10.0	8.0	11	4	11.8	1	0157190	0157206	0099278
3/8	19	75	21	12.5	10.0	13	4	15.25	1	0157220	0157237	0099315
1/2	14	87	26	16.0	12.5	16	4	19	1	0157251	0157268	0099261
5/8	14	91	26	18.0	14.0	18	4	21	1	0157282	0099322	0099339
3/4	14	96	28	20.0	16.0	20	4	24.5	1	0157299	0150757	0099308
7/8	14	102	29	22.4	18.0	22	4	28.25	1	0157305	0099353	0099360
1"	11	109	33	25.0	20.0	24	4	30.75	1	0157312	0157329	0099254
1.1/4	11	119	36	31.5	25.0	28	6	39.5	1	0157336	0099216	0099223
1.1/2	11	125	37	35.5	28.0	31	6	45	1	0157343	0099193	0099209
2"	11	140	41	40.0	31.5	34	6	57	1	0157367	0157374	0099292

**Note:** ISO shank and square dimensions will necessitate metric holders

# SPECIAL PURPOSE TAPS

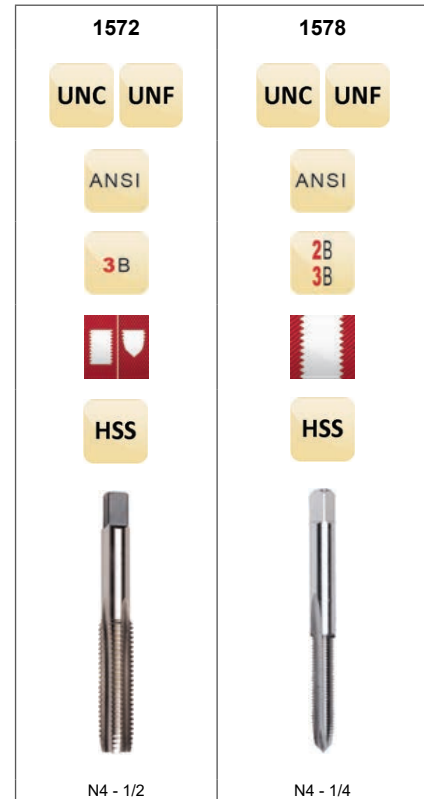
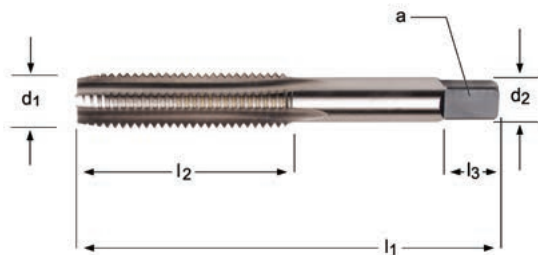


## Screw Thread Insert, STI

**1572** - Straight flute, hand tap

**1578** - Spiral point, machine tap

Designed for use in aluminum, magnesium, and other non-ferrous materials where taps of this type are most commonly used. Taps suitable for other materials can be furnished on request. STI taps are dimensionally oversize and utilize a larger tap drill size so that the thread they produce will accept a helical coil wire screw thread insert of the same nominal size and pitch. For a particular size and pitch the lower H-Limit number is suggested for class 2B and 3B threads, while the higher H-Limit is suggested for class 2B.



Nominal d <sub>1</sub>	TPI UNC	TPI UNF	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch /	□ a Inch	l <sub>3</sub> Inch	# of Flutes	Limits	Pack Qty	1572 - Plug	1572 Bottoming	1578 - Plug
4	40		2"	11/16	0.1410	0.1100	3/16	2	H2	1	—	—	1010491
4	40		2"	11/16	0.1410	0.1100	3/16	3	H2	1	1010419	1010421	—
6	32		2.3/8	7/8	0.1940	0.1520	1/4	2	H2	1	—	—	1010494
6	32		2.3/8	7/8	0.1940	0.1520	1/4	2	H3	1	—	—	1010495
6	32		2.3/8	7/8	0.1940	0.1520	1/4	3	H3	1	1010427	1010429	—
8	32		2.3/8	15/16	0.2200	0.1650	9/32	2	H2	1	—	—	1010498
8	32		2.3/8	15/16	0.2200	0.1650	9/32	2	H3	1	—	—	1010499
8	32		2.3/8	15/16	0.2200	0.1650	9/32	3	H3	1	1010435	1010437	—
10	24		2.1/2	1"	0.2550	0.1910	5/16	3	H2	1	1010438	1010440	—
10		32	2.1/2	1"	0.2550	0.1910	9/32	2	H2	1	—	—	1010502
10		32	2.1/2	1"	0.2550	0.1910	5/16	3	H2	1	1010442	1010444	—
10		32	2.1/2	1"	0.2550	0.1910	5/16	3	H3	1	1010443	1010445	—
1/4	20		2.23/32	1.1/8	0.3180	0.2380	5/16	2	H2	1	—	—	1010506
1/4	20		2.23/32	1.1/8	0.3180	0.2380	5/16	2	H3	1	—	—	1010507
1/4	20		2.23/32	1.1/8	0.3180	0.2380	3/8	3	H3	1	1010451	1010453	—
1/4		28	2.23/32	1.1/8	0.3180	0.2380	5/16	2	H2	1	—	—	1010508
1/4		28	2.23/32	1.1/8	0.3180	0.2380	5/16	2	H3	1	—	—	1010509
1/4		28	2.23/32	1.1/8	0.3180	0.2380	3/8	2	H2	1	—	1010456	—
5/16	18		2.15/16	1.1/4	0.3810	0.2860	7/16	4	H3	1	1010458	—	—
3/8	16		3.3/8	1.21/32	0.3670	0.2750	7/16	4	H3	1	1010466	1010468	—
7/16	14		3.19/32	1.21/32	0.4290	0.3220	1/2	4	H3	1	1010474	—	—
7/16		20	3.3/8	1.21/32	0.3670	0.2750	7/16	4	H3	1	—	—	—
1/2	13		3.13/16	1.13/16	0.4800	0.3600	9/16	4	H3	1	1010482	—	—
1/2		20	3.19/32	1.21/32	0.4290	0.3220	1/2	4	H3	1	—	—	—

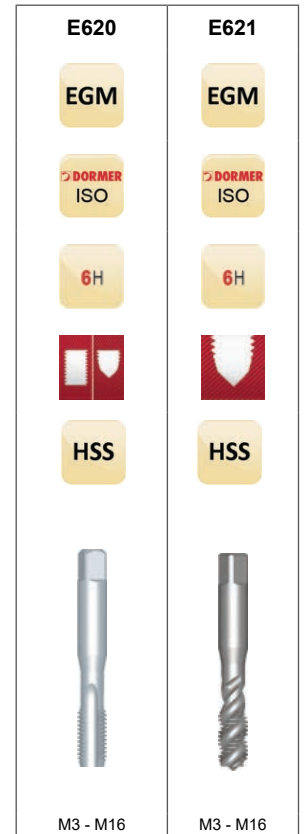
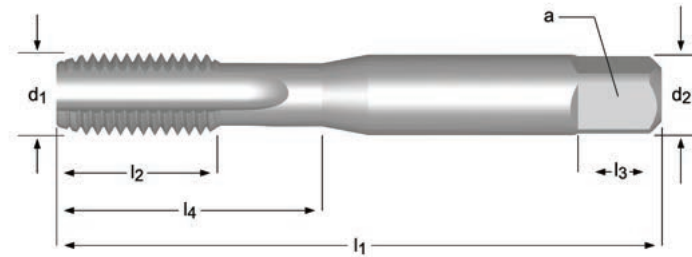


## Screw Thread Insert, STI, Semi-Bottoming

**E620** - Straight flute

**E621** - Spiral flute

Designed for use in aluminum, magnesium, and other non-ferrous materials where taps of this type are most commonly used. Taps suitable for other materials can be furnished on request. STI taps are dimensionally oversized and utilize a larger tap drill size so that the thread they produce will accept a helical coil wire screw thread insert of the same nominal size and pitch.

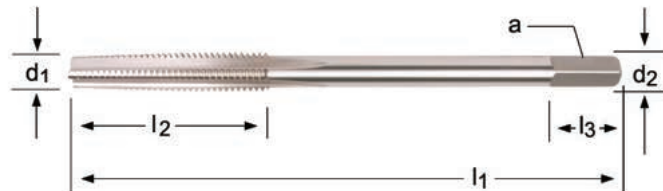


Nominal d <sub>1</sub>	P mm	l <sub>1</sub> mm	l <sub>2</sub> mm	d <sub>2</sub> Ø mm	□ a mm	l <sub>3</sub> mm	# of Flutes	↔	l <sub>4</sub> mm	Pack Qty	E620	E621
3	0.50	53	14	4.00	3.15	6	3	3.2	14	1	0384824	0384916
4	0.70	58	11	5.00	4.00	7	3	4.2	20	1	0384831	0384923
5	0.80	66	13	6.30	5.00	8	3	5.2	26	1	0384848	0384930
6	1.00	72	16	8.00	6.30	9	3	6.3	29	1	0384855	—
6	1.00	72	16	8.00	6.30	9	3	6.3	31	1	—	0384947
8	1.25	80	18	10.00	8.00	11	3	8.4	32	1	0384862	—
8	1.25	80	18	10.00	8.00	11	3	8.4	34	1	—	0384954
10	1.50	89	22	9.00	7.10	10	3	10.5		1	0384879	0384961
12	1.75	95	24	11.20	9.00	12	4	12.5		1	0384886	—
12	1.75	95	24	11.20	9.00	12	3	12.5		1	—	0384978
14	2.00	112	29	14.00	11.20	14	4	14.5		1	0384893	—
14	2.00	112	29	14.00	11.20	14	3	14.5		1	—	0384985
16	2.00	112	29	14.00	11.20	14	4	16.5		1	0384909	—
16	2.00	112	29	14.00	11.20	14	3	16.5		1	—	0384992

# SPECIAL PURPOSE TAPS

## Nut Style

**U1511** For small production runs in conventional tapping machines. They have a relatively long shank smaller than the minor diameter to permit accumulation of several nuts after tapping. Available in taper style, 7-10 thread chamfer.



U1511

UNC

ANSI

3B



HSS



1/4 - 1/2

UNC	TPI	$l_1$ Inch	$l_2$ Inch	$d_2$ Ø Inch	$\square$ a Inch	$l_3$ Inch	# of Flutes	Limits	Chamfer	Pack Qty	U1511
1/4	20	5"	1.5/8	0.1850	0.1390	9/16	4	H3	Taper	1	1010375
5/16	18	5.1/2	1.13/16	0.2400	0.1800	5/8	4	H3	Taper	1	1010376
3/8	16	6"	2"	0.2940	0.2200	11/16	4	H3	Taper	1	1010377
1/2	13	7"	2.1/2	0.4000	0.3000	7/8	4	H3	Taper	1	1010378

## Pulley Style

**1519** These taps have the same major diameters and pitch diameters as standard fractional size taps, but with extended shanks for reaching locations inaccessible to regular hand taps. Although originally designed for tapping pulley holes, the long shank permits tapping other long reach applications.



1519

UNC

ANSI

3B



HSS



1/4 - 3/4

UNC	TPI	$l_1$ Inch	$l_2$ Inch	$d_2$ Ø Inch	$\square$ a Inch	$l_3$ Inch	# of Flutes	Limits	Chamfer	Pack Qty	1519
1/4	20	6"	1.000	0.2550	0.1910	5/16	4	H3	Plug	1	1010379
1/4	20	8"	1.000	0.2550	0.1910	5/16	4	H3	Plug	1	1010380
5/16	18	6"	1.1/8	0.3180	0.2380	3/8	4	H3	Plug	1	1010381
5/16	18	8"	1.1/8	0.3180	0.2380	3/8	4	H3	Plug	1	1010382
3/8	16	6"	1.1/4	0.3810	0.2860	7/16	4	H3	Plug	1	1010383
3/8	16	8"	1.1/4	0.3810	0.2860	7/16	4	H3	Plug	1	1010384
3/8	16	10"	1.1/4	0.3810	0.2860	7/16	4	H3	Plug	1	1010385
1/2	13	6"	1.21/32	0.5070	0.3800	9/16	4	H3	Plug	1	1010388
1/2	13	8"	1.21/32	0.5070	0.3800	9/16	4	H3	Plug	1	1010389
1/2	13	10"	1.21/32	0.5070	0.3800	9/16	4	H3	Plug	1	1010390
5/8	11	6"	1.13/16	0.6330	0.4750	11/16	4	H3	Plug	1	1010392
5/8	11	8"	1.13/16	0.6330	0.4750	11/16	4	H3	Plug	1	1010393
5/8	11	10"	1.13/16	0.6330	0.4750	11/16	4	H3	Plug	1	1010394
3/4	10	10"	2.000	0.7590	0.5690	3/4	4	H3	Plug	1	1010396

# SPECIAL PURPOSE TAPS

## Combination Drill & Tap

**1994** Spiral Flute 15°. Drills and taps in a single pass, reducing cycle time. Commonly used in multi-spindle operations with reversing capacity. Designed to provide 65% thread engagement and a 2B class of fit.

Bright finish improves chip flow in soft or non-ferrous materials.



1994(UNF)

UNC UNF

ANSI

2B



HSS



No.4 - 1/2

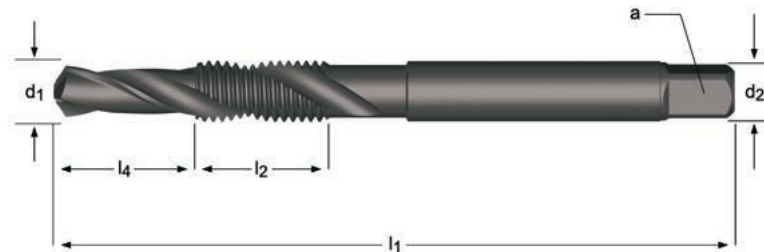
UNC	UNF	TPI	d <sub>1</sub> Ø Inch	l <sub>1</sub> Inch	l <sub>2</sub> Inch	d <sub>2</sub> Ø Inch	□ a Inch	l <sub>3</sub> Inch	l <sub>4</sub> Inch	# of Flutes	Pack Qty	1994
4		40	0.0890	1.7/8	3/8	0.1410	0.1100	3/16	1/4	2	1	1110010
5		40	0.1015	1.15/16	13/32	0.1410	0.1100	3/16	9/32	2	1	1110020
6		32	0.1110	2"	7/16	0.1410	0.1100	3/16	5/16	2	1	1110030
8		32	0.1360	2.1/8	1/2	0.1680	0.1310	1/4	3/8	2	1	1110040
10		24	0.1540	2.3/8	5/8	0.1940	0.1520	1/4	13/32	2	1	1110050
	10	32	0.1610	2.3/8	5/8	0.1940	0.1520	1/4	13/32	2	1	1110054
12		24	0.1800	2.3/8	21/32	0.2200	0.1650	9/32	15/32	2	1	1110060
	12	28	0.1850	2.3/8	21/32	0.2200	0.1650	9/32	15/32	2	1	1110064
1/4		20	0.2055	2.1/2	25/32	0.2550	0.1910	5/16	17/32	2	1	1110080
	1/4	28	0.2188	2.1/2	25/32	0.2550	0.1910	5/16	17/32	2	1	1110084
5/16		18	0.2660	2.27/32	15/16	0.3180	0.2380	3/8	11/16	2	1	1110090
	5/16	24	0.2770	2.27/32	15/16	0.3180	0.2380	3/8	11/16	2	1	1110094
3/8		16	0.3230	3.3/8	1.1/16	0.3810	0.2860	7/16	13/16	2	1	1110100
	3/8	24	0.3390	3.3/8	1.1/16	0.3810	0.2860	7/16	13/16	2	1	1110104
7/16		14	0.3770	3.3/4	1.1/4	0.3230	0.2420	13/32	1"	2	1	1110110
	7/16	20	0.3937	3.3/4	1.1/4	0.3230	0.2420	13/32	1"	2	1	1110114
1/2		13	0.4331	4.1/16	1.3/8	0.3670	0.2750	7/16	1.1/8	2	1	1110120
	1/2	20	0.4531	4.1/16	1.3/8	0.3670	0.2750	7/16	1.1/8	2	1	1110124

## Combination Drill & Tap

**E651** Spiral Flute 30°. Drills and taps in a single pass, reducing cycle time. Commonly used in multi-spindle operations with reversing capacity. Designed to provide 65% thread engagement and a 2B class of fit.

**E654**

Steam oxide finish reduces wear and chip welding in harder ferrous materials.



E651 / E654

UNC UNF

DORMER  
DIN

2B



HSS



No.6 - 5/8

UNC	UNF	TPI	d <sub>1</sub> nom mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>4</sub> mm	d <sub>2</sub> Ø mm	□ a mm	# of Flutes	Pack Qty	E651 / E654
6		32	2.85	56.9	12	6.0	3.50	2.90	2	1	0388907
8		32	3.50	64.0	12	8.0	4.50	3.55	2	1	0273272
	8	36	3.50	64.0	13	8.0	4.50	3.55	2	1	0339053
10		24	3.90	72.0	15	10.0	5.00	4.00	2	1	0273197
	10	32	4.10	72.0	16	10.0	5.00	4.00	2	1	0338971
12		24	4.50	77.0	15	11.0	5.60	4.50	2	1	0273210
	12	28	4.70	77.0	17	11.0	5.60	4.50	2	1	0338995
1/4		20	5.10	83.0	17	13.0	6.30	5.00	2	1	0273227
	1/4	28	5.50	83.0	19	13.0	6.30	5.00	2	1	0339008
5/16		18	6.60	94.0	21	16.0	8.00	6.30	2	1	0273241
	5/16	24	6.90	94.0	22	16.0	8.00	6.30	2	1	0339022
3/8		16	8.00	104.0	23	19.0	10.00	8.00	2	1	0273234
	3/8	24	8.50	104.0	24	19.0	10.00	8.00	2	2	0339015
7/16		14	9.40	107.0	25	22.0	8.00	6.30	2	1	0273265
	7/16	20	9.90	107.0	25	22.0	8.00	6.30	2	1	0339046
1/2		13	10.80	114.0	29	25.0	9.00	7.10	2	1	0273203
	1/2	20	11.50	114.0	29	25.0	9.00	7.10	2	1	0338988
9/16		12	12.20	124.0	29	28.0	11.20	9.00	2	1	0273289
	9/16	18	12.90	124.0	30	28.0	11.20	9.00	2	1	0339060
5/8		11	13.50	134.0	31	32.5	12.50	10.00	2	1	0273258
	5/8	18	14.50	134.0	32	32.0	12.50	10.00	2	1	0339039

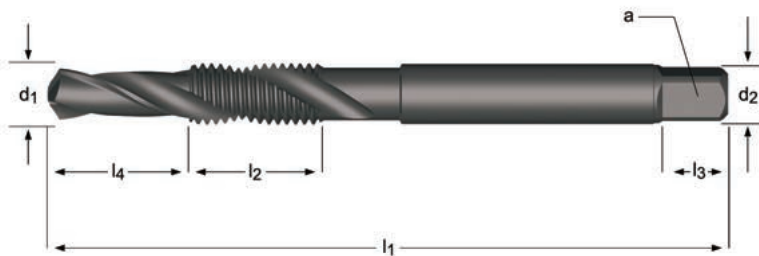
# SPECIAL PURPOSE TAPS



## Combination Drill & Tap

**E650** Spiral Flute 30°. Drills and taps in a single pass, reducing cycle time. Commonly used in multi-spindle operations with reversing capacity. Designed to provide 65% thread engagement and a 2B class of fit.

Steam oxide finish reduces wear and chip welding in harder ferrous materials.



E650

M

DORMER  
ISO

6H



HSS



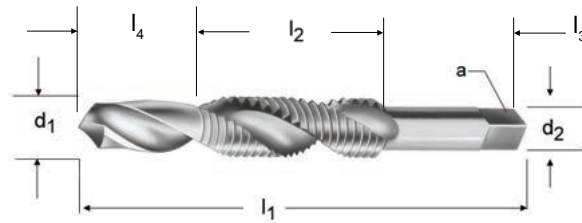
M3 - M16

M	P mm	d <sub>1</sub> Ø mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>4</sub> mm	d <sub>2</sub> Ø mm	∇ a mm	l <sub>3</sub> mm	# of Flutes	Pack Qty	E650
3	0.50	2.5	56	10	6	3.15	2.5	5.0	2	1	0167861
4	0.70	3.3	65	12	8	4.0	3.15	6.0	2	1	0127551
5	0.80	4.2	69	15	10	5.0	4.00	7.0	2	1	0127568
6	1.00	5.0	84	18	12	6.3	5.00	8.0	2	1	0127575
8	1.25	6.8	96	21	16	8.0	6.30	9.0	2	1	0127582
10	1.50	8.5	108	22	20	10.0	8.00	11.0	2	1	0127513
12	1.75	10.2	113	29	24	9.0	7.10	10.0	2	1	0127520
14	2.00	12.0	123	30	28	11.2	9.00	12.0	2	1	0127537
16	2.00	14.0	134	32	32	12.5	10.00	13.0	2	1	0127544

## Combination Drill & Tap, NPT Pipe Threads

**E653** Spiral Flute 27°. Drills and taps in a single pass, reducing cycle time. Commonly used in multi-spindle operations with reversing capacity.

Bright finish improves chip flow in soft or non-ferrous materials.



E653

NPT

ANSI

Normal



HSS



1/8 - 1"

NPT	TPI	d <sub>1</sub> nom Inch	l <sub>1</sub> Inch	l <sub>2</sub> Inch	l <sub>3</sub> Inch	l <sub>4</sub> Inch	d <sub>2</sub> ∅ Inch	□ a Inch	# of Flutes	Pack Qty	E653
1/8	27	0.3346	2.7/8	3/4	3/8	3/4	0.4370	0.3280	2	1	0297285
1/4	18	0.4331	3.5/16	1.1/16	7/16	7/8	0.5620	0.4210	2	1	0297278
3/8	18	0.5709	3.1/2	1.1/16	1/2	15/16	0.7000	0.5310	2	1	0297308
1/2	14	0.7087	4.3/8	1.3/8	5/8	1.1/4	0.6870	0.5150	2	1	0297261
3/4	14	0.9055	4.9/16	1.3/8	11/16	1.5/16	0.9060	0.6790	2	1	0297292
1"	11.5	1.1417	5.3/8	1.3/4	13/16	1.5/8	1.1250	0.8430	2	1	0297247

## Tap Wrench, T-Handle

**1215** T-Handle tap wrenches have a sliding handle and chuck. Designed for hand tapping in tight places and can also be used with any tool that can be turned by hand.



Tap Wrench #	Hand Reamer Capacity Inch	Hand Reamer Capacity mm	Hand Tap Capacity Inch	Hand Tap Capacity mm	Pack Qty	1215
T0	1/8 - 3/16	M3 - M5	1/16 - 5/32	M1 - M4	1	1810372
T1	3/16 - 5/16	M4 - M7	3/16 - 7/16	M4 - M10	1	1810373
T2	1/4 - 15/32	M6 - M14	1/4 - 9/16	M6 - M14	1	1810374



**Tap Wrench, Straight Handle**

**3850** Straight handle tap wrenches are ideal for hand tapping. The straight handle design provides greater leverage, particularly suited for use with larger diameters. Simple to operate. Hardened steel jaws are opened and closed by simply twisting one hand which is knurled for side gripping.



**3850**



No.8 - No.14

Number	Hand Reamer Capacity Inch	Hand Reamer Capacity mm	Hand Tap Capacity Inch	Hand Tap Capacity mm	$l_1$ Length	Pack Qty	<b>3850</b>
8	1/8 - 5/16	M3 - M8	1/16 - 5/16	M1 - M8	7"	1	1810017
9	3/16 - 3/8	M5 - M9	3/16 - 1/2	M4 - M12	10.1/2"	1	1810018
10	1/4 - 9/16	M6 - M14	1/4 - 3/4	M3 - M8	15"	1	1810019
11	3/8 - 3/4	M9 - M19	3/8 - 1"	M10 - M25	20"	1	1810020
12	3/8 - 7/8	M9 - M22	3/8 - 1.1/8	M10 - M27	25.5/8"	1	1810021
14	5/8 - 1.1/2	M16 - M39	7/8 - 1.7/8	M22 - M42	40.1/2"	1	1810022

# MISCELLANEOUS

## Tap & Drill Combination Sets

**229CSET** 18 piece tap (styles 1500 and 1528) with corresponding drills (styles R10P & R18P). Metal index.



229CSET

UNC

ANSI







HSS



Set

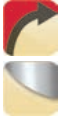











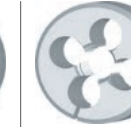
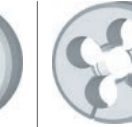


Set	Style	Pieces per Set	UNC Tap Sizes	Tap Drill Sizes	Pack Qty	229CSET
229C	1500,1528 Taps; R10P,R15P,R18P Drills	18	6-32,8-32,10-24,10-32,1/4-20,5/16-18,3/8-16,7/16-14,1/2-13	#36,#29,#25,#21,#7,#F,5/16,U,27/64	1	4111502

# Visual Index - Dies

























Thread Form:	<b>UNC</b>	<b>UNF</b>
Standard:	<b>ANSI</b>	<b>ANSI</b>
Tolerance:		
Chamfer:		
Tool Material:	<b>CS</b>	<b>CS</b>
Direction of Cut:		
Finish/Coating:		
		
Style:	<b>2010(UNC)</b>	<b>2010(UNF)</b>
Range:	No.4 - 1.1/2	No.10 - 1.1/2

Application Material Groups (AMG)			Hardness HRC	Page #	383	383
1. Steel	1.1 Magnetic soft steel	12L14, 12L15	<120 HB	1.1	26	26
	1.2 Structural Steel/ case carburising steel	1005-1025, 1214, 1215, A36	<200 HB	1.2	23	23
	1.3 Plain Carbon steel	1030-1060, 1050-1060, 1144-1146	<24	1.3	20	20
	1.4 Alloy steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	<24	1.4	16	16
	1.5 Alloy steel/ Hardened and tempered steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	>24<38	1.5		
	1.6 Alloy steel/ Hardened and tempered steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	>38	1.6		
	1.7 Alloy steel Hardened	A2-D2, H10-H41, L1-L6, M1-M42, T1	49-55	1.7		
	1.8 Alloy steel Hardened	A2-D2, H10-H41, L1-L6, M1-M42, T1	55-63	1.8		
2. Stainless Steel	2.1 Free machining Stainless Steel	200, 303, 416, 420F, 430F, 440	<24	2.1	13	13
	2.2 Austenitic	301, 302, 304, 316, 321, 330, CUSTOM 455, AM-350	<24	2.2	7	7
	2.3 Ferritic + Austenitic, Martensitic	318-329, 400-446, DUPLEX	<32	2.3		
	2.4 Precipitation Hardened	15-5PH, Custom 450 17-4PH	<32	2.4		
3. Cast Iron	3.1 Lamellar graphite	Grey, G10, Gg40, J431C, A48 CLASS 20	<150 HB	3.1	26	26
	3.2 Lamellar graphite	Grey, GG25-Gg40, J158, A48 CLASS 40-60	>150 HB<32	3.2	23	23
	3.3 Nodular graphite/ Malleable Cast Iron	A220, A436, A439, A602, Black, GGG40-GGG70	<200 HB	3.3	20	20
	3.4 Nodular graphite/ Malleable Cast Iron	Black Gts/Gtw, J434C	>200 HB<32	3.4	16	16
4. Titanium	4.1 Titanium, unalloyed	Commercially Pure	<200 HB	4.1		
	4.2 Titanium, alloyed	6Al4V, 6A14V-2Sn, Monel, Monel K	<28	4.2		
	4.3 Titanium, alloyed	6Al4V-4Mo, 7A14V-4Mo, 4911-4967	>28<38	4.3	7	7
5. Nickel	5.1 Nickel, unalloyed	Commercially Pure, 17644, 200, 5553	<150 HB	5.1	30	30
	5.2 Nickel, alloyed	Monel 400, Hastelloy C, Inconel 625, Waspaloy	<28	5.2	7	7
	5.3 Nickel, alloyed	Inconel 718, Nimonic 75-95, Rene 41, Inconel 825, A286	>28<38	5.3	7	7
6. Copper	6.1 Copper	Commercially Pure	<100 HB	6.1	30	30
	6.2 β-Brass, Bronze	314-340, 350-370	<200 HB	6.2	26	26
	6.3 α-Brass	Alloyed Cu + Al + Fe, Long Chipping	<200 HB	6.3	23	23
	6.4 High Strength Bronze	Ampco 18-25	<49	6.4		
7. Aluminium Magnesium	7.1 Al, Mg, unalloyed	Commercially Pure	<100 HB	7.1	33	33
	7.2 Al alloyed, Si<0.5%	6061 T6, 7075, 314-340	<150 HB	7.2	49	49
	7.3 Al alloyed, Si>0.5%<10%	6061 T6, 380-390	<120 HB	7.3	49	49
	7.4 Al alloyed, Si>10% Mg alloys	Magnesium Whisker Reinforced	<120 HB	7.4	33	33
8. Synthetic Materials	8.1 Thermoplastics	Ultradid, Polystrol	---	8.1	49	49
	8.2 Thermosetting plastics	Bakelit, Pertinax	---	8.2	33	33
	8.3 Reinforced plastic materials	CFK, GFKAFK	---	8.3	16	16
9. Hard Mat.	9.1 Cermets (Metal-ceramics)	Ferrotic	<54	9.1		
10. Graphite	10.1 Standard graphite		---	10.1		

# Visual Index - Dies

	UNS	NPT	UNC	UNF	UNC	UNF	M	G
	ANSI	ANSI	ANSI	ANSI	BS 1127: 1950	BS 1127: 1950	ANSI	BS 1127: 1950
					1.75XP	1.75XP		1.75XP
	CS	CS	HSS	HSS	HSS	HSS	HSS	HSS
								
								
	<b>2010(UNS)</b>	<b>2010(NPT)</b>	<b>2510(UNC)</b>	<b>2510(UNF)</b>	<b>F320</b>	<b>F330</b>	<b>2710M</b>	<b>F370</b>
	1"	1/8 - 1/2	No.5 - 7/8	No.5 - 7/8	No.4 - 1.1/4	No.4 - 1.1/2	M2 - M20	1/8 - 1.1/2
	<b>373</b>	<b>373</b>	<b>385</b>	<b>385</b>	<b>387</b>	<b>387</b>	<b>389</b>	<b>390</b>
1.1	26	26	26	26	26	26	26	26
1.2	23	23	23	23	23	23	23	23
1.3	20	20	20	20	20	20	20	20
1.4	16	16	16	16	16	16	16	16
1.5								
1.6								
1.7								
1.8								
2.1	13	13	13	13	13	13	13	13
2.2	7	7	7	7	7	7	7	7
2.3								
2.4								
3.1	26	26	26	26	26	26	26	26
3.2	23	23	23	23	23	23	23	23
3.3	20	20	20	20	20	20	20	20
3.4	16	16	16	16	16	16	16	16
4.1								
4.2								
4.3	7	7	7	7	7	7	7	7
5.1	30	30	30	30	30	30	30	30
5.2	7	7	7	7	7	7	7	7
5.3	7	7	7	7	7	7	7	7
6.1	30	30	30	30	30	30	30	30
6.2	26	26	26	26	26	26	26	26
6.3	23	23	23	23	23	23	23	23
6.4								
7.1	33	33	33	33	33	33	33	33
7.2	49	49	49	49	49	49	49	49
7.3	49	49	49	49	49	49	49	49
7.4	33	33	33	33	33	33	33	33
8.1	49	49	49	49	49	49	49	49
8.2	33	33	33	33	33	33	33	33
8.3	16	16	16	16	16	16	16	16
9.1								
10.1								

# Visual Index - Dies

	M	UNC	UNF	UNS	NPT	M	M	MF
	ISO <b>2568</b>	ANSI	ANSI	ANSI	ANSI	ANSI	BS <b>1127: 1950</b>	BS <b>1127: 1950</b>
	6g						6g	6g
	1.75XP						1.75XP	1.75XP
	HSS	CS	CS	CS	CS	CS	HSS	HSS
								
								
								
	<b>F201</b> M3 - M20	<b>2025(UNC)</b> 1/4 - 1.1/2	<b>2025(UNF)</b> 1/4 - 1.1/2	<b>2025(UNS)</b> 11/16 - 1"	<b>2025(NPT)</b> 1/8 - 1"	<b>2325M</b> M6 - M20	<b>F302</b> M3 - M36	<b>F312</b> M8 - M24
	<b>391</b>	<b>392</b>	<b>392</b>	<b>392</b>	<b>392</b>	<b>393</b>	<b>394</b>	<b>395</b>
1.1	26	26	26	26	26	26	26	26
1.2	23	23	23	23	23	23	23	23
1.3	20	20	20	20	20	20	20	20
1.4	16	16	16	16	16	16	16	16
1.5								
1.6								
1.7								
1.8								
2.1	13	13	13	13	13	13	13	13
2.2	7	7	7	7	7	7	7	7
2.3								
2.4								
3.1	26	26	26	26	26	26	26	26
3.2	23	23	23	23	23	23	23	23
3.3	20	20	20	20	20	20	20	20
3.4	16	16	16	16	16	16	16	16
4.1								
4.2								
4.3	7	7	7	7	7	7	7	7
5.1	30	30	30	30	30	30	30	30
5.2	7	7	7	7	7	7	7	7
5.3	7	7	7	7	7	7	7	7
6.1	30	30	30	30	30	30	30	30
6.2	26	26	26	26	26	26	26	26
6.3	23	23	23	23	23	23	23	23
6.4								
7.1	33	33	33	33	33	33	33	33
7.2	49	49	49	49	49	49	49	49
7.3	49	49	49	49	49	49	49	49
7.4	33	33	33	33	33	33	33	33
8.1	49	49	49	49	49	49	49	49
8.2	33	33	33	33	33	33	33	33
8.3	16	16	16	16	16	16	16	16
9.1								
10.1								

# List Number Index - Dies



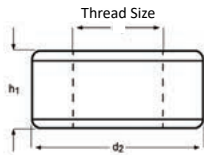
Pgs. 379-397

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2710M.....	389
F201 .....	391
F302 .....	394
F312 .....	395
F320 .....	387
F330 .....	387
F370 .....	390
L110.....	396

**Round Adjustable, Split Type**

**2010** Round adjustable dies can be closed down by approximately 0.006" on diameter. Bright finish improves chip flow in soft or non-ferrous materials.

*Note: Die pictured has 4 clearance holes.  
The number of clearance holes will increase or decrease depending on the size of the die  
NPT type dies are not split*



2010		2010(UNS)	2010(NPT)
UNC	UNF	UNS	NPT
CS	CS	CS	CS
2B	2B		
No.4 - 1.1/2		1"	1/8 - 1/2

UNC	UNF	UNS	NPT	TPI	d <sub>2</sub> Ø Inch	h <sub>1</sub> Inch	Pack Qty	2010 (UNC)(UNF)	2010 (UNS)	2010 (NPT)
4				40	13/16	1/4	1	1410016	—	—
5				40	13/16	1/4	1	1410022	—	—
6				32	1"	3/8	1	1410027	—	—
6				32	13/16	1/4	1	1410026	—	—
8				32	1"	3/8	1	1410033	—	—
8				32	13/16	1/4	1	1410032	—	—
	10			32	1"	3/8	1	1410042	—	—
	10			32	13/16	1/4	1	1410041	—	—
10				24	1"	3/8	1	1410039	—	—
10				24	13/16	1/4	1	1410038	—	—
	12			28	13/16	1/4	1	1410047	—	—
12				24	13/16	1/4	1	1410044	—	—
	1/4			28	1"	3/8	1	1410069	—	—
	1/4			28	1.1/2	1/2	1	1410071	—	—
	1/4 (UNEF)			32	1"	3/8	1	1410077	—	—
1/4				20	1"	3/8	1	1410064	—	—
1/4				20	1.1/2	1/2	1	1410066	—	—
1/4				20	13/16	1/4	1	1410063	—	—
	5/16			24	1"	3/8	1	1410085	—	—
	5/16			24	1.1/2	1/2	1	1410087	—	—
	5/16			32	1"	3/8	1	1410090	—	—
5/16				18	1"	3/8	1	1410080	—	—
5/16				18	1.1/2	1/2	1	1410082	—	—
5/16				18	13/16	1/4	1	1410079	—	—
5/16				18	2"	5/8	1	1410083	—	—
	3/8			24	1"	3/8	1	1410097	—	—
	3/8			24	1.1/2	1/2	1	1410099	—	—
3/8				16	1"	3/8	1	1410093	—	—
3/8				16	1.1/2	1/2	1	1410095	—	—
3/8				16	2"	5/8	1	1410096	—	—
			1/8	27	1"	3/8	1	—	—	1410203
			1/8	27	1.1/2	1/2	1	—	—	1410204
	7/16			20	1"	3/8	1	1410105	—	—

# DIES



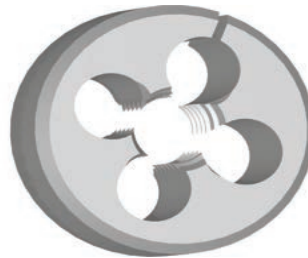
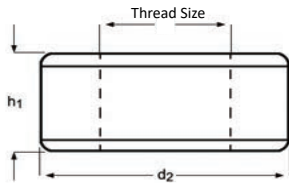
UNC	UNF	UNS	NPT	TPI	d <sub>2</sub> Ø Inch	h <sub>1</sub> Inch	Pack Qty	2010 (UNC)(UNF)	2010 (UNS)	2010 (NPT)
	7/16			20	1.1/2	1/2	1	1410107	—	—
7/16				14	1"	3/8	1	1410101	—	—
7/16				14	1.1/2	1/2	1	1410103	—	—
	1/2			20	1.1/2	1/2	1	1410114	—	—
1/2				13	1.1/2	1/2	1	1410110	—	—
1/2				13	2"	5/8	1	1410111	—	—
			1/4	18	1.1/2	1/2	1	—	—	1410205
			1/4	18	2"	5/8	1	—	—	1410206
	9/16			18	1.1/2	1/2	1	1410120	—	—
9/16				12	1.1/2	1/2	1	1410117	—	—
	5/8			18	1.1/2	1/2	1	1410126	—	—
	5/8			18	2"	5/8	1	1410127	—	—
5/8				11	1.1/2	1/2	1	1410123	—	—
5/8				11	2"	5/8	1	1410124	—	—
			3/8	18	1.1/2	1/2	1	—	—	1410207
			3/8	18	2"	5/8	1	—	—	1410208
	3/4			16	2"	5/8	1	1410133	—	—
3/4				10	2"	5/8	1	1410131	—	—
			1/2	14	2"	5/8	1	—	—	1410209
	7/8			14	2"	5/8	1	1410137	—	—
7/8				9	2"	5/8	1	1410135	—	—
		1"		14	3"	1"	1	—	1410144	—
	1"			12	3"	1"	1	1410142	—	—
1"				8	3"	1"	1	1410140	—	—
1.1/8				7	3"	1"	1	1410145	—	—
	1.1/4			12	3"	1"	1	1410148	—	—
1.1/4				7	3"	1"	1	1410147	—	—
1.3/8				6	3"	1"	1	1410149	—	—
	1.1/2			12	3"	1"	1	1410152	—	—
1/1/2				6	3"	1"	1	1410151	—	—



**Round Adjustable, Split Type**

**2510** Round adjustable dies can be closed down by approximately 0.006” on diameter. Bright finish improves chip flow in soft or non-ferrous materials.

*Note: Die pictured has 4 clearance holes. The number of clearance holes will increase or decrease depending on the size of the die*



2510(UNC)	2510(UNF)
UNC	UNF
HSS	HSS
ANSI	ANSI
2B	2B
N5 - 7/8	N5 - 7/8

UNC	UNF	TPI	d <sub>2</sub> ∅ Inch	h <sub>1</sub> Inch	Pack Qty	2510(UNC)	2510(UNF)
	5	44	13/16	1/4	1	—	1410154
5		40	13/16	1/4	1	1410153	—
	6	40	13/16	1/4	1	—	1410157
	8	36	13/16	1/4	1	—	1410161
8		32	1"	3/8	1	1410160	—
8		32	13/16	1/4	1	1410159	—
	10	32	1"	3/8	1	—	1410165
	10	32	13/16	1/4	1	—	1410166
10		24	1"	3/8	1	1410164	—
10		24	13/16	1/4	1	1410163	—
	12	28	13/16	1/4	1	—	1410169
12		24	13/16	1/4	1	1410167	—
	1/4	28	1"	3/8	1	—	1410175
	1/4	28	1.1/2	1/2	1	—	1410176
	1/4	28	13/16	1/4	1	—	1410174
1/4		20	1"	3/8	1	1410172	—
1/4		20	1.1/2	1/2	1	1410173	—
	5/16	24	1"	3/8	1	—	1410181
	5/16	24	1.1/2	1/2	1	—	1410182
	5/16	24	13/16	1/4	1	—	1410180
5/16		18	1"	3/8	1	1410178	—
5/16		18	1.1/2	1/2	1	1410179	—
	3/8	24	1"	3/8	1	—	1410185
	3/8	24	1.1/2	1/2	1	—	1410186
3/8		16	1"	3/8	1	1410183	—
3/8		16	1.1/2	1/2	1	1410184	—
	7/16	20	1"	3/8	1	—	1410189
	7/16	20	1.1/2	1/2	1	—	1410190
7/16		14	1"	3/8	1	1410187	—
7/16		14	1.1/2	1/2	1	1410188	—
	1/2	20	1.1/2	1/2	1	—	1410192
1/2		13	1.1/2	1/2	1	1410191	—
	9/16	18	1.1/2	1/2	1	—	1410194

# DIES



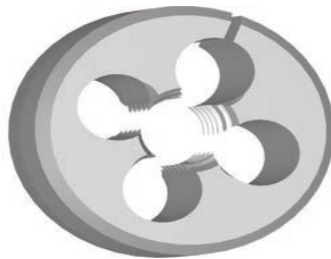
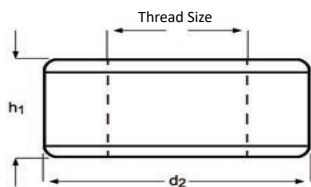
UNC	UNF	TPI	d <sub>2</sub> Ø Inch	h <sub>1</sub> Inch	Pack Qty	2510(UNC)	2510(UNF)
9/16		12	1.1/2	1/2	1	1410193	—
	5/8	18	1.1/2	1/2	1	—	1410197
5/8		11	1.1/2	1/2	1	1410195	—
	3/4	16	2"	5/8	1	—	1410200
3/4		10	2"	5/8	1	1410199	—
	7/8	14	2"	5/8	1	—	1410202
7/8		9	2"	5/8	1	1410201	—

## Round Adjustable, Split Type

**F320** Round adjustable dies can be closed down by approximately 0.006" on diameter. Bright finish improves chip flow in soft or non-ferrous materials.

**F330**

*Note: Die pictured has 4 clearance holes. The number of clearance holes will increase or decrease depending on the size of the die.*



F320	F330
UNC	UNF
HSS	HSS
BS 1127: 1950	BS 1127: 1950
2B	2B
N4 - 1.1/4	N4 - 1.1/2

UNC	UNF	TPI	d <sub>1</sub> nom mm	d <sub>2</sub> Ø Inch	h <sub>1</sub> Inch	Pack Qty	F320	F330
	4	48	2.85	13/16	1/4	1	—	0207307
4		40	2.85	13/16	1/4	1	0206614	—
	5	44	3.18	13/16	1/4	1	—	0207314
5		40	3.18	13/16	1/4	1	0206621	—
	6	40	3.51	13/16	1/4	1	—	0207338
6		32	3.51	13/16	1/4	1	0206645	—
	8	36	4.17	13/16	1/4	1	—	0207352
8		32	4.17	1"	3/8	1	0206676	—
8		32	4.17	13/16	1/4	1	0206669	—
	10	32	4.83	13/16	1/4	1	—	0207376
	10	32	4.83	1"	3/8	1	—	0207383
10		24	4.83	1"	3/8	1	0206690	—
10		24	4.83	13/16	1/4	1	0206683	—
	12	28	5.49	13/16	1/4	1	—	0207390
12		24	5.49	13/16	1/4	1	0206706	—
	1/4	28	6.35	1"	3/8	1	—	0207420
	1/4	28	6.35	1.1/2	1/2	1	—	0207444
	1/4	28	6.35	13/16	1/4	1	—	0207413
1/4		20	6.35	1"	3/8	1	0206737	—
1/4		20	6.35	1.1/2	1/2	1	0206751	—
1/4		20	6.35	1.5/16	7/16	1	0206744	—
1/4		20	6.35	13/16	1/4	1	0206720	—
	5/16	24	7.94	1"	3/8	1	—	0207451
	5/16	24	7.94	1.1/2	1/2	1	—	0207475
	5/16	24	7.94	1.5/16	7/16	1	—	0207468
5/16		18	7.94	1"	3/8	1	0206768	—
5/16		18	7.94	1.1/2	1/2	1	0206782	—
	3/8	24	9.53	1"	3/8	1	—	0207482
	3/8	24	9.53	1.1/2	1/2	1	—	0207505
	3/8	24	9.53	1.5/16	7/16	1	—	0207499
3/8		16	9.53	1"	3/8	1	0206799	—
3/8		16	9.53	1.1/2	1/2	1	0206812	—
3/8		16	9.53	1.5/16	7/16	1	0206805	—

# DIES

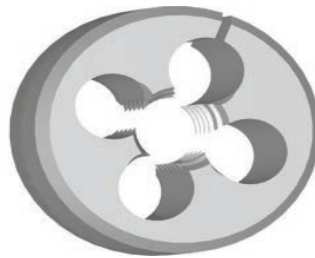
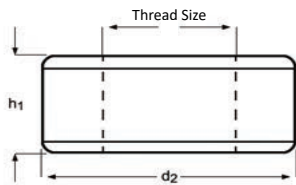


UNC	UNF	TPI	d <sub>1</sub> nom mm	d <sub>2</sub> Ø Inch	h <sub>1</sub> Inch	Pack Qty	F320	F330
	7/16	20	11.11	1"	3/8	1	—	0207512
	7/16	20	11.11	1.1/2	1/2	1	—	0207536
	7/16	20	11.11	1.5/16	7/16	1	—	0207529
7/16		14	11.11	1.1/2	1/2	1	0206850	—
7/16		14	11.11	1.5/16	7/16	1	0206843	—
	1/2	20	12.70	1.1/2	1/2	1	—	0207550
	1/2	20	12.70	1.5/16	7/16	1	—	0207543
1/2		13	12.70	1.1/2	1/2	1	0206874	—
1/2		13	12.70	1.5/16	7/16	1	0206867	—
1/2		13	12.70	2"	5/8	1	0206881	—
	9/16	18	14.29	1.1/2	1/2	1	—	0207581
	9/16	18	14.29	1.5/16	7/16	1	—	0207574
9/16		12	14.29	1.1/2	1/2	1	0206904	—
	5/8	18	15.88	1.1/2	1/2	1	—	0207604
	5/8	18	15.88	2"	5/8	1	—	0207611
5/8		11	15.88	1.1/2	1/2	1	0206928	—
5/8		11	15.88	2"	5/8	1	0206935	—
	3/4	16	19.05	1.1/2	1/2	1	—	0207635
	3/4	16	19.05	2"	5/8	1	—	0207642
3/4		10	19.05	1.1/2	1/2	1	0206959	—
3/4		10	19.05	2"	5/8	1	0206966	—
	7/8	14	22.23	2"	5/8	1	—	0207659
7/8		9	22.23	2"	5/8	1	0206973	—
	1"	12	25.40	2"	5/8	1	—	0207666
1"		8	25.40	2"	5/8	1	0206980	—
	1.1/8	12	28.58	3"	7/8	1	—	0207673
1.1/8		7	28.58	3"	7/8	1	0206997	—
	1.1/4	12	31.75	3"	7/8	1	—	0207680
1.1/4		7	31.75	3"	7/8	1	0207000	—
	1.1/2	12	38.10	3"	7/8	1	—	0207703

**Round Adjustable, Split Type**

**2710M** Round adjustable dies can be closed down by approximately 0.006” on diameter. Bright finish improves chip flow in soft or non-ferrous materials.

**Note:** Die pictured has 4 clearance holes. The number of clearance holes will increase or decrease depending on the size of the die



**2710M**

M

HSS

ANSI

6H

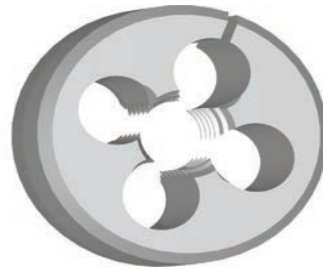
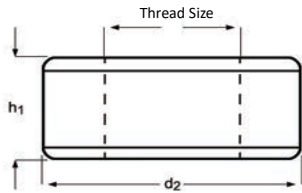
M2 - M20

M	P mm	d <sub>2</sub> Ø Inch	h <sub>1</sub> Inch	Pack Qty	2710M
2	0.40	13/16	1/4	1	1410573
2.5	0.45	13/16	1/4	1	1410575
3	0.50	13/16	1/4	1	1410577
4	0.70	13/16	1/4	1	1410579
4.5	0.75	13/16	1/4	1	1410580
5	0.80	13/16	1/4	1	1410581
6	1.00	1"	3/8	1	1410582
8	1.25	1"	3/8	1	1410584
9	1.25	1"	3/8	1	1410585
10.0	1.50	1"	3/8	1	1410586
12	1.75	1"	3/8	1	1410630
12	1.75	1.1/2	1/2	1	1410588
14	2.00	1.1/2	1/2	1	1410589
16	2.00	1.1/2	1/2	1	1410590
18	2.50	2"	5/8	1	1410591
20	2.50	2"	5/8	1	1410592

## Round Adjustable, Split Type

**F370** Round adjustable dies can be closed down by approximately 0.006" on diameter. Bright finish improves chip flow in soft or non-ferrous materials.

**Note:** Die pictured has 4 clearance holes. The number of clearance holes will increase or decrease depending on the size of the die.



F370

G

HSS



BS  
1127:  
1950



1/8 - 1.1/2

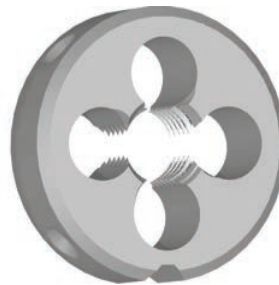
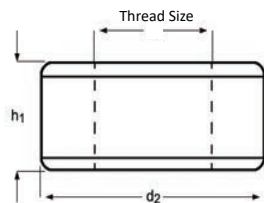
G(BSP)	TPI	d <sub>1</sub> nom mm	d <sub>2</sub> Ø Inch	h <sub>1</sub> Inch	Pack Qty	F370
1/8	28	9.73	1"	3/8	1	0209325
1/4	19	13.16	1.5/16	7/16	1	0209332
3/8	19	16.66	1.1/2	1/2	1	0209349
1/2	14	20.96	2"	5/8	1	0209356
5/8	14	22.91	2"	5/8	1	0209363
3/4	14	26.44	2"	5/8	1	0209370
7/8	14	30.20	2.1/4	11/16	1	0209387
1"	11	33.25	2.1/4	11/16	1	0209394
1.1/4	11	41.91	3"	7/8	1	0209400
1.1/2	11	47.80	4"	1"	1	0209417

## Gun Nosed Dies (Left Hand)

### F201

Left hand gun nosed dies have a chamfer length similar to semi-bottoming taps to lead the threads. This design direct chips away from the cutting area. Bright finish improves chip flow in soft or non-ferrous materials.

**Note:** Die pictured has 4 clearance holes.  
The number of clearance holes will increase or decrease depending on the size of the die



**F201**

**M**

**HSS**

**ISO 2568**

**6H**

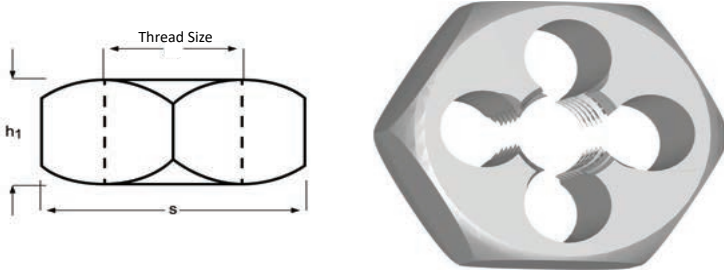
M3 - M20

M	P mm	$d_2$ Ø mm	$h_1$ mm	Pack Qty	F201
3	0.50	20	5	1	0164747
4	0.70	20	5	1	0105030
5	0.80	20	7	1	0105047
6	1.00	20	7	1	0105054
8	1.25	25	9	1	0105061
10	1.50	30	11	1	0104996
12	1.75	38	14	1	0105009
14	2.00	38	14	1	0105016
16	2.00	45	18	1	0105023
18	2.50	45	18	1	0164754
20	2.50	45	18	1	0164761

## Hexagon Rethreading Bolt Dies (Dienuts)

**2025** Rethreading bolt dies (dienuts) are used for reclaiming or cleaning up threads by hand. They are not normally used for cutting threads from solid. Bright finish improves chip flow in soft or non-ferrous materials.

**Note:** Die pictured has 4 clearance holes.  
The number of clearance holes will increase or decrease depending on the size of the die



2025(UNC)	2025(UNF)	2025(UNS)	2025(NPT)
UNC	UNF	UNS	NPT
CS	CS	CS	CS
ANSI	ANSI	ANSI	ANSI
2B	2B	2B	
1/4 - 1.1/2	1/4 - 1.1/2	11/16 - 1"	1/8 - 1"

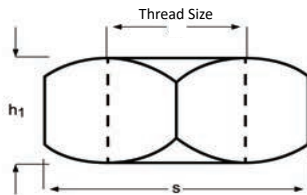
UNC	UNF	UNS	NPT	TPI	S Inch	h <sub>1</sub> Inch	Pack Qty	2025(UNC)	2025(UNF)	2025(UNS)	2025(NPT)
		1/8	27	1.1/16	3/8	1		—	—	—	1410270
	1/4		28	19/32	1/2	1		—	1410240	—	—
1/4			20	19/32	1/2	1		1410239	—	—	—
		1/4	18	1.1/4	5/8	1		—	—	—	1410271
	5/16		24	11/16	5/16	1		—	1410242	—	—
5/16			18	11/16	5/16	1		1410241	—	—	—
	3/8		24	25/32	3/8	1		—	1410244	—	—
3/8			16	25/32	3/8	1		1410243	—	—	—
		3/8	18	1.7/16	5/8	1		—	—	—	1410272
	7/16		20	7/8	7/16	1		—	1410246	—	—
7/16			14	7/8	7/16	1		1410245	—	—	—
	1/2		20	1.1/16	1/2	1		—	1410248	—	—
1/2			13	1.1/16	1/2	1		1410247	—	—	—
		1/2	14	1.5/8	3/4	1		—	—	—	1410273
	9/16		18	1.1/16	1/2	1		—	1410250	—	—
9/16			12	1.1/16	1/2	1		1410249	—	—	—
	5/8		18	1.1/4	5/8	1		—	1410252	—	—
5/8			11	1.1/4	5/8	1		1410251	—	—	—
		11/16	11	1.7/16	3/4	1		—	—	1410253	—
		11/16	16	1.7/16	3/4	1		—	—	1410254	—
	3/4		16	1.7/16	3/4	1		—	1410256	—	—
3/4			10	1.7/16	3/4	1		1410255	—	—	—
		3/4	14	2"	13/16	1		—	—	—	1410274
	7/8		14	1.5/8	7/8	1		—	1410258	—	—
7/8			9	1.5/8	7/8	1		1410257	—	—	—
		1"	14	1.13/16	1"	1		—	—	1410261	—
	1"		12	1.13/16	1"	1		—	1410260	—	—
1"			8	1.13/16	1"	1		1410259	—	—	—
		1"	11.5	2.3/8	1"	1		—	—	—	1410275
	1.1/8		12	2"	1"	1		—	1410263	—	—
1.1/8			7	2"	1"	1		1410262	—	—	—
	1.1/4		12	2.3/16	1"	1		—	1410265	—	—
1.1/4			7	2.3/16	1"	1		1410264	—	—	—
	1.3/8		12	2.3/8	1"	1		—	1410267	—	—
1.3/8			6	2.3/8	1"	1		1410266	—	—	—
	1.1/2		12	2.9/16	1"	1		—	1410269	—	—
1.1/2			6	2.9/16	1"	1		1410268	—	—	—



**Hexagon Rethreading Bolt Dies (Dienuts)**

**2325M** Rethreading bolt dies (dienuts) are used for reclaiming or cleaning up threads by hand. They are not normally used for cutting threads from solid. Bright finish improves chip flow in soft or non-ferrous materials.

*Note: Die pictured has 4 clearance holes. The number of clearance holes will increase or decrease depending on the size of the die.*



2325M

M

CS

ANSI

6H

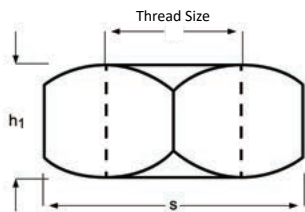
M6 - M20

M	P mm	S Inch	h <sub>1</sub> Inch	Pack Qty	2325M
6	1.00	1	3/8	1	1410609
8	1.25	1	3/8	1	1410611
9	1.25	1	3/8	1	1410612
10	1.50	1	3/8	1	1410613
12	1.75	1	3/8	1	1410615
14	2.00	1.7/16	1/2	1	1410616
16	2.00	1.7/16	1/2	1	1410618
18	1.50	1.7/16	1/2	1	1410620
18	2.50	1.7/16	1/2	1	1410619
20	2.50	1.13/16	3/4	1	1410621

## Hexagon Rethreading Bolt Dies (Dienuts)

**F302** Rethreading bolt dies (dienuts) are used for reclaiming or cleaning up threads by hand. They are not normally used for cutting threads from solid. Bright finish improves chip flow in soft or non-ferrous materials.

**Note:** Die pictured has 4 clearance holes. The number of clearance holes will increase or decrease depending on the size of the die.



F302

M

HSS



BS  
1127:  
1950

6H



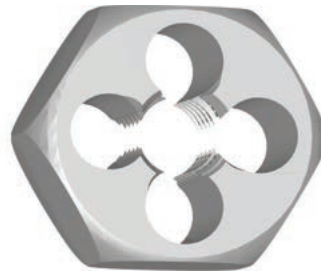
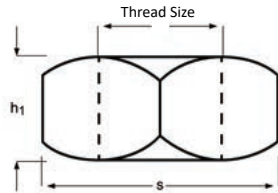
M3 - M36

M	P mm	S decimal Inch	h <sub>1</sub> Inch	Pack Qty	F302
3	0.50	0.7100	1/4	1	0105627
4	0.70	0.7100	1/4	1	0105672
5	0.80	0.7100	1/4	1	0105719
6	1.00	0.7100	1/4	1	0105733
7	1.00	0.8200	5/16	1	0105740
8	1.25	0.8200	5/16	1	0105757
10	1.50	0.9200	3/8	1	0105528
11	1.50	1.0100	7/16	1	0105535
12	1.75	1.1000	1/2	1	0105542
14	2.00	1.3000	5/8	1	0105559
16	2.00	1.3000	5/8	1	0105566
18	2.50	1.4800	11/16	1	0105573
20	2.50	1.4800	11/16	1	0105580
22	2.50	1.6700	13/16	1	0105597
24	3.00	2.0500	15/16	1	0105603
27	3.00	2.2200	1.1/16	1	0105610
30	3.50	2.2200	1.1/16	1	0105634
33	3.50	2.5800	1.1/8	1	0105641
36	4.00	2.7600	1.1/4	1	0105658

## Hexagon Rethreading Bolt Dies (Dienuts)

**F312** Rethreading bolt dies (dienuts) are used for reclaiming or cleaning up threads by hand. They are not normally used for cutting threads from solid. Bright finish improves chip flow in soft or non-ferrous materials.

**Note:** Die pictured has 4 clearance holes.  
The number of clearance holes will increase or decrease depending on the size of the die



**F312**

**MF**

**HSS**

**BS 1127: 1950**

**6H**

M8 - M24

MF	P mm	S decimal Inch	h <sub>1</sub> Inch	Pack Qty	F312
8	0.75	0.8200	5/16	1	0206331
8	1.00	0.8200	5/16	1	0206348
10	1.00	0.9200	3/8	1	0206379
10	1.25	0.9200	3/8	1	0206386
12	1.00	1.0100	7/16	1	0206393
12	1.25	1.0100	7/16	1	0206409
12	1.50	1.0100	7/16	1	0206416
14	1.50	1.3000	5/8	1	0206430
16	1.50	1.3000	5/8	1	0206454
18	1.50	1.4800	11/16	1	0206461
20	1.50	1.4800	11/16	1	0206485
22	1.50	1.6700	13/16	1	0206508
24	1.50	2.0500	15/16	1	0206522
24	2.00	2.0500	15/16	1	0206539

## Die Stocks, Straight Handle

**L110** Designed for use with Dormer gun nosed dies. The die is held in place by two opposed cone point screws in the stock which locate in two indents in the die. When this is effected, the split in the die lines up opposite a third pointed set screw which can be run in to spread the die slightly for minute adjustment.



L110



16.00 - 4"

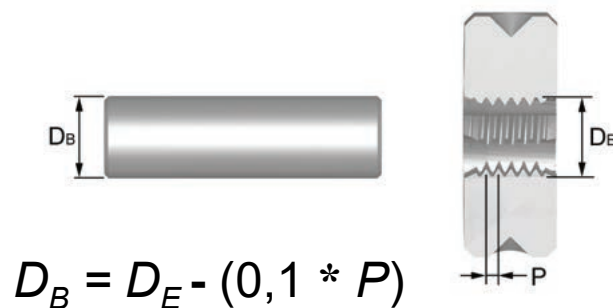
Nr.	Die Size Ø x H	Pack Qty	L110
1"	16 x 5	1	0111604
2a	20 x 5	1	0111611
2b	20 x 7	1	0111628
3	25 x 9	1	0111635
4"	30 x 11	1	0111642
5	38 x 14	1	0111666
5f	38 x 10	1	0111659
6	45 x 18	1	0111680
6f	45 x 14	1	0111673
7	55 x 22	1	0111703
7f	55 x 16	1	0111697
8	65 x 25	1	0111727
8f	65 x 18	1	0111710
9	75 x 30	1	0111741
9f	75 x 20	1	0111734
10	90 x 36	1	0111765
10f	90 x 22	1	0111758
	13/16 x 1/4	1	0218013
	1 x 3/8	1	0218020
	1.5/16 x 7/16	1	0218037
	1.1/2 x 1/2	1	0218044
	2 x 5/8	1	0218051
	2.1/4 x 11/16	1	0218068
	3 x 7/8	1	0218075
	4 x 1	1	0218082

## TECHNICAL TIPS ON THREADING WITH DIES

1. Before starting the die or dienut, chamfer the end of the bar at an angle of 45 degrees to eliminate sudden loading of the leading edges. Ensure the die or dienut is presented to the bolt squarely.
2. Make use of the large tolerances associated with the major diameter of the bolt, by reducing the diameter of the bar (see below). This will reduce the cutting force to a minimum.
3. Use the gun nose type of die, as this ensures the chips are directed away from the cutting area.
4. Ensure a good supply of the correct lubricant is aimed at the cutting area.
5. When adjusting split dies, avoid opening out as this will cause rubbing. Split dies may be closed down by approximately 0.15mm, by turning the adjustment screws equally. Pressure on one side of the die only may cause breakage.
6. Generally speaking, dienuts are used for reclaiming or cleaning out existing threads by hand. They tend to be of a more robust construction and should only be used in exceptional circumstances to cut a thread from solid.

## PRE-MACHINING DIMENSIONS

The diameter of the bolt blank must be smaller than the max. external diameter of the screw thread.



# Visual Index - End Mills

## HSS End Mill - Feed Rate Chart

		Feed per Tooth (Ft) Dia Inches																
Type of Cut	Alpha Code	0.078	1/8	5/32	3/16	1/4	5/16	13/32	1/2	9/16	5/8	11/16	3/4	7/8	1"	1.1/4	1.1/2	
 ↓ 0,5D ↔ D	A	0.0003	0.0005	0.0007	0.0009	0.0011	0.0017	0.0024	0.0028	0.0033	0.0038	0.0038	0.0038	0.0039	0.0041	0.0042	0.0043	
	B	0.0003	0.0005	0.0006	0.0009	0.0010	0.0015	0.0021	0.0026	0.0030	0.0034	0.0034	0.0034	0.0035	0.0037	0.0037	0.0038	
	C	0.0003	0.0004	0.0006	0.0007	0.0009	0.0014	0.0019	0.0023	0.0027	0.0031	0.0031	0.0031	0.0031	0.0033	0.0034	0.0034	
	D	0.0003	0.0004	0.0006	0.0008	0.0009	0.0015	0.0020	0.0024	0.0028	0.0032	0.0032	0.0032	0.0032	0.0033	0.0035	0.0038	0.0040
	E	0.0005	0.0007	0.0009	0.0014	0.0017	0.0025	0.0034	0.0041	0.0048	0.0055	0.0056	0.0066	0.0066	0.0067	0.0060	0.0066	0.0069
	F	0.0004	0.0005	0.0007	0.0008	0.0010	0.0013	0.0016	0.0020	0.0022	0.0025	0.0028	0.0031	0.0031	0.0031	0.0033	0.0033	0.0033
 ↓ D ↔ 0,8D	G					0.0010	0.0013	0.0014	0.0017	0.0020	0.0022	0.0025	0.0028	0.0028	0.0021	0.0021	0.0022	
	H					0.0009	0.0012	0.0013	0.0015	0.0018	0.0020	0.0023	0.0025	0.0021	0.0019	0.0019	0.0020	
	I					0.0008	0.0011	0.0011	0.0014	0.0016	0.0018	0.0020	0.0023	0.0023	0.0017	0.0017	0.0018	
	J					0.0009	0.0012	0.0013	0.0015	0.0018	0.0020	0.0023	0.0026	0.0026	0.0019	0.0019	0.0020	
	K					0.0014	0.0019	0.0026	0.0031	0.0036	0.0059	0.0035	0.0039	0.0038	0.0043	0.0043	0.0046	
	L					0.0004	0.0005	0.0007	0.0008	0.0010	0.0011	0.0012	0.0013	0.0013	0.0013	0.0015	0.0017	
 ↓ 1,5D ↔ 0,25D	M	0.0003	0.0005	0.0007	0.0009	0.0012	0.0016	0.0022	0.0027	0.0031	0.0036	0.0041	0.0045	0.0035	0.0041	0.0038	0.0042	
	N	0.0003	0.0004	0.0006	0.0008	0.0011	0.0015	0.0020	0.0024	0.0028	0.0032	0.0037	0.0041	0.0024	0.0037	0.0034	0.0038	
	O	0.0002	0.0004	0.0006	0.0007	0.0010	0.0013	0.0018	0.0022	0.0026	0.0029	0.0033	0.0036	0.0029	0.0033	0.0031	0.0034	
	P	0.0003	0.0004	0.0006	0.0008	0.0011	0.0014	0.0019	0.0023	0.0027	0.0031	0.0015	0.0039	0.0031	0.0035	0.0033	0.0036	
	Q	0.0004	0.0006	0.0008	0.0010	0.0015	0.0019	0.0026	0.0031	0.0036	0.0041	0.0035	0.0039	0.0039	0.0044	0.0050	0.0055	
	R	0.0005	0.0006	0.0008	0.0010	0.0011	0.0015	0.0019	0.0022	0.0026	0.0029	0.0033	0.0036	0.0036	0.0036	0.0041	0.0043	
 ↓ 1,5D ↔ 0,1D	S	0.0004	0.0006	0.0009	0.0011	0.0015	0.0020	0.0028	0.0034	0.0039	0.0045	0.0051	0.0056	0.0044	0.0051	0.0048	0.0052	
	T	0.0004	0.0006	0.0008	0.0010	0.0014	0.0018	0.0025	0.0030	0.0035	0.0051	0.0046	0.0051	0.0040	0.0046	0.0043	0.0047	
	U	0.0003	0.0005	0.0007	0.0009	0.0013	0.0016	0.0023	0.0028	0.0032	0.0036	0.0041	0.0046	0.0036	0.0041	0.0039	0.0043	
	V	0.0004	0.0005	0.0008	0.0010	0.0013	0.0017	0.0024	0.0029	0.0034	0.0039	0.0043	0.0048	0.0038	0.0043	0.0041	0.0045	
	X	0.0005	0.0007	0.0010	0.0013	0.0018	0.0023	0.0032	0.0039	0.0045	0.0052	0.0044	0.0049	0.0048	0.0055	0.0062	0.0068	
	Y	0.0006	0.0008	0.0010	0.0012	0.0014	0.0019	0.0023	0.0028	0.0024	0.0036	0.0041	0.0045	0.0045	0.0045	0.0051	0.0054	

## Carbide End Mill - Feed Rate Chart

# of Flutes	Type of Cut	Depth/Width of Cut	Alpha Code	Feed Per Tooth (Ft) Dia Inches										
				1/8	5/32	3/16	1/4	5/16	13/32	1/2	9/16	5/8	11/16	3/4
>4		↓ 1,5 ↔ 0,05	A				0.0010	0.0015	0.0015	0.0015	0.0015	0.0020	0.0020	0.0025
			B				0.0020	0.0020	0.0025	0.0030	0.0035	0.0040	0.0040	0.0045
			C				0.0030	0.0035	0.0040	0.0045	0.0050	0.0055	0.0060	0.0070
3-4		↓ 1,5 ↔ 0,1	A	0.0010	0.0015	0.0020	0.0020	0.0025	0.0025	0.0030	0.0035	0.0040	0.0045	0.0050
			B	0.0015	0.0020	0.0025	0.0030	0.0035	0.0040	0.0045	0.0050	0.0055	0.0060	0.0070
			C	0.0015	0.0020	0.0025	0.0030	0.0040	0.0050	0.0060	0.0065	0.0070	0.0080	0.0090
3-4		↓ 1 ↔ 0,5	A	0.0005	0.0005	0.0005	0.0010	0.0010	0.0015	0.0015	0.0020	0.0020	0.0025	0.0025
			B	0.0005	0.0005	0.0010	0.0015	0.0015	0.0020	0.0020	0.0025	0.0030	0.0035	0.0040
			C	0.0005	0.0010	0.0015	0.0015	0.0020	0.0025	0.0030	0.0035	0.0040	0.0045	0.0050
2-3		↓ 0,5 ↔ 1	A	0.0005	0.0010	0.0010	0.0010	0.0015	0.0015	0.0020	0.0020	0.0025	0.0025	0.0030
			B	0.0010	0.0010	0.0010	0.0015	0.0015	0.0020	0.0025	0.0030	0.0035	0.0035	0.0040
			C	0.0015	0.0015	0.0015	0.0020	0.0025	0.0030	0.0035	0.0040	0.0045	0.0050	0.0050
3-4		↓ 0,5 ↔ 1	B				0.0010	0.0020	0.0030	0.0030	0.0035	0.0040	0.0040	0.0040
		↓ 1 ↔ 0,5												
2 & 4		↓ 0,1 - 0,5mm ↔ 0,1 - 0,5mm	A	0.0010	0.0010	0.0015	0.0015	0.0020	0.0020	0.0025	0.0030	0.0030		
			BC	0.0010	0.0010	0.0015	0.0020	0.0020	0.0025	0.0030	0.0035	0.0040		
4		↓ 0,01 - 0,1 ↔ ≤ 1	A				0.0020	0.0020	0.0025	0.0030		0.0030		
			BC				0.0020	0.0025	0.0030	0.0035		0.0040		

# Visual Index - End Mills

## How To Use The Charts on the Left to Find Cutting Feed Rate (IPR):

1. Find your Alpha Code on the AMG Chart (example: 279U : U is the Alpha Code).
2. Find the closest diameter for your cutting application on the chart.
3. Select the type of cut and # of flutes to find your Ft Range.

Application Material Groups (AMG)			Hardness HRC	ISO
1. Steel	1.1 Magnetic soft steel	12L14, 12L15	<120 HB	P 1
	1.2 Structural Steel/ case carburising steel	1005-1025, 1214, 1215, A36	<200 HB	P 1
	1.3 Plain Carbon steel	1030-1060, 1050-1060, 1144-1146	<24	P 2
	1.4 Alloy steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	<24	P 3
	1.5 Alloy steel/ Hardened and tempered steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	>24<38	P 4
	1.6 Alloy steel/ Hardened and tempered steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	>38	H 1
	1.7 Alloy steel Hardened	A2-D2, H10-H41, L1-L6, M1-M42, T1	49-55	H 3
	1.8 Alloy steel Hardened	A2-D2, H10-H41, L1-L6, M1-M42, T1	55-63	H 4
2. Stainless Steel	2.1 Free machining Stainless Steel	200, 303, 416, 420F, 430F, 440	<24	M 1
	2.2 Austenitic	301, 302, 304, 316, 321, 330, CUSTOM 455, AM-350	<24	M 3
	2.3 Ferritic + Austenitic, Martensitic	318-329, 400-446, DUPLEX	<32	M 2
	2.4 Precipitation Hardened	15-5PH, Custom 450 17-4PH	<32	S 2
3. Cast Iron	3.1 Lamellar graphite	Grey, G10, Gg40, J431C, A48 CLASS 20	<150 HB	K 1
	3.2 Lamellar graphite	Grey, GG25-Gg40, J158, A48 CLASS 40-60	>150 HB<32	K 2
	3.3 Nodular graphite/ Malleable Cast Iron	A220, A436, A439, A602, Black, GGG40-GGG70	<200 HB	K 3
	3.4 Nodular graphite/ Malleable Cast Iron	Black Gts/Gtw, J434C	>200 HB<32	K 4
4. Titanium	4.1 Titanium, unalloyed	Commercially Pure	<200 HB	S 1
	4.2 Titanium, alloyed	6Al4V, 6A14V-2Sn, Monel, Monel K	<28	S 2
	4.3 Titanium, alloyed	6Al4V-4Mo, 7A14V-4Mo, 4911-4967	>28<38	S 3
5. Nickel	5.1 Nickel, unalloyed	Commercially Pure, 17644, 200, 5553	<150 HB	S 1
	5.2 Nickel, alloyed	Monel 400, Hastelloy C, Inconel 625, Waspaloy	<28	S 2
	5.3 Nickel, alloyed	Iconel 718, Nimonic 75-95, Rene 41, Iconel 825, A286	>28<38	S 3
6. Copper	6.1 Copper	Commercially Pure	<100 HB	N 3
	6.2 β-Brass, Bronze	314-340, 350-370	<200 HB	N 4
	6.3 α-Brass	Alloyed Cu + Al + Fe, Long Chipping	<200 HB	N 3
	6.4 High Strength Bronze	Ampco 18-25	<49	N 4
7. Aluminium Magnesium	7.1 Al, Mg, unalloyed	Commercially Pure	<100 HB	N 1
	7.2 Al alloyed, Si<0.5%	6061 T6, 7075, 314-340	<150 HB	N 1
	7.3 Al alloyed, Si>0.5%<10%	6061 T6, 380-390	<120 HB	N 1
	7.4 Al alloyed, Si>10% Mg alloys	Magnesium Whisker Reinforced	<120 HB	N 2
8. Synthetic Materials	8.1 Thermoplastics	Ultramid, Polystrol	---	O
	8.2 Thermosetting plastics	Bakelit, Pertinax	---	O
	8.3 Reinforced plastic materials	CFK, GFKAFK	---	O
9. Hard Mat.	9.1 Cermets (Metal-ceramics)	Ferrotic	<54	H
10. Graphite	10.1 Standard graphite		---	O

# Visual Index - End Mills

Tool Material:	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	
Application:															
Type:	W	W	W												
Number of Flutes:	Z 2	Z 2	Z 2	Z 2	Z 2	Z 2	Z 2	Z 2	Z 2	Z 2	Z 2	Z 2	Z 2	Z 2	
Cut Length:															
Helix:	$\lambda 45^\circ$	$\lambda 45^\circ$	$\lambda 37^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	
Shank:															
Finish/Coating:		Zn	Zn			TAIN				TAIN		AITN			
Tolerance:				Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	
Direction:															
Style:	S106	S206	S207	S116	S108	S208	S109	S110	S111	S211	S112	S212	S113	S213	S114
Range:	1/4 - 1"	1/4 - 1"	1/8 - 1"	1/8 - 1/2	1/16 - 5/8	1/16 - 5/8	2.00 - 25.00	1/8 - 1/2	1/8 - 1/2	1/8 - 1/2	1/16 - 1/2	1/16 - 1/2	2.00 - 20.00	2.00 - 12.00	1/8 - 5/8
Page #	405	405	406	407	408	408	409	410	411	411	412	412	413	413	414
1.1				289B	289B	400B	289B	269B	249B	361B	289B	400B	289B	400B	269B
1.2				223B	223B	298B	223B	212B	200B	269B	223B	298B	223B	298B	212B
1.3				223B	223B	298B	223B	212B	200B	269B	223B	298B	223B	298B	212B
1.4				180B	180B	259B	180B	171B	161B	239B	180B	259B	180B	259B	170B
1.5				161B	161B	230B	161B	152B	144B	200B	161B	230B	161B	230B	152B
1.6				148B	148B	200B	148B	140B	131B	180B	148B	200B	148B	200B	140B
1.7															
1.8															
2.1				200A	200A	325A	200A	190A	180A	298A	200A	325A	200A	325A	190A
2.2				141A	141A	223A	141A	125A	108A	180A	141A	223A	141A	223A	125A
2.3				108A	108A	174A	108A	103A	98A	171A	108A	174A	108A	174A	103A
2.4				89A	89A	131A	89A	78A	66A	131A	89A	131A	89A	131A	78A
3.1				374B	374B	551B	374B	336A	298B	499B	374B	551B	374B	551B	336A
3.2				318B	318B	525B	318B	284B	249B	400B	318B	525B	318B	525B	284B
3.3				318B	318B	525B	318B	284B	249B	400B	318B	525B	318B	525B	284B
3.4				249B	249B	374B	249B	225B	200B	341B	249B	374B	249B	374B	225B
4.1						230B				200B		230B		230B	
4.2						200B				180B		200B		200B	
4.3						190B				174B		190B		190B	
5.1						230B				200B		230B		230B	
5.2						161A				141A		161A		161A	
5.3						98A				85A		98A		98A	
6.1				649C	649C		649C	617C	584C		649C		649C		617C
6.2				499C	499C		499C	474C	449C		499C		499C		474C
6.3				499C	499C		499C	474C	449C		499C		499C		474C
6.4				125B	125B		125B	117B	108B		125B		125B		117B
7.1	2326C	2326C	2093C	1499C	1499C		1499C	1424C	1348C		1499C		1499C		1424C
7.2	1749C	1749C	1575C	1499C	1499C		1499C	1424C	1348C		1499C		1499C		1424C
7.3	1171C	1171C	1056C	649C	649C		649C	617C	584C		649C		649C		617C
7.4	751B	751B	676B	400B	400B		400B	380B	361B		400B		400B		380B
8.1															
8.2															
8.3															
9.1															
10.1															



# Visual Index - End Mills

	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	
	Z 2	Z 2	Z 3	Z 3	Z 4	Z 4	Z 4	Z 4	Z 4	Z 4	Z 4	Z 4	Z 4	Z 4	Z 4	Z 4	Z 4
	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$
	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal
	<b>S115</b>	<b>S215</b>	<b>S121</b>	<b>S221</b>	<b>S129</b>	<b>S134</b>	<b>S234</b>	<b>S135</b>	<b>S235</b>	<b>S136</b>	<b>S236</b>	<b>S137</b>	<b>S237</b>	<b>S138</b>	<b>S238</b>	<b>S139</b>	<b>S239</b>
	1/8 - 1/2	1/8 - 1/2	1/16 - 1/2	1/16 - 1/2	1/8 - 1/2	1/16 - 1"	1/16 - 1"	2.00 - 25.00	2.00 - 20.00	1/8 - 3/4	1/8 - 3/4	1/8 - 1"	1/8 - 1"	1/16 - 3/4	1/16 - 3/4	2.00 - 12.00	2.00 - 12.00
	<b>415</b>	<b>415</b>	<b>416</b>	<b>416</b>	<b>417</b>	<b>418</b>	<b>418</b>	<b>419</b>	<b>419</b>	<b>420</b>	<b>420</b>	<b>421</b>	<b>421</b>	<b>422</b>	<b>422</b>	<b>423</b>	<b>423</b>
1.1	249B	361B	289B	400B	361B	361B	499B	361B	499B	343B	474B	325B	449B	361B	499B	361B	499B
1.2	200B	269B	223B	298B	325B	325B	449B	325B	449B	312B	425B	298B	400B	325B	449B	325B	449B
1.3	200B	269B	223B	298B	325B	325B	449B	325B	449B	312B	425B	298B	400B	325B	449B	325B	449B
1.4	161B	239B	180B	259B	298B	298B	423B	298B	423B	287B	406B	276B	390B	298B	423B	298B	423B
1.5	144B	200B	161B	230B	249B	249B	400B	249B	400B	238B	380B	226B	361B	249B	400B	249B	400B
1.6	131B	180B	148B	200B	230B	230B	328B	230B	328B	205B	313B	180B	298B	230B	328B	230B	328B
1.7																	
1.8																	
2.1	180A	298A	200A	325A	239A	239A	351A	239A	351A	220A	338A	200A	325A	239A	351A	239A	351A
2.2	108A	180A	141A	223A	171A	171A	276A	171A	276A	156A	251A	141A	226A	171A	276A	171A	276A
2.3	98A	171A	108A	174A	131A	131A	200A	131A	200A	123A	182A	115A	164A	131A	200A	131A	200A
2.4	82A	89A			105A	105A	164A	105A	164A	97A	140A	89A	115A	98A	148A	98A	148A
3.1	298B	499B	374B	551B	449B	449B	699B	449B	699B	405B	650B	361B	600B	449B	699B	449B	699B
3.2	249B	400B	318B	525B	377B	377B	649B	377B	649B	338B	578B	298B	508B	377B	649B	377B	649B
3.3	249B	400B	318B	525B	377B	377B	649B	377B	649B	338B	578B	298B	508B	377B	649B	377B	649B
3.4	200B	341B	249B	374B	279B	279B	430B	279B	430B	254B	415B	230B	400B	279B	430B	279B	430B
4.1		200B		230B			259B		259B		245B		230B		259B		259B
4.2		180B		200B			230B		230B		220B		210B		230B		230B
4.3		174B		190B			200B		200B		190B		180B		200B		200B
5.1	148B	200B		230B			266B		266B		251B		236B		266B		266B
5.2		141A		161A			200A		200A		190A		180A		200A		200A
5.3		85A		98A			131A		131A		123A		115A		131A		131A
6.1	584C		649C		679C	679C		679C		646C		613C		679C		679C	
6.2	449C		499C		574C	574C		574C		546C		518C		574C		574C	
6.3	449C		499C		574C	574C		574C		546C		518C		574C		574C	
6.4	108B		125B		144B	144B		144B		138B		131B		144B		144B	
7.1	1348C		1499C		1601C	1601C		1601C		1525C		1450C		1601C		1601C	
7.2	1348C		1499C		1601C	1601C		1601C		1525C		1450C		1601C		1601C	
7.3	584C		649C		708C	708C		708C		674C		640C		708C		708C	
7.4	361B		400B		479B	479B		479B		455B		430B		479B		479B	
8.1																	
8.2																	
8.3																	
9.1																	
10.1																	

# Visual Index - End Mills

	HM	HM	HM	HM	HM	HM	HM	HSS-E PM	HSS	HSS	HSS	HSS-E	HSS-E PM	HSS	HSS	
					N	N	N	N					N			
	Z 4	Z 4	Z 4	Z 4	Z 4	Z 4	Z 4	Z 2	Z 2	Z 2	Z 2	Z 2	Z 2	Z 2	Z 2	
	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda^\circ$	$\lambda^\circ$	$\lambda^\circ$	$\lambda 30^\circ$ $\gamma 12^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$ $\gamma 12^\circ$	$\lambda 30^\circ$	$\lambda 38^\circ$	
		AlTiN		Normal	Normal								DIN 1835B			
	<b>S146</b>	<b>S246</b>	<b>S147</b>	<b>S247</b>	<b>S223HAS</b>	<b>S223HB</b>	<b>S248HAS</b>	<b>S248HB</b>	<b>C110</b>	<b>C600</b>	<b>C601</b>	<b>C602</b>	<b>C603</b>	<b>C123</b>	<b>C604</b>	<b>C605</b>
	1/4 - 5/8	1/4 - 5/8	1/8 - 5/8	1/8 - 5/8	1/8 - 1"	1/8 - 1"	5/16 - 1"	5/16 - 1"	1.00 - 50.00	1/8 - 3/4	1/8 - 1.1/2	1/8 - 1"	1/8 - 1"	1/16 - 40.00	1/8 - 3/4	1/4 - 1"
	<b>424</b>	<b>424</b>	<b>425</b>	<b>425</b>	<b>426</b>	<b>426</b>	<b>427</b>	<b>427</b>	<b>428</b>	<b>430</b>	<b>431</b>	<b>432</b>	<b>433</b>	<b>434</b>	<b>436</b>	<b>437</b>
1.1	343B	450B	325B	400B	801C	801C	801C	801C	197A	98A	98A	98A	164A	180A	112S	164A
1.2	312B	412B	298B	374B	778C	778C	778C	778C	164A	89A	89A	89A	131A	148A	89S	131A
1.3	312B	412B	298B	374B	522C	522C	522C	522C	131B	75B	75B	75B	115B	131B	79T	115B
1.4	287B	387B	276B	351B	463B	463B	463B	463B	115B				98B	115B		
1.5	238B	363B	226B	325B	328B	328B	328B	328B								
1.6	205B	288B	180B	249B	285A	285A	285A	285A								
1.7					187A	187A	364A	364A								
1.8					125A	125A	240A	240A								
2.1	220A	288A	200A	226A	489B	489B	489B	489B	98F				75F	82F		75F
2.2	156A	233A	141A	190A	400B	400B	400B	400B								62F
2.3	123A	176A	115A	151A	302B	302B	302B	302B								
2.4		135A		121A	256A	256A	256A	256A								
3.1	405B	500B	361B	499B	456C	456C	771C	771C	115A	82A	82A	82A	92A	98A	89S	
3.2	338B	540N	298B	430B	381B	381B	571B	571B	98A	66A	66A	66A	75A	82A	72S	
3.3	338B	540B	298B	430B	305B	305B	538B	538B	164B	82B	82B	82B	131B	148B	89T	
3.4	255B	384B	230B	338B	256B	256B	433B	433B	98B				82B	98B		
4.1		230B		200B	522B	522B	1017B	1017B	115D	59D	59D	59D	92D	98D	62V	92D
4.2		210B		190B	463B	463B	902B	902B	82D	49D	49D	49D	75D	82D	49V	
4.3		180B			387A	387A	755B	755B								
5.1		238B		210B	358B	358B	614B	614B	197D	98D	98D	98D	157D	164D	108V	157D
5.2		176A			269A	269A	525A	525A	49C	20C	20C	20C	43C	49C	20U	
5.3					223A	223A	436A	436A								
6.1	646C		613C	699C					279C	180C	180C	180C	410C	262C	200U	410C
6.2	602C		518C	571C					279C	197C	197C	197C	410C	262C	223U	
6.3	546C		518C	571C					279C	197C	197C	197C	410C	262C	223U	
6.4	137B		131B	180B												
7.1	1526C		1450C	1650C					722E	197E	197E	197E	984E	656E	243X	984E
7.2	1526C		1450C	1650C					722E	180E	180E	180E	984E	656E	194X	984E
7.3	674C		640C	708C					279E	115E	115E	115E	295E	262E	144X	295E
7.4	455B		430B	410B												
8.1									295C	197C	197C	197C	410C	262C	200U	410C
8.2																
8.3																
9.1																
10.1																

# Visual Index - End Mills

	HSS	HSS	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	HSS	HSS	HSS-E PM	HSS-E PM	HSS	HSS-E
	Z 2	Z 3	Z 3	Z 4-8	Z 4-8	Z 4-8	Z 4-8	Z 4-8	Z 4-8	Z 4	Z 4	Z 4-8	Z 4-8	Z 4-8	Z 4-8
	$\lambda 38^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$ $\gamma 12^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$ $\gamma 12^\circ$	$\lambda 30^\circ$ $\gamma 12^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$
			DIN 1835B									DIN 1835B	DIN 1835B		
	$+0.003$ $-0.000$	$+0.003$ $-0.000$	e8	$+0.005$ $-0.000$	$+0.005$ $-0.000$	$+0.005$ $-0.000$	$+0.005$ $-0.000$	$+0.005$ $-0.000$	$+0.005$ $-0.000$	Normal	$+0.003$ $-0.000$	k10	k10	$+0.003$ $-0.000$	$+0.003$ $-0.000$
	<b>C606</b>	<b>C607</b>	<b>C346</b>	<b>C608</b>	<b>C609</b>	<b>C610</b>	<b>C611</b>	<b>C612</b>	<b>C613</b>	<b>C614</b>	<b>C615</b>	<b>C247</b>	<b>C273</b>	<b>C617</b>	<b>C618</b>
	1/4 - 3/4	1/8 - 1"	3.00 - 20.00	1/4 - 1"	1/4 - 1"	1/4 - 1"	1/4 - 1"	1/4 - 1"	1/4 - 3/4	1/8 - 3/4	1/8 - 1"	2.00 - 50.00	2.00 - 40.00	1/8 - 1"	1/8 - 1"
	<b>438</b>	<b>439</b>	<b>440</b>	<b>441</b>	<b>441</b>	<b>442</b>	<b>442</b>	<b>443</b>	<b>444</b>	<b>445</b>	<b>446</b>	<b>447</b>	<b>449</b>	<b>451</b>	<b>452</b>
1.1	148A		148A	164G	197G	164G	197G	148G	148G	115S	164S	180S	164S	115S	164S
1.2	118A	131A	115A	131G	184G	131G	184G	118G	118G	92S	131S	148S	164S	92S	131S
1.3	102B	115B	98B	115H	161H	115H	161H	102H	102H	79T	115T	131T	115T	79T	115T
1.4		98B	82B	98H	138H	98H	138H	89H	89H	69T	98T	115T	98T	69T	98T
1.5		66C													
1.6															
1.7															
1.8															
2.1	66F		66F	75L	105L	75L	105L	66L	66L	52Y	75Y	82Y	33Y	52Y	75Y
2.2	56F	62F													
2.3															
2.4															
3.1			82A	92G	128G	92G	128G	82G	82G	92S	92S	98S	82S	92S	92S
3.2		75A	66A	75G	105G	75G	105G	66G	66G	75S	75S	82S	66S	75S	75S
3.3		131B	115B	131H	184H	131H	184H	118H	118H	92T	131T	148T	131T	92T	131T
3.4		82B	66B	82H	128H	82H	128H	72H	72H	56T	82T	82T	82T	56T	82T
4.1	82D	92D	82D	92J	128J	92J	128J	82J	82J	62V	92V	98V	82V	62V	92V
4.2		75D	66D	75J	105J	75J	105J	66J	66J	52V	75V	82V	66V	52V	75V
4.3		33D													
5.1	141D		148D	157J	220J	157J	220J	141J	141J	108V	157V	164V	148V	108V	157V
5.2		43C	33C	43I	59I	43I	59I	36I	36I	20U	43U	49U	33U	20U	43U
5.3		20D													
6.1	367C		230C	410I	574I	410I	574I	367I	367I	203U	410U	262U	230U	203U	410U
6.2		410C	230C	410I	574I	410I	574I	367I	367I	223U	410U	262U	230U	223U	410U
6.3		410C	230C	410I	574I	410I	574I	367I	367I	223U	410U	262U	230U	223U	410U
6.4		49C													
7.1	886E		590E								984X	656X	590X		984X
7.2	886E		590E	984K	1378K	984K	1378K	886K	886K	197X	984X	656X	590X	197X	984X
7.3	266E	295E		295K	413K	295K	413K	266K	266K	148X	295X	262X	230X	148X	295X
7.4		197A													
8.1	367C		230C	410I	574I	410I	574I	367I	367I	203U	410U	262U	230U	203U	410U
8.2		410C													
8.3															
9.1															
10.1															

# List Number Index - End Mills

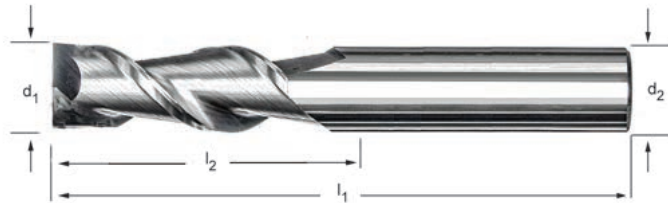


Pgs. 398-452

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C123 .....	434	S112 .....	412	S236 .....	420
C247 .....	447	S113 .....	413	S237 .....	421
C273 .....	449	S114 .....	414	S238 .....	422
C346 .....	440	S115 .....	415	S239 .....	423
C600 .....	430	S116 .....	407	S246 .....	424
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C604 .....	436	S135 .....	419		
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S108 .....	408	S223HA .....	426		
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## Regular Length, Square End, 45° Helix

- S106** Double gullet flute design allows for fast, efficient evacuation of chips in soft and non-ferrous materials
- S206** Zirconium coating increases surface hardness, improves chip evacuation and tool life allowing for higher removal rates in soft and non-ferrous materials



$d_1$ Ø Inch	$d_1$ decimal Inch	$d_2$ Ø Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	S106	S206
1/4	0.2500	1/4	1"	2-1/2	2	1	7648490	7648497
5/16	0.3125	5/16	1"	3"	2	1	7648491	7648498
3/8	0.3750	3/8	1"	2-1/2	2	1	7648492	7648499
1/2	0.5000	1/2	1-1/4	3"	2	1	7648493	7648500
5/8	0.6250	5/8	1-5/8	3-1/2	2	1	7648494	7648501
3/4	0.7500	3/4	1-3/4	4"	2	1	7648495	7648502
1"	1.0000	1"	1-1/2	4"	2	1	7648496	7648503

# Solid Carbide 2-Flute End Mill



## Regular Length, Square End, 37° Helix

**S207** Unique flute design along with the Zirconium coating allow for faster speeds and feeds in soft and non-ferrous materials



S207

HM



Z  
2

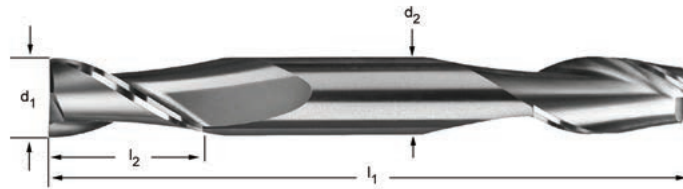


1/8 - 1"

$d_1$ Ø Inch	$d_1$ decimal Inch	$d_2$ Ø Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	S207
1/8	0.1250	1/8	1/2	1-1/2	2	1	7648504
1/8	0.1250	1/8	3/4	2"	2	1	7648505
5/32	0.1563	5/32	9/16	2"	2	1	7648506
3/16	0.1875	3/16	3/4	2"	2	1	7648507
3/16	0.1875	3/16	1-1/8	3"	2	1	7648508
1/4	0.2500	1/4	1"	2-1/2	2	1	7648509
1/4	0.2500	1/4	1-1/2	4"	2	1	7648510
5/16	0.3125	5/16	3/4	2-1/2	2	1	7648511
5/16	0.3125	5/16	1-5/8	4"	2	1	7648512
3/8	0.3750	3/8	1"	2-1/2	2	1	7648513
3/8	0.3750	3/8	2"	4"	2	1	7648514
7/16	0.4375	7/16	1"	2-1/2	2	1	7648515
7/16	0.4375	7/16	2"	4"	2	1	7648516
1/2	0.5000	1/2	1"	3"	2	1	7648517
1/2	0.5000	1/2	3"	6"	2	1	7648518
9/16	0.5625	9/16	1-1/4	3"	2	1	7648519
5/8	0.6250	5/8	1-5/8	3-1/2	2	1	7648520
5/8	0.6250	5/8	2-1/4	5"	2	1	7648521
3/4	0.7500	3/4	1-3/4	4"	2	1	7648522
3/4	0.7500	3/4	3"	6"	2	1	7648523
1"	1.0000	1"	1-1/2	4"	2	1	7648524
1"	1.0000	1"	4"	6"	2	1	7648525

## Regular Length, Square End, Double End, 30° Helix

**S116** Double end provides two cutting ends in one tool. Bright finish improves chip flow in soft and non-ferrous materials



**S116**

**HM**

**Z**  
**2**

1/8 - 1/2

<b>d<sub>1</sub></b> <b>Ø</b> <b>Inch</b>	<b>d<sub>1</sub></b> <b>decimal</b> <b>Inch</b>	<b>d<sub>2</sub></b> <b>Ø</b> <b>Inch</b>	<b>l<sub>2</sub></b> <b>Inch</b>	<b>l<sub>1</sub></b> <b>Inch</b>	<b># of</b> <b>Flutes</b>	<b>Pack</b> <b>Qty</b>	<b>S116</b>
1/8	0.1250	3/8	3/8	3"	2	1	7648650
5/32	0.1562	3/8	7/16	3"	2	1	7648651
3/16	0.1875	3/8	1/2	3"	2	1	7648652
1/4	0.2500	3/8	5/8	3"	2	1	7648653
5/16	0.3125	3/8	3/4	3.1/2	2	1	7648654
3/8	0.3750	3/8	3/4	3.1/2	2	1	7648655
1/2	0.5000	1/2	1"	4"	2	1	7648656

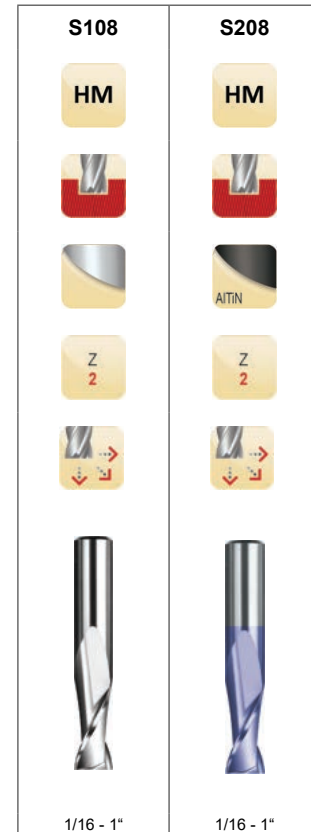
# Solid Carbide 2-Flute End Mill



## Regular Length, Square End, 30° Helix

**S108** Bright finish improves chip flow in soft and non-ferrous materials.

**S208** ALTiN coating increases surface hardness, improves chip flow and tool life allowing higher metal removal rates.



$d_1$ Ø Inch	$d_1$ decimal Inch	$d_2$ Ø Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	S108	S208
1/16	0.0625	1/8	1/4	1.1/2	2	1	7648526	7648544
5/64	0.0781	1/8	1/4	1.1/2	2	1	7648527	7648545
3/32	0.0938	1/8	3/8	1.1/2	2	1	7648528	7648546
1/8	0.1250	1/8	1/2	1.1/2	2	1	7648529	7648547
9/64	0.1406	3/16	9/16	2"	2	1	7648530	—
5/32	0.1562	3/16	9/16	2"	2	1	7648531	7648548
11/64	0.1719	3/16	9/16	2"	2	1	7648532	—
3/16	0.1875	3/16	5/8	2"	2	1	7648533	7648549
7/32	0.2188	1/4	5/8	2.1/2	2	1	7648534	7648550
1/4	0.2500	1/4	3/4	2.1/2	2	1	7648535	7648551
5/16	0.3125	5/16	7/8	2.1/2	2	1	7648536	7648552
3/8	0.3750	3/8	7/8	2.1/2	2	1	7648537	7648553
7/16	0.4375	7/16	1"	2.1/2	2	1	7648538	7648554
1/2	0.5000	1/2	1"	3"	2	1	7648539	7648555
9/16	0.5625	9/16	1.1/4	3.1/2	2	1	7648540	7648556
5/8	0.6250	5/8	1.1/4	3.1/2	2	1	7648541	7648557
3/4	0.7500	3/4	1.1/2	4"	2	1	7648542	—
1"	1.0000	1"	1.1/2	4"	2	1	7648543	—



## Regular Length, Square End, 30° Helix

**S109** Bright finish improves chip flow in soft and non-ferrous materials.



**S109**

HM

Z  
2

2.00 - 25.00

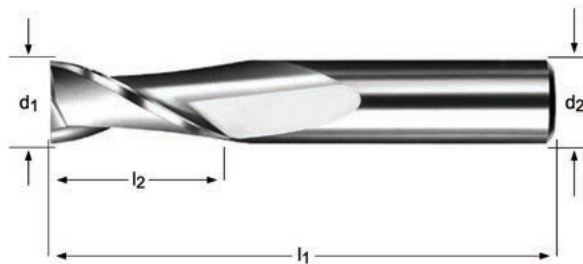
$d_1$ Ø mm	$d_1$ decimal Inch	$d_2$ Ø mm	$l_2$ mm	$l_1$ mm	# of Flutes	Pack Qty	S109
2.00	0.0787	3.0	6.0	38.0	2	1	7648558
2.50	0.0984	3.0	7.0	38.0	2	1	7648559
3.00	0.1181	3.0	12.0	38.0	2	1	7648560
4.00	0.1575	4.0	14.0	50.0	2	1	7648561
4.50	0.1772	5.0	14.0	50.0	2	1	7648562
5.00	0.1969	5.0	16.0	50.0	2	1	7648563
6.00	0.2362	6.0	19.0	63.0	2	1	7648564
7.00	0.2756	8.0	19.0	63.0	2	1	7648565
8.00	0.3150	8.0	20.0	63.0	2	1	7648566
9.00	0.3543	10.0	22.0	70.0	2	1	7648567
10.00	0.3937	10.0	22.0	70.0	2	1	7648568
11.00	0.4331	11.0	25.0	70.0	2	1	7648569
12.00	0.4724	12.0	25.0	75.0	2	1	7648570
14.00	0.5512	14.0	30.0	88.0	2	1	7648571
16.00	0.6299	16.0	32.0	88.0	2	1	7648572
20.00	0.7874	20.0	38.0	100.0	2	1	7648573
25.00	0.9843	25.0	38.0	100.0	2	1	7648574

# Solid Carbide 2-Flute End Mill



## Long Length, Square End, 30° Helix

**S110** Bright finish improves chip flow in soft and non-ferrous materials.



S110

HM



Z  
2



1/8 - 1/2

$d_1$ Ø Inch	$d_1$ decimal Inch	$d_2$ Ø Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	S110
1/8	0.1250	1/8	3/4	2"	2	1	7648575
3/16	0.1875	3/16	3/4	2.1/2	2	1	7648576
1/4	0.2500	1/4	1.1/8	3"	2	1	7648577
3/8	0.3750	3/8	1.1/8	3"	2	1	7648578
1/2	0.5000	1/2	2"	4"	2	1	7648579

## Extra Long Length, Square End, 30° Helix

- S111** Bright finish improves chip flow in soft and non-ferrous materials.
- S211** ALTiN coating increases surface hardness, improves chip flow and tool life allowing higher metal removal rates.



$d_1$ Ø Inch	$d_1$ decimal Inch	$d_2$ Ø Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	S111	S211
1/8	0.1250	1/8	1"	3"	2	1	7648580	7648586
3/16	0.1875	3/16	1.1/8	3"	2	1	7648581	7648587
1/4	0.2500	1/4	1.1/2	4"	2	1	7648582	7648588
5/16	0.3125	5/16	1.5/8	4"	2	1	7648583	—
3/8	0.3750	3/8	1.3/4	4"	2	1	7648584	7648589
1/2	0.5000	1/2	3"	6"	2	1	7648585	7648590

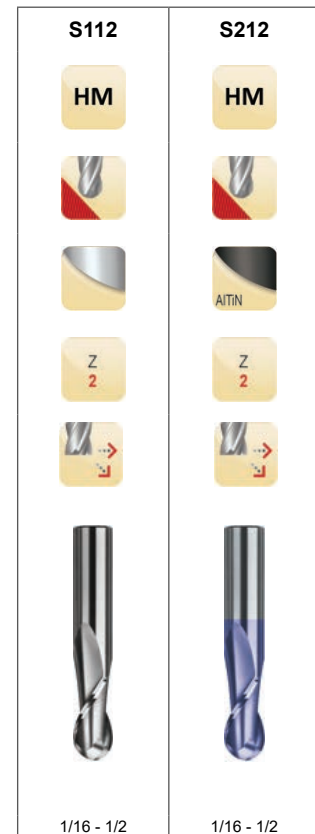
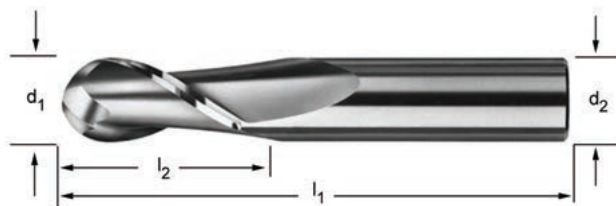
# Solid Carbide 2-Flute End Mill



## Regular Length, Ball Nose, 30° Helix

**S112** Ball nose for cutting internal part radius. Bright finish improves chip flow in soft or non-ferrous materials.

**S212** Ball nose for cutting internal part radius. ALTiN coating increases surface hardness, improves chip flow and tool life, allowing higher metal removal rates.

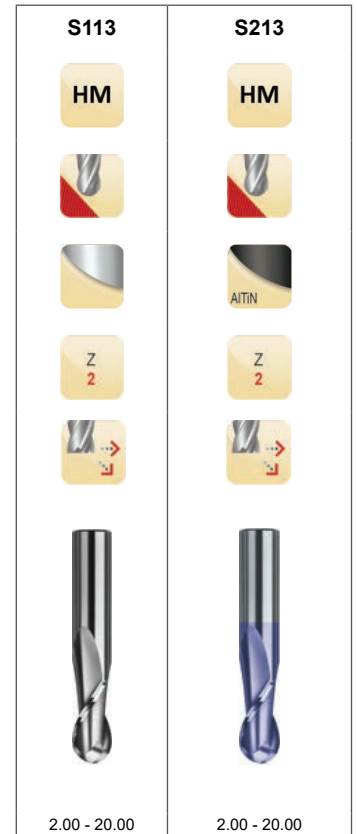
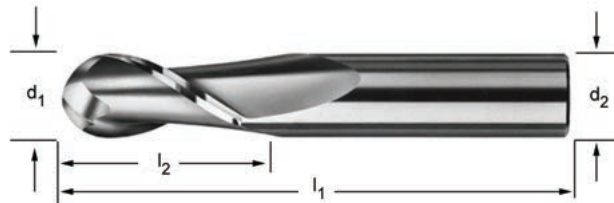


$d_1$ Ø Inch	$d_1$ decimal Inch	$d_2$ Ø Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	S112	S212
1/16	0.0625	1/8	1/4	1.1/2	2	1	7648591	7648601
3/32	0.0938	1/8	3/8	1.1/2	2	1	7648592	—
1/8	0.1250	1/8	1/2	1.1/2	2	1	7648593	7648602
5/32	0.1562	3/16	9/16	2"	2	1	7648594	—
3/16	0.1875	3/16	5/8	2"	2	1	7648595	7648603
7/32	0.2188	1/4	5/8	2.1/2	2	1	7648596	7648604
1/4	0.2500	1/4	3/4	2.1/2	2	1	7648597	7648605
5/16	0.3125	5/16	7/8	2.1/2	2	1	7648598	7648606
3/8	0.3750	3/8	7/8	2.1/2	2	1	7648599	7648607
1/2	0.5000	1/2	1"	3"	2	1	7648600	7648608

## Regular Length, Ball Nose, 30° Helix

**S113** Ball nose for cutting internal part radius. Bright finish improves chip flow in soft or non-ferrous materials.

**S213** Ball nose for cutting internal part radius. ALTiN coating increases surface hardness, improves chip flow and tool life, allowing higher metal removal rates.



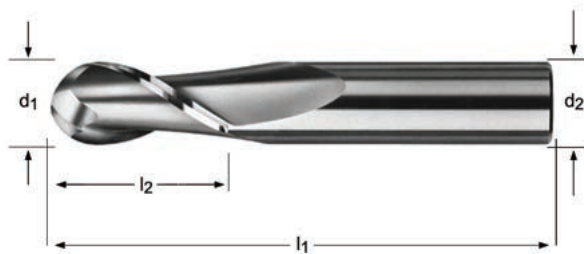
$d_1$ Ø mm	$d_1$ decimal Inch	$d_2$ Ø mm	$l_2$ mm	$l_1$ mm	# of Flutes	Pack Qty	S113	S213
2.00	0.0787	3.0	6.0	38.0	2	1	7648609	—
2.50	0.0984	3.0	6.0	38.0	2	1	7648610	—
3.00	0.1181	3.0	12.0	38.0	2	1	7648611	7648622
4.00	0.1575	4.0	14.0	50.0	2	1	7648612	7648623
5.00	0.1969	5.0	16.0	50.0	2	1	7648613	7648624
6.00	0.2362	6.0	19.0	63.0	2	1	7648614	7648625
7.00	0.2756	8.0	19.0	63.0	2	1	7648615	7648626
8.00	0.3150	8.0	19.0	63.0	2	1	7648616	7648627
9.00	0.3543	10.0	22.0	70.0	2	1	7648617	7648628
10.00	0.3937	10.0	22.0	70.0	2	1	7648618	7648629
12.00	0.4724	12.0	25.0	75.0	2	1	7648619	7648630
16.00	0.6299	16.0	32.0	88.0	2	1	7648620	—
20.00	0.7874	20.0	38.0	100.0	2	1	7648621	—

# Solid Carbide 2-Flute End Mill



## Long Length, Ball Nose, 30° Helix

**S114** Ball nose for cutting internal part radius. Bright finish improves chip flow in soft or non-ferrous materials.



S114

HM



Z  
2



1/8 - 5/8

$d_1$ Ø Inch	$d_1$ decimal Inch	$d_2$ Ø Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	S114
1/8	0.1250	1/8	3/4	2"	2	1	7648631
3/16	0.1875	3/16	3/4	2.1/2	2	1	7648632
1/4	0.2500	1/4	1.1/8	3"	2	1	7648633
5/16	0.3125	5/16	1.1/8	3"	2	1	7648634
3/8	0.3750	3/8	1.1/8	3"	2	1	7648635
1/2	0.5000	1/2	2"	4"	2	1	7648636
5/8	0.6250	5/8	2.1/4	5"	2	1	7648637

## Extra Long Length, Ball Nose, 30° Helix

**S115** Ball nose for cutting internal part radius. Bright finish improves chip flow in soft or non-ferrous materials.

**S215** Ball nose for cutting internal part radius. ALTiN coating increases surface hardness, improves chip flow and tool life, allowing higher metal removal rates.



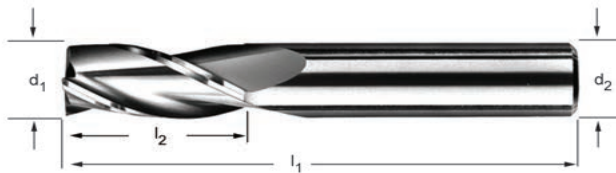
$d_1$ Ø Inch	$d_1$ decimal Inch	$d_2$ Ø Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	S115	S215
1/8	0.1250	1/8	1"	3"	2	1	7648638	7648644
3/16	0.1875	3/16	1.1/8	3"	2	1	7648639	7648645
1/4	0.2500	1/4	1.1/2	4"	2	1	7648640	7648646
5/16	0.3125	5/16	1.5/8	4"	2	1	7648641	7648647
3/8	0.3750	3/8	1.3/4	4"	2	1	7648642	7648648
1/2	0.5000	1/2	3"	6"	2	1	7648643	7648649

# Solid Carbide 3-Flute End Mill



## Regular Length, Square End, 30° Helix

- S121** 3-flute design for less chatter. Bright finish improves chip flow in soft or non-ferrous materials.
- S221** 3-flute design for less chatter. ALTiN coating increases surface hardness, improves chip flow and tool life allowing higher metal removal rates.



$d_1$ Ø Inch	$d_1$ decimal Inch	$d_2$ Ø Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	S121	S221
1/16	0.0625	1/8	1/4	1.1/2	3	1	7648657	7648666
3/32	0.0938	1/8	3/8	1.1/2	3	1	7648658	7648667
1/8	0.1250	1/8	1/2	1.1/2	3	1	7648659	7648668
5/32	0.1562	3/16	9/16	2"	3	1	7648660	7648669
3/16	0.1875	3/16	5/8	2"	3	1	7648661	7648670
1/4	0.2500	1/4	3/4	2.1/2	3	1	7648662	7648671
5/16	0.3125	5/16	7/8	2.1/2	3	1	7648663	7648672
3/8	0.3750	3/8	7/8	2.1/2	3	1	7648664	7648673
1/2	0.5000	1/2	1"	3"	3	1	7648665	7648674



## Square End, Double End , 30° Helix

**S129 Regular Length.** Double end provides two cutting ends in one tool. Bright finish improves chip flow in soft and non-ferrous materials.



$d_1$ Ø Inch	$d_1$ decimal Inch	$d_2$ Ø Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	S129
1/8	0.1250	3/8	3/8	3"	4	1	7648719
5/32	0.1562	3/8	7/16	3"	4	1	7648720
3/16	0.1875	3/8	1/2	3"	4	1	7648721
1/4	0.2500	3/8	5/8	3"	4	1	7648722
5/16	0.3125	3/8	3/4	3.1/2	4	1	7648723
3/8	0.3750	3/8	3/4	3.1/2	4	1	7648724
1/2	0.5000	1/2	1"	4"	4	1	7648725

# Solid Carbide 4-Flute End Mill



## Regular Length, Square End , 30° Helix

**S134** Bright finish improves chip flow in soft or non-ferrous materials.

**S234** ALTiN coating increases surface hardness, improves chip flow and tool life allowing higher metal removal rates.



$d_1$ Ø Inch	$d_1$ decimal Inch	$d_2$ Ø Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	S124	S234
1/16	0.0625	1/8	1/4	1.1/2	4	1	7648726	7648748
5/64	0.0781	1/8	1/4	1.1/2	4	1	7648727	7648749
3/32	0.0938	1/8	3/8	1.1/2	4	1	7648728	7648750
7/64	0.1094	1/8	3/8	1.1/2	4	1	7648729	7648751
1/8	0.1250	1/8	1/2	1.1/2	4	1	7648730	7648752
9/64	0.1406	3/16	9/16	2"	4	1	7648731	7648753
5/32	0.1562	3/16	9/16	2"	4	1	7648732	7648754
11/64	0.1719	3/16	9/16	2"	4	1	7648733	7648755
3/16	0.1875	3/16	5/8	2"	4	1	7648734	7648756
13/64	0.2031	1/4	5/8	2.1/2	4	1	7648735	7648757
7/32	0.2188	1/4	5/8	2.1/2	4	1	7648736	7648758
1/4	0.2500	1/4	3/4	2.1/2	4	1	7648737	7648759
5/16	0.3125	5/16	7/8	2.1/2	4	1	7648738	7648760
3/8	0.3750	3/8	7/8	2.1/2	4	1	7648739	7648761
7/16	0.4375	7/16	1"	2.1/2	4	1	7648740	7648762
1/2	0.5000	1/2	1"	3"	4	1	7648741	7648763
9/16	0.5625	9/16	1.1/4	3.1/2	4	1	7648742	7648764
5/8	0.6250	5/8	1.1/4	3.1/2	4	1	7648743	7648765
11/16	0.6875	3/4	1.1/2	4"	4	1	7648744	7648766
3/4	0.7500	3/4	1.1/2	4"	4	1	7648745	7648767
7/8	0.8750	7/8	1.1/2	4"	4	1	7648746	7648768
1"	1.0000	1"	1.1/2	4"	4	1	7648747	7648769

## Regular Length, Square End , 30° Helix

**S135** Bright finish improves chip flow in soft or non-ferrous materials.

**S235** AlTiN coating increases surface hardness, improves chip flow and tool life allowing higher metal removal rates.



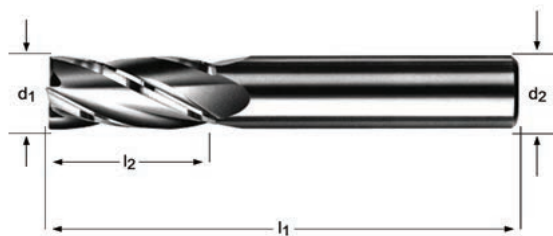
d <sub>1</sub> Ø mm	d <sub>1</sub> decimal Inch	d <sub>2</sub> Ø mm	l <sub>2</sub> mm	l <sub>1</sub> mm	# of Flutes	Pack Qty	S135	S235
2.00	0.0787	3.0	6.0	38.0	4	1	7648770	7648789
2.50	0.0984	3.0	7.0	38.0	4	1	7648771	7648790
3.00	0.1181	3.0	12.0	38.0	4	1	7648772	7648791
3.50	0.1378	4.0	12.0	50.0	4	1	7648773	7648792
4.00	0.1575	4.0	14.0	50.0	4	1	7648774	7648793
4.50	0.1772	5.0	14.0	50.0	4	1	7648775	7648794
5.00	0.1969	5.0	16.0	50.0	4	1	7648776	7648795
6.00	0.2362	6.0	19.0	63.0	4	1	7648777	7648796
7.00	0.2756	8.0	19.0	63.0	4	1	7648778	7648797
8.00	0.3150	8.0	19.0	63.0	4	1	7648779	7648798
9.00	0.3543	10.0	22.0	70.0	4	1	7648780	7648799
10.00	0.3937	10.0	22.0	70.0	4	1	7648781	7648800
11.00	0.4331	11.0	25.0	70.0	4	1	7648782	7648801
12.00	0.4724	12.0	25.0	75.0	4	1	7648783	7648802
14.00	0.5512	14.0	30.0	88.0	4	1	7648784	7648803
16.00	0.6299	16.0	32.0	88.0	4	1	7648785	7648804
18.00	0.7087	18.0	36.0	100.0	4	1	7648786	7648805
20.00	0.7874	20.0	38.0	100.0	4	1	7648787	7648806
25.00	0.9843	25.0	38.0	100.0	4	1	7648788	—

# Solid Carbide 4-Flute End Mill



## Long Length, Square End , 30° Helix

- S136** Bright finish improves chip flow in soft or non-ferrous materials.
- S236** AlTiN coating increases surface hardness, improves chip flow and tool life allowing higher metal removal rates.

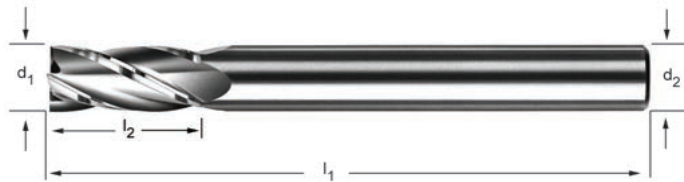


$d_1$ Ø Inch	$d_1$ decimal Inch	$d_2$ Ø Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	S136	S236
1/8	0.1250	1/8	3/4	2"	4	1	7648807	7648816
3/16	0.1875	3/16	3/4	2.1/2	4	1	7648808	7648817
1/4	0.2500	1/4	1.1/8	3"	4	1	7648809	7648818
5/16	0.3125	5/16	1.1/8	3"	4	1	7648810	7648819
3/8	0.3750	3/8	1.1/8	3"	4	1	7648811	7648820
7/16	0.4375	7/16	2"	4"	4	1	7648812	7648821
1/2	0.5000	1/2	2"	4"	4	1	7648813	7648822
5/8	0.6250	5/8	2.1/4	5"	4	1	7648814	7648823
3/4	0.7500	3/4	2.1/4	5"	4	1	7648815	7648824

## Extra Long Length, Square End , 30° Helix

**S137** Bright finish improves chip flow in soft or non-ferrous materials.

**S237** AlTiN coating increases surface hardness, improves chip flow and tool life allowing higher metal removal rates.



d <sub>1</sub> Ø Inch	d <sub>1</sub> decimal Inch	d <sub>2</sub> Ø Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	# of Flutes	Pack Qty	S137	S237
1/8	0.1250	1/8	1"	3"	4	1	7648825	7648835
3/16	0.1875	3/16	1.1/8	3"	4	1	7648826	7648836
1/4	0.2500	1/4	1.1/2	4"	4	1	7648827	7648837
5/16	0.3125	5/16	1.5/8	4"	4	1	7648828	7648838
3/8	0.3750	3/8	1.3/4	4"	4	1	7648829	7648839
7/16	0.4375	7/16	3"	6"	4	1	7648830	7648840
1/2	0.5000	1/2	3"	6"	4	1	7648831	7648841
5/8	0.6250	5/8	3"	6"	4	1	7648832	7648842
3/4	0.7500	3/4	3"	6"	4	1	7648833	7648843
1"	1.0000	1"	3"	6"	4	1	7648834	7648844

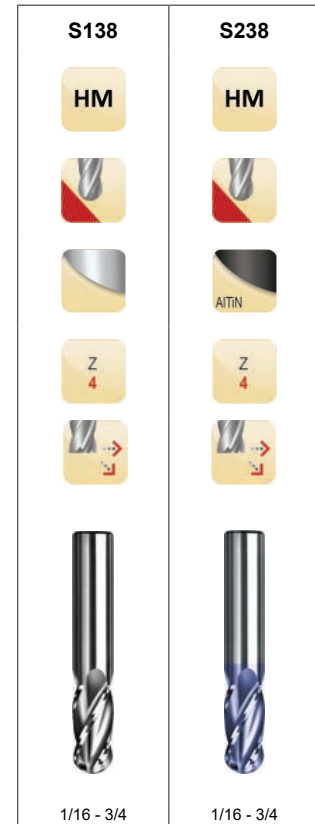
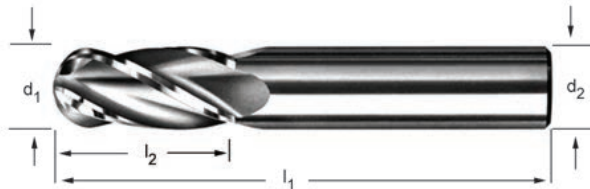
# Solid Carbide 4-Flute End Mill



## Regular Length, Ball Nose , 30° Helix

**S138** Ball nose for cutting internal part radius. Bright finish improves chip flow in soft or non-ferrous materials.

**S238** Ball nose for cutting internal part radius. AlTiN coating increases surface hardness, improves chip flow and tool life allowing higher metal removal rates.

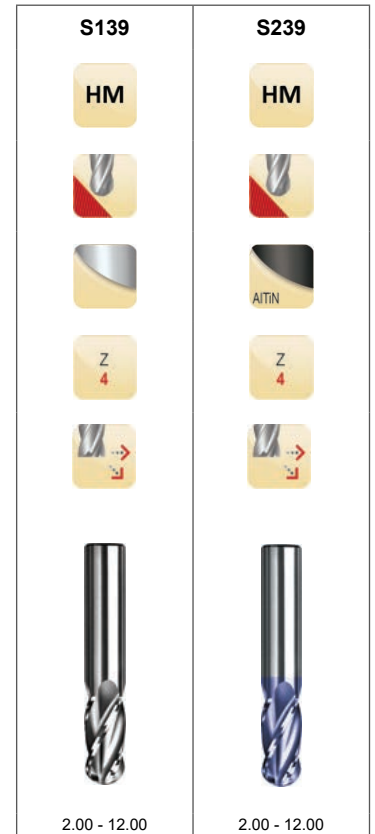
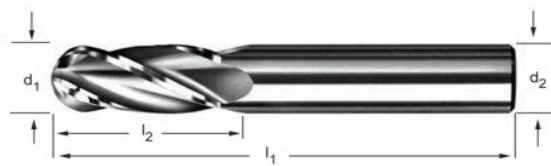


$d_1$ Ø Inch	$d_1$ decimal Inch	$d_2$ Ø Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	S138	S238
1/16	0.0625	1/8	1/4	1.1/2	4	1	7648845	7648857
3/32	0.0938	1/8	3/8	1.1/2	4	1	7648846	7648858
1/8	0.1250	1/8	1/2	1.1/2	4	1	7648847	7648859
5/32	0.1562	3/16	9/16	2"	4	1	7648848	7648860
3/16	0.1875	3/16	5/8	2"	4	1	7648849	7648861
1/4	0.2500	1/4	3/4	2.1/2	4	1	7648850	7648862
5/16	0.3125	5/16	7/8	2.1/2	4	1	7648851	7648863
3/8	0.3750	3/8	7/8	2.1/2	4	1	7648852	7648864
7/16	0.4375	7/16	1"	2.1/2	4	1	7648853	7648865
1/2	0.5000	1/2	1"	3"	4	1	7648854	7648866
5/8	0.6250	5/8	1.1/4	3.1/2	4	1	7648855	7648867
3/4	0.7500	3/4	1.1/2	4"	4	1	7648856	7648868

## Regular Length, Ball Nose, 30° Helix

**S139** Ball nose for cutting internal part radius. Bright finish improves chip flow in soft or non-ferrous materials.

**S239** Ball nose for cutting internal part radius. AlTiN coating increases surface hardness, improves chip flow and tool life allowing higher metal removal rates.



d <sub>1</sub> Ø mm	d <sub>1</sub> decimal Inch	d <sub>2</sub> Ø mm	l <sub>2</sub> mm	l <sub>1</sub> mm	# of Flutes	Pack Qty	S139	S239
2.00	0.0787	3.0	6.0	38.0	4	1	7648877	7648878
3.00	0.1181	3.0	12.0	38.0	4	1	7648876	7648879
4.00	0.1575	4.0	14.0	50.0	4	1	7648875	7648880
4.50	0.1772	5.0	14.0	50.0	4	1	7648874	—
5.00	0.1969	5.0	16.0	50.0	4	1	7648873	7648881
6.00	0.2362	6.0	19.0	63.0	4	1	7648872	7648882
8.00	0.3150	8.0	19.0	63.0	4	1	7648871	7648883
10.00	0.3937	10.0	22.0	70.0	4	1	7648870	7648884
12.00	0.4724	12.0	25.0	75.0	4	1	7648869	7648885

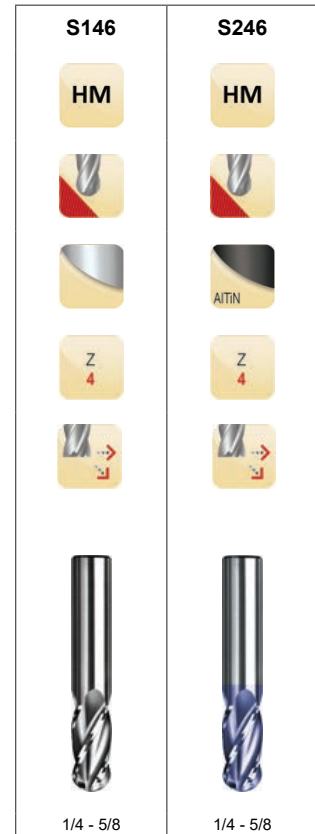
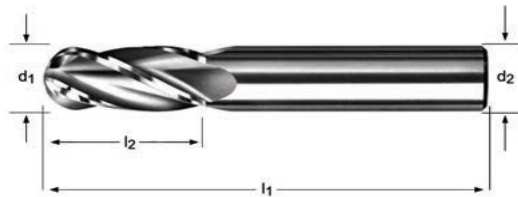
# Solid Carbide 4-Flute End Mill



## Long Length, Ball Nose, 30° Helix

**S146** Ball nose for cutting internal part radius. Bright finish improves chip flow in soft or non-ferrous materials.

**S246** Ball nose for cutting internal part radius. AlTiN coating increases surface hardness, improves chip flow and tool life allowing higher metal removal rates.



$d_1$ Ø Inch	$d_1$ decimal Inch	$d_2$ Ø Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	<b>S146</b>	<b>S246</b>
1/4	0.2500	1/4	1.1/8	3"	4	1	7648886	7648890
3/8	0.3750	3/8	1.1/8	3"	4	1	7648887	7648891
1/2	0.5000	1/2	2"	4"	4	1	7648888	7648892
5/8	0.6250	5/8	2.1/4	5"	4	1	7648889	7648893



## Extra Long Length, Ball Nose, 30° Helix

**S147** Ball nose for cutting internal part radius. Bright finish improves chip flow in soft or non-ferrous materials.

**S247** Ball nose for cutting internal part radius. AlTiN coating increases surface hardness, improves chip flow and tool life allowing higher metal removal rates.



d <sub>1</sub> Ø Inch	d <sub>1</sub> decimal Inch	d <sub>2</sub> Ø Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	# of Flutes	Pack Qty	S147	S247
1/8	0.1250	1/8	1"	3"	4	1	7648894	7648901
3/16	0.1875	3/16	1.1/8	3"	4	1	7648895	7648902
1/4	0.2500	1/4	1.1/2	4"	4	1	7648896	7648903
5/16	0.3125	5/16	1.5/8	4"	4	1	7648897	7648904
3/8	0.3750	3/8	1.3/4	4"	4	1	7648898	7648905
1/2	0.5000	1/2	3"	6"	4	1	7648899	7648906
5/8	0.6250	5/8	3"	6"	4	1	7648900	7648907

# Solid Carbide 4-Flute End Mill



## Regular Length, Corner Radius, Unequal Helix

**S223HA**    ALTiN coating increases hardness, and improves tool life  
**S223HB**    allowing higher metal removal rates. These unequal helix cutters with corner radii are designed for higher speeds and deeper cuts. Provides superior workpiece finishes by eliminating vibrations and harmonics. Excellent for milling tough alloys and hardened steels.

**S223HB** has a Weldon shank.



d <sub>1</sub> Ø Inch	d <sub>1</sub> decimal Inch	d <sub>2</sub> Ø Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	R Radius	# of Flutes	Pack Qty	S223HA	S223HB
1/8	0.1250	1/8	3/8	1-1/2	.015	4	1	7648675	7648697
1/8	0.1250	1/8	3/8	1-1/2	.030	4	1	7648676	7648698
3/16	0.1875	3/16	7/16	2"	.015	4	1	7648677	7648699
3/16	0.1875	3/16	7/16	2"	.030	4	1	7648678	7648700
1/4	0.2500	1/4	5/8	2-1/2	.015	4	1	7648679	7648701
1/4	0.2500	1/4	5/8	2-1/2	.030	4	1	7648680	7648702
5/16	0.3125	1/4	1/2	2"	.015	4	1	7648681	7648703
5/16	0.3125	1/4	1/2	2"	.030	4	1	7648682	7648704
3/8	0.3750	3/8	7/8	2-1/2	.015	4	1	7648683	7648705
3/8	0.3750	3/8	7/8	2-1/2	.030	4	1	7648684	7648706
7/16	0.4375	7/16	5/8	2-1/2	.020	4	1	7648685	7648707
7/16	0.4375	7/16	5/8	2-1/2	.045	4	1	7648686	7648708
1/2	0.5000	1/2	1-1/4	3"	.030	4	1	7648687	7648709
1/2	0.5000	1/2	1-1/4	3"	.060	4	1	7648688	7648710
9/16	0.5625	9/16	1-1/8	3-1/2	.045	4	1	7648689	7648711
9/16	0.5625	9/16	1-1/8	3-1/2	.060	4	1	7648690	7648712
5/8	0.6250	5/8	1-1/4	3-1/2	.060	4	1	7648691	7648713
5/8	0.6250	5/8	1-1/4	5"	.090	4	1	7648692 *	7648714 *
3/4	0.7500	3/4	1-1/2	4"	.030	4	1	7648693	7648715
3/4	0.7500	3/4	1-1/2	4"	.060	4	1	7648694	7648716
1"	1.0000	1"	2-1/4	5"	.030	4	1	7648695 *	7648717 *
1"	1.0000	1"	2-1/4	5"	.090	4	1	7648696 *	7648718 *

\* Will require a reduction of 30% - 60% in cutting speed.

## Regular Length, Corner Radius, Unequal Helix

**S248HA**    ALTiN coating increases hardness, and improves tool life  
**S248HB**    allowing higher metal removal rates. These unequal helix cutters with corner radii are designed for higher speeds and deeper cuts. Provides superior workpiece finishes by eliminating vibrations and harmonics. Excellent for milling tough alloys and hardened steels.

**S248HB** has a Weldon shank.



d <sub>1</sub> Ø Inch	d <sub>1</sub> decimal Inch	d <sub>2</sub> Ø Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	R Radius	# of Flutes	Pack Qty	S248HA	S248HB
5/16	0.3125	5/16	13/16	2-1/2	.015	5	1	7648908	7648927
5/16	0.3125	5/16	13/16	2-1/2	.030	5	1	7648909	7648928
3/8	0.3750	3/8	7/8	2-1/2	.015	5	1	7648910	7648929
3/8	0.3750	3/8	7/8	2-1/2	.030	5	1	7648911	7648930
7/16	0.4375	7/16	5/8	2-1/2	.020	5	1	7648912	7648931
7/16	0.4375	7/16	5/8	2-1/2	.045	5	1	7648913	7648932
1/2	0.5000	1/2	1"	3"	.030	5	1	7648914	7648933
1/2	0.5000	1/2	1-1/4	3"	.030	5	1	7648915	7648934
1/2	0.5000	1/2	1-1/4	3"	.060	5	1	7648916	7648935
9/16	0.5625	9/16	1-1/8	3-1/2	.020	5	1	7648917	7648936
9/16	0.5625	9/16	1-1/8	3-1/2	.045	5	1	7648918	7648937
9/16	0.5625	9/16	1-1/8	3-1/2	.060	5	1	7648919	7648938
5/8	0.6250	5/8	1-1/4	3-1/2	.045	5	1	7648920	7648939
5/8	0.6250	5/8	1-1/4	3-1/2	.060	5	1	7648921	7648940
5/8	0.6250	5/8	1-1/4	3-1/2	.090	5	1	7648922	7648941
3/4	0.7500	3/4	1-1/2	4"	.030	5	1	7648923	7648942
3/4	0.7500	3/4	1-1/2	4"	.060	5	1	7648924	7648943
1"	1.0000	1"	2-1/4	5"	.030	5	1	7648925 *	7648944 *
1"	1.0000	1"	2-1/4	5"	.090	5	1	7648926 *	7648945 *

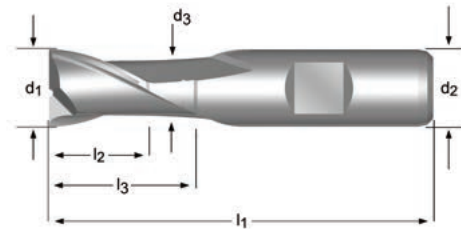
\* Will require a reduction of 30% - 60% in cutting speed.

# HSS-PM 2-Flute End Mill



Stub Length, Square End, Weldon Shank, 30° Helix

**C110** Powdered Metal. P9 slotting tolerance.



**C110**

HSS-E PM

P9

Z 2

1.00 - 50.00

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø mm	d <sub>2</sub> Ø <sub>h<sub>s</sub></sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	# of Flutes	l <sub>3</sub> mm	d <sub>3</sub> Ø mm	Pack Qty	C110
	1.00	6	2.5	47	2	-	-	1	0353165
	1.50	6	3	47	2	-	-	1	0353172
1/16	1.59	6	3	47	2	-	-	1	0639795
	1.80	6	4	48	2	-	-	1	0353189
	2.00	6	4	48	2	-	-	1	0353301
3/32	2.38	6	5	49	2	-	-	1	0639801
	2.50	6	5	49	2	-	-	1	0353318
	2.80	6	5	49	2	-	-	1	0353325
	3.00	6	5	49	2	-	-	1	0353370
1/8	3.18	6	6	50	2	-	-	1	0639818
	3.50	6	6	50	2	-	-	1	0353387
	3.80	6	7	51	2	-	-	1	0353394
	4.00	6	7	51	2	-	-	1	0353424
	4.50	6	7	51	2	-	-	1	0353431
3/16	4.76	6	8	52	2	-	-	1	0639825
	4.80	6	8	52	2	-	-	1	0353448 <sup>1)2)</sup>
	5.00	6	8	52	2	-	-	1	0353455
	5.50	6	8	52	2	-	-	1	0353462
	5.75	6	8	52	2	-	-	1	0353479 <sup>1)2)</sup>
	6.00	6	8	52	2	-	-	1	0353486
1/4	6.35	10	10	60	2	-	-	1	0639832
	6.50	10	10	60	2	-	-	1	0353493
	6.75	10	10	60	2	-	-	1	0629031
	7.00	10	10	60	2	-	-	1	0353509
	7.50	10	10	60	2	-	-	1	0353516
	7.75	10	11	61	2	-	-	1	0573495 <sup>1)2)</sup>
5/16	7.94	10	11	61	2	-	-	1	0639849
	8.00	10	11	61	2	-	-	1	0353523
	8.50	10	11	61	2	-	-	1	0353530
	9.00	10	11	61	2	-	-	1	0353547

<sup>1)</sup> Diameter tolerance h10

<sup>2)</sup> Slot not in P9 tolerance

<sup>3)</sup> Available in HSCo only

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø mm	d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	# of Flutes	l <sub>3</sub> mm	d <sub>3</sub> Ø mm	Pack Qty	C110
3/8	9.50	10	11	61	2	-	-	1	0353554
	9.52	10	13	63	2	22.5	9.5	1	0639856
	9.70	10	13	63	2	22.5	9.5	1	0573501 <sup>1)2)</sup>
13/32	10.00	10	13	63	2	22.5	9.5	1	0353196
	10.32	12	13	70	2	-	-	1	0639863
	10.50	12	13	70	2	-	-	1	0353202
7/16	11.00	12	13	70	2	-	-	1	0353219
	11.11	12	13	70	2	-	-	1	0639870
	11.50	12	13	70	2	-	-	1	0573433
1/2	11.70	12	16	73	2	27.5	11.5	1	0573440 <sup>1)2)</sup>
	12.00	12	16	73	2	27.5	11.5	1	0353226
	12.50	12	16	73	2	27.5	11.5	1	0573457
17/32	12.70	12	16	73	2	27.5	11.5	1	0639887
	13.00	12	16	73	2	27.5	11.5	1	0353233
	13.49	12	16	73	2	27.5	11.5	1	0639894
9/16	13.70	12	16	73	2	27.5	11.5	1	0573464 <sup>1)2)</sup>
	14.00	12	16	73	2	27.5	11.5	1	0353240
	14.29	12	16	73	2	27.5	11.5	1	0639900
5/8	15.00	12	16	73	2	27.5	11.5	1	0353257
	15.70	16	19	79	2	30.5	15.5	1	0573471 <sup>1)2)</sup>
	15.88	16	19	79	2	30.5	15.5	1	0639917
11/16	16.00	16	19	79	2	30.5	15.5	1	0353264
	17.00	16	19	79	2	30.5	15.5	1	0353271
	17.46	16	19	79	2	30.5	15.5	1	0639924
3/4	17.70	16	19	79	2	30.5	15.5	1	0628942
	18.00	16	19	79	2	30.5	15.5	1	0353288
	19.00	16	19	79	2	30.5	15.5	1	0353295
7/8	19.05	20	22	88	2	37.5	18.5	1	0639931
	19.70	20	22	88	2	37.5	19.5	1	0628959
	20.00	20	22	88	2	37.5	19.5	1	0353332
1"	21.70	20	22	88	2	37.5	19.5	1	0628966
	22.00	20	22	88	2	37.5	19.5	1	0353349
	22.22	20	22	88	2	37.5	19.5	1	0639948
1.1/8	24.00	25	26	102	2	45.5	23.5	1	0573488
	24.70	25	26	102	2	45.5	24.5	1	0628973
	25.00	25	26	102	2	45.5	24.5	1	0353356
1.1/4	25.40	25	26	102	2	45.5	24.5	1	0621929
	26.00	25	26	102	2	45.5	24.5	1	0628980
	28.00	25	26	102	2	45.5	24.5	1	0353363
1.1/2	28.58	25	26	102	2	45.5	24.5	1	0639962
	30.00	25	26	102	2	45.5	24.5	1	0353400
	31.75	32	32	112	2	51.5	31.5	1	0639979
1.3/4	32.00	32	32	112	2	51.5	31.5	1	0353417
	35.00	32	32	112	2	51.5	31.5	1	0639986 <sup>1)3)</sup>
	36.00	32	32	112	2	51.5	31.5	1	0628997 <sup>1)3)</sup>
1.5	40.00	40	38	130	2	59.5	39.0	1	0629000 <sup>1)3)</sup>
	45.00	40	38	130	2	59.5	38.0	1	0629017 <sup>1)3)</sup>
	50.00	50	45	147	2	66.5	48.0	1	0629024 <sup>1)3)</sup>

<sup>1)</sup> Diameter tolerance h10

<sup>2)</sup> Slot not in P9 tolerance

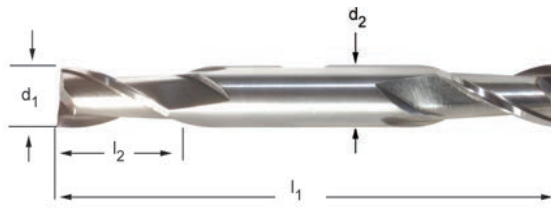
<sup>3)</sup> Available in HSCo only

# HSS 2-Flute End Mill



## Regular Length, Square End, Weldon Shank, 30° Helix

**C600** Double end provides two cutting ends in one tool. Bright finish improves chip flow in soft or non-ferrous materials.



C600

HSS



Z  
2

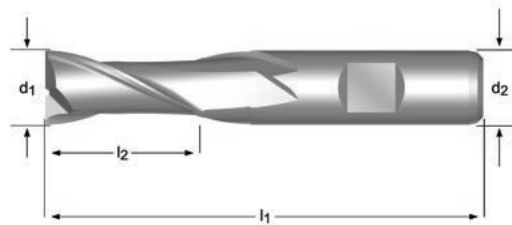


1/8 - 3/4

$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ Ø Inch	# of Flutes	Pack Qty	C600
1/8	0.1250	3/8	3.1/16	3/8	2	1	7647759
5/32	0.1562	7/16	3.1/8	3/8	2	1	7647820
3/16	0.1875	7/16	3.1/4	3/8	2	1	7647821
1/4	0.2500	1/2	3.3/8	3/8	2	1	7647822
9/32	0.2812	9/16	3.3/8	3/8	2	1	7647823
5/16	0.3125	9/16	3.1/2	3/8	2	1	7647824
11/32	0.3437	9/16	3.1/2	3/8	2	1	7647825
3/8	0.3750	9/16	3.1/2	3/8	2	1	7647826
13/32	0.4062	13/16	4.1/8	1/2	2	1	7647827
7/16	0.4375	13/16	4.1/8	1/2	2	1	7647828
1/2	0.5000	13/16	4.1/8	1/2	2	1	7647829
5/8	0.6250	1.1/8	5"	5/8	2	1	7647830
3/4	0.7500	1.5/16	5.5/8	3/4	2	1	7647831

## Regular Length, Square End, Weldon Shank, 30° Helix

**C601** Bright finish improves chip flow in soft or non-ferrous materials.



**C601**

**HSS**

**Z**  
**2**

1/8 - 1/2

d <sub>1</sub> Ø Inch	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	d <sub>2</sub> Ø Inch	# of Flutes	Pack Qty	C601
1/8	0.1250	3/8	2.5/16	3/8	2	1	7647832
3/16	0.1875	7/16	2.3/8	3/8	2	1	7647833
1/4	0.2500	1/2	2.7/16	3/8	2	1	7647834
5/16	0.3125	9/16	2.1/2	3/8	2	1	7647835
3/8	0.3750	9/16	2.1/2	3/8	2	1	7647836
7/16	0.4375	13/16	2.11/16	3/8	2	1	7647837
1/2	0.5000	13/16	2.11/16	3/8	2	1	7647838
1/2	0.5000	1"	3.1/4	1/2	2	1	7647839
9/16	0.5625	1.1/8	3.3/8	1/2	2	1	7647840
5/8	0.6250	1.1/8	3.3/8	1/2	2	1	7647841
5/8	0.6250	1.5/16	3.3/4	5/8	2	1	7647844
11/16	0.6875	1.5/16	3.5/8	1/2	2	1	7647842
11/16	0.6875	1.5/16	3.3/4	5/8	2	1	7647845
3/4	0.7500	1.5/16	3.5/8	1/2	2	1	7647843
3/4	0.7500	1.5/16	3.3/4	5/8	2	1	7647846
3/4	0.7500	1.5/16	3.7/8	3/4	2	1	7647859
13/16	0.8125	1.1/2	4"	5/8	2	1	7647847
7/8	0.8750	1.1/2	4"	5/8	2	1	7647848
7/8	0.8750	1.1/2	4.1/8	3/4	2	1	7647860
7/8	0.8750	1.1/2	4.1/8	7/8	2	1	7647851
15/16	0.9375	1.1/2	4"	5/8	2	1	7647849
1"	1.0000	1.1/2	4"	5/8	2	1	7647850
1"	1.0000	1.1/2	4.1/8	3/4	2	1	7647861
1"	1.0000	1.1/2	4.1/8	7/8	2	1	7647852
1"	1.0000	1.5/8	4.1/2	1"	2	1	7647853
1.1/8	1.1250	1.5/8	4.1/4	3/4	2	1	7647862
1.1/8	1.1250	1.5/8	4.1/2	1"	2	1	7647854
1.1/4	1.2500	1.5/8	4.1/2	1"	2	1	7647855
1.1/4	1.2500	1.5/8	4.1/2	1.1/4	2	1	7647857
1.1/2	1.5000	1.5/8	4.1/4	3/4	2	1	7647863
1.1/2	1.5000	1.5/8	4.1/2	1"	2	1	7647856
1.1/2	1.5000	1.5/8	4.1/2	1.1/4	2	1	7647858

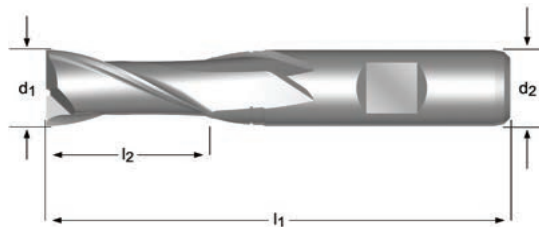
# HSS 2-Flute End Mill



## Regular Length, Square End, Keyway, Weldon Shank, 30° Helix

**C602**

Keyway cutter, close tolerance (+0.0000"/-0.0015").  
Bright finish improves chip flow in soft or non-ferrous materials.



**C602**

**HSS**

**Z**  
**2**

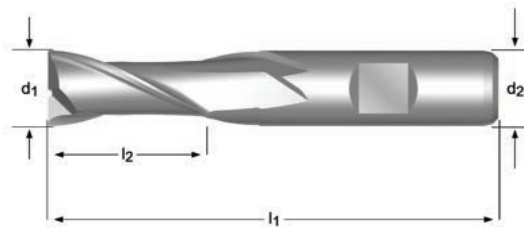
1/8 - 1"

d <sub>1</sub> Ø Inch	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	d <sub>2</sub> Ø Inch	# of Flutes	Pack Qty	<b>C602</b>
1/8	0.1250	3/8	2.5/16	3/8	2	1	7647864
3/16	0.1875	7/16	2.3/8	3/8	2	1	7647865
1/4	0.2500	1/2	2.7/16	3/8	2	1	7647866
5/16	0.3125	9/16	2.1/2	3/8	2	1	7647867
3/8	0.3750	9/16	2.1/2	3/8	2	1	7647868
1/2	0.5000	1"	3.1/4	1/2	2	1	7647869
5/8	0.6250	1.5/16	3.3/4	5/8	2	1	7647870
3/4	0.7500	1.5/16	3.7/8	3/4	2	1	7647871
7/8	0.8750	1.1/2	4.1/8	7/8	2	1	7647872
1"	1.0000	1.5/8	4.1/2	1"	2	1	7647873



## Regular Length, Square End, Weldon Shank, 30° Helix

**C603** Bright finish improves chip flow in soft or non-ferrous materials.



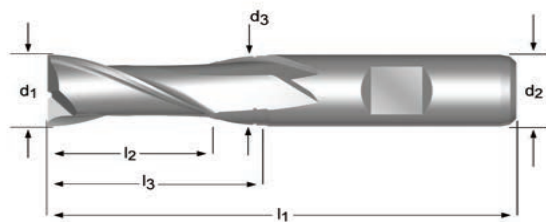
$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ Ø Inch	# of Flutes	Pack Qty	C603
1/8	0.1250	3/8	2.5/16	3/8	2	1	7647874
3/16	0.1875	7/16	2.3/8	3/8	2	1	7647875
1/4	0.2500	1/2	2.7/16	3/8	2	1	7647876
5/16	0.3125	9/16	2.1/2	3/8	2	1	7647877
3/8	0.3750	9/16	2.1/2	3/8	2	1	7647878
1/2	0.5000	1"	3.1/4	1/2	2	1	7647879
5/8	0.6250	1.5/16	3.3/4	5/8	2	1	7647880
3/4	0.7500	1.5/16	3.7/8	3/4	2	1	7647881
1"	1.0000	1.5/8	4.1/2	1"	2	1	7647882

# HSS-PM 2-Flute End Mill



## Regular Length, Square End, Weldon Shank, 30° Helix

**C123** Powdered Metal. P9 slotting tolerance.



C123

HSS-E  
PM

P9



Z  
2



1/16 - 40.00

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø mm	d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	# of Flutes	l <sub>3</sub> mm	d <sub>3</sub> Ø mm	Pack Qty	C123
1/16	1.59	6	7	51	2	—	—	1	0640012 <sup>1)</sup>
	2.00	6	7	51	2	—	—	1	0353646
	2.50	6	8	52	2	—	—	1	0353653
	3.00	6	8	52	2	—	—	1	0353714
1/8	3.18	6	10	54	2	—	—	1	0640029 <sup>1)</sup>
	3.50	6	10	54	2	—	—	1	0353721
5/32	3.97	6	11	55	2	—	—	1	0640036 <sup>1)</sup>
	4.00	6	11	55	2	—	—	1	0353769
	4.50	6	11	55	2	—	—	1	0353776
3/16	4.76	6	13	57	2	—	—	1	0640043 <sup>1)</sup>
	5.00	6	13	57	2	—	—	1	0353790
	5.50	6	13	57	2	—	—	1	0353806
	6.00	6	13	57	2	—	—	1	0353813
1/4	6.35	10	16	66	2	—	—	1	0640050 <sup>1)</sup>
	6.50	10	16	66	2	—	—	1	0353820
	7.00	10	16	66	2	—	—	1	0353837
	7.50	10	16	66	2	—	—	1	0353844
5/16	7.94	10	19	69	2	—	—	1	0640067 <sup>1)</sup>
	8.00	10	19	69	2	—	—	1	0353851
	8.50	10	19	69	2	—	—	1	0353868
	9.00	10	19	69	2	—	—	1	0353875
	9.50	10	19	69	2	—	—	1	0353882
3/8	9.52	10	22	72	2	31.5	9.5	1	0640074 <sup>1)</sup>
	10.00	10	22	72	2	31.5	9.5	1	0353561
	11.00	12	22	79	2	—	—	1	0353578
	12.00	12	26	83	2	37.5	11.5	1	0353585
1/2	12.70	12	26	83	2	37.5	11.5	1	0640081 <sup>1)</sup>
	13.00	12	26	83	2	37.5	11.5	1	0353592
	14.00	12	26	83	2	37.5	11.5	1	0353608
9/16	14.29	12	26	83	2	37.5	11.5	1	0640098 <sup>1)</sup>

<sup>1)</sup> Diameter tolerance -.0005 inches / -.0013 inches

<sup>2)</sup> Diameter tolerance -.0005 inches / -.0015 inches

<sup>3)</sup> Available in HSCo only

$d_1$ Ø Inch	$d_1$ Ø mm	$d_2$ Ø <sub>h<sub>6</sub></sub> mm	$l_2$ mm	$l_1$ mm	# of Flutes	$l_3$ mm	$d_3$ Ø mm	Pack Qty	C123
5/8	15.00	12	26	83	2	37.5	11.5	1	0353615
	15.88	16	32	92	2	43.5	15.5	1	0640104 <sup>1)</sup>
	16.00	16	32	92	2	43.5	15.5	1	0353622
3/4	18.00	16	32	92	2	43.5	15.5	1	0353639
	19.05	20	38	104	2	53.5	18.5	1	0640111 <sup>2)</sup>
	20.00	20	38	104	2	53.5	19.5	1	0353660
	22.00	20	38	104	2	53.5	19.5	1	0353677
1"	25.00	25	45	121	2	64.5	24.5	1	0353691
	25.40	25	45	121	2	64.5	24.5	1	0640128
	30.00	25	45	121	2	64.5	24.5	1	0353738
	32.00	32	53	133	2	72.5	31.5	1	0353745
	36.00	32	53	133	2	72.5	31.5	1	0353752 <sup>3)</sup>
	40.00	40	63	155	2	84.5	39.0	1	0353783 <sup>3)</sup>

<sup>1)</sup> Diameter tolerance -.0005 inches / -.0013 inches

<sup>2)</sup> Diameter tolerance -.0005 inches / -.0015 inches

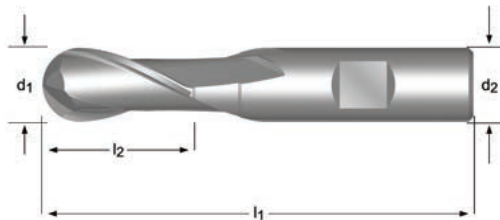
<sup>3)</sup> Available in HSCo only

# HSS 2-Flute End Mill



## Regular Length, Ball Nose, Weldon Shank, 30° Helix

**C604** Ball nose for cutting internal radius. Bright finish improves chip flow in soft or non-ferrous materials.



C604

HSS



Z  
2

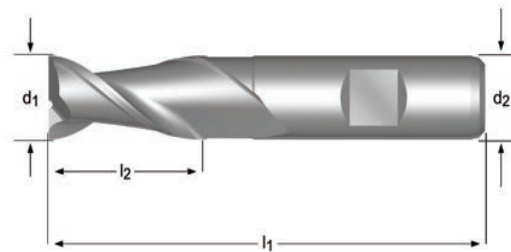


1/8 - 3/4

d <sub>1</sub> Ø Inch	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> inch	d <sub>2</sub> Ø Inch	# of Flutes	Pack Qty	C604
1/8	0.1250	3/8	2.5/16	3/8	2	1	7647883
3/16	0.1875	1/2	2.3/8	3/8	2	1	7647884
1/4	0.2500	5/8	2.7/16	3/8	2	1	7647885
5/16	0.3125	3/4	2.1/2	3/8	2	1	7647886
3/8	0.3750	3/4	2.1/2	3/8	2	1	7647887
7/16	0.4375	1"	3.1/4	1/2	2	1	7647888
1/2	0.5000	1"	3.1/4	1/2	2	1	7647889
9/16	0.5625	1.1/8	3.3/8	1/2	2	1	7647890
5/8	0.6250	1.1/8	3.3/8	1/2	2	1	7647891
3/4	0.7500	1.5/16	3.5/8	1/2	2	1	7647892

**Regular Length, Square End, Weldon Shank, 37° Helix**

**C605** High Helix design for aluminum and other non-ferrous materials.



C605

HSS



1/4 - 1"

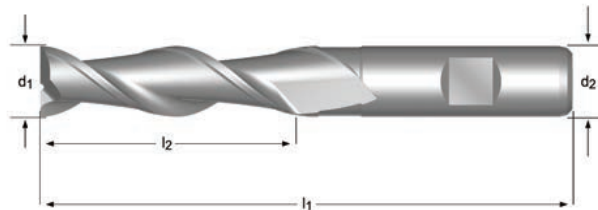
$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ Ø Inch	# of Flutes	Pack Qty	C605
1/4	0.2500	5/8	2.7/16	3/8	2	1	7647893
5/16	0.3125	3/4	2.1/2	3/8	2	1	7647894
3/8	0.3750	3/4	2.1/2	3/8	2	1	7647895
1/2	0.5000	1.1/4	3.1/4	1/2	2	1	7647896
3/4	0.7500	1.5/8	3.7/8	3/4	2	1	7647897
1"	1.0000	2"	4.1/2	1"	2	1	7647898

# HSS 2-Flute End Mill



## Long Length, Square End, Weldon Shank, 37° Helix

**C606** High Helix design for aluminum and other non-ferrous materials.



C606

HSS



Z  
2

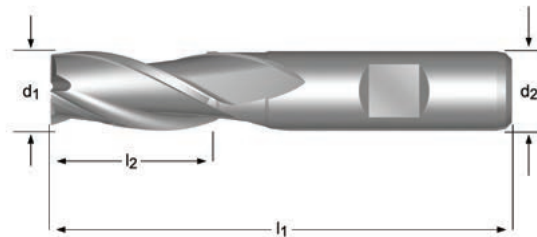


1/4 - 3/4

$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ Ø Inch	# of Flutes	Pack Qty	C606
1/4	0.2500	1.1/4	3.1/16	3/8	2	1	7647899
5/16	0.3125	1.3/8	3.1/8	3/8	2	1	7647900
3/8	0.3750	1.1/2	3.1/4	3/8	2	1	7647901
1/2	0.5000	2"	4"	1/2	2	1	7647902
3/4	0.7500	3"	5.1/4	3/4	2	1	7647903

## Regular Length, Square End, Weldon Shank, 30° Helix

**C607** 3-flute design for less chatter. Bright finish improves chip flow in soft or non-ferrous materials.



$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ Ø Inch	# of Flutes	Pack Qty	C607
1/8	0.1250	3/8	2.5/16	3/8	3	1	7647904
3/16	0.1875	1/2	2.3/8	3/8	3	1	7647905
1/4	0.2500	5/8	2.7/16	3/8	3	1	7647906
5/16	0.3125	3/4	2.1/2	3/8	3	1	7647907
3/8	0.3750	3/4	2.1/2	3/8	3	1	7647908
7/16	0.4375	1"	2.11/16	3/8	3	1	7647909
1/2	0.5000	1.1/4	3.1/4	1/2	3	1	7647910
9/16	0.5625	1.3/8	3.3/8	1/2	3	1	7658817
5/8	0.6250	1.5/8	3.3/4	5/8	3	1	7647912
3/4	0.7500	1.5/8	3.3/4	5/8	3	1	7647913
3/4	0.7500	1.5/8	3.7/8	3/4	3	1	7647916
1"	1.0000	1.7/8	4"	5/8	3	1	7647914
1"	1.0000	2"	4.1/2	1"	3	1	7647915

# Cobalt 3-Flute End Mill



## Long Length, Square End, Weldon Shank, 30° Helix

**C346** P9 slotting tolerance. 3 flute design provides less chatter.

C346

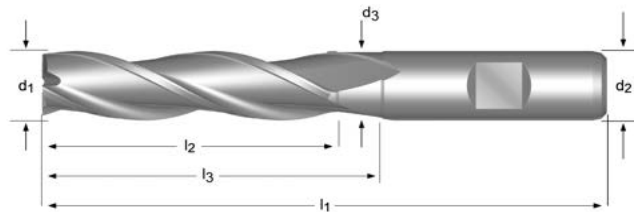
HSS-E



Z  
3



3.00 - 20.00

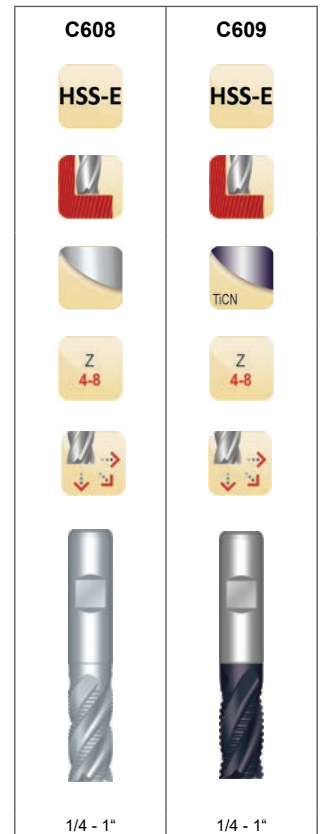
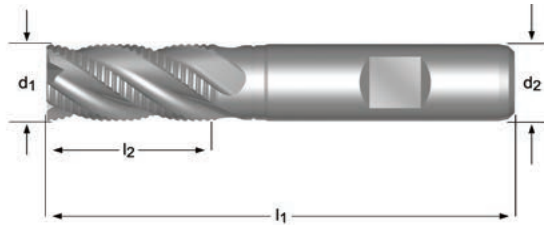


d <sub>1</sub> Ø mm	d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	# of Flutes	l <sub>3</sub> mm	d <sub>3</sub> Ø mm	Pack Qty	C346
3.00	6	12	56	3	-	-	1	0122297
4.00	6	19	63	3	-	-	1	0122303
5.00	6	24	68	3	-	-	1	0122310
6.00	6	24	68	3	-	-	1	0122327
7.00	10	30	80	3	-	-	1	0126325
8.00	10	38	88	3	-	-	1	0126332
9.00	10	38	88	3	-	-	1	0126349
10.00	10	45	95	3	-	-	1	0126233
11.00	12	45	102	3	-	-	1	0126240
12.00	12	53	110	3	-	-	1	0126257
13.00	12	53	110	3	64.5	11.5	1	0126264
14.00	12	53	110	3	64.5	11.5	1	0126271
15.00	12	53	110	3	64.5	11.5	1	0126288
16.00	16	63	123	3	74.5	15.5	1	0126295
18.00	16	63	123	3	74.5	15.5	1	0126301
20.00	20	75	141	3	90.5	19.5	1	0126318



## Regular Length, Square End, Roughing, Weldon Shank, 30° Helix

- C608** Roughing, Fine Profile, provides a stronger edge and runs longer than conventional coarse profile roughers. Bright finish.
- C609** TiCN coating lowers the coefficient of friction and improves wear resistance on the end mill.



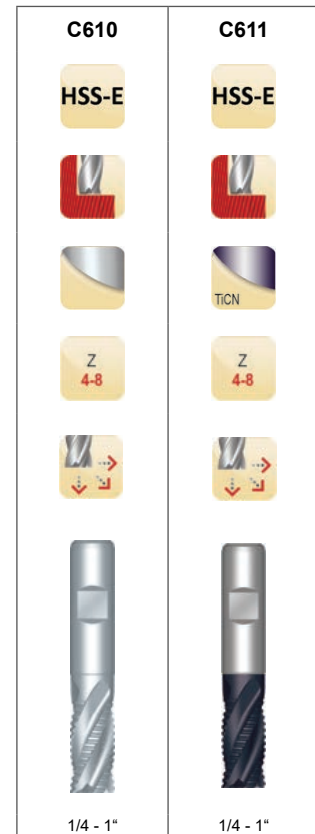
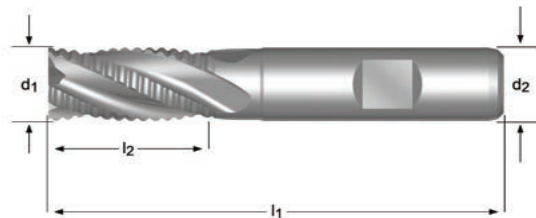
$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ Ø Inch	# of Flutes	Pack Qty	C608	C609
1/4	0.2500	5/8	2.7/16	3/8	4	1	7647917	7647927
5/16	0.3125	3/4	2.1/2	3/8	4	1	7647918	7647928
3/8	0.3750	3/4	2.1/2	3/8	4	1	7647919	7647929
7/16	0.4375	1.1/4	3.1/4	1/2	4	1	7647920	7647930
1/2	0.5000	1.1/4	3.1/4	1/2	4	1	7647921	7647931
9/16	0.5625	1.3/8	3.3/8	1/2	4	1	7647922	—
5/8	0.6250	1.5/8	3.3/4	5/8	4	1	7647923	7647932
3/4	0.7500	1.5/8	3.7/8	3/4	4	1	7647924	7647933
7/8	0.8750	1.7/8	4.1/8	3/4	5	1	7647925	—
1"	1.0000	2"	4.1/2	1"	5	1	7647926	7647934

# Cobalt Multi-Flute End Mill



## Regular Length, Square End, Roughing, Weldon Shank, 30° Helix

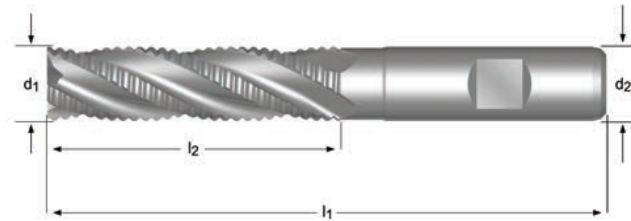
- C610** Roughing, Coarse Profile, for maximum metal removal in one pass. Bright finish.
- C611** TiCN coating lowers the coefficient of friction and improves wear resistance on the end mill.



$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ Ø Inch	# of Flutes	Pack Qty	C610	C611
1/4	0.2500	5/8	2.7/16	3/8	4	1	7647935	7647945
5/16	0.3125	3/4	2.1/2	3/8	4	1	7647936	7647946
3/8	0.3750	3/4	2.1/2	3/8	4	1	7647937	7647947
7/16	0.4375	1.1/4	3.1/4	1/2	4	1	7647938	7647948
1/2	0.5000	1.1/4	3.1/4	1/2	4	1	7647939	7647949
9/16	0.5625	1.3/8	3.3/8	1/2	4	1	7647940	—
5/8	0.6250	1.5/8	3.3/4	5/8	4	1	7647941	7647950
3/4	0.7500	1.5/8	3.7/8	3/4	4	1	7647942	7647951
7/8	0.8750	1.7/8	4.1/8	3/4	5	1	7647943	7647952
1"	1.0000	2"	4.1/2	1"	5	1	7647944	7647953

## Long Length, Square End, Roughing, Weldon Shank, 30° Helix

**C612** Roughing, Coarse Profile, for maximum metal removal in one pass. Bright finish.



**C612**

HSS-E

Z  
4-8

1/4 - 1"

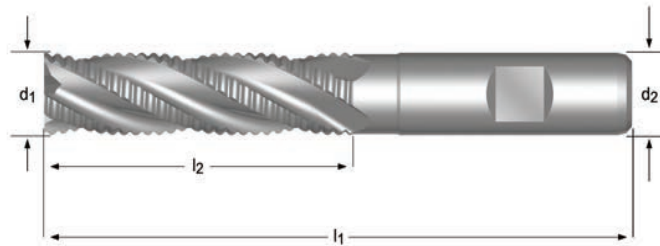
$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ Ø Inch	# of Flutes	Pack Qty	<b>C612</b>
1/4	0.2500	1.1/4	3.1/8	3/8	4	1	7647954
3/8	0.3750	1.1/2	3.1/4	3/8	4	1	7647955
1/2	0.5000	2"	4"	1/2	4	1	7647956
5/8	0.6250	2.1/2	4.5/8	5/8	4	1	7647957
3/4	0.7500	3"	5.1/4	3/4	4	1	7647958
7/8	0.8750	3.1/2	5.3/4	3/4	6	1	7647959
1"	1.0000	4"	6.1/2	1"	5	1	7647960

# Cobalt 4-Flute End Mill



## Long Length, Square End, Roughing, Weldon Shank, 30° Helix

**C613** Roughing, Fine Profile, provides a stronger edge and runs longer than conventional coarse profile roughers. Bright finish.



C613

HSS-E



Z  
4-8

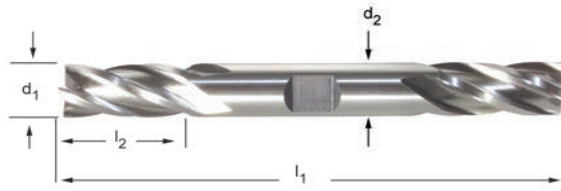


1/4 - 3/4

$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ Ø Inch	# of Flutes	Pack Qty	C613
1/4	0.2500	1.1/4	3.1/8	3/8	4	1	7647961
3/8	0.3750	1.1/2	3.1/4	3/8	4	1	7647962
1/2	0.5000	2"	4"	1/2	4	1	7647963
3/4	0.7500	3"	5.1/4	3/4	4	1	7647964

## Regular Length, Square End, Weldon Shank, 30° Helix

**C614** Double end provides two cutting ends in one tool. Bright finish improves chip flow in soft or non-ferrous materials.



C614

HSS



Z  
4



1/8 - 3/4

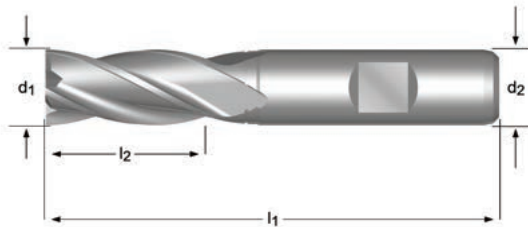
$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ Ø Inch	# of Flutes	Pack Qty	C614
1/8	0.1250	3/8	3.1/16	3/8	4	1	7647965
3/16	0.1875	1/2	3.1/4	3/8	4	1	7647966
1/4	0.2500	5/8	3.3/8	3/8	4	1	7647967
5/16	0.3125	3/4	3.1/2	3/8	4	1	7647968
3/8	0.3750	3/4	3.1/2	3/8	4	1	7647969
1/2	0.5000	1"	4.1/8	1/2	4	1	7647970
5/8	0.6250	1.3/8	5"	5/8	4	1	7647971
3/4	0.7500	1.5/8	5.5/8	3/4	4	1	7647972

# HSS 4-Flute End Mill



## Regular Length, Square End, Weldon Shank, 30° Helix

**C615** Bright finish improves chip flow in soft or non-ferrous materials.



C615

HSS



Z  
4

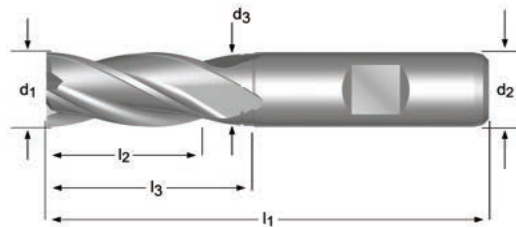


1/8 - 1"

$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ Ø Inch	# of Flutes	Pack Qty	C615
1/8	0.1250	3/8	2.5/16	3/8	4	1	7647973
3/16	0.1875	1/2	2.3/8	3/8	4	1	7647974
1/4	0.2500	5/8	2.7/16	3/8	4	1	7647975
5/16	0.3125	3/4	2.1/2	3/8	4	1	7647976
3/8	0.3750	3/4	2.1/2	3/8	4	1	7647977
1/2	0.5000	1.1/4	3.1/4	1/2	4	1	7647978
5/8	0.6250	1.5/8	3.3/4	5/8	4	1	7647979
11/16	0.6875	1.5/8	3.3/4	5/8	4	1	7647980
3/4	0.7500	1.5/8	3.7/8	3/4	4	1	7647981
7/8	0.8750	1.7/8	4.1/8	7/8	4	1	7647982
1"	1.0000	2"	4.1/2	1"	4	1	7647983

## Regular Length, Square End, Weldon Shank, 30° Helix

**C247** Powdered Metal. Bright finish improves chip flow in soft or non-ferrous materials.



**C247**

**HSS-E PM**

**N**

**Z 4-8**

2.00 - 50.00

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø mm	d <sub>2</sub> Ø <sub>h<sub>6</sub></sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	# of Flutes	l <sub>3</sub> mm	d <sub>3</sub> Ø mm	Pack Qty	<b>C247</b>
	2.00	6	7	51	4	—	—	1	0354667
	2.50	6	8	52	4	—	—	1	0354674
	3.00	6	8	52	4	—	—	1	0354728
1/8	3.18	6	10	54	4	—	—	1	0640142 <sup>1)</sup>
	3.50	6	10	54	4	—	—	1	0354735
	4.00	6	11	55	4	—	—	1	0354766
	4.50	6	11	55	4	—	—	1	0354773
3/16	4.76	6	13	57	4	—	—	1	0640159 <sup>1)</sup>
	5.00	6	13	57	4	—	—	1	0354780
	5.50	6	13	57	4	—	—	1	0354797
	6.00	6	13	57	4	—	—	1	0354803
1/4	6.35	10	16	66	4	—	—	1	0640166 <sup>1)</sup>
	6.50	10	16	66	4	—	—	1	0354810
	7.00	10	16	66	4	—	—	1	0354827
	7.50	10	16	66	4	—	—	1	0354834
5/16	7.94	10	19	69	4	—	—	1	0640173 <sup>1)</sup>
	8.00	10	19	69	4	—	—	1	0354841
	8.50	10	19	69	4	—	—	1	0354858
	9.00	10	19	69	4	—	—	1	0354865
	9.50	10	19	69	4	—	—	1	0354872
3/8	9.52	10	22	72	4	31.5	9.5	1	0640180 <sup>1)</sup>
	10.00	10	22	72	4	31.5	9.5	1	0354582
	11.00	12	22	79	4	—	—	1	0354599
	12.00	12	26	83	4	37.5	11.5	1	0354605
1/2	12.70	12	26	83	4	37.5	11.5	1	0640197 <sup>1)</sup>
	13.00	12	26	83	4	37.5	11.5	1	0354612
	14.00	12	26	83	4	37.5	11.5	1	0354629
9/16	14.29	12	26	83	4	37.5	11.5	1	0640203 <sup>1)</sup>
	15.00	12	26	83	4	37.5	11.5	1	0354636
5/8	15.88	16	32	92	4	43.5	15.5	1	0640210 <sup>1)</sup>

<sup>1)</sup> Diameter tolerance +.0025 inches / -.0005 inches

<sup>2)</sup> Not center Cutting

<sup>3)</sup> Available in HSCo only

# Cobalt-PM Multi-Flute End Mill



d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø mm	d <sub>2</sub> Øh <sub>6</sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	# of Flutes	l <sub>3</sub> mm	d <sub>3</sub> Ø mm	Pack Qty	C247
	16.00	16	32	92	4	43.5	15.5	1	0354643
	17.00	16	32	92	4	43.5	15.5	1	0609316
	18.00	16	32	92	4	43.5	15.5	1	0354650
	19.00	16	32	92	4	43.5	15.5	1	0609323
3/4	19.05	20	38	104	4	53.5	18.5	1	0640227 <sup>1)</sup>
	20.00	20	38	104	4	53.5	19.5	1	0354681
	21.00	20	38	104	4	53.5	19.5	1	0609330
	22.00	20	38	104	5	53.5	19.5	1	0354698
7/8	22.22	20	38	104	5	53.5	19.5	1	0640234 <sup>1)</sup>
	23.00	20	38	104	5	53.5	19.5	1	0609347
	24.00	25	45	121	5	64.5	23.5	1	0609354
	25.00	25	45	121	5	64.5	24.5	1	0354704
1"	25.40	25	45	121	5	64.5	24.5	1	0640241 <sup>1)</sup>
	26.00	25	45	121	6	64.5	24.5	1	0609361
	28.00	25	45	121	6	64.5	24.5	1	0354711
	30.00	25	45	121	6	64.5	24.5	1	0354742
	32.00	32	53	133	6	72.5	31.5	1	0354759
	36.00	32	53	133	6	72.5	31.5	1	0609378 <sup>2)3)</sup>
	40.00	40	63	155	6	84.5	39.0	1	0609385 <sup>2)3)</sup>
	50.00	50	75	177	8	96.5	48.0	1	0640258 <sup>2)3)</sup>

<sup>1)</sup> Diameter tolerance +.0025 inches / -.0005 inches

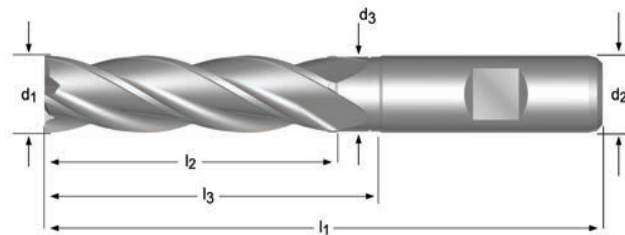
<sup>2)</sup> Not center Cutting

<sup>3)</sup> Available in HSCo only



## Long Length, Square End, Weldon Shank

**C273** Powdered Metal. Bright finish improves chip flow in soft or non-ferrous materials.



**C273**

**HSS-E PM**

**Z 4-6**

2.00 - 40.00

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø mm	d <sub>2</sub> Ø <sub>h<sub>6</sub></sub> mm	l <sub>2</sub> mm	l <sub>1</sub> mm	# of Flutes	l <sub>3</sub> mm	d <sub>3</sub> Ø mm	Pack Qty	<b>C273</b>
	2.00	6	10	54	4	—	—	1	0354964
	2.50	6	12	56	4	—	—	1	0354971
	3.00	6	12	56	4	—	—	1	0355022
1/8	3.18	6	15	59	4	—	—	1	0640265 <sup>1)</sup>
	3.50	6	15	59	4	—	—	1	0355039
	4.00	6	19	63	4	—	—	1	0355060
	4.50	6	19	63	4	—	—	1	0355077
3/16	4.76	6	24	68	4	—	—	1	0640272 <sup>1)</sup>
	5.00	6	24	68	4	—	—	1	0355084
	5.50	6	24	68	4	—	—	1	0355091
	6.00	6	24	68	4	—	—	1	0355107
1/4	6.35	10	30	80	4	—	—	1	0640289 <sup>1)</sup>
	7.00	10	30	80	4	—	—	1	0355114
	8.00	10	38	88	4	—	—	1	0355121
	9.00	10	38	88	4	—	—	1	0355138
3/8	9.52	10	45	95	4	54.5	9.5	1	0640296 <sup>1)</sup>
	10.00	10	45	95	4	54.5	9.5	1	0354889
	11.00	12	45	102	4	—	—	1	0354896
	12.00	12	53	110	4	64.5	11.5	1	0354902
1/2	12.70	12	53	110	4	64.5	11.5	1	0640302 <sup>1)</sup>
	13.00	12	53	110	4	64.5	11.5	1	0354919
	14.00	12	53	110	4	64.5	11.5	1	0354926
	15.00	12	53	110	4	64.5	11.5	1	0354933
5/8	15.88	16	63	123	4	74.5	15.5	1	0640319 <sup>1)</sup>
	16.00	16	63	123	4	74.5	15.5	1	0354940
	18.00	16	63	123	4	74.5	15.5	1	0354957
3/4	19.05	20	75	141	4	90.5	18.5	1	0640326 <sup>1)</sup>
	20.00	20	75	141	4	90.5	19.5	1	0354988
	22.00	20	75	141	5	90.5	19.5	1	0354995
	25.00	25	90	166	5	109.5	24.5	1	0355008

<sup>1)</sup> Diameter tolerance +.0025 inches / -.0005 inches

<sup>2)</sup> Available in HSCo only

<sup>3)</sup> Not Center Cutting

# Cobalt-PM Multi-Flute End Mill



$d_1$ Ø Inch	$d_1$ Ø mm	$d_2$ Ø <sub>h<sub>6</sub></sub> mm	$l_2$ mm	$l_1$ mm	# of Flutes	$l_3$ mm	$d_3$ Ø mm	Pack Qty	C273
1"	25.40	25	90	166	5	109.5	24.5	1	0640340 <sup>1)</sup>
	28.00	25	90	166	6	109.5	24.5	1	0355015
	30.00	25	90	166	6	109.5	24.5	1	0355046
	32.00	32	106	186	6	125.5	31.5	1	0355053
	40.00	40	125	217	6	146.5	39.0	1	0609309 <sup>2)3)</sup>

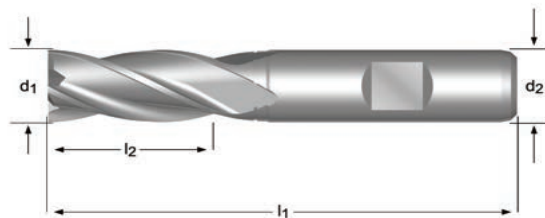
<sup>1)</sup> Diameter tolerance +.0025 inches / -.0005 inches

<sup>2)</sup> Available in HSCo only

<sup>3)</sup> Not Center Cutting

## Regular Length, Square End, Weldon Shank, 30° Helix

**C617** Multi-flute finishing. Bright finish improves chip flow in soft or non-ferrous materials.



C617

HSS



Z  
4-8



1/8 - 1"

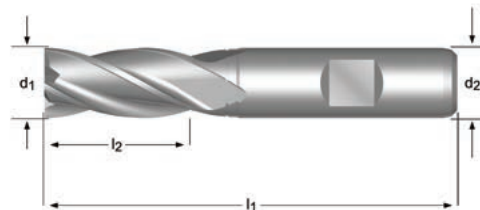
$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ Ø Inch	# of Flutes	Pack Qty	C617
1/8	0.1250	3/8	2.5/16	3/8	4	1	7647984
3/16	0.1875	1/2	2.3/8	3/8	4	1	7647985
1/4	0.2500	5/8	2.7/16	3/8	4	1	7647986
5/16	0.3125	3/4	2.1/2	3/8	4	1	7647987
3/8	0.3750	3/4	2.1/2	3/8	4	1	7647988
7/16	0.4375	1"	2.11/16	3/8	4	1	7647989
1/2	0.5000	1"	2.11/16	3/8	4	1	7647990
1/2	0.5000	1.1/4	3.1/4	1/2	4	1	7647991
9/16	0.5625	1.3/8	3.3/8	1/2	4	1	7647992
5/8	0.6250	1.3/8	3.3/8	1/2	4	1	7647993
5/8	0.6250	1.5/8	3.3/4	5/8	4	1	7647996
11/16	0.6875	1.5/8	3.5/8	1/2	4	1	7647994
11/16	0.6875	1.5/8	3.3/4	5/8	4	1	7647997
3/4	0.7500	1.5/8	3.5/8	1/2	4	1	7647995
3/4	0.7500	1.5/8	3.3/4	5/8	4	1	7647998
3/4	0.7500	1.5/8	3.7/8	3/4	4	1	7648005
13/16	0.8125	1.7/8	4"	5/8	6	1	7647999
7/8	0.8750	1.7/8	4"	5/8	6	1	7648000
7/8	0.8750	1.7/8	4.1/8	3/4	4	1	7648006
7/8	0.8750	1.7/8	4.1/8	7/8	4	1	7648002
1"	1.0000	1.7/8	4"	5/8	6	1	7648001
1"	1.0000	1.7/8	4.1/8	3/4	4	1	7648007
1"	1.0000	1.7/8	4.1/8	7/8	4	1	7648003
1"	1.0000	2"	4.1/2	1"	4	1	7648004

# Cobalt 4-Flute End Mill



## Regular Length, Square End, Weldon Shank, 30° Helix

**C618** Multi-flute finishing for high strength heat resistant materials, stainless and alloy steel, super alloys, and titanium alloys.



**C618**

HSS-E

Z  
4-6

1/8 - 1"

d <sub>1</sub> Ø Inch	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	d <sub>2</sub> Ø Inch	# of Flutes	Pack Qty	C618
1/8	0.1250	3/8	2.5/16	3/8	4	1	7648008
3/16	0.1875	1/2	2.3/8	3/8	4	1	7648009
1/4	0.2500	5/8	2.7/16	3/8	4	1	7648010
5/16	0.3125	3/4	2.1/2	3/8	4	1	7648011
3/8	0.3750	3/4	2.1/2	3/8	4	1	7648012
1/2	0.5000	1.1/4	3.1/4	1/2	4	1	7648013
5/8	0.6250	1.5/8	3.3/4	5/8	4	1	7648014
3/4	0.7500	1.5/8	3.7/8	3/4	4	1	7648015
1"	1.0000	2"	4.1/2	1"	4	1	7648016

# Visual Index - Reamers

## Feed Rate Chart - Reamers

Alpha Code	Reamers - Feed in Inches per Revolution												Ø Diameter
	1/16	5/64	1/8	3/16	5/16	25/64	1/2	5/8	25/32	1"	1-13/16	1-1/2	
A	0.002	0.002	0.003	0.004	0.006	0.007	0.007	0.009	0.010	0.011	0.013	0.015	0.017
B	0.002	0.003	0.004	0.006	0.007	0.008	0.009	0.011	0.012	0.014	0.016	0.020	0.022
C	0.003	0.003	0.005	0.007	0.009	0.010	0.011	0.013	0.015	0.017	0.019	0.024	0.027
D	0.031	0.004	0.006	0.008	0.011	0.013	0.014	0.016	0.019	0.021	0.024	0.029	0.033
E	0.004	0.006	0.007	0.010	0.014	0.015	0.017	0.020	0.021	0.025	0.030	0.036	0.043
F	0.006	0.007	0.010	0.014	0.017	0.020	0.022	0.025	0.028	0.031	0.037	0.047	0.059

Application Material Groups (AMG)		Hardness HRC	ISO
1. Steel	1.1 Magnetic soft steel	12L14, 12L15	<120 HB
	1.2 Structural Steel/ case carburising steel	1005-1025, 1214, 1215, A36	<200 HB
	1.3 Plain Carbon steel	1030-1060, 1050-1060, 1144-1146	<24
	1.4 Alloy steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	<24
	1.5 Alloy steel/ Hardened and tempered steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	>24<38
	1.6 Alloy steel/ Hardened and tempered steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	>38
	1.7 Alloy steel Hardened	A2-D2, H10-H41, L1-L6, M1-M42, T1	49-55
	1.8 Alloy steel Hardened	A2-D2, H10-H41, L1-L6, M1-M42, T1	55-63
2. Stainless Steel	2.1 Free machining Stainless Steel	200, 303, 416, 420F, 430F, 440	<24
	2.2 Austenitic	301, 302, 304, 316, 321, 330, CUSTOM 455, AM-350	<24
	2.3 Ferritic + Austenitic, Martensitic	318-329, 400-446, DUPLEX	<32
	2.4 Precipitation Hardened	15-5PH, Custom 450 17-4PH	<32
3. Cast Iron	3.1 Lamellar graphite	Grey, G10, Gg40, J431C, A48 CLASS 20	<150 HB
	3.2 Lamellar graphite	Grey, GG25-Gg40, J158, A48 CLASS 40-60	>150 HB<32
	3.3 Nodular graphite/ Malleable Cast Iron	A220, A436, A439, A602, Black, GGG40-GGG70	<200 HB
	3.4 Nodular graphite/ Malleable Cast Iron	Black Gts/Gtw, J434C	>200 HB<32
4. Titanium	4.1 Titanium, unalloyed	Commercially Pure	<200 HB
	4.2 Titanium, alloyed	6Al4V, 6Al4V-2Sn, Monel, Monel K	<28
	4.3 Titanium, alloyed	6Al4V-4Mo, 7Al4V-4Mo, 4911-4967	>28<38
5. Nickel	5.1 Nickel, unalloyed	Commercially Pure, 17644, 200, 5553	<150 HB
	5.2 Nickel, alloyed	Monel 400, Hastelloy C, Inconel 625, Waspaloy	<28
	5.3 Nickel, alloyed	Inconel 718, Nimonic 75-95, Rene 41, Inconel 825, A286	>28<38
6. Copper	6.1 Copper	Commercially Pure	<100 HB
	6.2 β-Brass, Bronze	314-340, 350-370	<200 HB
	6.3 α-Brass	Alloyed Cu + Al + Fe, Long Chipping	<200 HB
	6.4 High Strength Bronze	Ampco 18-25	<49
7. Aluminium Magnesium	7.1 Al, Mg, unalloyed	Commercially Pure	<100 HB
	7.2 Al alloyed, Si<0.5%	6061 T6, 7075, 314-340	<150 HB
	7.3 Al alloyed, Si>0.5%<10%	6061 T6, 380-390	<120 HB
	7.4 Al alloyed, Si>10% Mg alloys	Magnesium Whisker Reinforced	<120 HB
8. Synthetic Materials	8.1 Thermoplastics	Ultramid, Polystrol	---
	8.2 Thermosetting plastics	Bakelit, Pertinax	---
	8.3 Reinforced plastic materials	CFK, GFKAFK	---
9. Hard Mat.	9.1 Cermet (Metal-ceramics)	Ferrotic	<54
10. Graphite	10.1 Standard graphite	---	O

# Visual Index - Reamers

Tool Material:	HM	HM	HM	HM	HM	HSS-E	HSS	HSS	HSS-E	HSS-E	HSS	HSS
Finish/Coating:												
Standard:	DIN 8050	DIN 8093	DIN 8051	DIN 8094	DIN 8093	DIN 212	ANSI	ANSI	BS 328	DIN 212	ANSI	ANSI
Direction of Cut:												
Shank:					DIN 6535HA 							
Tolerance:	H7	H7	H7	H7	Ø .05 - 5.5 0: +0.004 Ø5.51 - 12 0: +0.005	Ø .05 - 5.5 0: +0.004 Ø5.51 - 12 0: +0.005	USCTI	USCTI	H7	H7		USCTI
Tolerance:												
Countersink Angle:												
Taper Gradient:												1:48
Style:	B441	B400	B442	B411	B481	B170	4533	4535	B901	B157	B122	4588
Range:	10.00 - 20.00	1.00 - 20.00	10.00 - 20.00	5.00 - 30.00	0.98 - 12.05	0.98 - 12.00	N60 - 1.1/2	1/16 - 1"	1.50 - 1/2	2.00 - 20.00	3/8 - 1.1/16	7/0 - 10
Page #	457	458	459	460	461	463	466	470	471	472	473	474
1.1	59B	59B	59B	59B	59B	82C	82C	82C	59C	82C	59C	59C
1.2	59B	59B	59B	59B	59B	66C	66C	66C	46C	66C	46C	46C
1.3	46B	46B	46B	46B	46B	52C	52C	52C	36C	52C	36C	36C
1.4	46B	46B	46B	46B	46B	49B	49B	49B	33B	49B	33B	33B
1.5	33C	33C	33C	33C	33C	30B	30B	30B	16B	30B	16B	16B
1.6	33C	33C	33C	33C	33C	16A	16A	16A	13A	16A	13A	13A
1.7												
1.8												
2.1						36C	36C	36C	26C	36C	26C	26C
2.2						20B	20B	20B		20B	16B	16B
2.3						26B	26B	26B		26B	20B	20B
2.4							20B	20B				
3.1	56D	56D	56D	56D	56D	52E	52E	52E	46E		46E	46E
3.2	56D	56D	56D	56D	56D	49D	49D	49D	36D		36D	36D
3.3	56D	56D	56D	56D	56D	43C	43C	43C	33C		33C	33C
3.4	46D	46D	46D	46D	46D	36C	36C	36C	30C		30C	30C
4.1	46C	46C	46C	46C	46C	49C	49C	49C	36C	49C	36C	36C
4.2	46C	46C	46C	46C	46C	30B	30B	30B	16B	30B	16B	16B
4.3	33B	33B	33B	33B	33B	16B	16B	16B	13B	16B	13B	13B
5.1	33C	33C	33C	33C	33C	26D	26D	26D	16D	26D	16D	16D
5.2	33B	33B	33B	33B	33B	16C	16C	16C	10C	16C		
5.3	33B	33B	33B	33B	33B	10C	10C	10C	7C	10C		
6.1	125E	125E	125E	125E	125E	82D	82D	82D	59D	82D	59D	59D
6.2	125E	125E	125E	125E	125E	92E	92E	92E	66E	92E	66E	66E
6.3	125E	125E	125E	125E	125E	82D	82D	82D	59D		59D	59D
6.4	125D	125D	125D	125D	125D	46D	46D	46D	36D		36D	36D
7.1	197D	197D	197D	197D	197D				75F	92F	75F	75F
7.2	197D	197D	197D	197D	197D				59F	82F	59F	59F
7.3	82D	82D	82D	82D	82D					66E	49E	49E
7.4	82D	82D	82D	82D	82D					52D	46D	46D
8.1	82C	82C	82C	82C	82C					98B		
8.2	43C	43C	43C	43C	43C				69B		69B	69B
8.3												
9.1										10A		
10.1												

# Visual Index - Reamers

	HSS-E	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS
	BS 328	DIN 311	ANSI	ANSI	DORMER	ANSI	ANSI	ANSI	DIN 206	BS 328	ANSI
	H7	k11	USCTI	USCTI		USCTI	USCTI	USCTI	H7		USCTI
											60°
											↓
											100°
						1:48	1:48			1:48	
	<b>B101</b>	<b>B121</b>	<b>4579</b>	<b>4500</b>	<b>B334</b> <b>B335</b>	<b>4587</b>	<b>4591</b>	<b>4600</b>	<b>B100</b>	<b>B301</b>	<b>4608</b>
	3.00 - 2"	10.00 - 30.00	7/16 - 1.1/16	1/8 - 1"	N000 N16 Blades Nuts	N0 - N10	N0 - N10	1/8 - 1"	1.50 - 50.00	1/16 - 1/2	1/4 - 1"
	<b>475</b>	<b>477</b>	<b>478</b>	<b>479</b>	<b>480</b> <b>481</b>	<b>482</b>	<b>483</b>	<b>484</b>	<b>485</b>	<b>487</b>	<b>488</b>
1.1	59C	59C	59C	82C	59C	59C	59C	59C	59C	59C	98F
1.2	46C	46C	46C	66C	46C	46C	46C	46C	46C	46C	82E
1.3	36C	36C	36C	52C	36C	36C	36C	36C	36C	36C	66D
1.4	33B	33B	33B	49B	33B	33B	33B	33B	33B	33B	49D
1.5	16B	16B	16B	30B	16B	16B	16B	16B	16B	16B	33B
1.6	13A	13A	13A	16A	13A	13A	13A	13A	13A	13A	20A
1.7											
1.8											
2.1	26C		26C	36C	26F	26C	26C	26C	26F	26C	26C
2.2			16B	20B		16B	16B	16B		16B	20B
2.3			20B	26B		20B	20B	20B		20B	13A
2.4				20B				20B			
3.1	46E	46E	46E	52E	46E	46E	46E	46E	46E	46E	82F
3.2	36D	36D	36D	49D	36D	36D	36D	36D	36D	36D	49D
3.3	33C	33C	33C	43C	33C	33C	33C	33C	33C	33C	39C
3.4	30C	30C	30C	36C	30C	30C	30C	30C	30C	30C	26C
4.1	36C	36C	36C	49C	36C	36C	36C	36C	36C	36C	39C
4.2	16B		16B	30B	16B	16B	16B	16B	16B	16B	33A
4.3	13B		13B	16B	13B	13B	13B	13B	13B	13B	26A
5.1	16D		16D	26D	16D	16D	16D	16D	16D	16D	39C
5.2	10C			16C	10C				10C		20B
5.3	7C			10C	7C				7C		13A
6.1	59D		59D	82D	59D	59D	59D	59D	59D	59D	82D
6.2	66E		66E	92E	66E	66E	66E	66E	66E	66E	66F
6.3	59D		59D	82D	59D	59D	59D	59D	59D	59D	82F
6.4	36D		36D	46D	36D	36D	36D	36D	36D	36D	33D
7.1	75F		75F		75F	75F	75F	75F	75F	75F	98G
7.2	59F		59F		59F	59F	59F	59F	59F	59F	82F
7.3			49E			49E	49E	49E		49E	66F
7.4			46D			46D	46D	46D		46D	33F
8.1											98G
8.2	69B	69B	69B		69B	69B	69B	69B	69B	69B	66G
8.3											
9.1											
10.1											

# List Number Index - Reamers



Pgs. 453 - 488

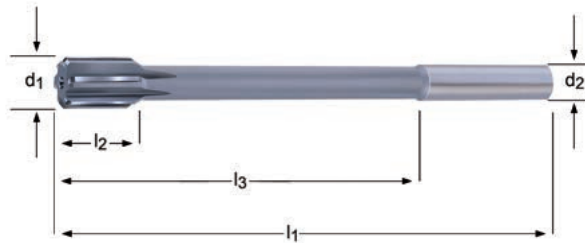
4500.....	479	B157.....	472
4533.....	466	B170.....	463
4535.....	470	B301.....	487
4579.....	478	B334.....	480
4587.....	482	B335.....	481
4588.....	474	B400.....	458
4591.....	483	B411.....	460
4600.....	484	B441.....	457
4608.....	488	B442.....	459
B100.....	485	B481.....	461
B101.....	475	B901.....	471
B121.....	477		
B122.....	473		



## Machine Reamer, Straight Shank, Brazed Carbide Tipped

**B441** Extremely unequal flute spacing. Straight flute. For machine reaming of abrasive, hard ferrous, and non-ferrous materials.

1.1 1.2 1.3 1.4 1.5 1.6 3.1 3.2 3.3 3.4 4.1 4.2 4.3 5.1 5.2  
5.3 6.1 6.2 6.3 6.4 7.1 7.2 7.3 7.4 8.1 8.2



B441

HM



DIN  
8050



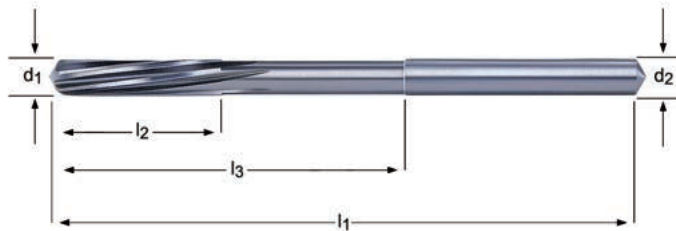
10.00 - 20.00

$d_1$ Ø mm	$l_1$ mm	$l_2$ mm	$l_3$ mm	# of Flutes	$d_2$ Ø $h_9$ mm	Pack Qty	B441
10.0	133	19	87	6	10	1	0421086
11.0	142	19	96	6	10	1	0421093
12.0	151	19	105	6	10	1	0421109
13.0	151	19	105	6	10	1	0426302
14.0	160	19	110	6	12.5	1	0421116
15.0	162	19	112	6	12.5	1	0421123
16.0	170	22	120	6	12.5	1	0421130
17.0	175	22	123	6	14	1	0421147
18.0	182	22	130	6	14	1	0421154
19.0	189	22	131	6	16	1	0421161
20.0	195	22	137	6	16	1	0421178

## Machine Reamer, Straight Shank

**B400** Extremely unequal flute spacing with left hand slow spiral, right hand cut. For machine reaming of abrasive, hard ferrous, and non-ferrous materials.

1.1 1.2 1.3 1.4 1.5 1.6 3.1 3.2 3.3 3.4 4.1 4.2 4.3 5.1 5.2  
5.3 6.1 6.2 6.3 6.4 7.1 7.2 7.3 7.4 8.1 8.2



B400

HM



DIN  
8093



1.00 - 20.00

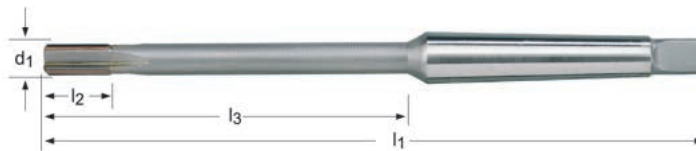
$d_1$ Ø mm	$l_1$ mm	$l_2$ mm	$l_3$ mm	# of Flutes	$d_2$ Ø <sub>h<sub>6</sub></sub> mm	Pack Qty	B400
1.0	34	5.5	15	3	1.0	1	0052983
1.2	38	7.5	16.5	3	1.2	1	0052990
1.4	40	8	18	3	1.5	1	0053003
1.5	40	8	18	3	1.5	1	0053010
1.6	43	9	20	3	1.6	1	0053027
1.8	46	10	22	4	1.8	1	0053034
2.0	49	11	24	4	2.0	1	0053041
2.2	53	12	25	4	2.2	1	0053058
2.5	57	14	29	4	2.5	1	0053065
2.8	61	15	33	6	3.0	1	0053072
3.0	61	15	33	6	3.0	1	0144152
3.2	65	16	37	6	3.2	1	0144169
3.5	70	18	42	6	3.5	1	0144176
4.0	75	19	47	6	4.0	1	0144183
4.5	80	21	52	6	4.5	1	0144190
5.0	86	23	58	6	5.0	1	0144206
5.5	93	26	57	6	5.6	1	0144213
6.0	93	26	57	6	5.6	1	0144220
6.5	101	28	65	6	6.3	1	0144237
7.0	109	31	73	6	7.1	1	0144244
8.0	117	33	81	6	8.0	1	0144251
9.0	125	36	85	6	9.0	1	0144268
10.0	133	38	93	6	10.0	1	0144275
12.0	151	44	111	6	10.0	1	0144282
14.0	160	47	115	6	12.5	1	0144299 <sup>1)</sup>
16.0	170	52	125	6	12.5	1	0144305 <sup>1)</sup>
18.0	182	56	137	6	14.0	1	0144312 <sup>1)</sup>
20.0	195	60	147	6	16.0	1	0144329 <sup>1)</sup>

<sup>1)</sup> Brazed Carbide Tipped

## Machine Reamer, Taper Shank, Brazed Carbide Tipped

**B442** Extremely unequal flute spacing with straight flute. For machine reaming of abrasive, hard ferrous, and non-ferrous materials.

- 1.1 1.2 1.3 1.4 1.5 1.6 3.1 3.2 3.3 3.4 4.1 4.2 4.3 5.1 5.2  
5.3 6.1 6.2 6.3 6.4 7.1 7.2 7.3 7.4 8.1 8.2



B442

HM



DIN  
8051



10.00 - 20.00

$d_1$ Ø mm	$l_1$ mm	$l_2$ mm	$l_3$ mm	# of Flutes	MTS	Pack Qty	B442
10.0	168	19	102.5	6	1	1	0421185
12.0	182	19	116.5	6	1	1	0421192
14.0	189	19	123.5	6	1	1	0421208
15.0	204	19	124	6	2	1	0421215
16.0	210	22	130	6	2	1	0421222
17.0	214	22	134	6	2	1	0421239
18.0	219	22	139	6	2	1	0421246
19.0	223	22	143	6	2	1	0426319
20.0	228	22	148	6	2	1	0421253

## Machine Reamer, Taper Shank

**B411** Extremely unequal spacing with left hand spiral, and right hand cut. For machine reaming of abrasive, hard ferrous, and non-ferrous materials.

1.1 1.2 1.3 1.4 1.5 1.6 3.1 3.2 3.3 3.4 4.1 4.2 4.3 5.1 5.2  
5.3 6.1 6.2 6.3 6.4 7.1 7.2 7.3 7.4 8.1 8.2



B411

HM



DIN  
8094



5.00 - 30.00

$d_1$ Ø mm	$l_1$ mm	$l_2$ mm	$l_3$ mm	# of Flutes	MTS	Pack Qty	B411
5.0	133	23	67.5	6	1	1	0053195 <sup>1)</sup>
6.0	138	26	72.5	6	1	1	0053201 <sup>1)</sup>
7.0	150	31	84.5	6	1	1	0053218 <sup>1)</sup>
8.0	156	33	90.5	6	1	1	0053225 <sup>1)</sup>
9.0	162	36	96.5	6	1	1	0053232 <sup>1)</sup>
10.0	168	38	102.5	6	1	1	0053126 <sup>1)</sup>
12.0	182	44	116.5	6	1	1	0053140 <sup>1)</sup>
14.0	189	47	123.5	8	1	1	0053164 <sup>1)</sup>
15.0	204	50	124	8	2	1	0053171 <sup>1)</sup>
16.0	210	52	130	8	2	1	0053188 <sup>1)</sup>
17.0	214	54	134	6	2	1	0144336 <sup>2)</sup>
18.0	219	56	139	6	2	1	0144343 <sup>2)</sup>
19.0	223	58	143	6	2	1	0144350 <sup>2)</sup>
20.0	228	60	148	6	2	1	0144367 <sup>2)</sup>
22.0	237	64	157	6	2	1	0144374 <sup>2)</sup>
24.0	268	68	169	8	3	1	0144381 <sup>2)</sup>
25.0	268	68	169	8	3	1	0144398 <sup>2)</sup>
26.0	273	70	174	8	3	1	0144404 <sup>2)</sup>
30.0	281	73	182	8	3	1	0144411 <sup>2)</sup>

<sup>1)</sup> Carbide Head  
<sup>2)</sup> Carbide Tipped

## High Precision, Straight Shank

**B481** High Precision NC Centesimal Reamers are offered in 0.01mm increments. Extremely unequal flute spacing with left hand slow spiral, right hand cut. For machining reaming of abrasive, hard ferrous, and non-ferrous materials. Ideal for hydraulic and heat shrink tool holding systems.

1.1 1.2 1.3 1.4 1.5 1.6 3.1 3.2 3.3 3.4 4.1 4.2 4.3 5.1 5.2  
5.3 6.1 6.2 6.3 6.4 7.1 7.2 7.3 7.4 8.1 8.2



B481

HM



DIN  
8093



0.98 - 12.05

$d_1$ Ø mm	$l_1$ mm	$l_2$ mm	$l_3$ mm	# of Flutes	$d_2$ Ø <sub>h<sub>6</sub></sub> mm	Pack Qty	B481
0.98	49.5	6	21.5	3	4	1	0421567
0.99	49.5	6	21.5	3	4	1	0421574
1.00	49.5	6	21.5	3	4	1	0421581
1.01	49.5	6	21.5	3	4	1	0421598
1.02	49.5	6	21.5	3	4	1	0421604
1.03	49.5	9	21.5	3	4	1	0421611
1.48	49	9	21	3	4	1	0421628
1.49	49	9	21	3	4	1	0421635
1.50	49	9	21	3	4	1	0421642
1.51	49	9	21	3	4	1	0421659
1.52	49	9	21	3	4	1	0421666
1.53	49	9	21	3	4	1	0421673
1.98	49	12	21	4	4	1	0421680
1.99	49	12	21	4	4	1	0421697
2.00	49	12	21	4	4	1	0421857
2.01	49	12	21	4	4	1	0421864
2.02	49	12	21	4	4	1	0421871
2.03	49	12	21	4	4	1	0421888
2.48	59	16	31	4	4	1	0421895
2.49	59	16	31	4	4	1	0421901
2.50	59	16	31	4	4	1	0421918
2.51	59	16	31	4	4	1	0421925
2.52	59	16	31	4	4	1	0421932
2.53	59	16	31	4	4	1	0421949
2.97	62.5	17	35	6	4	1	0421956
2.98	62.5	17	35	6	4	1	0421963
2.99	62.5	17	35	6	4	1	0421970
3.00	62.5	17	35	6	4	1	0421987
3.01	62.5	17	35	6	4	1	0421994
3.02	62.5	17	35	6	4	1	0422007
3.03	62.5	17	35	6	4	1	0422014
3.97	75	19	47	6	4	1	0422021
3.98	75	19	47	6	4	1	0422038

# APPLICATION CARBIDE REAMER



$d_1$ Ø	$l_1$	$l_2$	$l_3$	# of Flutes	$d_2$ Øh <sub>6</sub> mm	Pack Qty	B481
mm	mm	mm	mm		mm		
3.99	75	19	47	6	4	1	0422045
4.00	75	19	47	6	4	1	0422052
4.01	75	19	47	6	4	1	0422069
4.02	75	19	47	6	4	1	0422076
4.03	75	19	47	6	4	1	0422083
4.97	86	23	50	6	6	1	0422090
4.98	86	23	50	6	6	1	0422106
4.99	86	23	50	6	6	1	0422113
5.00	86	23	50	6	6	1	0422120
5.01	86	23	50	6	6	1	0422137
5.02	86	23	50	6	6	1	0422144
5.03	86	23	50	6	6	1	0422151
5.97	93	26	57	6	6	1	0422168
5.98	93	26	57	6	6	1	0422175
5.99	93	26	57	6	6	1	0422182
6.00	93	26	57	6	6	1	0422199
6.01	93	26	57	6	6	1	0422205
6.02	93	26	57	6	6	1	0422212
6.03	93	26	57	6	6	1	0422229
7.97	117	33	81	6	8	1	0422236
7.98	117	33	81	6	8	1	0422243
7.99	117	33	81	6	8	1	0422250
8.00	117	33	81	6	8	1	0422267
8.01	117	33	81	6	8	1	0422274
8.02	117	33	81	6	8	1	0422281
8.03	117	33	81	6	8	1	0422298
8.04	117	33	81	6	8	1	0422304
9.97	133	38	93	6	10	1	0422311
9.98	133	38	93	6	10	1	0422328
9.99	133	38	93	6	10	1	0422335
10.00	133	38	93	6	10	1	0421703
10.01	133	38	93	6	10	1	0421710
10.02	133	38	93	6	10	1	0421727
10.03	133	38	93	6	10	1	0421734
10.04	133	38	93	6	10	1	0421741
10.05	133	38	93	6	10	1	0421758
11.97	151	44	106	6	12	1	0421765
11.98	151	44	106	6	12	1	0421772
11.99	151	44	106	6	12	1	0421789
12.00	151	44	106	6	12	1	0421796
12.01	151	44	106	6	12	1	0421802
12.02	151	44	106	6	12	1	0421819
12.03	151	44	106	6	12	1	0421826
12.04	151	44	106	6	12	1	0421833
12.05	151	44	106	6	12	1	0421840

## High Precision, Straight Shank

**B170** Centesimal Reamer by 0.01mm increments.  
Left hand slow spiral, right hand cut. For machine reaming of abrasive, hard ferrous, and non-ferrous materials.

1.1 1.2 1.3 1.4 1.5 1.6 2.1 2.2 2.3 3.1 3.2 3.3 3.4 4.1 4.2  
4.3 5.1 5.2 5.3 6.1 6.2 6.3 6.4



B170

HSS-E



DIN 212



0.98 - 12.00

$d_1$ Ø mm	$l_1$ mm	$l_2$ mm	$l_3$ mm	# of Flutes	$d_2$ Ø $h_9$ mm	Pack Qty	B170
0.98	34	5.5	15	3	1.0	1	0127957
0.99	34	5.5	15	3	1.0	1	0127964
1.00	34	5.5	15	3	1.0	1	0127971
1.01	34	5.5	15	3	1.0	1	0127988
1.02	34	5.5	15	3	1.0	1	0127995
1.03	34	5.5	15	3	1.0	1	0128008
1.04	34	5.5	15	3	1.0	1	0128015
1.05	34	5.5	15	3	1.0	1	0128022
1.49	40	8.0	18	3	1.5	1	0128459
1.50	40	8.0	18	3	1.5	1	0128466
1.51	43	9.0	20	3	1.6	1	0050392
1.52	43	9.0	20	3	1.6	1	0128473
1.98	49	11.0	24	4	2.0	1	0128916
1.99	49	11.0	24	4	2.0	1	0128923
2.00	49	11.0	24	4	2.0	1	0130896
2.01	49	11.0	24	4	2.0	1	0130902
2.02	49	11.0	24	4	2.0	1	0130919
2.03	49	11.0	24	4	2.0	1	0130926
2.04	49	11.0	24	4	2.0	1	0130933
2.05	49	11.0	24	4	2.0	1	0130940
2.49	57	14.0	28	4	2.5	1	0131367
2.50	57	14.0	28	4	2.5	1	0131374
2.51	57	14.0	28	4	2.5	1	0131381
2.52	57	14.0	28	4	2.5	1	0131398
2.98	61	15.0	32	6	3.0	1	0131848
2.99	61	15.0	32	6	3.0	1	0131855
3.00	61	15.0	32	6	3.0	1	0131862
3.01	65	16.0	35	6	3.2	1	0050491
3.02	65	16.0	35	6	3.2	1	0131879
3.03	65	16.0	35	6	3.2	1	0131886
3.04	65	16.0	35	6	3.2	1	0131893
3.05	65	16.0	35	6	3.2	1	0131909
3.49	70	18.0	40	6	3.5	1	0132302

# APPLICATION COBALT REAMER



$d_1$ Ø	$l_1$	$l_2$	$l_3$	# of Flutes	$d_2$ Ø $h_3$ mm	Pack Qty	B170
mm	mm	mm	mm		mm		
3.50	70	18.0	40	6	3.5	1	0132319
3.51	70	18.0	40	6	3.5	1	0132326
3.52	70	18.0	40	6	3.5	1	0132333
3.98	75	19.0	43	6	4.0	1	0132784
3.99	75	19.0	43	6	4.0	1	0132791
4.00	75	19.0	43	6	4.0	1	0132807
4.01	75	19.0	43	6	4.0	1	0132814
4.02	75	19.0	43	6	4.0	1	0132821
4.03	75	19.0	43	6	4.0	1	0132838
4.04	75	19.0	43	6	4.0	1	0132845
4.05	75	19.0	43	6	4.0	1	0132852
4.49	80	21.0	47	6	4.5	1	0133286
4.50	80	21.0	47	6	4.5	1	0133293
4.51	80	21.0	47	6	4.5	1	0133309
4.52	80	21.0	47	6	4.5	1	0133316
4.98	86	23.0	52	6	5.0	1	0133767
4.99	86	23.0	52	6	5.0	1	0133774
5.00	86	23.0	52	6	5.0	1	0133781
5.01	86	23.0	52	6	5.0	1	0133798
5.02	86	23.0	52	6	5.0	1	0133804
5.03	86	23.0	52	6	5.0	1	0133811
5.04	86	23.0	52	6	5.0	1	0133828
5.05	86	23.0	52	6	5.0	1	0133835
5.49	93	26.0	57	6	5.6	1	0134269
5.50	93	26.0	57	6	5.6	1	0134276
5.51	93	26.0	57	6	5.6	1	0134283
5.52	93	26.0	57	6	5.6	1	0134290
5.98	93	26.0	57	6	5.6	1	0134757
5.99	93	26.0	57	6	5.6	1	0134764
6.00	93	26.0	57	6	5.6	1	0134771
6.01	101	28.0	63	6	6.3	1	0134788
6.02	101	28.0	63	6	6.3	1	0134795
6.03	101	28.0	63	6	6.3	1	0134801
6.04	101	28.0	63	6	6.3	1	0134818
6.05	101	28.0	63	6	6.3	1	0134825
6.49	101	28.0	63	6	6.3	1	0135242
6.50	101	28.0	63	6	6.3	1	0135259
6.51	101	28.0	63	6	6.3	1	0135303
6.52	101	28.0	63	6	6.3	1	0135310
6.98	109	31.0	69	6	7.1	1	0135761
6.99	109	31.0	69	6	7.1	1	0135778
7.00	109	31.0	69	6	7.1	1	0135785
7.01	109	31.0	69	6	7.1	1	0135792
7.02	109	31.0	69	6	7.1	1	0135808
7.03	109	31.0	69	6	7.1	1	0135815
7.04	109	31.0	69	6	7.1	1	0135822
7.05	109	31.0	69	6	7.1	1	0135839
7.49	109	31.0	69	6	7.1	1	0136270
7.50	109	31.0	69	6	7.1	1	0136287
7.51	117	33.0	75	6	8.0	1	0136294
7.52	117	33.0	75	6	8.0	1	0136300
7.98	117	33.0	75	6	8.0	1	0136751
7.99	117	33.0	75	6	8.0	1	0136768
8.00	117	33.0	75	6	8.0	1	0136959
8.01	117	33.0	75	6	8.0	1	0136775
8.02	117	33.0	75	6	8.0	1	0136782
8.03	117	33.0	75	6	8.0	1	0136799
8.04	117	33.0	75	6	8.0	1	0136805
8.05	117	33.0	75	6	8.0	1	0136812
8.49	117	33.0	75	6	8.0	1	0137260
8.50	117	33.0	75	6	8.0	1	0137277
8.51	125	36.0	81	6	9.0	1	0050590
8.52	125	36.0	81	6	9.0	1	0137284
8.98	125	36.0	81	6	9.0	1	0137734
8.99	125	36.0	81	6	9.0	1	0137741
9.00	125	36.0	81	6	9.0	1	0137758



$d_1$ Ø	$l_1$	$l_2$	$l_3$	# of Flutes	$d_2$ Ø $h_3$ mm	Pack Qty	B170
mm	mm	mm	mm		mm		
9.01	125	36.0	81	6	9.0	1	0137765
9.02	125	36.0	81	6	9.0	1	0137772
9.03	125	36.0	81	6	9.0	1	0137789
9.04	125	36.0	81	6	9.0	1	0137796
9.05	125	36.0	81	6	9.0	1	0137802
9.49	125	36.0	81	6	9.0	1	0138236
9.50	125	36.0	81	6	9.0	1	0138243
9.51	133	38.0	87	6	10.0	1	0138250
9.52	133	38.0	87	6	10.0	1	0138267
9.98	133	38.0	87	6	10.0	1	0138717
9.99	133	38.0	87	6	10.0	1	0138724
10.00	133	38.0	87	6	10.0	1	0128930
10.01	133	38.0	87	6	10.0	1	0128947
10.02	133	38.0	87	6	10.0	1	0128954
10.03	133	38.0	87	6	10.0	1	0128961
10.04	133	38.0	87	6	10.0	1	0128978
10.05	133	38.0	87	6	10.0	1	0128985
10.49	133	38.0	87	6	10.0	1	0129463
10.51	133	38.0	87	6	10.0	1	0129470
10.52	133	38.0	87	6	10.0	1	0129487
10.98	142	41.0	96	6	10.0	1	0129883
10.99	142	41.0	96	6	10.0	1	0129890
11.00	142	41.0	96	6	10.0	1	0129906
11.01	142	41.0	96	6	10.0	1	0129913
11.02	142	41.0	96	6	10.0	1	0129920
11.03	142	41.0	96	6	10.0	1	0129937
11.04	142	41.0	96	6	10.0	1	0129944
11.05	142	41.0	96	6	10.0	1	0129951
11.49	142	41.0	96	6	10.0	1	0130384
11.50	142	41.0	96	6	10.0	1	0130391
11.51	142	41.0	96	6	10.0	1	0130407
11.52	142	41.0	96	6	10.0	1	0130414
11.98	151	44.0	105	6	10.0	1	0130865
11.99	151	44.0	105	6	10.0	1	0130872
12.00	151	44.0	105	6	10.0	1	0130889

# HSS REAMER

## Chucking Reamer, Straight Shank

**4533** Straight Flute, Right Hand Cut. Chucking reamers have shorter and deeper flutes than hand reamers and are specifically designed for accurate machine reaming in most materials and equipment including screw machines, turret lathes, drill presses, and machining centers. Recommended for most general purpose reaming.

Produced per ASME B94.2-1995 Standards.



4533

HSS



ANSI



N60 - 1.1/2

$d_1$ Ø "/Nr./letter	$d_1$ decimal Inch	$d_2$ decimal Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	4533
N60	0.0400	0.0390	1/2	2.1/2	4	1	5010173
N59	0.0410	0.0390	1/2	2.1/2	4	1	5010175
N58	0.0420	0.0390	1/2	2.1/2	4	1	5010177
N57	0.0430	0.0390	1/2	2.1/2	4	1	5010179
N56	0.0465	0.0455	1/2	2.1/2	4	1	5010186
3/64	0.0469	0.0455	1/2	2.1/2	4	1	5010187
N55	0.0520	0.0510	1/2	2.1/2	4	1	5010198
N54	0.0550	0.0510	1/2	2.1/2	4	1	5010204
N53	0.0595	0.0585	1/2	2.1/2	4	1	5010213
1/16	0.0625	0.0585	1/2	2.1/2	4	1	5010219
N52	0.0635	0.0585	1/2	2.1/2	4	1	5010221
N51	0.0670	0.0660	3/4	3"	4	1	5010228
N50	0.0700	0.0660	3/4	3"	4	1	5010234
N49	0.0730	0.0660	3/4	3"	4	1	5010240
N48	0.0760	0.0720	3/4	3"	4	1	5010246
5/64	0.0781	0.0720	3/4	3"	4	1	5010251
N47	0.0785	0.0720	3/4	3"	4	1	5010252
N46	0.0810	0.0771	3/4	3"	4	1	5010257
N45	0.0820	0.0771	3/4	3"	4	1	5010259
N44	0.0860	0.0810	3/4	3"	4	1	5010267
N43	0.0890	0.0810	3/4	3"	4	1	5010273
N42	0.0935	0.0880	3/4	3"	4	1	5010282
3/32	0.0938	0.0880	3/4	3"	4	1	5010283
N41	0.0960	0.0928	7/8	3.1/2	4	1	5010288
N40	0.0980	0.0928	7/8	3.1/2	4	1	5010292
N39	0.0995	0.0928	7/8	3.1/2	4	1	5010295
N38	0.1015	0.0950	7/8	3.1/2	4	1	5010299
N37	0.1040	0.0950	7/8	3.1/2	4	1	5010304
N36	0.1065	0.1030	7/8	3.1/2	4	1	5010309
7/64	0.1094	0.1030	7/8	3.1/2	4	1	5010316
N35	0.1100	0.1030	7/8	3.1/2	4	1	5010318
N34	0.1110	0.1055	7/8	3.1/2	4	1	5010320
N33	0.1130	0.1055	7/8	3.1/2	4	1	5010324

# HSS REAMER

d <sub>1</sub> Ø "Nr./letter	d <sub>1</sub> decimal Inch	d <sub>2</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	# of Flutes	Pack Qty	4533
N32	0.1160	0.1120	7/8	3.1/2	4	1	5010330
N31	0.1200	0.1120	7/8	3.1/2	4	1	5010338
	0.1230	0.1120	7/8	3.1/2	4	1	5010344
	0.1240	0.1190	7/8	3.1/2	4	1	5010346
	0.1247	0.1190	7/8	3.1/2	4	1	5010349
1/8	0.1250	0.1190	7/8	3.1/2	4	1	5010350
	0.1260	0.1190	7/8	3.1/2	4	1	5010354
N30	0.1285	0.1190	7/8	3.1/2	4	1	5010359
N29	0.1360	0.1275	1"	4"	4	1	5010374
N28	0.1405	0.1350	1"	4"	4	1	5010383
9/64	0.1410	0.1350	1"	4"	4	1	5010384
N27	0.1440	0.1350	1"	4"	4	1	5010391
N26	0.1470	0.1430	1"	4"	4	1	5010397
N25	0.1495	0.1430	1"	4"	4	1	5010402
N24	0.1520	0.1460	1"	4"	4	1	5010407
N23	0.1540	0.1460	1"	4"	4	1	5010411
5/32	0.1562	0.1510	1"	4"	6	1	5010416
N22	0.1570	0.1510	1"	4"	6	1	5010418
N21	0.1590	0.1530	1.1/8	4.1/2	6	1	5010422
N20	0.1610	0.1530	1.1/8	4.1/2	6	1	5010426
N19	0.1660	0.1595	1.1/8	4.1/2	6	1	5010436
N18	0.1695	0.1595	1.1/8	4.1/2	6	1	5010443
11/64	0.1719	0.1645	1.1/8	4.1/2	6	1	5010448
N17	0.1730	0.1645	1.1/8	4.1/2	6	1	5010451
N16	0.1770	0.1700	1.1/8	4.1/2	6	1	5010459
N15	0.1800	0.1755	1.1/8	4.1/2	6	1	5010465
N14	0.1820	0.1755	1.1/8	4.1/2	6	1	5010469
N13	0.1850	0.1800	1.1/8	4.1/2	6	1	5010475
	0.1855	0.1800	1.1/8	4.1/2	6	1	5010476
	0.1865	0.1800	1.1/8	4.1/2	6	1	5010478
	0.1870	0.1800	1.1/8	4.1/2	6	1	5010479
3/16	0.1875	0.1800	1.1/8	4.1/2	6	1	5010480
	0.1885	0.1800	1.1/8	4.1/2	6	1	5010482
N12	0.1890	0.1800	1.1/8	4.1/2	6	1	5010483
N11	0.1910	0.1860	1.1/4	5"	6	1	5010487
N10	0.1935	0.1860	1.1/4	5"	6	1	5010492
N9	0.1960	0.1895	1.1/4	5"	6	1	5010498
N8	0.1990	0.1895	1.1/4	5"	6	1	5010504
N7	0.2010	0.1945	1.1/4	5"	6	1	5010508
13/64	0.2031	0.1945	1.1/4	5"	6	1	5010513
N6	0.2040	0.1945	1.1/4	5"	6	1	5010515
N5	0.2055	0.2016	1.1/4	5"	6	1	5010518
N4	0.2090	0.2016	1.1/4	5"	6	1	5010525
N3	0.2130	0.2075	1.1/4	5"	6	1	5010533
7/32	0.2188	0.2075	1.1/4	5"	6	1	5010545
N2	0.2210	0.2173	1.1/2	6"	6	1	5010550
N1	0.2280	0.2173	1.1/2	6"	6	1	5010564
A	0.2340	0.2265	1.1/2	6"	6	1	5010576
15/64	0.2344	0.2265	1.1/2	6"	6	1	5010577
B	0.2380	0.2329	1.1/2	6"	6	1	5010585
C	0.2420	0.2329	1.1/2	6"	6	1	5010593
D	0.2460	0.2329	1.1/2	6"	6	1	5010602
	0.2480	0.2329	1.1/2	6"	6	1	5010606
	0.2490	0.2400	1.1/2	6"	6	1	5010608
	0.2495	0.2400	1.1/2	6"	6	1	5010609
1/4	0.2500	0.2400	1.1/2	6"	6	1	5010610
	0.2510	0.2400	1.1/2	6"	6	1	5010612
F	0.2570	0.2485	1.1/2	6"	6	1	5010619
G	0.2610	0.2485	1.1/2	6"	6	1	5010622
17/64	0.2656	0.2485	1.1/2	6"	6	1	5010623
H	0.2660	0.2485	1.1/2	6"	6	1	5010624
I	0.2720	0.2485	1.1/2	6"	6	1	5010626
J	0.2770	0.2485	1.1/2	6"	6	1	5010627
K	0.2810	0.2485	1.1/2	6"	6	1	5010628
9/32	0.2812	0.2485	1.1/2	6"	6	1	5010629
L	0.2900	0.2792	1.1/2	6"	6	1	5010630

# HSS REAMER



d <sub>1</sub> Ø "/Nr./letter	d <sub>1</sub> decimal Inch	d <sub>2</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	# of Flutes	Pack Qty	4533
M	0.2950	0.2792	1.1/2	6"	6	1	5010631
19/64	0.2969	0.2792	1.1/2	6"	6	1	5010632
N	0.3020	0.2792	1.1/2	6"	6	1	5010633
	0.3105	0.2792	1.1/2	6"	6	1	5010636
	0.3115	0.2792	1.1/2	6"	6	1	5010638
	0.3120	0.2792	1.1/2	6"	6	1	5010639
5/16	0.3125	0.2792	1.1/2	6"	6	1	5010640
	0.3135	0.2792	1.1/2	6"	6	1	5010642
O	0.3160	0.2792	1.1/2	6"	6	1	5010645
P	0.3230	0.2792	1.1/2	6"	6	1	5010647
21/64	0.3281	0.2792	1.1/2	6"	6	1	5010648
Q	0.3320	0.2792	1.1/2	6"	6	1	5010649
R	0.3390	0.2792	1.1/2	6"	6	1	5010650
11/32	0.3438	0.2792	1.1/2	6"	6	1	5010651
S	0.3480	0.3100	1.3/4	7"	6	1	5010652
T	0.3580	0.3100	1.3/4	7"	6	1	5010653
23/64	0.3594	0.3100	1.3/4	7"	6	1	5010654
U	0.3680	0.3100	1.3/4	7"	6	1	5010655
	0.3730	0.3100	1.3/4	7"	6	1	5010658
	0.3740	0.3100	1.3/4	7"	6	1	5010659
	0.3745	0.3100	1.3/4	7"	6	1	5010660
3/8	0.3750	0.3100	1.3/4	7"	6	1	5010661
	0.3760	0.3100	1.3/4	7"	6	1	5010662
V	0.3770	0.3100	1.3/4	7"	6	1	5010663
W	0.3860	0.3100	1.3/4	7"	6	1	5010665
25/64	0.3906	0.3100	1.3/4	7"	6	1	5010666
X	0.3970	0.3100	1.3/4	7"	6	1	5010667
Y	0.4040	0.3100	1.3/4	7"	6	1	5010668
13/32	0.4062	0.3100	1.3/4	7"	6	1	5010670
Z	0.4130	0.3730	1.3/4	7"	6	1	5010671
27/64	0.4219	0.3730	1.3/4	7"	6	1	5010672
	0.4355	0.3730	1.3/4	7"	6	1	5010673
	0.4365	0.3730	1.3/4	7"	6	1	5010674
	0.4370	0.3730	1.3/4	7"	6	1	5010675
7/16	0.4375	0.3730	1.3/4	7"	6	1	5010676
	0.4385	0.3730	1.3/4	7"	6	1	5010677
29/64	0.4531	0.3730	1.3/4	7"	6	1	5010678
15/32	0.4688	0.3730	1.3/4	7"	6	1	5010679
31/64	0.4844	0.4355	2"	8"	6	1	5010680
	0.4980	0.4355	2"	8"	6	1	5010681
	0.4990	0.4355	2"	8"	6	1	5010682
	0.4995	0.4355	2"	8"	6	1	5010683
1/2	0.5000	0.4355	2"	8"	6	1	5010684
	0.5010	0.4355	2"	8"	6	1	5010685
33/64	0.5156	0.4355	2"	8"	6	1	5010690
17/32	0.5312	0.4355	2"	8"	6	1	5010691
35/64	0.5469	0.4355	2"	8"	8	1	5010692
9/16	0.5625	0.4355	2"	8"	8	1	5010693
37/64	0.5781	0.4355	2"	8"	8	1	5010694
19/32	0.5938	0.4355	2"	8"	8	1	5010695
39/64	0.6094	0.5620	2.1/4	9"	8	1	5010696
5/8	0.6250	0.5620	2.1/4	9"	8	1	5010698
41/64	0.6406	0.5620	2.1/4	9"	8	1	5010700
21/32	0.6562	0.5620	2.1/4	9"	8	1	5010701
43/64	0.6719	0.5620	2.1/4	9"	8	1	5010702
11/16	0.6875	0.5620	2.1/4	9"	8	1	5010703
45/64	0.7031	0.5620	2.1/4	9"	8	1	5010704
23/32	0.7188	0.5620	2.1/4	9"	8	1	5010705
47/64	0.7344	0.6245	2.1/2	9.1/2	8	1	5010706
3/4	0.7500	0.6245	2.1/2	9.1/2	8	1	5010708
49/64	0.7656	0.6245	2.1/2	9.1/2	8	1	5010710
25/32	0.7812	0.6245	2.1/2	9.1/2	8	1	5010711
51/64	0.7969	0.6245	2.1/2	9.1/2	8	1	5010712
13/16	0.8125	0.6245	2.1/2	9.1/2	8	1	5010713
53/64	0.8281	0.6245	2.1/2	9.1/2	8	1	5010714
27/32	0.8438	0.6245	2.1/2	9.1/2	8	1	5010715

# HSS REAMER

$d_1$ Ø "/Nr./letter	$d_1$ decimal Inch	$d_2$ decimal Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	4533
55/64	0.8594	0.7495	2.5/8	10"	8	1	5010716
7/8	0.8750	0.7495	2.5/8	10"	8	1	5010717
57/64	0.8906	0.7495	2.5/8	10"	8	1	5010718
29/32	0.9062	0.7495	2.5/8	10"	8	1	5010719
59/64	0.9219	0.7495	2.5/8	10"	8	1	5010720
15/16	0.9375	0.7495	2.5/8	10"	8	1	5010721
61/64	0.9531	0.7495	2.5/8	10"	8	1	5010722
31/32	0.9688	0.7495	2.5/8	10"	8	1	5010723
63/64	0.9844	0.8745	2.3/4	10.1/2	8	1	5010724
1"	1.0000	0.8745	2.3/4	10.1/2	8	1	5010725
1.1/16	1.0625	0.8745	2.3/4	10.1/2	8	1	5010726
1.1/8	1.1250	0.8745	2.7/8	11"	8	1	5010727
1.3/16	1.1875	0.9995	2.7/8	11"	8	1	5010728
1.1/4	1.2500	0.9995	3"	11.1/2	8	1	5010729
1.3/8	1.3750	0.9995	3.1/4	12"	8	1	5010731
1.1/2	1.5000	1.2495	3.1/2	12.1/2	8	1	5010733

# HSS REAMER

## Chucking Reamer, Straight Shank

**4535**

Slow Right Hand Spiral Flute, Right Hand Cut. Cuts with a smoother, chatter free action than straight flute reamers. Recommended for more difficult to ream materials, better surface finish requirements, applications with an interruption, and to aid in chip evacuation in blind holes.

Designed for accurate machine reaming using all types of equipment and incorporating all other design features of the straight flute style.

Produced per ASME B94.2-1995 standards.



4535

HSS



ANSI



1/16 - 1"

$d_1$ Ø Inch	$d_1$ decimal Inch	$d_2$ Ø Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	4535
1/16	0.0625	0.0585	1/2	2.1/2	4	1	5010054
5/64	0.0781	0.0720	3/4	3"	4	1	5010055
3/32	0.0938	0.0880	3/4	3"	4	1	5010056
7/64	0.1094	0.1030	7/8	3.1/2	4	1	5010057
1/8	0.1250	0.1190	7/8	3.1/2	4	1	5010058
5/32	0.1562	0.1510	1"	4"	6	1	5010060
11/64	0.1719	0.1645	1.1/8	4.1/2	6	1	5010061
3/16	0.1875	0.1800	1.1/8	4.1/2	6	1	5010062
13/64	0.2031	0.1945	1.1/4	5"	6	1	5010063
7/32	0.2188	0.2075	1.1/4	5"	6	1	5010064
1/4	0.2500	0.2400	1.1/2	6"	6	1	5010066
17/64	0.2656	0.2485	1.1/2	6"	6	1	5010067
9/32	0.2812	0.2485	1.1/2	6"	6	1	5010068
5/16	0.3125	0.2792	1.1/2	6"	6	1	5010070
11/32	0.3438	0.2792	1.1/2	6"	6	1	5010072
3/8	0.3750	0.3100	1.3/4	7"	6	1	5010074
25/64	0.3906	0.3100	1.3/4	7"	6	1	5010075
13/32	0.4062	0.3100	1.3/4	7"	6	1	5010076
7/16	0.4375	0.3730	1.3/4	7"	6	1	5010078
31/64	0.4844	0.4355	2"	8"	6	1	5010081
1/2	0.5000	0.4355	2"	8"	6	1	5010082
17/32	0.5312	0.4355	2"	8"	6	1	5010083
9/16	0.5625	0.4355	2"	8"	8	1	5010084
5/8	0.6250	0.5620	2.1/4	9"	8	1	5010086
11/16	0.6875	0.5620	2.1/4	9"	8	1	5010088
3/4	0.7500	0.6245	2.1/2	9.1/2	8	1	5010090
7/8	0.8750	0.7495	2.5/8	10"	8	1	5010094
1"	1.0000	0.8745	2.3/4	10.1/2	8	1	5010098

## Machine Reamer, Straight Shank

**B901** Left Hand Slow Spiral, Right Hand Cut. Steam Oxide in flutes reduces wear and chip welding in soft ferrous materials.



**B901**

**HSS-E**



**BS  
328**



1.50mm - 1/2

$d_1$ Ø Inch	$d_1$ Ø mm	$l_1$ mm	$l_2$ mm	# of Flutes	Pack Qty	<b>B901</b>
	1.50	44	21	4	1	0180808
1/16	1.59	44	21	4	1	0180815
	2.00	50	25	4	1	0180822
3/32	2.38	58	29	4	1	0180839
	2.50	58	29	4	1	0180846
	3.00	62	31	4	1	0180853
1/8	3.18	66	33	4	1	0180860
	3.50	71	35	4	1	0180877
5/32	3.97	76	38	6	1	0180891
	4.00	76	38	6	1	0180907
	4.50	81	41	6	1	0180921
3/16	4.76	87	44	6	1	0180938
	5.00	87	44	6	1	0180945
13/64	5.16	87	44	6	1	0180952
	5.50	93	47	6	1	0180969
7/32	5.56	93	47	6	1	0180976
15/64	5.95	93	47	6	1	0180983
	6.00	93	47	6	1	0180990
1/4	6.35	100	50	6	1	0181003
	7.00	107	54	6	1	0181010
9/32	7.14	107	54	6	1	0181027
5/16	7.94	115	58	6	1	0181034
	8.00	115	58	6	1	0181041
	9.00	124	62	6	1	0181065
3/8	9.52	133	66	6	1	0181072
	10.00	133	66	6	1	0181089
	11.00	142	71	6	1	0181102
7/16	11.11	142	71	6	1	0181119
	12.00	152	76	6	1	0181126
1/2	12.70	152	76	6	1	0181133

# COBALT REAMER



## Machine Reamer, Straight Shank

**B157** Left Hand Fast Sprial, Right Hand Cut.  
Designed for Stainless Steel, Titanium, and  
Nickel Alloy applications.

B157

HSS-E



DIN  
212



2.00 - 20.00

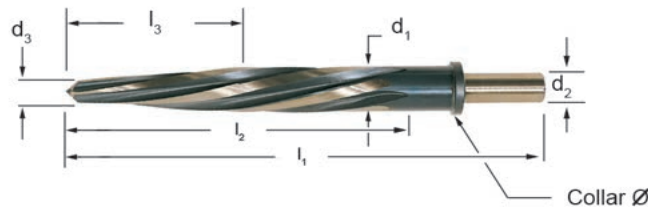


d <sub>1</sub> Ø mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>3</sub> mm	l <sub>4</sub> mm	# of Flutes	d <sub>2</sub> Øh <sub>9</sub> mm	Pack Qty	B157
2.0	49	11	3.5	24	3	2.0	1	0049648
3.0	61	15	4.0	32	3	3.0	1	0122198
4.0	75	19	4.0	43	3	4.0	1	0049679
5.0	86	23	4.5	52	3	5.0	1	0049693
6.0	93	26	6.0	57	3	5.6	1	0049716
7.0	109	31	7.0	69	3	7.1	1	0049730
8.0	117	33	9.0	75	3	8.0	1	0049747
9.0	125	36	9.5	81	3	9.0	1	0049754
10.0	133	38	10.0	87	3	10.0	1	0049617
11.0	142	41	10.5	96	3	10.0	1	0049624
12.0	151	44	11.0	105	3	10.0	1	0049631
13.0	151	44	11.5	105	3	10.0	1	0140352
14.0	160	47	12.0	110	3	12.5	1	0140369
15.0	162	50	12.5	112	3	12.5	1	0140376
16.0	170	52	13.0	120	3	12.5	1	0140383
17.0	175	54	13.5	123	3	14.0	1	0140390
18.0	182	56	14.0	130	3	14.0	1	0140406
19.0	189	58	14.5	131	3	16.0	1	0140413
20.0	195	60	15.0	137	3	16.0	1	0140420



## Car Reamer (Alignment Reamer), Reduced Shank

**B122** Left Hand Helical Flute, Right Hand Cut. 1/2" Reduced Shank with Tri-Flats. Combination Bronze and Steam Oxide in flutes reduces wear and chip welding in harder ferrous materials. Used to align or enlarge holes.



Note: Collar diameter =  $d_1 + 1/8"$   
 Collar thickness =  $3/16"$   
 Shank Length =  $1.1/2"$

**B122**

HSS



ANSI



3/8 - 1.1/16

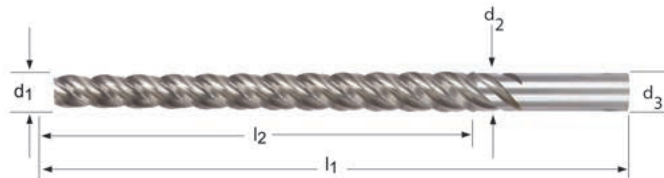
$d_1$ Ø Inch	$d_1$ decimal Inch	$l_1$ Inch	$l_2$ Inch	$l_3$ Inch	# of Flutes	$d_2$ Ø Inch	$d_3$ Ø Inch	Pack Qty	<b>B122</b>
3/8	0.3750	5.1/4	3.1/16	2	5	3/8	7/32	1	0426296
1/2	0.5000	5.5/16	3.3/4	2.5/8	5	1/2	1/4	1	0252376
9/16	0.5625	6.9/16	4.5/16	3.3/16	5	1/2	5/16	1	0252437
5/8	0.6250	6.9/16	4.5/16	3.3/16	5	1/2	3/8	1	0252413
11/16	0.6875	7	4.13/16	3.9/16	5	1/2	7/16	1	0252369
3/4	0.7500	7	4.13/16	3.9/16	5	1/2	1/2	1	0252406
13/16	0.8125	7.1/4	5.1/8	3.7/8	5	1/2	9/16	1	0252383
7/8	0.8750	7.1/4	5.1/8	3.7/8	5	1/2	5/8	1	0252420
15/16	0.9375	7.1/4	5.1/8	3.7/8	5	1/2	11/16	1	0252390
1"	1.0000	7.1/4	5.1/8	3.7/8	5	1/2	3/4	1	0252345
1.1/16	1.0625	7.1/4	5.1/4	3.7/8	5	1/2	13/16	1	0252352

# HSS REAMER

## Machine Reamer, Taper Pin Type, Straight Shank

**4588**

Left hand high spiral. Right hand cut taper pin (1/4" per foot). Designed to convert a straight hole into a tapered hole into which standard taper pins (ASA B5.20-1958) will fit. Ideal geometry for the machine reaming of pin holes on a production basis. Helical construction prevents chips from packing in flutes and reduces breakage.



4588

HSS



ANSI



1:48



7/0 - 10

nom Ø	d <sub>1</sub> Ø Inch	d <sub>2</sub> Ø Inch	d <sub>3</sub> Ø Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	# of Flutes	Pack Qty	4588
7/0	0.0497	0.0666	5/64	13/16	1.13/16	2	1	5011157
6/0	0.0611	0.0810	3/32	15/16	1.15/16	2	1	5011158
5/0	0.0719	0.0966	7/64	1.3/16	2.3/16	2	1	5011159
4/0	0.0869	0.1142	1/8	1.5/16	2.5/16	2	1	5011160
3/0	0.1029	0.1300	9/64	1.5/16	2.5/16	2	1	5011161
2/0	0.1137	0.1462	5/32	1.9/16	2.9/16	3	1	5011162
1	0.1447	0.1798	3/16	1.11/16	2.15/16	3	1	5011164
2	0.1600	0.2010	13/64	1.15/16	3.3/16	3	1	5011165
3	0.1813	0.2294	15/64	2.5/16	3.11/16	3	1	5011166
4	0.2071	0.2600	17/64	2.9/16	4.1/16	3	1	5011167
5	0.2410	0.2994	5/16	2.13/16	4.5/16	3	1	5011168
6	0.2773	0.3540	23/64	3.11/16	5.7/16	3	1	5011169
7	0.3297	0.4220	13/32	4.7/16	6.5/16	3	1	5011170
8	0.3971	0.5050	7/16	5.3/16	7.3/16	3	1	5011171
9	0.4800	0.6066	9/16	6.1/16	8.5/16	4	1	5011172
10	0.5799	0.7216	5/8	6.13/16	9.5/16	4	1	5011173

Note: Nom Ø is the Taper Pin number  
Per American Standard Taper Pin Specification ( ASA B5.20-1958)

## Machine Reamer, Taper Shank

**B101** Left hand slow spiral, right hand. Steam oxide in flutes reduces wear chip welding harder ferrous materials.



**B101**

HSS-E



BS  
328



3.00mm - 2"

Note: All sizes have 1mm x 45 chamfer (lead).  
Cutting diameters are produced to H7 tolerance

$d_1$ Ø Inch	$d_1$ Ø mm	$l_1$ mm	$l_2$ mm	# of Flutes	MTS	Pack Qty	B101
	3.00	112	33	4	1	1	0181560
1/8	3.18	112	33	4	1	1	0181140
	3.50	115	35	6	1	1	0181577
	4.00	117	38	6	1	1	0181584
	4.50	120	41	6	1	1	0181591
3/16	4.76	124	44	6	1	1	0181164
	5.00	124	44	6	1	1	0181607
	5.50	127	47	6	1	1	0181614
	6.00	127	47	6	1	1	0181621
1/4	6.35	130	50	6	1	1	0181188
	6.50	130	50	6	1	1	0181638
	7.00	134	54	6	1	1	0181645
5/16	7.94	138	58	6	1	1	0181201
	8.00	138	58	6	1	1	0181669
	8.50	138	58	6	1	1	0181676
	9.00	142	62	6	1	1	0181683
	9.50	142	62	6	1	1	0181690
3/8	9.52	146	66	6	1	1	0181225
	10.00	146	66	6	1	1	0181706
	10.50	146	66	6	1	1	0181713
	11.00	151	71	6	1	1	0181720
7/16	11.11	151	71	6	1	1	0181249
	12.00	156	76	6	1	1	0181744
	12.50	156	76	6	1	1	0181751
1/2	12.70	156	76	6	1	1	0181263
	13.00	156	76	6	1	1	0181768
	13.50	161	81	6	1	1	0181775
	14.00	161	81	8	1	1	0181782
9/16	14.29	181	81	8	2	1	0181287
	14.50	181	81	8	2	1	0181799
	15.00	181	81	8	2	1	0181805
	15.50	187	87	8	2	1	0181812
5/8	15.88	187	87	8	2	1	0181300

# COBALT REAMER



d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø mm	l <sub>1</sub> mm	l <sub>2</sub> mm	# of Flutes	MTS	Pack Qty	B101
	16.00	187	87	8	2	1	0181829
	16.50	187	87	8	2	1	0181836
	17.00	187	87	8	2	1	0181843
	18.00	193	93	8	2	1	0181850
	19.00	193	93	8	2	1	0181867
3/4	19.05	200	100	8	2	1	0181348
	20.00	200	100	8	2	1	0181874
13/16	20.64	200	100	8	2	1	0181362
	21.00	200	100	8	2	1	0181881
	22.00	207	107	8	2	1	0181898
7/8	22.22	207	107	8	2	1	0181386
	23.00	207	107	8	2	1	0181904
	24.00	242	115	8	3	1	0181911
	25.00	242	115	10	3	1	0181928
1"	25.40	242	115	10	3	1	0181423
	26.00	242	115	10	3	1	0181935
	27.00	251	124	10	3	1	0181942
	28.00	251	124	10	3	1	0181959
1.1/8	28.58	251	124	10	3	1	0181447
	29.00	251	124	10	3	1	0181966
	30.00	251	124	10	3	1	0181973
	31.00	260	133	10	3	1	0181980
1.1/4	31.75	260	133	10	3	1	0181461
	32.00	293	133	10	4	1	0181997
	34.00	302	142	10	4	1	0182017
1.3/8	34.93	302	142	10	4	1	0181485
	35.00	302	142	10	4	1	0182024
	36.00	302	142	10	4	1	0182031
	37.00	302	142	10	4	1	0182048
	38.00	312	152	10	4	1	0182055
1.1/2	38.10	312	152	10	4	1	0181508
	39.00	312	152	10	4	1	0182062
	40.00	312	152	10	4	1	0182079
	41.00	312	152	10	4	1	0182086
	42.00	312	152	10	4	1	0182093
	43.00	323	163	10	4	1	0182109
	44.00	323	163	10	4	1	0182116
1.3/4	44.45	323	163	10	4	1	0181522
	45.00	323	163	12	4	1	0182123
	46.00	323	163	12	4	1	0182130
	47.00	323	163	12	4	1	0182147
	48.00	334	174	12	4	1	0182154
	50.00	334	174	12	4	1	0182178
2"	50.80	334	174	12	4	1	0181546

## Bridge Reamer, Taper Shank

**B121** Left hand fast spiral, right hand cut tapered bridge reamer. Used in structural iron and steel applications for badly misaligned holes. The  $l_3$  length has a 1:10 starting taper.



B121

HSS



DIN 311



10.00 - 30.00

$d_1$ Ø	$l_1$	$l_2$	$l_3$	# of Flutes	MTS	Pack Qty	B121
10.0	171	95	30	4	1	1	0049020
11.0	176	100	33	4	1	1	0049037
12.0	199	105	39	4	2	1	0049044
13.0	199	105	39	4	2	1	0049051
14.0	209	115	42	4	2	1	0049068
15.0	219	125	45	4	2	1	0049075
16.0	229	135	48	4	2	1	0049082
17.0	251	135	51	4	3	1	0049099
18.0	261	145	58	4	3	1	0049105
19.0	261	145	58	4	3	1	0049112
20.0	271	155	62	4	3	1	0049129
21.0	271	155	62	4	3	1	0049136
22.0	281	165	66	4	3	1	0049143
23.0	281	165	66	4	3	1	0049150
24.0	296	180	72	4	3	1	0049167
25.0	296	180	72	4	3	1	0049174
26.0	296	180	72	4	3	1	0049181
30.0	311	195	78	5	3	1	0049211

# HSS REAMER

## Bridge Reamer, Taper Shank

**4579** Left hand slow spiral, right hand cut tapered bridge reamer. Used in structural iron and steel applications for badly misaligned holes.

Produced per ASME B94.2-1995 standards.



4579

HSS



ANSI

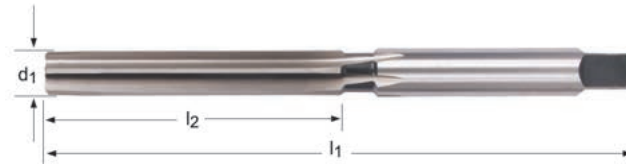


7/16 - 1.1/16

nom Ø	$d_1$ Ø (min)	$d_2$ Ø (max)	MTS	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	4579
7/16	1/4	7/16	2	4.3/8	8.1/4	4	1	5011055
1/2	9/32	1/2	2	5.1/8	9"	4	1	5011056
9/16	11/32	9/16	2	5.1/8	9"	4	1	5011057
5/8	3/8	5/8	2	6.1/8	10"	4	1	5011058
11/16	25/64	11/16	3	7.1/8	11.3/4	4	1	5011059
3/4	7/16	3/4	3	7.3/8	12"	4	1	5011060
13/16	1/2	13/16	3	7.3/8	12"	4	1	5011061
7/8	9/16	7/8	3	7.3/8	12"	4	1	5011062
15/16	5/8	15/16	3	7.3/8	12"	4	1	5011063
1"	11/16	1"	3	7.3/8	12"	4	1	5011064
1.1/16	3/4	1.1/16	3	7.3/8	12"	4	1	5011065

**Hand Reamer, Square Drive**

**4500** Straight flute hand reamer with square drive, right hand cut. Widely used by hand for the final sizing of drilled holes. The square on the shank allows it to be held in either a tap wrench or a vise depending on whether it is the reamer or the part that is rotating. A long starting taper allows for ease of entry and accurate alignment. The straight flute style is recommended for most general purpose hand reaming applications.



**4500**

**HSS**

**ANSI**

1/8 - 1"

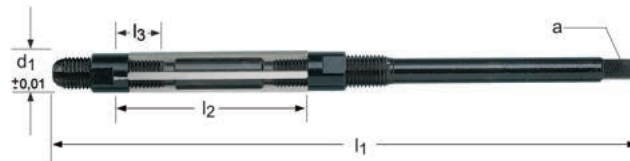
$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	<b>4500</b>
1/8	0.1250	1.1/2	3"	4	1	5010928
3/16	0.1875	1.3/4	3.1/2	6	1	5010930
1/4	0.2500	2"	4"	6	1	5010932
5/16	0.3125	2.1/4	4.1/2	6	1	5010934
3/8	0.3750	2.1/2	5"	6	1	5010936
7/16	0.4375	2.3/4	5.1/2	6	1	5010938
1/2	0.5000	3"	6"	6	1	5010940
9/16	0.5625	3.1/4	6.1/2	8	1	5010942
5/8	0.6250	3.1/2	7"	8	1	5010944
3/4	0.7500	4.3/16	8.3/8	8	1	5010948
7/8	0.8750	4.7/8	9.3/4	8	1	5010950
1"	1.0000	5.7/16	10.7/8	8	1	5010952

# HSS REAMER



## Adjustable Hand Reamer, Replaceable Blade Type

**B334** For light duty sizing of uninterrupted holes.



B334

HSS



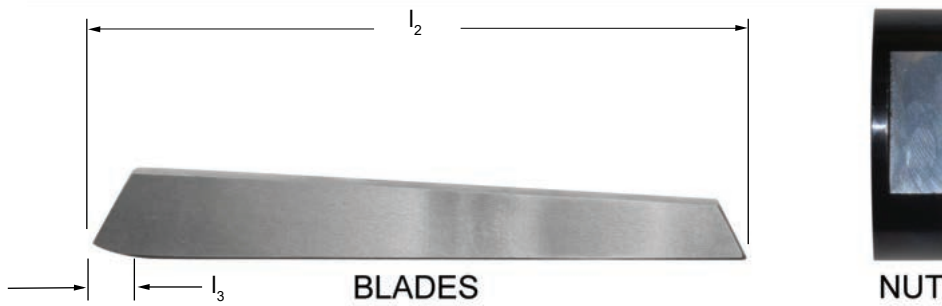
N000 - N16

Nr.	d min-max mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>3</sub> mm	# of Flutes	□ a mm	Pack Qty	B334
000	6.4 - 7.2	110	32	7	4	3.0	1	0052174
00	7.2 - 8.0	110	32	7	4	3.4	1	0052167
0	8.0 - 9.0	115	34	9	5	3.8	1	0052150
1	9.0 - 10.0	115	34	9	5	4.3	1	0052181
2	10.0 - 11.0	115	34	9	5	4.9	1	0052228
3	11.0 - 12.0	125	35	9	5	4.9	1	0052235
4	12.0 - 13.5	135	41	9	5	6.2	1	0052242
5	13.5 - 15.5	146	50	12	5	7.0	1	0052259
6	15.5 - 18.0	166	60	12	5	8.0	1	0052266
7	18.0 - 21.0	178	65	15	5	9.0	1	0052273
8	21.0 - 24.0	195	76	15	5	11.0	1	0052280
9	24.0 - 27.5	218	82	18	5	12.0	1	0052297
10	27.5 - 31.5	245	86	18	5	14.5	1	0052198
11	31.5 - 37.0	280	98	18	6	18.0	1	0052204
12	37.0 - 45.0	325	108	20	6	20.0	1	0052211
13	45.0 - 55.0	370	118	20	6	26.0	1	0140819
14	55.0 - 67.0	400	125	20	6	32.0	1	0140826
15	67.0 - 80.0	435	140	23	8	39.0	1	0140833
16	80.0 - 95.0	475	155	23	8	49.0	1	0140840



## Adjustable Hand Reamer, Replaceable Blade Type

**B335** Replace blades & nuts for use with B334



**B335**

**HSS**

**DORMER**

N000 BLADES -  
N16 NUTS

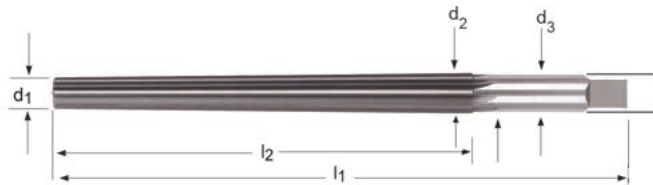
Nr.	$l_2$ mm	$l_3$ mm	Nuts Pack Qty	<b>B335 Nuts</b>	Blades Pack Qty	<b>B335 Blades</b>
000	32	7	1	0144640	4	0052327
00	32	7	1	0144633	4	0052310
0	34	9	1	0144626	5	0052303
1	34	9	1	0144657	5	0052334
2	34	9	1	0144664	5	0052372
3	35	9	1	0144671	5	0052389
4	41	9	1	0144688	5	0052396
5	50	12	1	0144695	5	0052402
6	60	12	1	0144701	5	0052419
7	65	15	1	0144718	5	0052426
8	76	15	1	0144725	5	0052433
9	82	18	1	0144732	5	0052440
10	86	18	1	0144749	5	0052341
11	98	18	1	0144756	6	0052358
12	108	20	1	0144763	6	0052365
13	118	20	1	0144770	6	0144589
14	125	20	1	0144787	6	0144596
15	140	23	1	0144794	8	0144602
16	155	23	1	0144800	8	0144619

# HSS REAMER

## Hand Reamer, Taper Pin Type, Square Drive

**4587** Straight flute taper pin (1/4" per foot), right hand cut. Designed to convert a straight hole into a tapered hole into which standard taper pins (ASA B5.20-1958) will fit. The square on the shank is suitable for holding a tap wrench or vise, depending on whether the reamer or part is rotating, making them ideal for hand use. Recommended for most materials.

Produced per ASME B94.2-1995 standards.



4587

HSS



ANSI



1:48



N0 - N10

nom Ø	d <sub>1</sub> Ø Inch	d <sub>2</sub> Ø Inch	d <sub>3</sub> Ø Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	# of Flutes	Pack Qty	4587
0	0.1287	0.1638	11/64	1.11/16	2.15/16	6	1	5011129
1	0.1447	0.1798	3/16	1.11/16	2.15/16	6	1	5011130
2	0.1600	0.2010	13/64	1.15/16	3.3/16	6	1	5011131
3	0.1813	0.2294	15/64	2.5/16	3.11/16	6	1	5011132
4	0.2071	0.2600	17/64	2.9/16	4.1/16	6	1	5011133
5	0.2410	0.2994	5/16	2.13/16	4.5/16	6	1	5011134
6	0.2773	0.3540	23/64	3.11/16	5.7/16	6	1	5011135
7	0.3297	0.4220	13/32	4.7/16	6.5/16	6	1	5011136
8	0.3971	0.5050	7/16	5.3/16	7.3/16	6	1	5011137
9	0.4800	0.6066	9/16	6.1/16	8.5/16	8	1	5011138
10	0.5799	0.7216	5/8	6.13/16	9.5/16	8	1	5011139

Note: Nom Ø is the Taper Pin number  
Per American Standard Taper Pin Specification ( ASA B5.20-1958)

**Hand Reamer, Taper Pin, Square Drive**

**4591** Left hand slow spiral flute, right hand cut taper pin (1/4" per foot) hand reamer with square drive.  
 Designed to convert a straight hole into a tapered hole into which standard taper pins (ASA B5.20-1958) will fit. The square on the shank is suitable for holding a tap wrench or vise, depending on whether the reamer or part is rotating, making them ideal for hand use.  
 Recommended for most materials.

Produced per ASME B94.2-1995 standards.



**4591**

HSS

ANSI

1:48

N0 - N10

nom Ø	$d_1$ Ø Inch	$d_2$ Ø Inch	$d_3$ Ø Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	<b>4591</b>
0	0.1287	0.1638	11/64	1.11/16	2.15/16	6	1	5011146
1	0.1447	0.1798	3/16	1.11/16	2.15/16	6	1	5011147
2	0.1600	0.2010	13/64	1.15/16	3.3/16	6	1	5011148
3	0.1813	0.2294	15/64	2.5/16	3.11/16	6	1	5011149
4	0.2071	0.2600	17/64	2.9/16	4.1/16	6	1	5011150
5	0.2410	0.2994	5/16	2.13/16	4.5/16	6	1	5011151
6	0.2773	0.3540	23/64	3.11/16	5.7/16	6	1	5011152
7	0.3297	0.4220	13/32	4.7/16	6.5/16	6	1	5011153
8	0.3971	0.5050	7/16	5.3/16	7.3/16	6	1	5011154
9	0.4800	0.6066	9/16	6.1/16	8.5/16	8	1	5011155
10	0.5799	0.7216	5/8	6.13/16	9.5/16	8	1	5011156

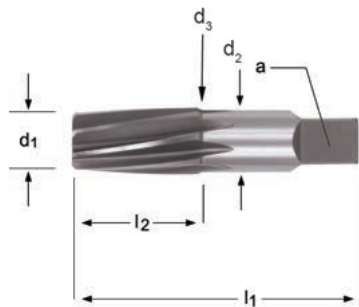
Note: Nom Ø is the Taper Pin number  
 Per American Standard Taper Pin Specification ( ASA B5.20-1958)

# HSS REAMER

## Hand Reamer, Taper Pipe Type, Square Drive

**4600** Left hand spiral flute, right hand cut taper (3/4" per foot) taper pipe reamer. Intended for reaming holes to be tapped with American Standard taper pipe taps. Generally used by hand with a tap wrench.

Produced per ASME B94.2-1995 standards.



4600

HSS



ANSI



1/8 - 1"

nom Ø	d <sub>1</sub> Ø Inch	d <sub>2</sub> Ø Inch	d <sub>3</sub> Ø Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	□ a mm	# of Flutes	Pack Qty	4600
1/8	0.3160	0.3620	0.4375	3/4	2.1/8	0.3280	6	1	1810007
1/4	0.4060	0.4720	0.5625	1.1/16	2.7/16	0.4210	6	1	1810008
3/8	0.5400	0.6060	0.7000	1.1/16	2.9/16	0.5310	8	1	1810009
1/2	0.6650	0.7510	0.6875	1.3/8	3.1/8	0.5150	8	1	1810010
3/4	0.8760	0.9620	0.9063	1.3/8	3.1/4	0.6790	10	1	1810011
1"	1.1030	1.2120	1.1250	1.3/4	3.3/4	0.8430	10	1	1810012

Note: Nom Ø (column 1) is the NPT pipe thread size. This is not the tool diameter.

## Hand Reamer, Square Drive

### B100

Left hand spiral flute, right hand cut. Widely used by hand for the final sizing of drilled holes. The square on the shank allows it to be held in either a tap wrench or a vise depending on whether it is the reamer or the part that is rotating. A long starting taper allows for ease of entry and accurate alignment.



Produced per DIN206 Form B.  
Cutting diameters are produced to H7 tolerance.  
Shank diameters (same as cutting diameters) but produced to e9 tolerance.

B100

HSS



DIN 206



1.50 - 50.00

d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>3</sub> mm	# of Flutes	□ a mm	Pack Qty	B100
	1.50	41	20	5	3	1.12	1	0179987
1/16	1.59	41	20	5	3	1.12	1	0179598
	1.60	44	21	5	3	1.25	1	0179994
5/64	1.98	47	23	6	4	1.40	1	0179604
	2.00	50	25	6	4	1.60	1	0048610
3/32	2.38	54	27	7	4	1.80	1	0179611
	2.50	58	29	7	4	2.10	1	0048634
7/64	2.78	62	31	8	6	2.10	1	0179628
	3.00	62	31	8	6	2.40	1	0048719
1/8	3.18	66	33	8	6	2.40	1	0179635
	3.20	66	33	8	6	2.40	1	0048726
	3.50	71	35	9	6	2.70	1	0048733
9/64	3.57	71	35	9	6	2.70	1	0179642
5/32	3.97	76	38	10	6	3.00	1	0179659
	4.00	76	38	10	6	3.00	1	0048801
11/64	4.37	81	41	10	6	3.40	1	0179666
	4.50	81	41	10	6	3.40	1	0048818
3/16	4.76	87	44	11	6	3.80	1	0179673
	5.00	87	44	11	6	3.80	1	0048887
13/64	5.16	87	44	11	6	3.80	1	0179680
	5.50	93	47	12	6	4.30	1	0048894
7/32	5.56	93	47	12	6	4.30	1	0179697
15/64	5.95	93	47	12	6	4.90	1	0179703
	6.00	93	47	12	6	4.90	1	0048917
1/4	6.35	100	50	13	6	4.90	1	0179710
	6.50	100	50	13	6	4.90	1	0140314
17/64	6.75	107	54	14	6	5.50	1	0179727
	7.00	107	54	14	6	5.50	1	0048924
9/32	7.14	107	54	14	6	6.20	1	0179734
	7.50	107	54	14	6	6.20	1	0140321
19/64	7.54	115	58	15	6	6.20	1	0179741
5/16	7.94	115	58	15	6	6.20	1	0179758
	8.00	115	58	15	6	6.20	1	0048931

# HSS REAMER



d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø mm	l <sub>1</sub> mm	l <sub>2</sub> mm	l <sub>3</sub> mm	# of Flutes	□ a mm	Pack Qty	B100
21/64	8.33	115	58	15	6	7.00	1	0179765
	8.50	115	58	15	6	7.00	1	0140338
11/32	8.73	124	62	16	6	7.00	1	0179772
	9.00	124	62	16	6	7.00	1	0048948
23/64	9.13	124	62	16	6	8.00	1	0179789
	9.50	124	62	16	6	8.00	1	0140345
3/8	9.52	124	62	17	6	8.00	1	0179796
25/64	9.92	133	66	17	6	8.00	1	0179802
	10.00	133	66	17	6	8.00	1	0048511
13/32	10.32	133	66	17	6	8.00	1	0179819
	10.50	133	66	17	6	8.00	1	0180006
7/16	11.00	142	71	18	6	9.00	1	0048528
	11.11	142	71	18	6	9.00	1	0179826
	11.50	142	71	18	6	9.00	1	0180013
	12.00	152	76	19	6	9.00	1	0048535
1/2	12.50	152	76	19	6	10.00	1	0180020
	12.70	152	76	19	6	10.00	1	0179840
	13.00	152	76	19	6	10.00	1	0048542
17/32	13.49	163	81	20	8	11.00	1	0179857
	13.50	163	81	20	8	11.00	1	0180037
	14.00	163	81	20	8	11.00	1	0048559
9/16	14.29	163	81	20	8	11.00	1	0179864
	14.50	163	81	20	8	11.00	1	0180044
	15.00	163	81	20	8	12.00	1	0048566
19/32	15.08	163	81	22	8	12.00	1	0179871
5/8	15.88	175	87	22	8	12.00	1	0179888
	16.00	175	87	22	8	12.00	1	0048573
	17.00	175	87	22	8	13.00	1	0048580
11/16	17.46	188	93	23	8	14.50	1	0179895
	18.00	188	93	23	8	14.50	1	0048597
	19.00	188	93	23	8	14.50	1	0048603
3/4	19.05	188	93	25	8	14.50	1	0179901
	20.00	201	100	25	8	16.00	1	0048658
13/16	20.64	201	100	25	8	16.00	1	0179925
	21.00	201	100	25	8	16.00	1	0180051
	22.00	215	107	27	8	18.00	1	0048665
7/8	22.22	215	107	27	8	18.00	1	0179949
	23.00	215	107	27	8	18.00	1	0180068
	24.00	231	115	29	8	18.00	1	0048672
	25.00	231	115	29	8	20.00	1	0048689
1"	25.40	231	115	29	8	20.00	1	0179970
	26.00	231	115	29	8	20.00	1	0048696
	27.00	247	124	31	10	22.00	1	0180075
	28.00	247	124	31	10	22.00	1	0048702
	29.00	247	124	31	10	22.00	1	0180082
	30.00	247	124	31	10	24.00	1	0048740
	31.00	265	133	33	10	24.00	1	0180099
	32.00	265	133	33	10	24.00	1	0048757
	33.00	265	133	33	10	26.00	1	0180105
	34.00	284	142	36	10	26.00	1	0048764
	35.00	284	142	36	10	29.00	1	0048771
	36.00	284	142	36	10	29.00	1	0048788
	37.00	284	142	36	10	29.00	1	0180112
	38.00	305	152	38	10	29.00	1	0048795
	39.00	305	152	38	10	32.00	1	0180129
40.00	305	152	38	10	32.00	1	0048825	
45.00	326	163	41	12	35.00	1	0048856	
50.00	347	174	44	12	39.00	1	0048900	

## Hand Reamer, Taper Pin Type, Square Drive

### B301

Straight flute taper pin (1/4" per foot), straight shank reamer. Designed to convert a straight hole into a tapered hole into which standard taper pins will fit. The square on the shank is suitable for holding a tap wrench or vise, depending on whether the reamer or part is rotating, making them ideal for hand use. Recommended for most materials.



B301

HSS



BS  
328



1:48



1/16 - 1/2

nom Ø	d <sub>1</sub> Ø mm	l <sub>1</sub> mm	l <sub>2</sub> mm	# of Flutes	□ a mm	d <sub>2</sub> Ø mm	Pack Qty	B301
1/16	1.10	51	25	4	1.2	1.63	1	0182277 <sup>1)</sup>
5/64	1.50	51	25	4	1.6	2.03	1	0182284 <sup>1)</sup>
3/32	1.75	57	32	4	2.0	2.41	1	0182291 <sup>1)</sup>
7/64	2.03	64	38	4	2.2	2.82	1	0182307 <sup>1)</sup>
1/8	2.30	70	44	4	2.5	3.23	1	0182314 <sup>1)</sup>
9/64	2.64	73	48	4	2.8	3.63	1	0182321 <sup>1)</sup>
5/32	2.95	76	51	4	3.1	4.01	1	0182338 <sup>1)</sup>
11/64	3.23	89	57	4	3.6	4.42	1	0182345 <sup>1)</sup>
3/16	3.50	102	70	4	4.0	4.95	1	0182352 <sup>1)</sup>
7/32	4.13	102	70	6	4.5	5.59	1	0182369 <sup>1)</sup>
1/4	4.64	117	86	6	5.0	6.43	1	0182376 <sup>2)</sup>
9/32	5.23	143	105	6	5.6	7.42	1	0182383 <sup>2)</sup>
5/16	5.84	143	105	6	6.3	8.03	1	0182390 <sup>2)</sup>
11/32	6.43	152	114	6	7.1	8.81	1	0182406 <sup>2)</sup>
3/8	7.03	165	127	6	8.0	9.68	1	0182413 <sup>2)</sup>
13/32	7.42	191	146	6	8.0	10.46	1	0182420 <sup>2)</sup>
7/16	8.21	191	146	6	9.0	11.25	1	0182437 <sup>2)</sup>
1/2	9.41	210	165	6	10.0	12.85	1	0182444 <sup>2)</sup>

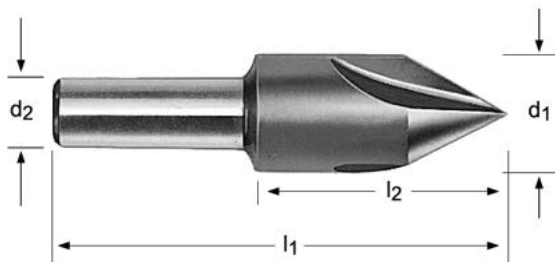
<sup>1)</sup> Limit of tolerance +0.0030

<sup>2)</sup> Limit of tolerance +0.0050

# HSS REAMER

## Straight Shank, 3-Flute

**4608** Center Reamer, Available in 60°, 82°, 90°, or 100° angles. Widely used to finish ream lathe centers in shafts, and countersink angles for screw heads and rivets. The odd number of flutes promotes smooth reamed finishes while eliminating chatter and providing better accuracy in most applications.



4608

HSS



ANSI



1/4 - 1"

d <sub>1</sub> Ø Inch	Angle	d <sub>2</sub> Ø Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	# of Flutes	Pack Qty	4608
1/4	60°	3/16	3/4	1.1/2	3	1	5011093
1/4	82°	3/16	3/4	1.1/2	3	1	5011098
1/4	90°	3/16	3/4	1.1/2	3	1	5011103
1/4	100°	3/16	3/4	1.1/2	3	1	5011108
3/8	60°	1/4	7/8	1.3/4	3	1	5011094
3/8	82°	1/4	7/8	1.3/4	3	1	5011099
3/8	90°	1/4	7/8	1.3/4	3	1	5011104
3/8	100°	1/4	7/8	1.3/4	3	1	5011109
1/2	60°	3/8	1"	2"	3	1	5011095
1/2	82°	3/8	1"	2"	3	1	5011100
1/2	90°	3/8	1"	2"	3	1	5011105
1/2	100°	3/8	1"	2"	3	1	5011110
5/8	60°	3/8	1"	2.1/4	3	1	5011096
5/8	82°	3/8	1"	2.1/4	3	1	5011101
5/8	90°	3/8	1"	2.1/4	3	1	5011106
5/8	100°	3/8	1"	2.1/4	3	1	5011111
3/4	60°	1/2	1.1/4	2.5/8	3	1	5011097
3/4	82°	1/2	1.1/4	2.5/8	3	1	5011102
3/4	90°	1/2	1.1/4	2.5/8	3	1	5011107
3/4	100°	1/2	1.1/4	2.5/8	3	1	5011112
1"	60°	1/2	1"	3"	3	1	46262132
1"	82°	1/2	1"	3"	3	1	46262133
1"	90°	1/2	1"	3"	3	1	46262134
1"	100°	1/2	1"	3"	3	1	46262135



**Visual Index - Countersinks & Counterbores**



# Visual Index - Countersinks & Counterbores

Alpha Code	Countersinks, Counterbores - Feed in Inches per Revolution										Ø Diameter
	1/4	5/16	5/64	5/8	25/32	1"	1-1/4	1-1/2	2-3/8	3"	
A	0.001	0.002	0.002	0.002	0.003	0.004	0.004	0.005	0.006	0.006	
B	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.006	0.007	0.008	
C	0.002	0.002	0.003	0.004	0.005	0.006	0.006	0.007	0.008	0.009	
D	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009	0.010	0.011	
E	0.003	0.004	0.005	0.006	0.007	0.008	0.010	0.011	0.012	0.013	
F	0.004	0.004	0.005	0.006	0.007	0.008	0.010	0.011	0.013	0.014	
G	0.004	0.005	0.006	0.007	0.008	0.009	0.011	0.013	0.014	0.016	
H	0.005	0.006	0.007	0.008	0.009	0.010	0.012	0.014	0.016	0.018	

Application Material Groups (AMG)			Hardness HRC	ISO
1. Steel	1.1 Magnetic soft steel	12L14, 12L15	<120 HB	P 1
	1.2 Structural Steel/ case carburising steel	1005-1025, 1214, 1215, A36	<200 HB	P 1
	1.3 Plain Carbon steel	1030-1060, 1050-1060, 1144-1146	<24	P 2
	1.4 Alloy steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	<24	P 3
	1.5 Alloy steel/ Hardened and tempered steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	>24<38	P 4
	1.6 Alloy steel/ Hardened and tempered steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	>38	H 1
	1.7 Alloy steel Hardened	A2-D2, H10-H41, L1-L6, M1-M42, T1	49-55	H 3
	1.8 Alloy steel Hardened	A2-D2, H10-H41, L1-L6, M1-M42, T1	55-63	H 4
2. Stainless Steel	2.1 Free machining Stainless Steel	200, 303, 416, 420F, 430F, 440	<24	M 1
	2.2 Austenitic	301, 302, 304, 316, 321, 330, CUSTOM 455, AM-350	<24	M 3
	2.3 Ferritic + Austenitic, Martensitic	318-329, 400-446, DUPLEX	<32	M 2
	2.4 Precipitation Hardened	15-5PH, Custom 450 17-4PH	<32	S 2
3. Cast Iron	3.1 Lamellar graphite	Grey, G10, Gg40, J431C, A48 CLASS 20	<150 HB	K 1
	3.2 Lamellar graphite	Grey, GG25-Gg40, J158, A48 CLASS 40-60	>150 HB<32	K 2
	3.3 Nodular graphite/ Malleable Cast Iron	A220, A436, A439, A602, Black, GGG40-GGG70	<200 HB	K 3
	3.4 Nodular graphite/ Malleable Cast Iron	Black Gts/Gtw, J434C	>200 HB<32	K 4
4. Titanium	4.1 Titanium, unalloyed	Commercially Pure	<200 HB	S 1
	4.2 Titanium, alloyed	6Al4V, 6Al4V-2Sn, Monel, Monel K	<28	S 2
	4.3 Titanium, alloyed	6Al4V-4Mo, 7Al4V-4Mo, 4911-4967	>28<38	S 3
5. Nickel	5.1 Nickel, unalloyed	Commercially Pure, 17644, 200, 5553	<150 HB	S 1
	5.2 Nickel, alloyed	Monel 400, Hastelloy C, Inconel 625, Waspaloy	<28	S 2
	5.3 Nickel, alloyed	Inconel 718, Nimonic 75-95, Rene 41, Inconel 825, A286	>28<38	S 3
6. Copper	6.1 Copper	Commercially Pure	<100 HB	N 3
	6.2 β-Brass, Bronze	314-340, 350-370	<200 HB	N 4
	6.3 α-Brass	Alloyed Cu + Al + Fe, Long Chipping	<200 HB	N 3
	6.4 High Strength Bronze	Ampco 18-25	<49	N 4
7. Aluminium Magnesium	7.1 Al, Mg, unalloyed	Commercially Pure	<100 HB	N 1
	7.2 Al alloyed, Si<0.5%	6061 T6, 7075, 314-340	<150 HB	N 1
	7.3 Al alloyed, Si>0.5%<10%	6061 T6, 380-390	<120 HB	N 1
	7.4 Al alloyed, Si>10% Mg alloys	Magnesium Whisker Reinforced	<120 HB	N 2
8. Synthetic Materials	8.1 Thermoplastics	Ultradid, Polystrol	---	O
	8.2 Thermosetting plastics	Bakelit, Pertinax	---	O
	8.3 Reinforced plastic materials	CFK, GFKAFK	---	O
9. Hard Mat.	9.1 Cermets (Metal-ceramics)	Ferrotic	<54	H
10. Graphite	10.1 Standard graphite		---	O

# Visual Index - Countersinks & Counterbores

Tool Material:	HM	HSS	HSS	HSS	HSS	HSS	HSS-E	HSS	HSS	HSS	HSS-E	HSS
Finish/Coating:					TN				TAIN		AITCN	TAIN
Standard:	DIN 335C	ANSI	ANSI	DIN 334C	DIN 334C	DIN 335C	DORMER	DIN 335C	DIN 335C	DIN 335C	DIN 335C	DIN 335C
Direction of Cut:												
Application:												
Shank:												
Countersink Angle:	90°	60°	60°	60°	60°	82°	90°	90°	90°	90°	90°	100°
		↓	↓									
		90°	82°									
Style:	G400	4603	4602	G135	G335	G154	G149	G136	G560	G142	G570	G171
Range:	6.30 - 31.00	1/4 - 1.1/2	1/2 - 1"	6.30 - 25.00	6.30 - 25.00	6.30 - 25.00	5.00 - 50.00	4.30 - 31.00	6.30 - 31.00	4.80 - 31.00	6.30 - 31.00	6.30 - 25.00
Page #	494	495	496	497	497	498	499	500	500	501	502	503
1.1	98F	98F	98F	98F	164E	98F	98D	98F	164E	98F	148E	164E
1.2	82E	82E	82E	82E	131E	82E	82D	82E	131E	82E	118E	131E
1.3	66D	66D	66D	66D	98D	66D	66C	66D	98D	66D	89D	98D
1.4	49D	49D	49D	49D	66D	49D	49B	49D	66D	49D	72D	66D
1.5	33B	33B	33B	33B	49B	33B	33A	33B	49B	33B	56B	49B
1.6	20A	20A	20A	20A	33B	20A	20A	20A	33B		39B	33B
1.7												
1.8												
2.1	26C	26C	26C	26C		26C	26B	26C		26C	56C	
2.2	20B	20B	20B	20B		20B	20A	20B		20B	39B	
2.3	13A	13A	13A	13A		13A		13A		13A	49A	
2.4											33A	
3.1	82F	82F	82F	82F	148F	82F	82D	82F	148F		131C	148F
3.2	49D	49D	49D	49D	115D	49D	49C	49D	115D		105C	115D
3.3	39C	39C	39C	39C	98C	39C	39A	39C	98C		89C	98C
3.4	26C	26C	26C	26C	98C	26C	26A	26C	98C		79C	98C
4.1	39C	39C	39C	39C	66C	39C	39B	39C	66C	39C		66C
4.2	33A	33A	33A	33A	49A	33A	33A	33A	49A	33A		49A
4.3	26A	26A	26A	26A	33A	26A	26A	26A	33A			33A
5.1	39C	39C	39C	39C	66C	39C	39B	39C	66C	39C		66C
5.2	20B	20B	20B	20B	33B	20B	20A	20B	33B	20B	20A	33B
5.3	13A	13A	13A	13A	20A	13A	13A	13A	20A		13A	20A
6.1	82D	82D	82D	82D	131D	82D	82B	82D	131D	82D	131D	131D
6.2	66F	66F	66F	66F	98F	66F	66C	66F	98F	66F	98F	98F
6.3	82F	82F	82F	82F	131F	82F	82C	82F	131F	82F	131F	131F
6.4	33D	33D	33D	33D	49D	33D	33B	33D	49D		49D	49D
7.1	98G	98G	98G	98G	164G	98G	98D	98G	164G	98G	148G	164G
7.2	82F	82F	82F	82F	131F	82F	82C	82F	131F	82F	118F	131F
7.3	66F	66F	66F	66F	98F	66F	66C	66F	98F	66F	89F	98F
7.4	33F	33F	33F	33F	49F	33F	33C	33F	49F	33F	43F	49F
8.1	98G	98G	98G	98G	164G	98G	98D	98G	164G	98G		164G
8.2	66G	66G	66G	66G	98G	66G	66D	66G	98G	66G		98G
8.3												
9.1												
10.1												

# Visual Index - Countersinks & Counterbores

	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS	HSS
	DORMER	DIN 335A	DIN 334D	DIN 335D	DIN 335D	DIN 335C	ANSI	ANSI	ANSI	ANSI	ANSI
	90°	90°	60°	90°	90°	90°					
	<b>G600</b>	<b>G132</b>	<b>G137</b>	<b>G138</b>	<b>G338</b>	<b>G236</b>	<b>4702</b>	<b>4706</b>	<b>4705</b>	<b>4703</b>	<b>4704</b>
	6.30 - 25.00	8.00 - 20.00	16.00 - 80.00	25.00 - 80.00	25.00 - 63.00	Set	1/4 - 2"	1/4 - 1"	1/4 - 1"	1/4 - 2.1/2	3/32 - 2"
	<b>504</b>	<b>505</b>	<b>506</b>	<b>507</b>	<b>507</b>	<b>508</b>	<b>509</b>	<b>510</b>	<b>510</b>	<b>512</b>	<b>513</b>
1.1	72F		98F	98F	164F		82C	82C	82C	82C	
1.2	56E		82E	82E	131E		66C	66C	66C	66C	
1.3	49D	66E	66D	66D	98D		52C	52C	52C	52C	
1.4	39D	49D	49D	49D	66D		49B	49B	49B	49B	
1.5	26B	33D	33B	33B	49B		30B	30B	30B	30B	
1.6	20A	20B	20A	20A	33A		16A	16A	16A	16A	
1.7											
1.8											
2.1	26C		26C	26C			36C	36C	36C	36C	
2.2	20B		20B	20B			20B	20B	20B	20B	
2.3	13A	13B	13A	13A			26B	26B	26B	26B	
2.4											
3.1	82F		82F	82F	148F		52E	52E	52E	52E	
3.2	49D		49D	49D	115D		49D	49D	49D	49D	
3.3	39C		39C	39C	98C		43C	43C	43C	43C	
3.4		26D	26C	26C	98C		36C	36C	36C	36C	
4.1			39C	39C	66C		49C	49C	49C	49C	
4.2		26A	33A	33A	49A		30B	30B	30B	30B	
4.3		26A	26A	26A	33A		16B	16B	16B	16B	
5.1			39C	39C	66C		26D	26D	26D	26D	
5.2		20C	20B	20B	33B		16C	16C	16C	16C	
5.3		13B	13A	13A	20A		10C	10C	10C	10C	
6.1	82D		82D	82D	131D		82D	82D	82D	82D	
6.2	66F		66F	66F	98F		92E	92E	92E	92E	
6.3	82F		82F	82F	131F		82D	82D	82D	82D	
6.4	33D	33F	33D	33D	49D		46D	46D	46D	46D	
7.1	98G		98G	98G	164G						
7.2	82F		82F	82F	131F						
7.3	66F		66F	66F	98F						
7.4	33F		33F	33F	49F						
8.1			98G	98G	164G						
8.2			66G	66G	98G						
8.3		16G									
9.1											
10.1											

# List Number Index - Countersinks/Counterbores



Pgs. 490-514

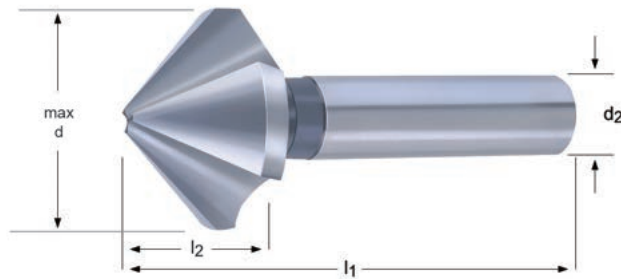
4602.....	496
4603.....	495
4702.....	509
4703.....	512
4704.....	513
4705.....	510
4706.....	510
G132.....	505
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G600.....	504

# MULTI-APPLICATION CARBIDE COUNTERSINK

## Solid Carbide, Straight Shank, 3-Flute

**G400** 90° Countersink with Straight Shank. Recommended for abrasive, hard ferrous, and non-ferrous materials.

1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	3.1	3.2	3.3	3.4	4.1	4.2
4.3	5.1	5.2	5.3	6.1	6.2	6.3	6.4	7.1	7.2	7.3	7.4	8.1	8.2	



G400

HM



DIN  
335C



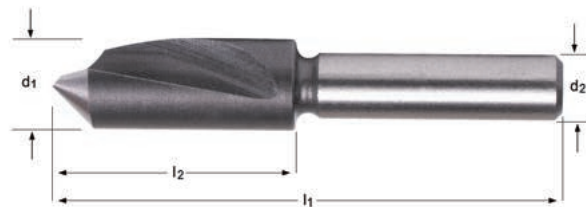
6.30 - 31.00

max d mm	min d mm	l <sub>2</sub> mm	l <sub>1</sub> mm	d <sub>2</sub> Øh <sub>6</sub> mm	# of Flutes	Pack Qty	G400
6.3 (1/4)	1.5	5.0	45	5	3	1	0128787
8.3 (5/16)	2.0	6.0	50	6	3	1	0128794
10.4 (3/8)	2.5	7.1	50	6	3	1	0128725
12.4 (1/2)	2.8	8.0	56	8	3	1	0128732
16.5 (5/8)	3.2	10.0	60	10	3	1	0128749
20.5 (3/4)	3.5	12.5	63	10	3	1	0128756
25.0 (1")	3.8	15.0	67	10	3	1	0128763
31.0 (1.1/4)	4.2	18.0	71	12	3	1	0128770

## Countersink, Straight Shank, Single-Flute

**4603** Available in 60°, 82°, or 90° angles. Engineered for machine use and light portable work. Single flute construction and low controlled relief assure the user of chatterless operation.

Best results obtained using high speeds and low feed. Recommended that the predrilled hole be at least 10% of the countersink diameter.



4603

HSS



ANSI



1/4 - 1.1/2

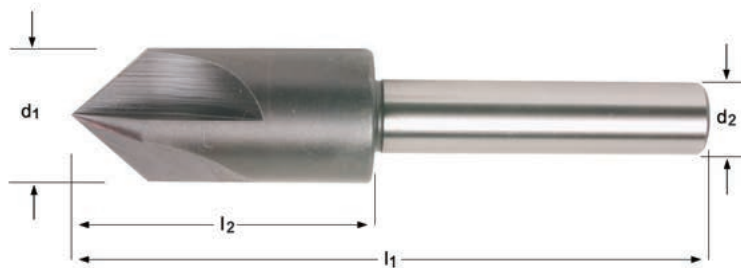
$d_1$ Ø Inch	angle	$d_2$ Ø Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	4603
1/4	82°	3/16	11/16	1.7/16	1	1	4710797
1/4	90°	3/16	11/16	1.7/16	1	1	4710805
3/8	60°	1/4	7/8	1.3/4	1	1	4710790
3/8	82°	1/4	25/32	1.21/32	1	1	4710798
3/8	90°	1/4	3/4	1.5/8	1	1	4710806
1/2	60°	1/4	1"	2"	1	1	4710791
1/2	82°	1/4	27/32	1.27/32	1	1	4710799
1/2	90°	1/4	13/32	1.13/16	1	1	4710807
5/8	82°	3/8	1.3/32	2.3/32	1	1	4710800
5/8	90°	3/8	1"	2"	1	1	4710808
3/4	60°	3/8	1.13/32	2.21/32	1	1	4710793
3/4	82°	3/8	1.5/32	2.13/32	1	1	4710801
3/4	90°	3/8	1.1/16	2.5/16	1	1	4710809
1"	60°	1/2	1.9/16	3.1/8	1	1	4710794
1"	82°	1/2	1.1/4	2.13/16	1	1	4710802
1"	90°	1/2	1.1/4	2.13/16	1	1	4710810
1.1/4	60°	1/2	1.3/4	3.3/4	1	1	4710795
1.1/4	82°	1/2	1.1/2	3.1/2	1	1	4710803
1.1/4	90°	1/2	1.9/16	3.9/16	1	1	4710811
1.1/2	60°	1/2	2.5/16	4.1/4	1	1	4710796
1.1/2	82°	1/2	1.15/16	3.7/8	1	1	4710804
1.1/2	90°	1/2	1.13/16	3.3/4	1	1	4710812

# HSS COUNTERSINK

## Countersink, Straight Shank, 4-Flute

**4602**

Countersink with angles of 60° for centers or 82° for flat head screws. Bright finish improves chip flow in soft ferrous or non-ferrous materials.



4602

HSS



ANSI



1/2 - 1"

$d_1$ Ø Inch	Angle	$d_2$ Ø Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	4602
1/2	60°	1/2	1.5/8	3.7/8	4	1	4710588
1/2	82°	1/2	1.5/8	3.7/8	4	1	4710593
5/8	60°	1/2	1.3/4	4"	4	1	4710589
5/8	82°	1/2	1.3/4	4"	4	1	4710594
3/4	60°	1/2	1.7/8	4.1/8	4	1	4710590
3/4	82°	1/2	1.7/8	4.1/8	4	1	4710595
7/8	60°	1/2	2"	4.1/4	4	1	4710591
7/8	82°	1/2	2"	4.1/4	4	1	4710596
1"	60°	1/2	2.1/8	4.3/8	4	1	4710592
1"	82°	1/2	2.1/8	4.3/8	4	1	4710597

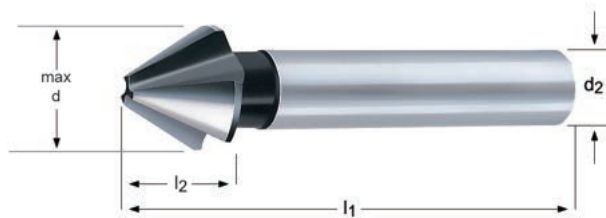


## Straight Shank, 3-Flute

60° countersink with straight shank for multiple materials.

**G135** Bright finish improves chip flow in soft ferrous or non-ferrous materials.

**G335** TiN coated for improved wear resistance.



G135	G335
6.30 - 25.00	6.30 - 25.00

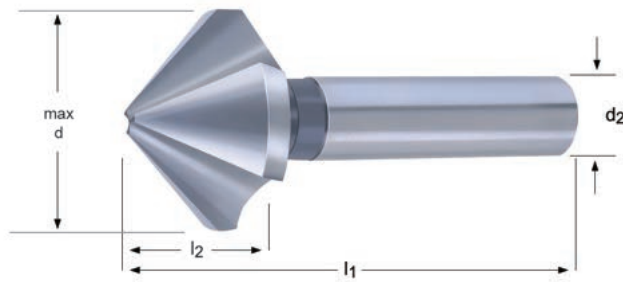
max d mm	min d mm	l <sub>2</sub> mm	l <sub>1</sub> mm	d <sub>2</sub> Øh <sub>9</sub> mm	# of Flutes	Pack Qty	G135	G335
6.3 (1/4)	1.6	6.8	45	5	3	1	0108482	0149546
8.0 (5/16)	2.0	8.5	50	6	3	1	0108499	0149553
10.0 (3/8)	2.5	7.6	50	6	3	1	0144817	0149560
12.5 (1/2)	3.2	11.7	56	8	3	1	0108444	0149577
16.0 (5/8)	4.0	14.5	63	10	3	1	0108451	0149584
20.0 (3/4)	5.0	17.5	67	10	3	1	0108468	0149591
25.0 (1")	6.3	20.5	71	10	3	1	0108475	0149607

# HSS COUNTERSINK



## Straight Shank, 3-Flute

**G154** 82° countersink for multiple materials. Bright finish improves chip flow in soft ferrous or non-ferrous materials.



G154

HSS



DIN  
335C

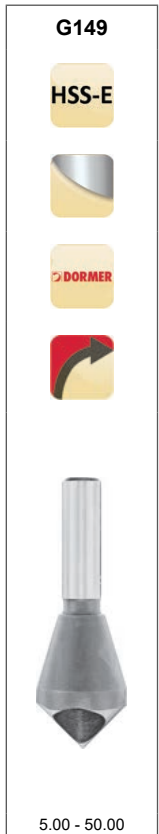
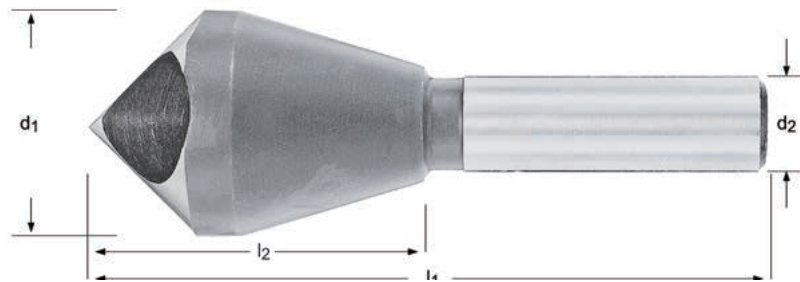


6.30 - 25.00

max d mm	min d mm	l <sub>2</sub> mm	l <sub>1</sub> mm	d <sub>2</sub> Øh <sub>9</sub> mm	# of Flutes	Pack Qty	G154
6.3 (1/4)	1.5	5.5	45	5	3	1	0149348
8.3 (5/16)	2.0	6.5	50	6	3	1	0149355
10.4 (3/8)	2.5	7.6	50	6	3	1	0149362
12.4 (1/2)	2.8	8.5	56	8	3	1	0149379
16.5 (5/8)	3.2	10.5	60	10	3	1	0149386
20.5 (3/4)	3.5	13.0	63	10	3	1	0149393
25.0 (1")	3.8	15.5	67	10	3	1	0149409

## Straight Shank, Single Flute

**G149** 90° Countersink, single flute, for multiple materials. Bright finish improves chip flow in soft ferrous or non-ferrous materials.



max d mm	min d mm	$l_2$ mm	$l_1$ mm	$d_2$ Ø mm	$d_1$ Ø mm	# of Flutes	Pack Qty	G149
5	2	19.0	45	6	10	1	1	0109106
10	5	23.0	48	8	14	1	1	0109038
15	10	34.0	65	10	21	1	1	0109045
20	15	43.0	84	12	28	1	1	0109052
25	20	48.0	102	15	35	1	1	0109069
30	25	61.0	115	15	44	1	1	0109076
35	30	65.0	127	15	48	1	1	0109083
40	35	66.0	136	15	53	1	1	0109090
50	40	85.0	166	20	60	1	1	0109113

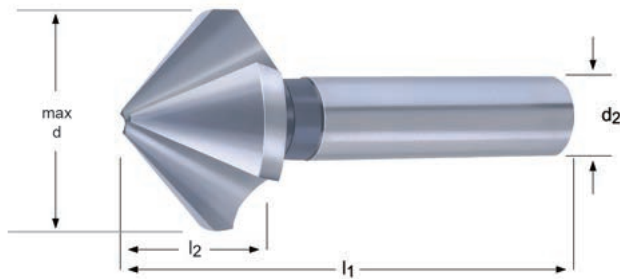
# HSS COUNTERSINK



## Straight Shank, 3-Flute

**G136** 90° Countersink with straight shank for multiple materials. Bright finish improves chip flow in soft ferrous or non-ferrous materials.

**G560** 90° Countersink with straight shank for multiple materials. TiAlN coating increases surface hardness, improves chip flow, and increases tool life.

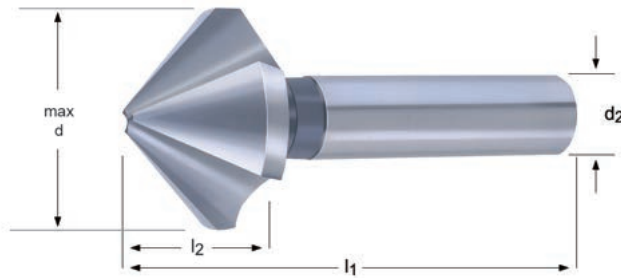


G136	G560
4.30 - 31.00	6.30 - 31.00

max d mm	min d mm	$l_2$ mm	$l_1$ mm	$d_2$ $\varnothing h_9$ mm	# of Flutes	Pack Qty	G136	G560
4.3	1.3	4.0	40	4	3	1	0108659	—
5.0	1.5	4.5	40	4	3	1	0108666	—
5.3	1.5	4.5	40	4	3	1	0108673	—
5.8	1.5	5.0	45	5	3	1	0108680	—
6.0	1.5	5.0	45	5	3	1	0108697	—
6.3	1.5	5.5	45	5	3	1	0108703	0109694
7.0	1.8	5.5	50	6	3	1	0108710	—
7.3	1.8	6.1	50	6	3	1	0108727	—
8.0	2.0	6.1	50	6	3	1	0108734	0127711
8.3	2.0	6.5	50	6	3	1	0108741	0127728
9.4	2.2	7.2	50	6	3	1	0108758	—
10.0	2.5	7.6	50	6	3	1	0108505	0109632
10.4	2.5	7.6	50	6	3	1	0108512	0109649
11.5	2.8	8.0	56	8	3	1	0108529	—
12.4	2.8	8.5	56	8	3	1	0108536	0109656
13.4	2.9	9.0	56	8	3	1	0108543	—
15.0	3.2	9.5	60	10	3	1	0108550	—
16.5	3.2	10.5	60	10	3	1	0108567	0109663
19.0	3.5	11.7	63	10	3	1	0108574	—
20.5	3.5	13.0	63	10	3	1	0108581	0109670
23.0	3.8	13.7	67	10	3	1	0108598	—
25.0	3.8	15.5	67	10	3	1	0108604	0109687
26.0	3.8	15.5	67	10	3	1	0108611	—
28.0	4.0	16.5	71	12	3	1	0108628	—
30.0	4.2	18.5	71	12	3	1	0108635	—
31.0	4.2	18.5	71	12	3	1	0108642	0127735

## Straight Shank, 3-Flute

**G142** 90° Countersink with extra radial relief for soft or gummy materials. Bright finish improves chip flow in these materials.



G142

HSS



DIN 335C



4.80 - 31.00

max d mm	min d mm	l <sub>2</sub> mm	l <sub>1</sub> mm	d <sub>2</sub> Øh <sub>9</sub> mm	# of Flutes	Pack Qty	G142
4.8	1.3	4.5	40	4	3	1	0168059
5.0	1.5	4.5	40	4	3	1	0168066
6.0	1.5	5.0	45	5	3	1	0168073
6.3	1.5	5.5	45	5	3	1	0149270
7.0	1.8	5.5	50	6	3	1	0168080
7.3	1.8	6.1	50	6	3	1	0168097
8.0	2.0	6.1	50	6	3	1	0168103
8.3	2.0	6.5	50	6	3	1	0150658
10.0	2.5	7.6	50	6	3	1	0168110
10.4	2.5	7.6	50	6	3	1	0149287
11.5	2.8	8.0	56	8	3	1	0168127
12.4	2.8	8.5	56	8	3	1	0149294
15.0	3.2	9.5	60	10	3	1	0168134
16.5	3.2	10.5	60	10	3	1	0149300
19.0	3.5	11.7	63	10	3	1	0168141
20.5	3.5	13.0	63	10	3	1	0149317
23.0	3.8	13.7	67	10	3	1	0168158
25.0	3.8	15.5	67	10	3	1	0149324
31.0	4.2	18.5	71	12	3	1	0149331

## Straight Shank, 3-Flute

**G570** 90° Countersink with AlTiCN coating designed primarily for Alloy Steels and Stainless Steels. Special PVD coating increases surface hardness and temperature resistance while maintaining a high level of toughness even in dry cutting conditions.

G570

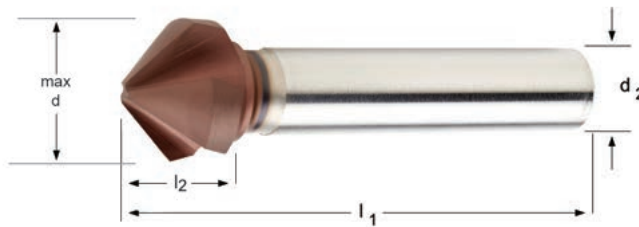
HSS-E

AlTiCN

DIN 335C



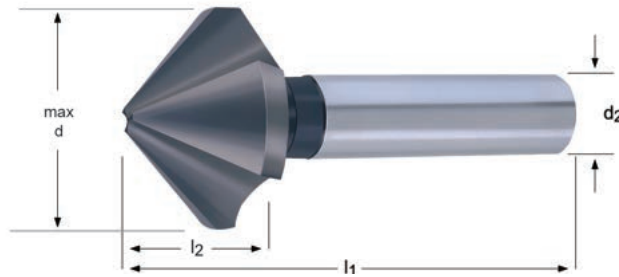
6.30 - 31.00



max d mm	min d mm	l <sub>2</sub> mm	l <sub>1</sub> mm	d <sub>2</sub> Øh <sub>9</sub> mm	# of Flutes	Pack Qty	G570
6.3	1.5	6.5	45	5	3	1	46381760
8.3	2.0	8.2	50	6	3	1	46381761
10.4	2.5	9.7	50	6	3	1	46381762
12.4	2.8	10.6	56	8	3	1	46381763
16.5	3.2	13.9	60	10	3	1	46381764
20.5	3.5	17.1	63	10	3	1	46381765
25.0	3.8	21.4	67	10	3	1	46381766
31.0	4.2	24.4	71	12	3	1	46381767

## Straight Shank, 3-Flute

**G171** 100° Countersink with straight shank design for cast iron, soft steels & aluminum. TiAIN coating increases surface hardness and improves tool life at higher speeds.



G171

HSS



DIN 335C



6.30 - 25.00

max d mm	min d mm	l <sub>2</sub> mm	l <sub>1</sub> mm	d <sub>2</sub> Øh <sub>3</sub> mm	# of Flutes	Pack Qty	G171
6.3	1.5	4.5	44.0	5.0	3	1	0372609
8.3	2.0	5.5	49.0	6.0	3	1	0372616
10.4	2.5	6.6	49.0	6.0	3	1	0372555
12.4	2.8	7.0	53.0	6.0	3	1	0372562
16.5	3.2	9.0	56.0	6.0	3	1	0372579
20.5	3.5	11.0	61.0	10.0	3	1	0372586
25.0	3.8	13.5	65.0	10.0	3	1	0372593

## Straight Shank, 3-Flute

**G600** 90° Countersink with straight shank for long reach applications. Multi-material type excellent for soft to medium steels. Bright finish improves chip flow in softer materials.



G600

HSS



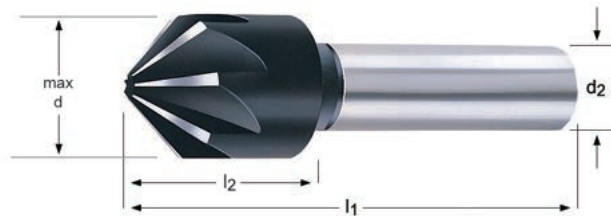
6.30 - 25.00

max d mm	min d mm	l <sub>2</sub> mm	l <sub>1</sub> mm	d <sub>2</sub> Øh <sub>9</sub> mm	# of Flutes	Pack Qty	G600
6.3	1.3	6.4	154	5	3	1	46381768
8.3	1.8	8.3	155	6	3	1	46381769
10.4	2.2	9.7	157	6	3	1	46381770
12.4	2.5	10.6	158	8	3	1	46381771
15.0	2.8	12.6	159	10	3	1	46381772
16.5	2.8	13.9	161	10	3	1	46381773
20.5	3.0	17.1	164	10	3	1	46381774
25.0	3.2	21.4	168	10	3	1	46381775



## Straight Shank, Multi-Flute

**G132** 90° Multi-flute countersink for better stability in harder materials.  
More flutes to share the load when cutting at slower speeds.



G132

HSS



DIN  
335A



8.00 - 20.00

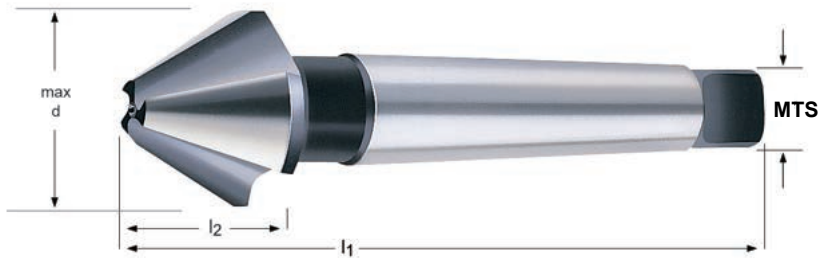
max d mm	min d mm	l <sub>2</sub> mm	l <sub>1</sub> mm	d <sub>2</sub> Øh <sub>9</sub> mm	# of Flutes	Pack Qty	G132
8.0	-	0.0	48	8	5	1	0108291
12.5	2.0	15.5	48	8	5	1	0108260
16.0	3.2	19.5	56	10	7	1	0108277
20.0	5.0	23.0	60	10	7	1	0108284

# HSS COUNTERSINK



## Taper Shank, 3-Flute

**G137** 60° Countersink with Morse Taper Shank for multiple materials. Bright finish improves chip flow in soft ferrous and non-ferrous materials.



G137

HSS



DIN 334D



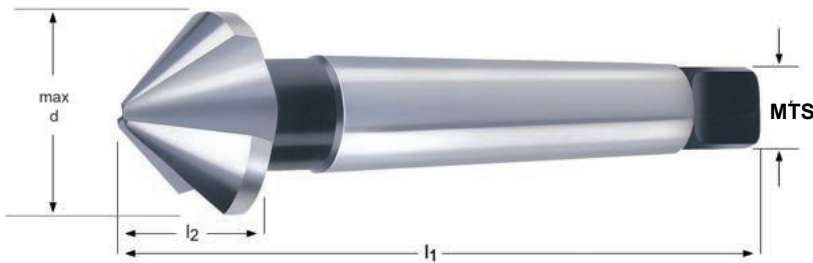
16.00 - 80.00

max d mm	min d mm	l <sub>2</sub> mm	l <sub>1</sub> mm	MTS	# of Flutes	Pack Qty	G137
16.0 (5/8)	4.0	14.5	90	1	3	1	0108765
20.0 (3/4)	5.0	17.5	106	2	3	1	0108772
25.0 (1")	6.3	20.0	112	2	3	1	0108789
31.5 (1.1/4)	10.0	23.0	118	2	3	1	0108796
40.0 (1.1/2)	12.5	28.5	150	3	3	1	0108802
50.0 (2")	16.0	36.0	160	3	3	1	0108819
63.0 (2.1/2)	20.0	43.0	190	4	3	1	0108826
80.0 (3")	25.0	54.0	200	4	3	1	0108833

## Taper Shank, 3-Flute

**G138** 90° Countersink with Morse Taper Shank for multiple materials. Excellent for steel, titanium & nickle alloys. Bright finish improves chip flow in soft ferrous and non-ferrous materials.

**G338** 90° Countersink with Morse Taper Shank for multiple materials. TiN coating increases surface hardness and improves chip flow in steel, cast iron and aluminum alloys.



max d mm	min d mm	l <sub>2</sub> mm	l <sub>1</sub> mm	MTS	# of Flutes	Pack Qty	G138	G338
25.0	3.8	15.5	106	2	3	1	0108895	0109502
30.0	4.2	18.5	112	2	3	1	0108925	—
31.0	4.2	20.0	112	2	3	1	0108932	0109519
34.0	4.5	19.5	118	2	3	1	0108949	—
37.0	4.8	21.7	118	2	3	1	0108956	0109526
40.0	10.0	20.5	140	3	3	1	0108963	0109533
50.0	14.0	24.1	150	3	3	1	0108970	0109540
63.0	16.0	28.5	180	4	3	1	0108987	0109557
80.0	22.0	36.0	190	4	3	1	0108994	—

## Straight Shank, 3-Flute

**G236** 90° Countersink sets in 4 or 6 pcs. Sets 1&2 in bright finish improves chip flow in soft ferrous & non-ferrous materials. Set 3 in TiAlN coating increases surface hardness and improves tool life.

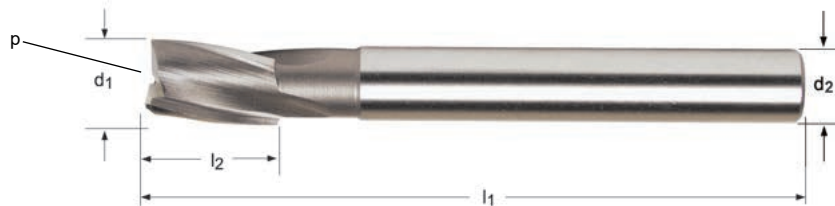


Set	Styles in set	Pieces per Set	Diameters in set	Pack Qty	G236
1	G136	6	6.30 mm, 8.30 mm, 10.40 mm, 12.40 mm, 16.50 mm, 20.50 mm	1	0217887
2	G136	4	6.30 mm, 10.40 mm, 16.50 mm, 20.50 mm	1	0344750
3	G560	6	6.30 mm, 8.30 mm, 10.40 mm, 12.40 mm, 16.50 mm, 20.50 mm	1	46521338

## Counterbore Body - Interchangeable Pilot Type

**4702** Short Length

Used to enlarge the end of a preformed hole when a flat bottom is required. The counterbore is an end cutting tool which utilizes and interchangeable pilot to align the enlarged hole being machined with the preformed hole. The 3 and 5 flute counterbore reduces chatter and improves finish.



4702

HSS



ANSI



1/4 - 2"

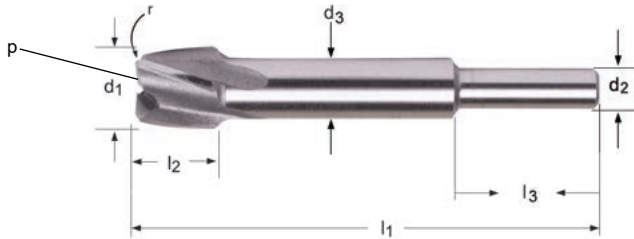
d <sub>1</sub> Ø Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	d <sub>2</sub> Ø Inch	# of Flutes	Pilot (p) Mounting Ø Inch	Pilot Ø min	Pilot Ø max	Pack Qty	4702
1/4	3/4	3.13/16	15/64	3	3/32	1/8	3/16	1	6210031
9/32	3/4	3.13/16	17/64	3	3/32	1/8	7/32	1	6210032
5/16	3/4	3.13/16	19/64	3	3/32	1/8	1/4	1	6210033
11/32	3/4	3.13/16	5/16	3	3/32	1/8	9/32	1	6210034
3/8	1"	4.1/16	5/16	3	5/32	3/16	5/16	1	6210035
13/32	1"	4.1/16	3/8	3	5/32	3/16	11/32	1	6210036
7/16	1"	4.1/16	3/8	3	5/32	3/16	3/8	1	6210037
15/32	1.1/4	4.5/16	7/16	3	3/16	3/16	13/32	1	6210038
1/2	1.1/4	4.5/16	7/16	3	3/16	3/16	7/16	1	6210039
9/16	1.1/4	4.5/16	1/2	3	3/16	3/16	1/2	1	6210041
19/32	1.1/4	5.1/8	1/2	3	3/16	3/16	17/32	1	6210042
5/8	1.1/4	5.1/8	1/2	3	3/16	3/16	9/16	1	6210043
11/16	1.1/4	5.1/8	1/2	3	3/16	3/16	5/8	1	6210045
3/4	1.1/2	5.3/8	1/2	3	1/4	5/16	11/16	1	6210047
25/32	1.1/2	5.3/8	5/8	3	1/4	5/16	23/32	1	6210048
13/16	1.1/2	5.3/8	5/8	3	1/4	5/16	3/4	1	6210049
27/32	1.1/2	5.3/8	3/4	3	1/4	5/16	25/32	1	6210050
7/8	1.1/2	5.3/8	3/4	3	1/4	5/16	13/16	1	6210051
1"	1.3/4	6.3/8	3/4	3	5/16	3/8	15/16	1	6210055
2"	2.1/2	8.3/8	1.1/2	5	1/2	9/16	1.15/16	1	6210065

# HSS COUNTERBORE

## Counterbore Body, Aircraft Series - Interchangeable Pilot Type

- 4705** Long Series, 3-flute
- 4706** Short Series (Aircraft) 4-flute with corner radius

Used for the facing of bosses, and counterboring recesses for spring pockets and screw heads. Supplied with corner radius to produce the fillets necessary for this type of work. Designed for pneumatic or electric drills.



$d_1$ Ø Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ Ø Inch	$l_3$ Inch	$d_3$ Ø Inch	# of Flutes	Pilot (p) Moun- ting Ø Inch	Pilot Ø min	Pilot Ø max	Pack Qty	4705	4706
1/4	1/2	2.3/8	1/4	1.1/8	15/64	4	3/32	1/8	3/16	1	—	6210137 <sup>1)</sup>
1/4	3/4	3.13/16	15/64	3.1/16	15/64	3	3/32	1/8	3/16	1	6210107	—
5/16	1/2	2.3/8	1/4	7/8	17/64	4	3/32	1/8	1/4	1	—	6210139 <sup>1)</sup>
5/16	3/4	3.13/16	19/64	3.1/16	19/64	3	3/32	1/8	1/4	1	6210109	—
11/32	1/2	2.3/8	1/4	7/8	19/64	4	3/32	1/8	9/32	1	—	6210140 <sup>1)</sup>
3/8	1/2	2.3/8	1/4	7/8	5/16	4	3/32	3/16	5/16	1	—	6210141 <sup>2)</sup>
3/8	3/4	3.13/16	5/16	3.1/16	5/16	3	3/32	3/16	5/16	1	6210111	—
13/32	1/2	2.13/16	1/4	7/8	5/16	4	1/8	3/16	11/32	1	—	6210142 <sup>2)</sup>
7/16	1/2	2.13/16	1/4	7/8	5/16	4	1/8	3/16	3/8	1	—	6210143 <sup>2)</sup>
7/16	3/4	3.13/16	3/8	3.1/16	3/8	3	1/8	3/16	3/8	1	6210113	—
15/32	1/2	2.13/16	1/4	7/8	5/16	4	1/8	1/4	13/32	1	—	6210144 <sup>2)</sup>
1/2	1/2	2.13/16	1/4	7/8	3/8	4	1/8	1/4	7/16	1	—	6210145 <sup>2)</sup>
1/2	3/4	3.13/16	7/16	3.1/16	7/16	3	1/8	1/4	7/16	1	6210115	—
17/32	1/2	2.13/16	1/4	7/8	3/8	4	1/8	1/4	15/32	1	—	6210146 <sup>2)</sup>
17/32	3/4	5.3/8	1/2	4.5/8	1/2	3	1/8	1/4	15/32	1	6210116	—
9/16	1/2	2.13/16	1/4	7/8	3/8	4	1/8	1/4	1/2	1	—	6210147 <sup>2)</sup>
9/16	3/4	5.3/8	1/2	4.5/8	1/2	3	1/8	1/4	1/2	1	6210117	—
19/32	3/4	5.3/8	1/2	4.3/16	9/16	3	1/8	1/4	17/32	1	6210118	—
5/8	3/4	5.3/8	1/2	4.3/16	9/16	3	1/8	1/4	9/16	1	6210119	—
11/16	1/2	2.13/16	1/4	7/8	1/2	4	1/8	1/4	5/8	1	—	6210151 <sup>3)</sup>
21/32	1.1/4	5.3/8	1/2	3.5/8	9/16	3	3/16	1/4	19/32	1	6210120	—
11/16	1.1/4	5.3/8	1/2	3.5/8	5/8	3	3/16	1/4	5/8	1	6210121	—
3/4	1.1/4	5.3/8	1/2	3.5/8	11/16	3	3/16	5/16	11/16	1	6210123	—

<sup>1)</sup> 1/32 Corner Radius  
<sup>2)</sup> 3/64 Corner Radius  
<sup>3)</sup> 0.0550" Corner Radius

# HSS COUNTERBORE

$d_1$ Ø Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ Ø Inch	$l_3$ Inch	$d_3$ Ø Inch	# of Flutes	Pilot Mounting Ø Inch	Pilot Ø min	Pilot Ø max	Pack Qty	4705	4706
3/4	1/2	2.13/16	1/4	7/8	1/2	4	3/16	5/16	11/16	1	—	6210153 <sup>3)</sup>
25/32	1.1/4	5.3/8	1/2	3.5/8	11/16	3	3/16	5/16	23/32	1	6210124	—
13/16	1.1/4	5.3/8	1/2	3.5/8	3/4	3	3/16	5/16	3/4	1	6210125	—
13/16	1/2	2.13/16	1/4	7/8	1/2	4	3/16	5/16	3/4	1	—	6210155 <sup>3)</sup>
7/8	1.1/4	5.3/8	1/2	3.5/8	3/4	3	3/16	5/16	13/16	1	6210126	—
7/8	1/2	2.13/16	1/4	7/8	1/2	4	3/16	5/16	13/16	1	—	6210157 <sup>3)</sup>
15/16	1.1/4	5.3/8	1/2	3.5/8	3/4	3	3/16	5/16	7/8	1	6210127	—
1"	1.1/4	5.3/8	1/2	3.5/8	3/4	3	3/16	3/8	15/16	1	6210128	—
1"	1/2	2.13/16	1/4	7/8	1/2	4	3/16	3/8	15/16	1	—	6210161 <sup>3)</sup>

<sup>1)</sup>1/32 Corner Radius

<sup>2)</sup>3/64 Corner Radius

<sup>3)</sup>0.0550" Corner Radius

# HSS COUNTERBORE

## Counterbore Body, Taper Shank, Short Series - Interchangeable Pilot Type

**4703**

Short counterbore body, with taper shank for use with detachable pilots which align counterbore to existing drilled hole. 3 & 5 Flute designs for less chatter.

4703

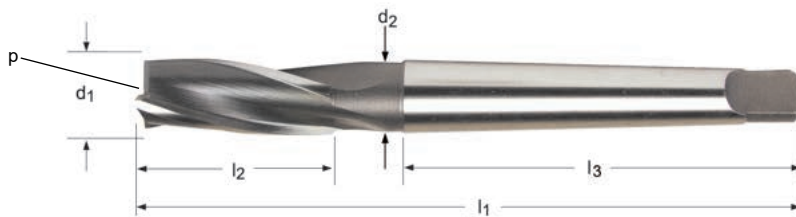
HSS



ANSI



1/4 - 2.1/2



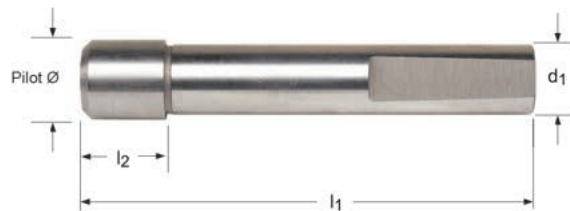
d <sub>1</sub> Ø Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	MTS	d <sub>2</sub> Neck Dia. Inch	l <sub>3</sub> Shank Length Inch	# of Flutes	pilot (p) mounting Ø Inch	pilot Ø min	pilot Ø max	Pack Qty	4703
5/16	3/4	3.13/16	1	19/64	2.9/16	3	3/32	1/8	1/4	1	6210068 *
1/2	1.1/4	4.5/16	1	29/64	2.9/16	3	3/16	1/4	7/16	1	6210074
9/16	1.1/4	4.5/16	1	29/64	2.9/16	3	3/16	1/4	1/2	1	6210076 *
11/16	1.1/4	5.1/8	2	5/8	3.1/8	3	3/16	1/4	5/8	1	6210080
3/4	1.1/2	5.3/8	2	21/32	3.1/8	3	1/4	5/16	11/16	1	6210082
13/16	1.1/2	5.3/8	2	21/32	3.1/8	3	1/4	5/16	3/4	1	6210084
7/8	1.1/2	5.3/8	2	21/32	3.1/8	3	1/4	5/16	13/16	1	6210085
15/16	1.1/2	6.1/8	2	7/8	3.7/8	3	1/4	5/16	7/8	1	6210086
1"	1.3/4	6.3/8	3	7/8	3.7/8	3	5/16	3/8	15/16	1	6210087
1.1/16	1.3/4	6.3/8	3	7/8	3.7/8	3	5/16	3/8	1"	1	6210088
1.1/8	1.3/4	6.3/8	3	7/8	3.7/8	3	5/16	3/8	1.1/16	1	6210089
1.3/16	1.3/4	6.3/8	3	7/8	3.7/8	3	5/16	3/8	1.1/8	1	6210090
1.1/4	2"	6.5/8	3	7/8	3.7/8	5	3/8	7/16	1.3/16	1	6210091
1.5/16	2"	6.5/8	3	7/8	3.7/8	5	3/8	7/16	1.1/4	1	6210092 *
1.3/8	2"	6.5/8	3	7/8	3.7/8	5	3/8	7/16	1.5/16	1	6210093
1.1/2	2"	7.7/8	4	1.3/16	4.7/8	5	3/8	7/16	1.7/16	1	6210094
1.5/8	2.1/4	8.1/8	4	1.3/8	4.7/8	5	7/16	1/2	1.9/16	1	6210095
1.3/4	2.1/4	8.1/8	4	1.3/8	4.7/8	5	7/16	1/2	1.11/16	1	6210096 *
2"	2.1/2	8.3/8	4	1.1/2	4.7/8	5	1/2	9/16	1.5/16	1	6210098
2.1/8	2.1/2	9.7/8	5	1.3/4	6.1/8	5	1/2	9/16	2.1/16	1	6210099
2.1/4	2.1/2	9.7/8	5	1.3/4	6.1/8	5	1/2	9/16	2.3/16	1	6210100 *

\* Starred items are outgoing products and are available only while supplies last.



## Counterbore Pilot, Detachable

**4704** Interchangeable detachable pilots for use with counterbore bodies. Pilot shank diameters must match counterbore body “pilot diameter” for proper match.



**4704**

**HSS**

**ANSI**

3/32 - 2"

pilot Ø Inch	d <sub>1</sub> Ø Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	<b>4704</b>
1/8	3/32	1/8	1.1/4	1	3210114
5/32	3/32	3/16	1.5/16	1	3210115
3/16	3/32	3/16	1.5/16	1	3210116
7/32	3/32	1/4	1.3/8	1	3210117
1/4	3/32	1/4	1.3/8	1	3210118
1/8	1/8	1/8	1.7/16	1	3210249
5/32	1/8	3/16	1.1/2	1	3210251
3/16	1/8	3/16	1.1/2	1	3210255
7/32	1/8	1/4	1.9/16	1	3210258
1/4	1/8	1/4	1.9/16	1	3210259
9/32	1/8	5/16	1.5/8	1	3210261
5/16	1/8	5/16	1.5/8	1	3210262
3/8	1/8	3/8	1.11/16	1	3210263
7/16	1/8	7/16	1.3/4	1	3210264
1/2	1/8	1/2	1.13/16	1	3210265
3/16	5/32	3/16	1.9/16	1	3210119
7/32	5/32	1/4	1.5/8	1	3210120
1/4	5/32	1/4	1.5/8	1	3210121
9/32	5/32	5/16	1.11/16	1	3210122
5/16	5/32	5/16	1.11/16	1	3210123
3/8	5/32	3/8	1.3/4	1	3210124
3/16	3/16	1/4	1.7/8	1	3210281
7/32	3/16	1/4	1.7/8	1	3210284
1/4	3/16	1/4	1.7/8	1	3210125
9/32	3/16	5/16	1.15/16	1	3210287
5/16	3/16	5/16	1.15/16	1	3210126
11/32	3/16	3/8	2"	1	3210444
3/8	3/16	3/8	2"	1	3210127
13/32	3/16	7/16	2.1/16	1	3210445
7/16	3/16	7/16	2.1/16	1	3210128
15/32	3/16	1/2	2.1/8	1	3210446
1/2	3/16	1/2	2.1/8	1	3210129
9/16	3/16	9/16	2.3/16	1	3210130
5/8	3/16	9/16	2.3/16	1	3210131
13/16	3/16	13/16	2.7/16	1	3210296

# HSS COUNTERBORE



pilot Ø Inch	d <sub>1</sub> Ø Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	Pack Qty	4704
7/8	3/16	7/8	2.1/2	1	3210297
1/4	1/4	1/4	1.11/16	1	3210300
9/32	1/4	5/16	1.3/4	1	3210302
5/16	1/4	5/16	1.3/4	1	3210132
3/8	1/4	3/8	1.13/16	1	3210133
7/16	1/4	7/16	1.7/8	1	3210134
1/2	1/4	1/2	1.15/16	1	3210135
17/32	1/4	9/16	2"	1	3210447
9/16	1/4	9/16	2"	1	3210136
5/8	1/4	5/8	2.1/16	1	3210137
11/16	1/4	11/16	2.1/8	1	3210138
3/4	1/4	3/4	2.3/16	1	3210139
13/16	1/4	7/8	2.5/16	1	3210140
1"	1/4	1"	2.7/16	1	3210314
3/8	5/16	3/8	2"	1	3210142
7/16	5/16	7/16	2.1/16	1	3210143
1/2	5/16	1/2	2.1/8	1	3210144
9/16	5/16	9/16	2.3/16	1	3210145
5/8	5/16	5/8	2.1/4	1	3210146
11/16	5/16	11/16	2.5/16	1	3210147
3/4	5/16	3/4	2.3/8	1	3210148
13/16	5/16	7/8	2.1/2	1	3210149
15/16	5/16	1"	2.5/8	1	3210151
1"	5/16	1"	2.5/8	1	3210152
7/16	3/8	7/16	2.5/16	1	3210155
1/2	3/8	1/2	2.3/8	1	3210156
9/16	3/8	9/16	2.7/16	1	3210157
5/8	3/8	5/8	2.1/2	1	3210158
11/16	3/8	11/16	2.9/16	1	3210159
3/4	3/8	3/4	2.5/8	1	3210160
13/16	3/8	7/8	2.3/4	1	3210161
7/8	3/8	7/8	2.3/4	1	3210162
15/16	3/8	1"	2.5/8	1	3210163
9/16	7/16	5/8	2.7/8	1	3210173
11/16	7/16	3/4	3"	1	3210175
3/4	7/16	3/4	3"	1	3210176
13/16	7/16	7/8	3.1/8	1	3210177
7/8	7/16	7/8	3.1/8	1	3210178
15/16	7/16	1"	3.1/4	1	3210179
1"	7/16	1"	3.1/4	1	3210180
9/16	1/2	5/8	3.1/8	1	3210195
1"	1/2	1"	3.1/2	1	3210202
1.1/2	1/2	1.1/2	4"	1	3210210

# List Number Index - Miscellaneous



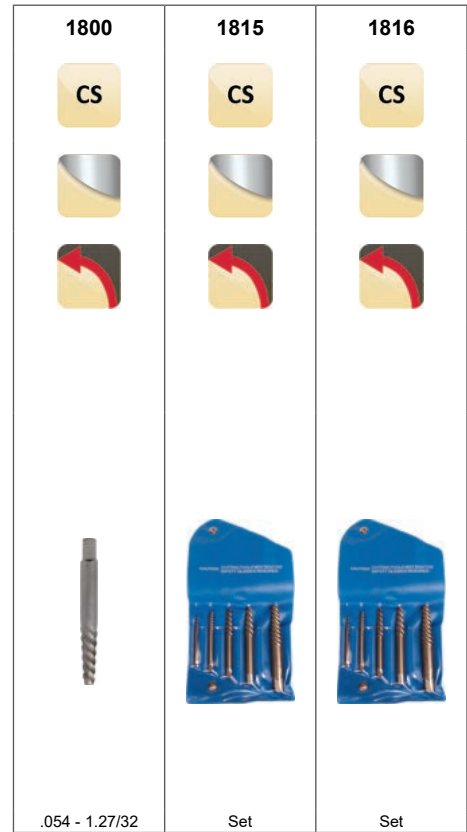
## Pgs. 515-519

411.....	518
430.....	518
K520.....	519
K521.....	519
1800.....	516
1815.....	516
1816.....	516
1900.....	517

# MISCELLANEOUS

## SCREW EXTRACTOR

- 1800** Screw Extractor
- 1815** Screw Extractor Set, 5 piece
- 1816** Screw Extractor Set, 6 piece



Nr.	d <sub>1</sub> Ø Inch	Sizes in Set	d <sub>2</sub> Ø Inch	Pieces per Set	l <sub>1</sub> Inch	Capacity For		Pack Qty	1800	1815set	1816set
						Screws & Bolts	Pipe Sizes				
801	0.0540		5/32		2"	3/16 - 1/4		12	3210001	—	—
802	0.0860		3/16		2.3/8	1/4 - 5/16		12	3210002	—	—
803	1/8		1/4		2.3/4	5/16 - 7/16		12	3210003	—	—
804	11/64		5/16		3"	7/16 - 9/16		6	3210004	—	—
805	1/4		7/16		3.3/8	9/16 - 3/4	1/8 - 1/4	6	3210005	—	—
806	3/8		5/8		3.3/4	3/4 - 1"	3/8	1	3210006	—	—
807	31/64		3/4		4.1/8	1 - 1.3/8	1/2	1	3210007	—	—
808	47/64		1"		4.3/8	1.3/8 - 1.3/4	3/4	1	3210008	—	—
809	31/32		1.1/4		4.5/8	1.3/4 - 2.1/8	1	1	3210009	—	—
810	1.7/32		1.17/32		5"	2.1/8 - 2.1/2	1.1/4	1	3210010	—	—
811	1.15/32		1.27/32		5.5/8	2.1/2 - 3	1.1/2	1	3210011	—	—
812	1.27/32		2.9/32		6.1/4	3 - 3.1/2	2	1	3210012	—	—
1815		801 - 805		5		3/16 - 3/4	1/8 - 1/4	1	—	3210013	—
1816		801 - 806		6		3/16 - 1	1/8 - 3/8	1	—	—	3210014

**DRILLING & TAPPING FLUID**

**1900 Drilling & Tapping Fluid** - A heavy oil for drilling & tapping all ferrous and non-ferrous materials. Increases productivity and extends tool life. Environmentally safe.

**Wax Stick** - Multi-purpose wax that sticks to the tool and effectively removes heat while adding lubrication. Withstands tremendous pressure. Can be used in lieu of drilling/tapping fluids and cutting oils.

**Foam** - Heavy duty aerosol foam coats the tools as it foams on contact. Will not contaminate existing coolant.

**Light Tapping Fluid** - A light viscosity heavy duty drilling & tapping fluid for reducing torque. Ideal for use with a re-circulation system. Can be added to existing cutting oils to increase lubricity. Will not contaminate existing coolant as it will float to the surface for easy skimming.



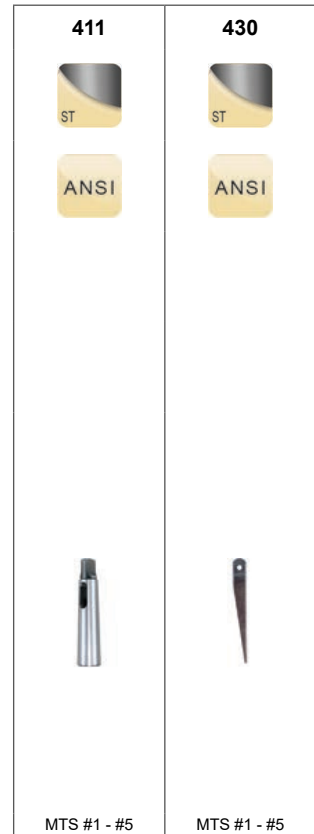
Sizes	Style	Description	Pack Qty	1900
1/2 oz	Trial Size	Drilling & Tapping Fluid	1	1910512
4 oz	Squirt Bottle	Drilling & Tapping Fluid	24	1910501
16 oz	Squirt Bottle	Drilling & Tapping Fluid	12	1910502
1 gal	Bottle	Drilling & Tapping Fluid	4	1910503
5 gal	Dispenser	Drilling & Tapping Fluid	1	1910506
5 gal	Pail	Drilling & Tapping Fluid	1	1910504
55 gal	Drum	Drilling & Tapping Fluid	1	1910505
1 lb	Stick	Wax	24	1950501
20 oz	Aerosol Can	Foam	12	1910509
1 gal	Bottle	Light Drilling & Tapping Fluid	4	1930503
16 oz	Squirt Bottle	Light Drilling & Tapping Fluid	12	1930502
16 oz	Squirt Bottle	Light Tapping Fluid (single)	1	46437347
16 oz	Squirt Bottle	Drilling & Tapping Fluid (single)	1	46437348
20 oz	Aerosol Can	Foam (single)	1	46437349
1 lb	Stick	Wax (single)	1	46437430

# MISCELLANEOUS

## SLEEVES & KEYS

**411** Taper shank (internal and external) adapters. Heat treated and externally ground. Steam oxide surface finish prevents corrosion.

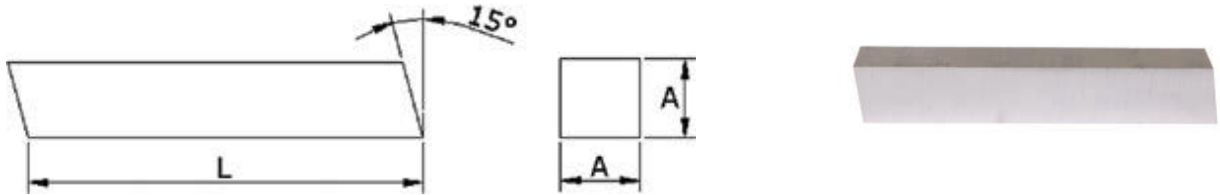
**430** Drill Drift. Dropped forged steel keys used for removing taper shank tools from adapting sleeves and machine spindles.



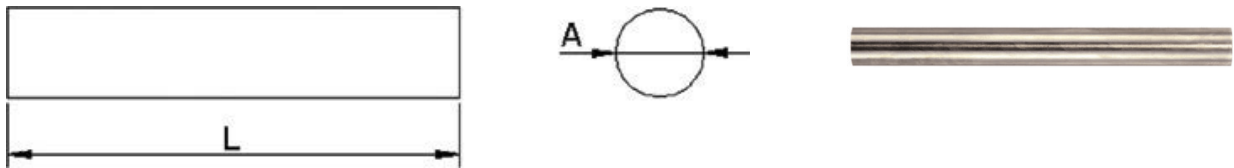
430 MTS #	411 Inside Taper	411 Outside Taper	Length	Pack Qty	411	430
1			4.1/2	1	—	3210338
2			5.1/2	1	—	3210339
3			7	1	—	3210340
4			8	1	—	3210341
5			9.7/8	1	—	3210342
	1	2	3.1/2	1	3210046	—
	1	3	3.15/16	1	3210047	—
	1	4	4.13/16	1	3210048	—
	2	3	4.3/8	1	3210050	—
	2	4	4.13/16	1	3210051	—
	3	4	5.5/16	1	3210053	—
	3	5	6.1/16	1	3210054	—
	4	5	6.1/2	1	3210055	—
	5	6	8.1/2	1	3210057	—

## TOOL BIT BLANKS

**K520** Cobalt ground blank with 15° beveled ends



**K521** Cobalt round blank



Sizes	Overall Length	K520
4	100	0160732
5	160	0160749
6	100	0110478
6	160	0110485
6	200	0110492
8	100	0110546
8	160	0110553
8	200	0110560
10	100	0110171
10	160	0110195
10	200	0110201
12	100	0110225
12	160	0110249
12	200	0110256
14	160	0110294
14	200	0110300
16	100	0110317
16	160	0110324
16	200	0110331
20	160	0110379
20	200	0110386
25	200	0110409
3/16	2.1/2	0254721
1/4	2.1/2	0254684
1/4	4"	0197943
5/16	2.1/2	0254790
5/16	3"	0254806
5/16	4"	0197950
3/8	3"	0254769
3/8	4"	0197967
3/8	6"	0254776
7/16	3.1/2	0340691
1/2	4"	0197974
1/2	6"	0197981
5/8	4.1/2	0197998
5/8	6"	0254820

Sizes	Overall Length	K521
4	100	0110799
6	160	0110805
8	100	0164884
8	200	0110843
10	100	0110850
10	200	0110881
12	100	0110904
12	160	0110911
12	200	0110607
14	200	0110638
15	100	0110645
16	160	0110669
18	160	0164914
1/4	4"	0110720
1/2	6"	0110782

# Technical Section - Icon Descriptions

Material



Carbide



High Speed Steel



High Speed Cobalt



High Speed Powder Metallurgy Steel



High Speed Cobalt Powder Metallurgy Steel



High Speed Steel and Carbide



Chromium Steel

Coating



Bright



Steam Tempered



Nitride



Nitride/ Steam Tempered



Bronze



Titanium Aluminium Nitride



Titanium Carbo-Nitride



Titanium Nitride



Bright/ Steam Tempered



Bright/ Titanium Nitride



Steam Tempered/ Bronze



Titanium Aluminium Nitride - Top



Titanium Nitride - Top



Ti-phon  
(TiAlCrSiN)



Purple / Bronze  
(Dual oxide surface treatment)



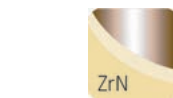
Alcrona Top  
(AlCrN - Top)



Aluminium Titanium Carbo-Nitride



Aluminium Titanium Nitride



Zirconium Coating



# Technical Section - Icon Descriptions

## Common Icons

Direction



Right hand rotation



Left hand rotation

Depth



## Drilling icons

Point Angle



Countersink °



60° Countersink



82° Countersink



90° Countersink

Form



Normal Helix



Quick Helix



Continuously Thinned Web

Coolant



Internal Coolant

# Technical Section - Icon Descriptions

## Drilling icons

### Shank



Straight Shank



Morse taper shank



DIN 6535 HA  
(cylindrical)



DIN 6535 HE



Reduced shank



Threaded Hex Shank



DIN 6535 HB / HE



DIN 6535 HB  
(Weldon Shank)

### Manufacturing Standards



# Technical Section - Icon Descriptions

## Reaming - Countersink Icons

### Taper Gradient



Imperial  
Standard  
Taper



Metric  
Standard  
Taper

### Tolerance



Industry standard  
hole tolerance



Specific  
Reamer  
Tolerance



ISO Tolerance  
for shafts

### Application



Countersink



Counterbore

### Countersink °



### Shank



Straight



Morse taper

### Manufacturing Standards



# Technical Section - Icon Descriptions

## Threading icons

### Thread form



Metric coarse



Metric fine



Unified Coarse



Unified Fine



Unified Special



British standard pipe fastening - G series



National taper pipe



National taper pipe dryseal



National straight pipe dryseal



National straight pipe mechanical



ISO Metric Coarse to DIN8140-2



British standard pipe taper - Rc Series

### Flute Geometry



Straight Flute



Spiral Point



Fluteless - thread forming



15° Helix



17° Helix



27° Helix



30° Helix



40° Helix



45° Helix



50° Helix



52° Helix



Straight Flute (hand tap)

### Hole Type



Through hole



Blind hole



Through or blind hole

# Technical Section - Icon Descriptions

## Threading icons

### Chamfer



Plug chamfer



Semi-bottoming



Full-bottoming



Semi-bottoming



Plug



Taper

### Tolerance



Common Class of fit



Multiple Classes of fit



Closer class of fit for accuracy



Common metric class of fit



Class of fit outside Std. for high strength or abrasive materials



Normal

### Standards



# Technical Section - Icon Descriptions

## Milling icons

Type



For steels with low to high resistance



For soft and malleable materials

Application



Slotting P9 tolerance



Slotting



Finishing (side cutting)



Roughing



Ball nose



Corner radius inside



Corner rounding outside

Direction



Slotting, ramping, plunging



Slotting, ramping



Finishing (side cutting)

Cut Length



Extra short



Short



Medium



Long



Extra long

# Technical Section - Icon Descriptions

## Milling icons

Diameter tolerance



Industry standard shaft tolerances

Helix Angle



Unequal Helix

# of teeth or flutes



Shank



Straight Shank



Weldon Shank



# Technical Section - General

## TOOL MATERIALS

### High Speed Steel

**HSS**

A medium-alloyed high speed steel that has good machinability and good performance. HSS exhibits hardness, toughness and wear resistance characteristics that make it attractive in a wide range of applications, for example in drills and taps.

### Cobalt High Speed Steel

**HSS-E**

This high speed steel contains cobalt for increased hot hardness. The composition of HSCo is a good combination of toughness and hardness. It has good machinability and good wear resistance, which makes it usable for drills, taps, milling cutters and reamers.

### Non Cobalt Powder Metallurgy Steel

**HSS PM**

Has a finer and more consistent grain structure than HSCo resulting in a tougher product. Tool life and wear resistance is normally higher than HSCo and this grade has superior edge strength and rigidity. Mainly used for milling cutters and taps.

### Sintered Cobalt High Speed Steel

**HSS-E PM**

HSCo-XP is a Cobalt high speed steel which has been produced using powder metallurgy technology. High speed steel produced by this method exhibits superior toughness and grindability. Taps and milling cutters find particular advantage when manufactured from XP grade steel.

### Chromium Steel

**CS**

Chromium steel is a tool steel in which the principal alloying element is Chromium. It is used only for the manufacture of taps and dies. This steel has lower hot hardness properties in comparison with high speed steels. Suited for hand tap applications.

	Grade	Hardness (HV10)	C %	W %	Mo %	Cr %	V %	Co %	Tool Material
<b>HSS</b>	M2	810-850	0.9	6.4	5.0	4.2	1.8	-	HSS
<b>HSS-E</b>	M35	830-870	0.93	6.4	5.0	4.2	1.8	4.8	HSCO
	M42	870-960	1.08	1.5	9.4	3.9	1.2	8.0	
<b>HSS PM</b>	-	830-870	0.9	6.25	5.0	4.2	1.9	-	HSS Powder Metal
<b>HSS-E PM</b>	ASP 2017	860-900	0.8	3.0	3.0	4.0	1.0	8.0	HSCO Powder Metal
	ASP 2030	870-910	1.28	6.4	5.0	4.2	3.1	8.5	
	ASP 2052	870-910	1.6	10.5	2.0	4.8	5.0	8.0	
<b>CS</b>	-	775-825	1.03	-	-	1.5	-	-	Chromium Steel



# Technical Section - General

## CARBIDE MATERIALS

### Carbide Materials (or Hard Materials)

**HM**

A sintered powder metallurgy steel, consisting of a metallic carbide composite with binder metal. The most central raw material is tungsten carbide (WC). Tungsten carbide contributes to the hardness of the material. Tantalum carbide (TaC), titanium carbide (TiC) and niobium carbide (NbC) complements WC and adjusts the properties to what is desired. These three materials are called cubic carbides. Cobalt (Co) acts as a binder and keeps the material together.

Carbide materials are often characterised by high compression strength, high hardness and therefore high wear resistance, but also by limited flexural strength and toughness. Carbide is used in taps, reamers, milling cutters, drills and thread milling cutters.

Properties	HSS materials	Carbide materials	K10/30F (often used for solid tools)
Hardness (HV30)	800-950	1300-1800	1600
Density (g/cm <sup>3</sup> )	8.0-9.0	7.2-15	14.45
Compressive strength (N/mm <sup>2</sup> )	3000-4000	3000-8000	6250
Flexural strength, (bending) (N/mm <sup>2</sup> )	2500-4000	1000-4700	4300
Heat resistance (°C)	550	1000	900
E-module (KN/mm <sup>2</sup> )	260-300	460-630	580
Grain size (µm)	-	0.2-10	0.8

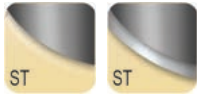
The combination of hard particle (WC) and binder metal (Co) give the following changes in characteristics.

Characteristic	Higher WC content give	Higher Co content give
Hardness	Higher hardness	Lower hardness
Compressive strength (CS)	Higher CS	Lower CS
Bending strength (BS)	Lower BS	Higher BS

Grain size also influences the material properties. Small grain sizes means higher hardness and coarse grains give more toughness.

# Technical Section - General

## SURFACE TREATMENTS



### Steam Tempering

Steam tempering gives a strongly adhering blue oxide surface that acts to retain cutting fluid and prevent chip to tool welding, thereby counteracting the formation of a built-up edge. Steam tempering can be applied to any bright tool but is most effective on drills and taps.



### Bronze Finish

The bronze finish is a thin oxide layer formed on the tool surface and it is applied principally to Cobalt and Vanadium high speed steels.



### Nitriding (FeN)

Nitriding is a process that is used to increase the hardness and wear resistance of the surface of a tool. It is particularly suitable for taps that are used on abrasive materials such as cast iron, bakelite, etc. Nitriding is used on twist drills when it is desirable to increase the strength and wear resistance of the cylindrical lands.

## SURFACE COATINGS



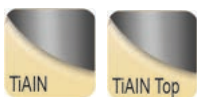
### Titanium Nitride Coating (TiN)

Titanium Nitride is a gold colored ceramic coating applied by physical vapour deposition (PVD). High hardness combined with low friction properties ensures considerably longer tool life, or alternatively, better cutting performance from tools which have not been coated. TiN coating is used mainly for drills and taps.



### Titanium Carbon Nitride Coating (TiCN)

Titanium Carbon Nitride is a ceramic coating applied by PVD coating technology. TiCN is harder than TiN and has a lower coefficient of friction. Its hardness and toughness in combination with good wear resistance ensures that it finds its principal application in the field of milling to enhance the performance of milling cutters.



### Titanium Aluminum Nitride Coating (TiAlN)

Titanium Aluminium Nitride is a multi layer ceramic coating applied by PVD coating technology, which exhibits high toughness and oxidation stability. These properties make it ideal for higher speeds and feeds, whilst at the same time improving tool life TiAlN is suitable for drilling and tapping. It is recommended to use TiAlN when machining dry.

# Technical Section - General



## Chromium Nitride Coating (CrN)

CrN is an excellent coating for aluminum alloys, copper alloys and low alloyed steel materials. CrN can also be used as an alternative on Titanium and Nickel alloys. This coating has a low tendency for built-up edges.



## Alcrona Top (AlCrN Top)

Alcrona Top is an aluminum chromium nitride coating mostly used for milling cutters. The coatings hot hardness and high oxidation resistance are two unique properties. When machining applications involving heavy mechanical and thermal stresses, these properties translate into supreme wear resistance.



## Hardlube (TiAlN/WC/C)

Super B is a Titanium Aluminum Nitride + Tungsten Carbide + Carbon Coating used for wet and minimal lubrication machining in drilling, milling and tapping applications. Very effective for cast iron, hardened steels and heat resistant super alloys.

## SURFACE TREATMENT / COATING PROPERTIES

Surface Treatments	Color	Coating material	Hardness (HV)	Thick-ness (µm)	Coating structure	Frict. coeff. against steel	Max. appl. temp. (°C)
ST	Dark grey	Fe 304	400	Max. 5	Conversion into the surface	–	550
Bronze	Bronze	Fe 304	400	Max. 5	Conversion into the surface	–	550
N	Grey	FeN	1300	20	Diffusion zone	–	550
TiN	Gold	TiN	2300	1-4	Mono-layer	0.4	600
TiCN	Blue grey	TiCN	3000	1-4	Multi-layer gradient	0.4	500
TiAlN	Black grey	TiAlN	3300	3	Nano structured	0.3-0.35	900
CrN	Silver grey	CrN	1750	3-4	Mono-layer	0.5	700
Alcrona Top	Blue grey	AlCrN Top	3200		Mono-layer	0.35	1100
Super B	Black	TiAlN+ WC/C	3000	2-6	Multi-layer lamellar	0.2	800

# Technical Section - General

## DECIMAL EQUIVALENTS

Size	Decimal Equivalent	Size	Decimal Equivalent	Size	Decimal Equivalent	Size	Decimal Equivalent	Size	Decimal Equivalent	Size	Decimal Equivalent
80	.0135	<b>1/16</b>	<b>.0625</b>	3.3 mm	.1299	5.4 mm	.2126	O	.3160	13.50 mm	.5315
0.35 mm	.0138	1.6 mm	.0630	3.4 mm	.1339	3	.2130	8.1 mm	.3189	<b>35/64</b>	<b>.5469</b>
79	.0145	52	.0635	29	.1360	5.5 mm	.2165	8.2 mm	.3228	14.00 mm	.5512
<b>1/64</b>	<b>.0156</b>	1.65 mm	.0650	3.5 mm	.1378	<b>7/32</b>	<b>.2188</b>	P	.3230	<b>9/16</b>	<b>.5625</b>
.4 mm	.0157	1.7 mm	.0669	28	.1405	5.6 mm	.2205	8.25 mm	.3248	14.50 mm	.5709
78	.0160	51	.0670	<b>9/64</b>	<b>.1406</b>	2	.2210	8.3 mm	.3268	<b>37/64</b>	<b>.5781</b>
.45 mm	.0177	1.75 mm	.0689	3.6 mm	.1417	5.7 mm	.2244	<b>21/64</b>	<b>.3281</b>	15.00 mm	.5906
77	.0180	50	.0700	27	.1440	5.75 mm	.2264	8.4 mm	.3307	<b>19/32</b>	<b>.5938</b>
.5 mm	.0197	1.8 mm	.0709	3.7 mm	.1457	1	.2280	Q	.3320	<b>39/64</b>	<b>.6094</b>
76	.0200	1.85 mm	.0728	26	.1470	5.8 mm	.2283	8.5 mm	.3346	15.50 mm	.6102
75	.0210	49	.0730	3.75 mm	.1476	5.9 mm	.2323	8.6 mm	.3386	<b>5/8</b>	<b>.6250</b>
.55 mm	.0217	1.9 mm	.0748	25	.1495	A	.2340	R	.3390	16.00 mm	.6299
74	.0225	48	.0760	3.8 mm	.1496	<b>15/64</b>	<b>.2344</b>	8.7 mm	.3425	<b>41/64</b>	<b>.6406</b>
.6 mm	.0236	1.95 mm	.0768	24	.1520	6 mm	.2362	<b>11/32</b>	<b>.3438</b>	16.50 mm	.6496
73	.0240	<b>5/64</b>	<b>.0781</b>	3.9 mm	.1535	B	.2380	8.75 mm	.3445	<b>21/32</b>	<b>.6562</b>
72	.0250	47	.0785	23	.1540	6.1 mm	.2402	8.8 mm	.3465	17.00 mm	.6693
.65 mm	.0256	2 mm	.0787	<b>5/32</b>	<b>.1562</b>	C	.2420	S	.3480	<b>43/64</b>	<b>.6719</b>
71	.0260	2.05 mm	.0807	22	.1570	6.2 mm	.2441	8.90 mm	.3504	<b>11/16</b>	<b>.6875</b>
.7 mm	.0276	46	.0810	4 mm	.1575	D	.2460	9.00 mm	.3543	17.50 mm	.6890
70	.0280	45	.0820	21	.1590	6.25 mm	.2461	T	.3580	<b>45/64</b>	<b>.7031</b>
.69 mm	.0292	2.1 mm	.0827	20	.1610	6.3 mm	.2480	9.10 mm	.3583	18.00 mm	.7087
.75 mm	.0295	2.15 mm	.0846	4.1 mm	.1614	E	.2500	<b>23/64</b>	<b>.3594</b>	<b>23/32</b>	<b>.7188</b>
68	.0310	44	.0860	4.2 mm	.1654	<b>1/4</b>	<b>.2500</b>	9.20 mm	.3622	18.50 mm	.7283
<b>1/32</b>	<b>.0312</b>	2.2 mm	.0866	19	.1660	6.4 mm	.2520	9.25 mm	.3642	<b>47/64</b>	<b>.7344</b>
.8 mm	.0315	2.25 mm	.0886	4.25 mm	.1673	6.5 mm	.2559	9.30 mm	.3661	19.00 mm	.7480
67	.0320	43	.0890	4.3 mm	.1693	F	.2570	U	.3680	<b>3/4</b>	<b>.7500</b>
66	.0330	2.3 mm	.0906	18	.1695	6.6 mm	.2598	9.40 mm	.3701	<b>49/64</b>	<b>.7656</b>
.85 mm	.0335	2.35 mm	.0925	<b>11/64</b>	<b>.1719</b>	G	.2610	9.50 mm	.3740	19.50 mm	.7677
65	.0350	42	.0935	17	.1730	6.7 mm	.2638	<b>3/8</b>	<b>.3750</b>	<b>25/32</b>	<b>.7812</b>
.9 mm	.0354	<b>3/32</b>	<b>.0938</b>	4.4 mm	.1732	<b>17/64</b>	<b>.2656</b>	V	.3770	20.00 mm	.7874
64	.0360	2.4 mm	.0945	16	.1770	6.75 mm	.2657	9.60 mm	.3780	<b>51/64</b>	<b>.7969</b>
63	.0370	41	.0960	4.5 mm	.1772	H	.2660	9.70 mm	.3819	20.50 mm	.8071
.95 mm	.0374	2.45 mm	.0965	15	.1800	6.8 mm	.2677	9.75 mm	.3839	<b>13/16</b>	<b>.8125</b>
62	.0380	40	.0980	4.6 mm	.1811	6.9 mm	.2717	9.80 mm	.3858	21.00 mm	.8268
61	.0390	2.5 mm	.0984	14	.1820	I	.2720	W	.3860	<b>53/64</b>	<b>.8281</b>
1 mm	.0394	39	.0995	13	.1850	7 mm	.2756	9.90 mm	.3898	<b>27/32</b>	<b>.8438</b>
60	.0400	38	.1015	4.7 mm	.1850	J	.2770	<b>25/64</b>	<b>.3906</b>	21.50 mm	.8465
59	.0410	2.60 mm	.1024	4.75 mm	.1870	7.1 mm	.2795	10.00 mm	.3937	<b>55/64</b>	<b>.8594</b>
1.05 mm	.0413	37	.1040	<b>3/16</b>	<b>.1875</b>	K	.2810	X	.3970	22.00 mm	.8661
58	.0420	2.7 mm	.1063	4.8 mm	.1890	<b>9/32</b>	<b>.2812</b>	Y	.4040	<b>7/8</b>	<b>.8750</b>
57	.0430	36	.1065	12	.1890	7.2 mm	.2835	<b>13/32</b>	<b>.4062</b>	22.50 mm	.8858
1.1 mm	.0433	2.75 mm	.1083	11	.1910	7.25 mm	.2854	Z	.4130	<b>57/64</b>	<b>.8906</b>
1.15 mm	.0453	<b>7/64</b>	<b>.1094</b>	4.9 mm	.1929	7.3 mm	.2874	10.50 mm	.4134	23.00 mm	.9055
56	.0465	35	.1100	10	.1935	L	.2900	<b>27/64</b>	<b>.4219</b>	<b>29/32</b>	<b>.9062</b>
<b>3/64</b>	<b>.0469</b>	2.8 mm	.1102	9	.1960	7.4 mm	.2913	11.00 mm	.4331	<b>59/64</b>	<b>.9219</b>
1.2 mm	.0472	34	.1110	5 mm	.1969	M	.2950	<b>7/16</b>	<b>.4375</b>	23.50 mm	.9252
1.25 mm	.0492	33	.1130	8	.1990	7.5 mm	.2953	11.50 mm	.4528	<b>15/16</b>	<b>.9375</b>
1.3 mm	.0512	2.9 mm	.1142	5.1 mm	.2008	<b>19/64</b>	<b>.2969</b>	<b>29/64</b>	<b>.4531</b>	24.00 mm	.9449
55	.0520	32	.1160	7	.2010	7.6 mm	.2992	<b>15/32</b>	<b>.4688</b>	<b>61/64</b>	<b>.9531</b>
1.35 mm	.0531	3 mm	.1181	<b>13/64</b>	<b>.2031</b>	N	.3020	12.00 mm	.4724	24.50 mm	.9646
54	.0550	31	.1200	6	.2040	7.7 mm	.3031	<b>31/64</b>	<b>.4844</b>	<b>31/32</b>	<b>.9688</b>
1.4 mm	.0551	3.1 mm	.1220	5.2 mm	.2047	7.75 mm	.3051	12.50 mm	.4921	25.00 mm	.9843
1.45 mm	.0571	<b>1/8</b>	<b>.1250</b>	5	.2055	7.8 mm	.3071	<b>1/2</b>	<b>.5000</b>	<b>63/64</b>	<b>.9844</b>
1.5 mm	.0591	3.2 mm	.1260	5.25 mm	.2067	7.9 mm	.3110	13.00 mm	.5118	<b>1.0000</b>	<b>1.0000</b>
53	.0595	3.25 mm	.1280	5.3 mm	.2087	<b>5/16</b>	<b>.3125</b>	<b>33/64</b>	<b>.5156</b>		
1.55 mm	.0610	30	.1285	4	.2090	8 mm	.3150	<b>17/32</b>	<b>.5312</b>		

# Technical Section - General

## HARDNESS CONVERSION TABLE

Rockwell Hardness			Brinell	Tensile Strength
C	B	A	Hardness	(Lbs./Sq.In.)
70	—	86.5	780	—
69	—	86.0	762	—
68	—	85.5	745	—
67	—	85.0	728	—
66	—	84.5	712	—
65	—	84.0	697	—
64	—	83.5	682	—
63	—	83.0	668	—
62	—	82.5	653	—
61	—	82.0	640	—
60	—	81.0	627	314,000
59	—	80.5	614	307,000
58	—	80.0	601	299,000
57	—	79.5	578	291,000
56	—	79.0	567	284,000
55	—	78.5	555	277,000
54	—	78.0	545	270,000
53	—	77.5	534	263,000
52	—	77.0	514	256,000
51	—	76.5	505	250,000
50	—	76.0	495	243,000
49	—	75.5	477	236,000
48	—	75.0	469	230,000
47	—	74.0	461	223,000
46	115	73.5	444	217,000
45	115	73.0	429	211,000
44	114	72.5	415	205,000
43	114	72.0	408	200,000
42	113	71.5	401	195,000
41	112	71.0	388	188,000
40	112	70.5	375	182,000
39	111	70.0	369	176,000

Rockwell Hardness			Brinell	Tensile Strength
C	B	A	Hardness	(Lbs./Sq.In.)
38	110	69.5	363	171,000
37	110	69.0	352	167,000
36	109	68.5	341	162,000
35	109	68.0	331	158,000
34	108	67.5	321	153,000
33	108	67.0	311	148,000
32	107	66.5	302	144,000
31	106	66.0	293	140,000
30	105	65.5	285	136,000
29	104	65.0	277	133,000
28	104	64.5	269	131,000
27	103	64.0	265	130,000
26	103	63.5	262	128,000
25	102	63.0	255	125,000
24	102	62.5	248	122,000
23	101	62.0	241	119,000
22	100	61.5	235	116,000
21	99	61.0	229	113,000
20	98	60.0	223	110,000
19	97	59.5	220	108,000
18	97	59.0	217	107,000
17	96	58.0	212	104,000
16	96	57.5	207	101,000
15	95	57.0	202	99,000
14	94	56.5	200	98,000
13	93	56.0	197	97,000
12	92	55.5	192	95,000
11	92	55.0	189	94,000
10	91	54.0	187	93,000
9	90	53.5	183	91,000
8	89	53.0	179	89,000
7	88	52.5	174	87,000

## LUBRICANTS

Lubricants or coolants are used on cutting tools to reduce friction or to reduce heat.

Type of Lubricant	Description	Advantages	Disadvantages
Emulsion	Emulsions or water-soluble cutting oils give lubrication properties combined with good cooling property. The oil concentrate in emulsion contains additives that give different properties like lubricators, preservatives and EP additives to improve bearing strength.	Reduces heat. Flushes away chips.	Disposal cost. Environment
Minimal lubrication	Minimal lubrication is a small amount of oil distributed with compressed air to lubricate the cutting or forming process.	Low cost. Good	Bad chip removal. Requires good set up of nozzle positioning
Oil	Cutting oils have good lubrication properties but do not provide such good cooling as water-based cutting fluids.	Good	High cost. Environment.
Dry / compressed air	Compressed air directed to the cutting process.	Clean process. Remove Chips. Low cost.	Works in a limited no. of applications.

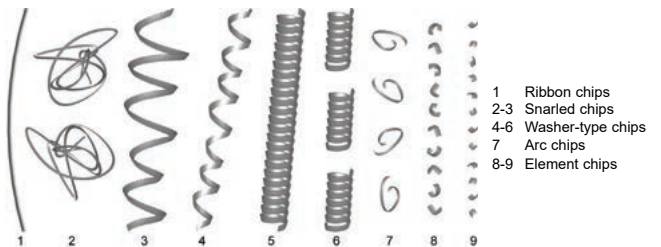


## TYPES OF CHIPS

Chip formation is mostly caused by plastic deformation. This process, due to the friction generated during machining, generates heat. Heat has the positive effect of increasing the plasticity of the workpiece material, but the negative effect of increasing the wear on the tool. When workpiece material reaches its breakage point, then the chip is generated. Its form and development depend on different factors, such as:

- Chemical-physical compatibility between tool and workpiece materials
- Cutting operation
- Cutting conditions (speed, feed, material removal rate)
- Tool geometry
- Friction coefficient (with or without coating)
- Lubrication

Depending on different combinations of the above mentioned factors, the chips can turn out in many different ways (see figure below).



Chips that are shaped as small "6's & 9's" are desirable in most machining applications. This will allow for the best possible chip evacuation from the deepest cavities. Tool life is also increased dramatically when chips are kept small and manageable. When the heat generated from cutting is kept in the chip instead of the tool, wear is kept to a minimum.

# Technical Section - General

## INDUSTRY STANDARD TOLERANCES FOR SHAFTS & HOLES

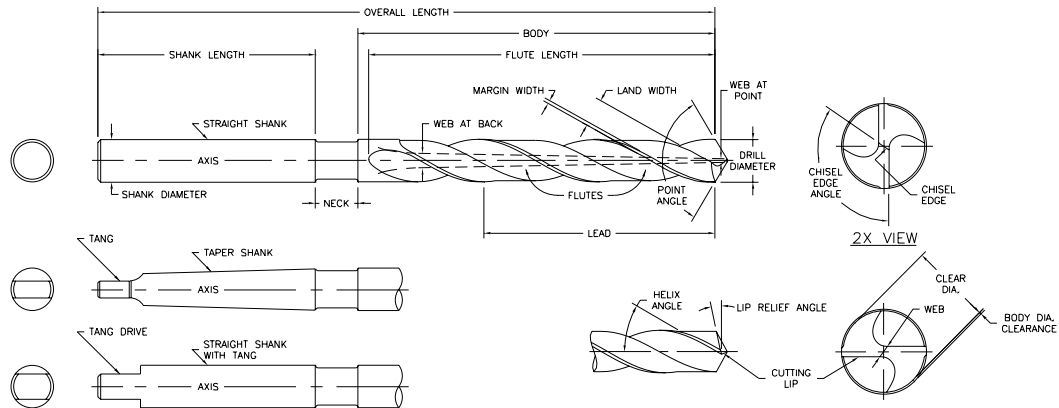
Tolerance values are shown in Microns ( $\mu\text{m}$ )

Formula for Microns ...1  $\mu\text{m}$  = 0.001 mm / 0.000039

Tolerance	Diameter (mm)							
	> 1 ≤ 3	> 3 ≤ 6	> 6 ≤ 10	> 10 ≤ 18	> 18 ≤ 30	> 30 ≤ 50	> 50 ≤ 80	> 80 ≤ 120
	Diameter (inch)							
	> 0.039 ≤ 0.118	> 0.118 ≤ 0.236	> 0.236 ≤ 0.394	> 0.394 ≤ 0.709	> 0.709 ≤ 1.181	> 1.181 ≤ 1.968	> 1.968 ≤ 3.149	> 3.149 ≤ 4.724
	Tolerance values ( $\mu\text{m}$ )							
e8	-14 / -28	-20 / -38	-25 / -47	-32 / -59	-40 / -73	-50 / -89	-60 / -106	-72 / -126
f6	-6 / -12	-10 / -18	-13 / -22	-16 / -27	-20 / -33	-25 / -41	-30 / -49	-36 / -58
f7	-6 / -16	-10 / -22	-13 / -28	-16 / -34	-20 / -41	-25 / -50	-30 / -60	-36 / -71
h6	0 / -6	0 / -8	0 / -9	0 / -11	0 / -13	0 / -16	0 / -19	0 / -22
h7	0 / -10	0 / -12	0 / -15	0 / -18	0 / -21	0 / -25	0 / -30	0 / -35
h8	0 / -14	0 / -18	0 / -22	0 / -27	0 / -33	0 / -39	0 / -46	0 / -54
h9	0 / -25	0 / -30	0 / -36	0 / -43	0 / -52	0 / -62	0 / -74	0 / -87
h10	0 / -40	0 / -48	0 / -58	0 / -70	0 / -84	0 / -100	0 / -120	0 / -140
h11	0 / -60	0 / -75	0 / -90	0 / -110	0 / -130	0 / -160	0 / -190	0 / -220
h12	0 / -100	0 / -120	0 / -150	0 / -180	0 / -210	0 / -250	0 / -300	0 / -350
k10	+40 / 0	+48 / 0	+58 / 0	+70 / 0	+84 / 0	+100 / 0	+120 / 0	+140 / 0
k12	+100 / 0	+120 / 0	+150 / 0	+180 / 0	+210 / 0	+250 / 0	+300 / 0	+350 / 0
m7	+2 / +12	+4 / +16	+6 / +21	+7 / +25	+8 / +29	+9 / +34	+11 / +41	+13 / +48
js14	+/- 125	+/- 150	+/- 180	+/- 215	+/- 260	+/- 310	+/- 370	+/- 435
js16	+/- 300	+/- 375	+/- 450	+/- 550	+/- 650	+/- 800	+/- 950	+/- 1100
H7	+10 / 0	+12 / 0	+15 / 0	+18 / 0	+21 / 0	+25 / 0	+30 / 0	+35 / 0
H8	+14 / 0	+18 / 0	+22 / 0	+27 / 0	+33 / 0	+39 / 0	+46 / 0	+54 / 0
H9	+25 / 0	+30 / 0	+36 / 0	+43 / 0	+52 / 0	+62 / 0	+74 / 0	+87 / 0
H12	+100 / 0	+120 / 0	+150 / 0	+180 / 0	+210 / 0	+250 / 0	+300 / 0	+350 / 0
P9	-6 / -31	-12 / -42	-15 / -51	-18 / -61	-22 / -74	-26 / -86	-32 / -106	-37 / -124
S7	-13 / -22	-15 / -27	-17 / -32	-21 / -39	-27 / -48	-34 / -59	-42 / -72	-58 / -93

# Technical Section - Drilling

## DRILL NOMENCLATURE



**Axis**—The imaginary straight line which forms the longitudinal center line of a drill.

**Backtaper**—A slight decrease in diameter from front to back in the body of a drill.

**Body**—The portion of a drill extending from the shank or neck to the outer corners of the cutting lips.

**Body Clearance Diameter**—The portion of the land that has been cut away so it will not bind against the walls of the hole.

**Chisel-Edge**—The edge at the end of the web that connects the cutting lips.

**Chisel-Edge Angle**—The included angle between the chisel-edge and cutting lip, as viewed from the end of a drill.

**Clearance Diameter**—The diameter over the cut away portion of the drill lands.

**Drill**—A rotary end cutting tool having one or more cutting lips, and having one or more helical or straight flutes for the passage of chips and the admission of a cutting fluid.

**Drill Diameter**—The diameter over the margins of a drill measured at the point.

**Flute Length**—The length from the outer corners of the cutting lips to the extreme back of the flutes. Includes the sweep of the tool used to generate the flutes and therefore does not indicate the usable length of flutes.

**Flutes**—Helical or straight grooves cut or formed in the body of a drill to provide cutting lips, permit removal of chips, and allow cutting fluid to reach the cutting lips.

**Helix Angle**—The angle formed by the leading edge of the land with a plane containing the axis of a drill.

**Land**—The peripheral portion of the body between adjacent flutes.

**Land Width**—The distance between the leading edge and heel of the land; measured at a right angle to the leading edge.

**Lead**—The axial advance of a leading edge of the land in one turn around the circumference.

**Lip Relief Angle**—The axial relief angle at the outer corner of the lip; measured by projection to a plane tangent to the periphery at the outer corner of the lip.

**Lips**—The cutting edges of a two flute drill extending from the chisel- edge to the periphery.

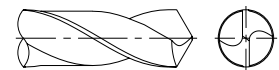
**Margin**—The cylindrical portion of the land, which is not cut away, to provide clearance.

**Neck**—The section of reduced diameter between the body and the shank of a drill.

**Overall Length**—The length from the extreme end of the shank to the outer corners of the cutting lip. It does not include the conical shank end often used on straight shank drills, nor the conical cutting point used on both straight and taper shank drills.

**Point**—The cutting end of a drill, made up of the ends of the lands and the web. In form, it resembles a cone, but departs from a true cone to furnish clearance behind the cutting lips.

**Conventional**—Conventional Points with 118° included point angles are the most commonly used because they provide satisfactory results in a wide variety of materials. A possible limitation is that the straight chisel edge contributes to walking at the drill point, often making it necessary to spot the hole for improved accuracy.

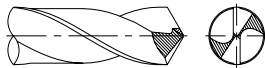


# Technical Section - Drilling

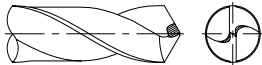
(CONTINUED FROM PRIOR PAGE)

## DRILL NOMENCLATURE

**Split** — Split-Points (commonly called Crankshaft Points) were originally developed for use on drills designed for deep oil holes in automotive crankshafts. Since its inception, the split-point has gained widespread use and is applied to both 118° and 135° included point angles. Its main advantages are the ability to reduce thrust and eliminate walking at the drill point. This is a distinct advantage when the drill is used in a portable drill or in drilling applications where bushings cannot be used. The split-point also has two positive rake cutting edges extending to the center of the drill, which can assist as a chipbreaker to produce small chips which can readily be ejected.



**Notched** — Notched Points were developed for drilling tough alloys. Commonly incorporated on heavy web drills, which allow the point to withstand the higher thrust loads required in drilling these materials. As with the split-point, the Notched Point contains two additional positive rake cutting edges extending toward the center of the drill. These secondary cutting lips, which extend no further than half the original cutting lip, can assist in chip control and reduce the torque required in drilling tough materials. Notched Points can be incorporated on both 118° and 135° included point angles, making them suitable for drilling a wide variety of materials.



**Point Angle**—The included angle between the cutting lips projected upon a plane parallel to the drill axis and parallel to the two cutting lips.

**Relative Lip Height**—The difference in indicator reading between the cutting lips of a drill. Measured at a right angle to the cutting lip at a specific distance from the axis of the tool.

**Shank**—The part of a drill by which it is held and driven.

**Tang**—The flattened end of a taper shank, intended to fit into a driving slot in a socket.

**Tang Drive**—Two opposite parallel driving flats on the extreme end of a straight shank.

**Taper Shank**—Drills having conical shanks suitable for direct fitting in machine spindles, driving sleeves, or sockets. Tapered shanks generally have a tang.

**Web**—The central portion of the body that joins the lands. The extreme end of the web forms the chisel-edge on a two flute drill.

**Web Thickness**—The thickness of the web at the point, unless another specific location is indicated.

## DRILLING TERMINOLOGY/ OPERATING FORMULAS

**Speed** — The speed of a drill is determined by the rate at which the outer periphery of the tool rotates in relation to material being cut. In general, the SFM at which a drill will operate is within a range based upon the workpiece material, its condition, hardness, and depth of hole. The deeper the hole, the greater tendency there is for more heat to be generated, due to length of drill engagement, as well as chip compaction. Thus, speed reduction is often recommended to minimize the amount of heat being generated. By increasing the SFM, fewer holes will result. Therefore, it is usually advisable to start the drilling process at a slower SFM and then increase to the maximum.

**Feed** — Feed rates for drilling are governed by the drill diameter machinability of materials and depth of hole. Small drills, harder materials, and deeper holes require additional considerations in selecting the proper feed rates.

The following terms and formulas can be used to determine the appropriate operating parameters.

Terms	Formulas
<b>IPM</b> = Inches Per Minute	$IPR \times RPM = \mathbf{IPM}$
<b>IPR</b> = Inches Per Revolution	$\frac{IPM}{RPM} = \mathbf{IPR}$
<b>RPM</b> = Revolutions Per Minute	$\frac{SFM \times 3.82}{D} = \mathbf{RPM}$
<b>SFM</b> = Surface Feet Per Minute	$D \times RPM \times .26 = \mathbf{SFM}$
<b>D</b> = Drill Diameter	

**Note:** For element and tolerance information, see specific technical sections on Solid Carbide or High Speed Steel.



# Technical Section - Drilling

## OPTIMIZING THE DRILLING OPERATION/TROUBLESHOOTING

### Drill Selection

Use the shortest drill the application will permit in order to achieve maximum tool rigidity.

### HOLDERS

Tool holders and collets must provide good concentricity between the drill and the machine spindle. Use a positive back stop to prevent the tool from backing up into the holder. Never collet the tool over the flutes or over-tighten the holder. Static runout in the tool assembly must be accurately checked and maintained.

### Workpiece

A secure and rigid workpiece to minimize deflection is needed, particularly on through-hole applications.

### Coolants

Coolants are recommended when drilling mild steel and high temperature alloys. The purpose of the coolant media is to direct the chips away from the cutting tool and workpiece. Excessive coolant pressure and/or too much volume can negatively affect performance. When using coolant fed drills, the coolant pressure that is required should be higher than normal. Suggested pressure for coolant fed drills is minimally 150 PSI. As the diameter of the drill is reduced, the higher the pressure. This is to assist the chip in evacuating from a more confined area.

## DRILLING TROUBLESHOOTING GUIDE

<b>Problem</b>	<b>Solution</b>
<b>Wear on Outer Corners</b>	<ul style="list-style-type: none"> <li>• Reduce cutting speed</li> <li>• Increase feed (IPR)</li> <li>• Improve direction of coolant flow</li> <li>• Increase coolant pressure</li> <li>• Add corner break</li> </ul>
<b>Chipping of Chisel Edge</b>	<ul style="list-style-type: none"> <li>• Check accuracy of drill runout</li> <li>• Check workpiece clamping accuracy and movement</li> <li>• Check point centrality and lip height</li> <li>• Increase feed rate</li> </ul>
<b>Chipping of Cutting Lips</b>	<ul style="list-style-type: none"> <li>• Check accuracy of drill runout</li> <li>• Check workpiece clamping accuracy and movement</li> <li>• Reduce speed</li> <li>• Reduce point clearance</li> <li>• Increase hone</li> </ul>
<b>Cracking of Lands</b>	<ul style="list-style-type: none"> <li>• Check movement of workpiece</li> <li>• Increase back taper</li> <li>• Check accuracy of drill runout</li> <li>• Chip packing; increase flute form opening or peck drill (HSS or HSCO only)</li> <li>• Slow down helix, horizontal drilling</li> <li>• Increase feed</li> <li>• When spot drilling, reduce feed</li> <li>• Improve direction of coolant flow</li> <li>• Increase coolant pressure</li> </ul>
<b>Oversize Hole</b>	<ul style="list-style-type: none"> <li>• Increase speed, reduce feed</li> <li>• Check workpiece clamping accuracy and movement</li> <li>• Check accuracy of drill runout</li> <li>• Chip packing, increase flute form opening or peck drill (HSS or HSCO only)</li> <li>• Check point centrality and lip height</li> </ul>
<b>Undersize Hole</b>	<ul style="list-style-type: none"> <li>• Improve direction of coolant flow</li> <li>• Reduce cutting speed, increase feed</li> <li>• Check drill diameter</li> </ul>
<b>Hole Not Round</b>	<ul style="list-style-type: none"> <li>• Check accuracy of drill runout</li> <li>• Check workpiece clamping accuracy and movement</li> <li>• Check point centrality and lip height</li> <li>• Chip packing, increase flute form opening or peck drill (HSS or HSCO only)</li> </ul>
<b>Drill Breakage</b>	<ul style="list-style-type: none"> <li>• Chip packing, increase flute form opening or peck drill (HSS or HSCO only)</li> <li>• Check workpiece clamping accuracy and movement</li> <li>• Check accuracy of drill runout</li> <li>• Reduce feed rate, increase feed rate</li> <li>• Improve direction of coolant flow</li> <li>• Increase coolant pressure</li> </ul>

# Technical Section - Drilling

## HOLE SIZE/ACHIEVABLE HOLE TOLERANCES

As geometric, substrate and coating configurations become more advanced, the ability of a drill to produce a more accurate hole size increases. In general, a standard geometry tool will achieve a hole size to H12. However as the configuration of the drill becomes more complex the achievable hole size, under favorable conditions, can be as good as H8.

To offer a better insight, listed below are the product types and their achievable hole tolerances:

HSS General Purpose drills – H12

HSS / HSCo Parabolic Flute Deep Hole Drills (PFX) – H10

HSS / HSCo High performance TiN/ TiALN coated (ADX) – H9

Solid Carbide High Performance TiN / TiALN coated (CDX) – H8

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### NOMINAL HOLE DIAMETER (MM)

Ø (mm)	H8	H9	H10	H12
≤ 3	0 / +0.014	0 / +0.025	0 / +0.040	0 / +0.100
> 3 ≤ 6	0 / +0.018	0 / +0.030	0 / +0.048	0 / +0.120
> 6 ≤ 10	0 / +0.022	0 / +0.036	0 / +0.058	0 / +0.150
> 10 ≤ 18	0 / +0.027	0 / +0.043	0 / +0.070	0 / +0.180
> 18 ≤ 30	0 / +0.033	0 / +0.052	0 / +0.084	0 / +0.210


### NOMINAL HOLE DIAMETER (INCHES)

Ø (inch)	H8	H9	H10	H12
≤ .1181	0 / +0.0006	0 / +0.0010	0 / +0.0016	0 / +0.0040
>.1181≤.2362	0 / +0.0007	0 / +0.0012	0 / +0.0019	0 / +0.0048
>.2362≤.3937	0 / +0.0009	0 / +0.0015	0 / +0.0023	0 / +0.0059
>.3937≤.7087	0 / +0.0011	0 / +0.0017	0 / +0.0028	0 / +0.0071
>.7087≤1.1811	0 / +0.0013	0 / +0.0021	0 / +0.0033	0 / +0.0083

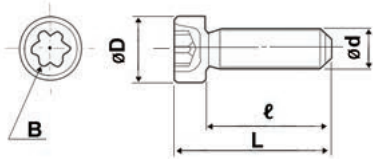
In view of the ability of some drills to produce a much tighter hole tolerance, due consideration should be given to drilled holes which are subject to secondary operations, eg. tapping, reaming. The diameter of the drill will need to be increased from what is recommended to account for the fact that the hole size produced will be smaller.

# Technical Section - Drilling - Hydra

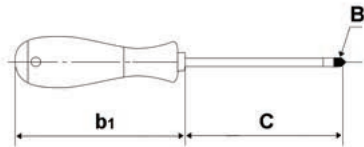
## Torque Table

					TORQUE VALUES Nm (metric System)	TORQUE VALUES in/lbs (inch System)
H860	H861	H853 3xD	H855 5xD	H858 8xD		
H860N1	H861N1	12.0mm-15.0mm 31/64"-39/64"	12.0mm-15.0mm 31/64"-39/64"	14.0mm-15.0mm	0.75-0.99	6.6-8.8
H860N2	H861N2	16.0mm-18.0mm 41/64"-23/32"	16.0mm-18.0mm 41/64"-23/32"	16.0mm-18.0mm	0.93-1.24	8.2-11.0
H860N3	H861N3	19.0mm-21.0mm 49/64"-27/32"	19.0mm-21.0mm 49/64"-27/32"	19.0mm-21.0mm	1.84-2.44	16.3-21.6
H860N4	H861N3	22.0mm-24.0mm 57/64"-31/32"	22.0mm-24.0mm 57/64"-31/32"	22.0mm-24.0mm	2.73-3.72	24.2-32.9
H860N5	H861N4	25.0mm-27.0mm 1.1/64"-1.3/32"	25.0mm-27.0mm 1.1/64"-1.3/32"	25.0mm-27.0mm	4.14-5.52	36.6-48.8
H860N6	H861N5	28.0mm-33.5mm 1.1/8"-1.3/16"	28.0mm-33.5mm 1.1/8"-1.3/16"	28.0mm-33.5mm	4.97-6.63	44.0-58.7
H860N7	H861N6	35.0mm-42.5mm	35.0mm-42.5mm	35.0mm-42.5mm	7.20	63.7

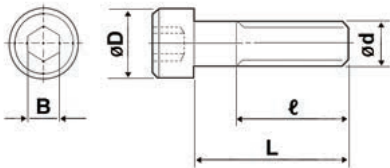
## Screws and screw-drivers data



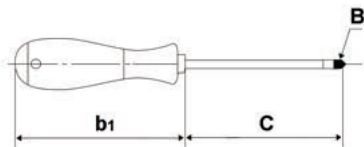
e-code	d	Pitch	L (mm)	l (mm)	D (mm)	B
H860N1	M2.2	0.45	7.5	5.7	3.5	8IP
H860N2	M2.5	0.45	9.0	7.0	4.1	10IP
H860N3	M3.0	0.50	10.5	8.0	4.9	15IP
H860N4	M3.5	0.60	11.5	8.8	5.5	15IP
H860N5	M4.0	0.70	12.5	9.5	6.0	20IP
H860N6	M4.5	0.75	14.3	10.8	6.8	25IP



code	B	C	b1
H861N1	8IP	60	104
H861N2	10IP	80	111
H861N3	15IP	80	111
H861N4	20IP	100	118
H861N5	25IP	100	118



e-code	d	Pitch	L (mm)	l (mm)	D (mm)	B
H860N7	M5.0	0.8	15	FULL	8.5	4



e-code	B	C	b1
H861N6	4	75	111

# Technical Section - Drilling - Hydra

## Drilling Hints & Tips with the Hydra Drill

### COOLANTS

For maximum chip evacuation and tool performance, coolant use is recommended.

Emulsion coolant concentration of 6 – 8% is recommended for most applications, at a coolant pressure of 20 bar or higher. For high strength steel, stainless steels and tougher drilling applications, use a higher concentration of 10-12%. In these applications, particularly in stainless steels, it is recommended to use the maximum coolant pressure on the machine.

The Hydra-drill coolant holes provide improved web strength and reduce heat at the cutting edges for increased productivity and longer tool life.

### HOLDERS

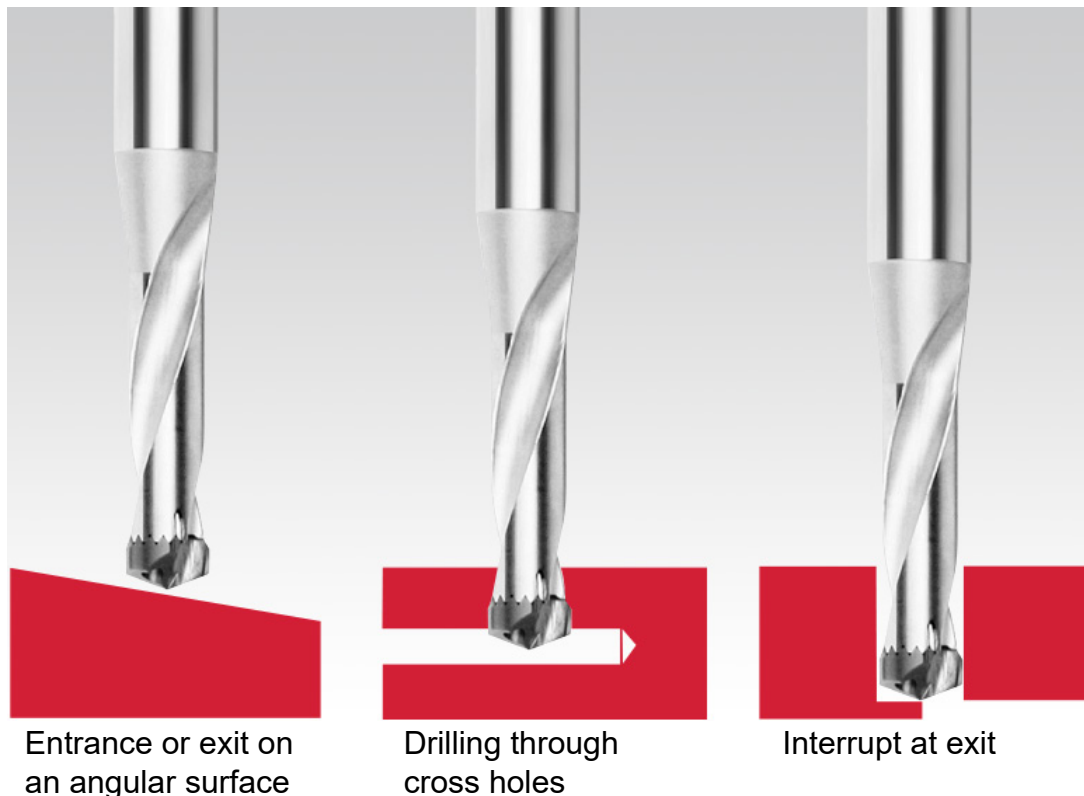
Always use tool holders and collets that provide good concentricity between the drill and the machine spindle. Use a positive stop to prevent the tool from backing up into the holder. Radial runout in the tool assembly must be accurately checked and maintained.

### WORKPIECE

A secure and rigid workpiece will minimise deflection, and allow for better accuracy and true position of the hole.

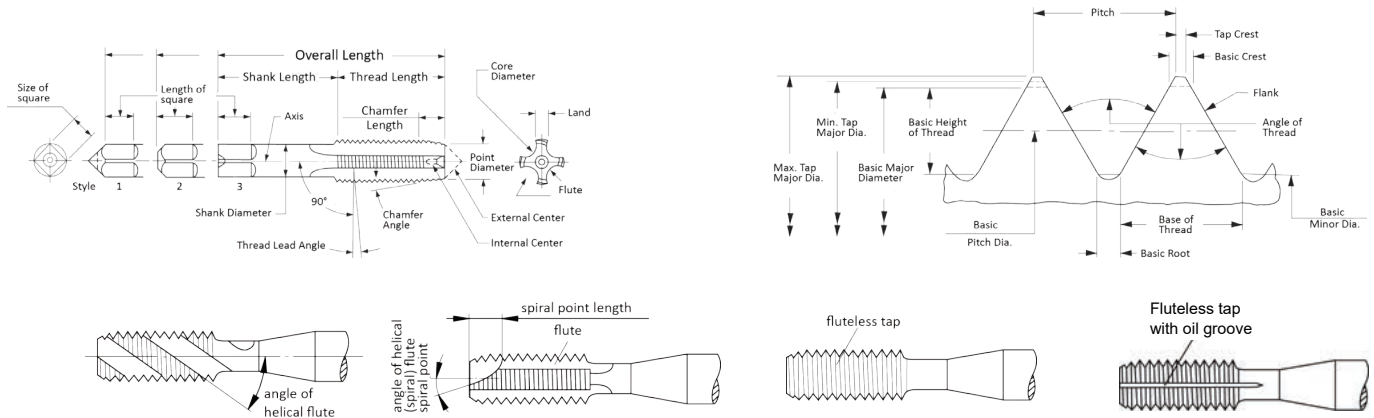
### FEEDS

It is important not to underfeed the drill which will cause it to dwell and dull. This is particularly true in work hardening materials. Feed rates should be high enough for proper chip formation.



In these drilling scenarios, reducing feed rate to 1/3 (33%) is generally recommended. Drilling into an entry angle of more than 10° is NOT recommended – surface should be milled flat first.

# Technical Section - Threading



**Allowance:** The minimum clearance or maximum interference which is intended between mating parts.

**Angle of Thread:** The angle included between the flanks of a thread measured in an axial plane.

**Back Taper:** A slight taper on the threaded portion of the tap making the pitch diameter near the shank smaller than that at the chamfer.

**Basic:** The theoretical or nominal standard size from which all variations are made.

**Chamfer:** The tapered and relieved cutting teeth at the front end of the threaded section. Common types of chamfer are taper, 8 to 10 pitches long, plug, 3 to 5 pitches and bottoming, 1 to 2 pitches.

**Crest:** The top surface joining the two sides or flanks of a thread.

**Cutting Face:** The leading side of the land.

**Flute:** The longitudinal channels formed on a tap to create cutting edges on the thread profile.

**Heel:** The following side of the land.

**Height of Thread:** In profile, distance between crest and bottom section of thread measured normal to the axis.

**Hook Face:** A concave cutting face of the land. This may be varied for different materials and conditions.

**Interrupted Thread:** Alternate teeth are removed in the thread helix on a tap; usually restricted to those having an odd number of flutes.

**Land:** One of the threaded sections between the flutes of a tap.

**Lead of Thread:** The distance a screw thread advances axially in one turn.

**Major Diameter:** The largest diameter of the screw or nut on a straight screw thread.

**Minor Diameter:** The smallest diameter of the screw or nut on a straight screw thread.

**Neck:** The reduced diameter, on some taps, between the threaded portion and the shank.

**Pitch:** The distance from a point on one thread to a corresponding point on the next thread, measured parallel to the axis.

**Pitch Diameter:** On a straight screw thread, the diameter of an imaginary cylinder where the width of the thread and the width of the space between threads is equal.

**Point Diameter:** The diameter at the leading end of the chamfered portion.

**Radial:** The straight face of a land, the plane of which passes through the axis of the tap.

**Rake:** The angle of the cutting face of the land in relation to an axial plane intersecting the cutting face at the major diameter.

**Relief:** The removal of metal behind the cutting edge to provide clearance between the part being threaded and a portion of the threaded land. Also, see back taper.

**CHAMFER RELIEF:** The gradual decrease in land height from cutting edge to heel on the chamfered portion of the tap land to provide radial clearance for the cutting edge.

**CON-ECCENTRIC RELIEF:** Radial relief in the thread form starting at the back of a concentric margin.

**ECCENTRIC THREAD RELIEF:** Radial relief in the thread form starting at the cutting edge and continuing to the heel.

**Root:** The bottom surface joining the flanks of two adjacent threads.

**Side or flank of thread:** The surface of the thread which connects the crest with the root.

**Shank:** The portion of the tap by which it is held and driven.

**Spiral Point:** An oblique cutting edge ground into the lands to provide a shear cutting action on the first few threads.

**Square:** The squared end of the tap shank.

**Thread:** The helical formed tooth of the tap which produces the thread in a tapped hole.

**Thread Lead Angle:** The angle made by the helix of the thread at the pitch diameter, with a plane perpendicular to the axis.

**Threads Per Inch:** The number of threads in one inch of length.

**Thread:**






**SINGLE:** A thread in which lead is equal to pitch.

**DOUBLE:** A thread in which lead is equal to twice the pitch.

**TRIPLE:** A thread in which lead is equal to triple the pitch.

# Technical Section - Threading

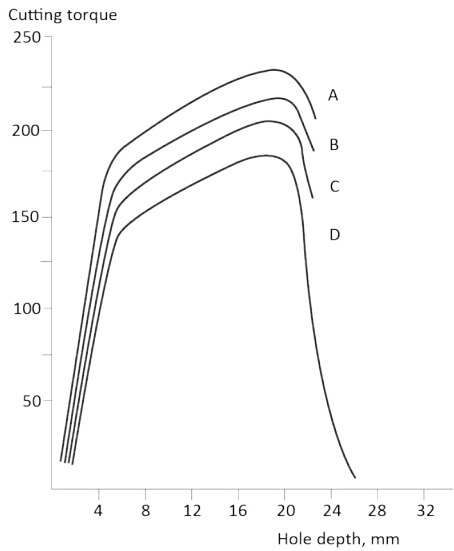
## TAP GEOMETRIES & APPLICATIONS

Description	Chips	Description	Chips
<p><b>Taps with straight flutes</b></p> <p>Straight flutes are the most commonly used type of tap. Suitable for use on most materials, mainly short chipping steel and cast iron, they form the basis of the program.</p>		<p><b>Taps with flutes only on the chamfer lead</b></p> <p>The cutting part of the tap is formed by gun nosing in the same manner as for a spiral point tap, the function being to drive the chips forward ahead of the cutting edges. This design is extremely rigid which facilitates good machining results. However, the short length of the gun nosing limits its application to a depth of hole less than about <math>1.5 \times \varnothing</math>.</p>	
<p><b>Taps with interrupted thread</b></p> <p>The interrupted thread ensures less friction and therefore less resistance, which is particularly important when threading material which is resilient and difficult to machine (e.g. aluminium, bronze). It is also easier for lubricant to penetrate to the cutting edges, thus helping to minimize the torque generated</p>		<p><b>Taps with spiral flutes</b></p> <p>Taps with spiral flutes are intended primarily for threading in blind holes. The helical flute transports the chips back away from the cutting edges and out of the hole, thus avoiding packing of chips in the flutes or at the bottom of the hole. In this way, danger of breaking the tap or damaging the thread is minimised.</p>	
<p><b>Spiral point taps</b></p> <p>The tap has a straight fairly shallow flute and is often referred to as a gun nose or spiral point tap. The gun nose or spiral point is designed to drive the chips forward. The relatively shallow flutes ensure that the sectional strength is maximised. They also act to allow lubricant to reach the cutting edges. This type of tap is recommended for threading through holes.</p>		<p><b>Cold forming taps</b></p> <p>Cold forming taps differ from cutting taps in that the thread is produced by plastic deformation of the component material rather than by the traditional cutting action. This means that no chips are produced by their action. The application range is materials with good formability. Tensile strength (Rm) should not exceed <math>1200 \text{ N/mm}^2</math> and the elongation factor (<math>A_5</math>) should not be less than 10%.</p> <p>Cold forming taps without flutes are suitable for normal machining and are especially suitable when vertically tapping blind holes. They are also available with through coolant.</p>	
<p><b>Nut taps</b></p> <p>These taps are generally used to thread nuts but can be used also on deep through holes. They have a shank diameter smaller than the nominal and a longer overall length, because their function is to accumulate nuts.</p> <p>They are used on special machines designed to thread huge amounts of nuts. They can work in steel and stainless steel.</p> <p>The first serial tap has a very long chamfer, in order to spread the cutting load on almost two thirds of the thread length.</p>		<p><b>Through coolant taps</b></p> <p>The performance of taps with through coolant holes is higher than the same taps used with external lubrication. These kinds of taps allow better evacuation of the chip, which is transported away from the cutting area itself. Wear on the cutting edge is reduced, since the cooling effect on the cutting zone is higher than the heat generation.</p> <p>Lubrication can be oil, emulsion or air pressurised with oil mist. Working pressure not less than 15 bar is required, but good results can be obtained with minimal lubrication.</p>	

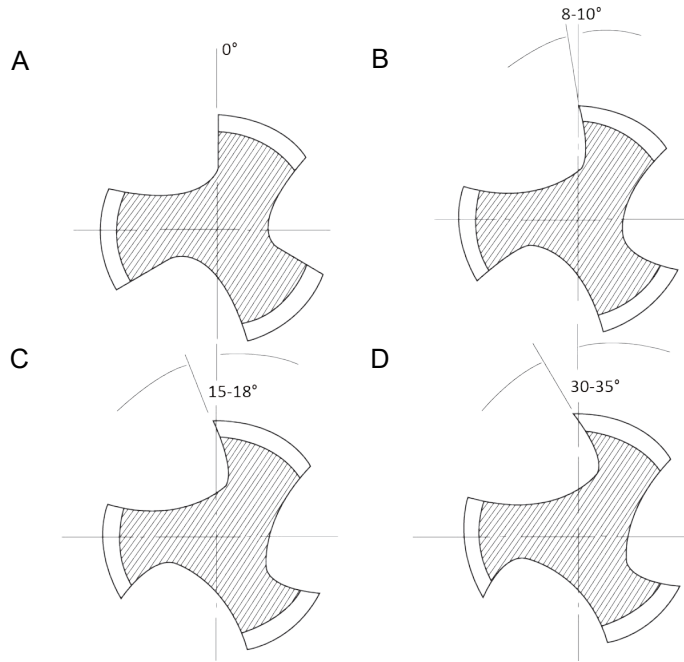
# Technical Section - Threading

## TAPPING TECHNICAL DATA

### Rake Angles

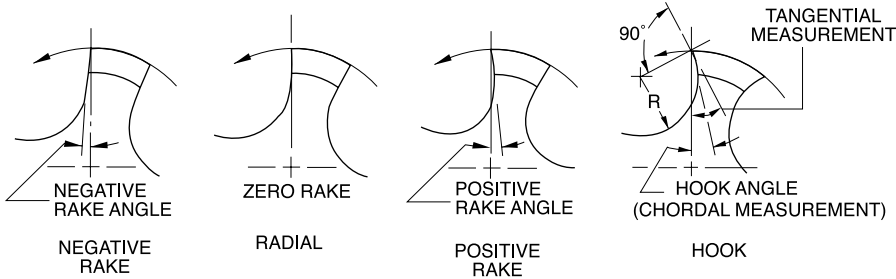


Threading tap M10 used with various rake angles in steel (low carbon steel)

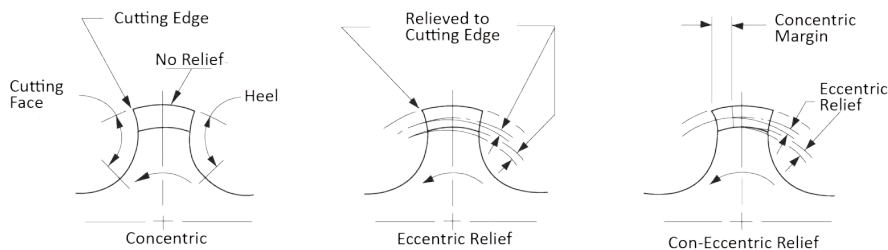


The rake angle has a primary influence on cutting forces and consequently the cutting torque and surface finish of the thread. Test results made with different rake angles are shown in the above diagram, illustrating how cutting torque

decreases with a larger rake angle. There is, however, a limit. A large rake angle means lower strength of the cutting edge.



### Relief Angles

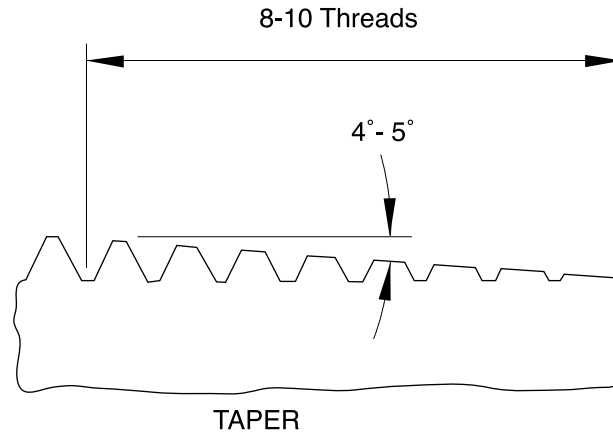
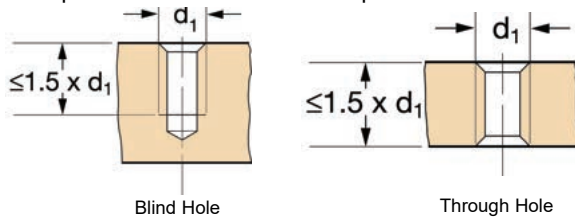


# Technical Section - Threading

## CUTTING CHAMFERS

The cutting part of a tap is the teeth of the chamfer on the leading end of the tap. The rest of the thread length is the cylindrical guiding part, which is slightly back-tapered for clearance. A decision on the best type of chamfer form has to be carefully made as both the tap life and quality of thread are greatly affected.

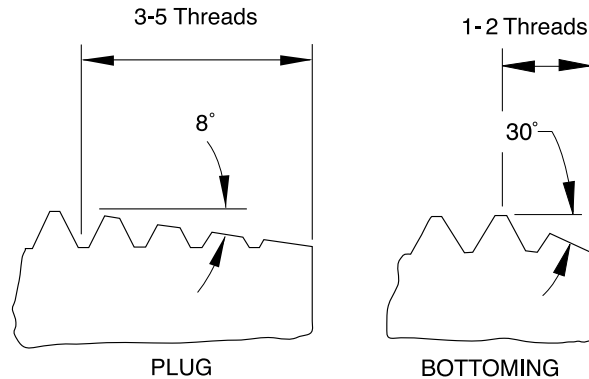
Generally, the form and length of chamfer depend on the type of hole to be tapped. Though holes do not normally cause difficulties whereas the tapping of blind holes can create certain problems associated with chip evacuation.



The length of the chamfer is determined by careful consideration of the following factors:

- The number of chamfer cutting teeth cannot be kept too low so as to avoid overloading, premature dulling and oversized or rough threads.
- A chamfer lead that is too long, however, increases the torque and the danger of breakage.

Commonly used chamfers are taper, plug and bottoming. Eight to ten cutting teeth per land are produced by a taper chamfer. A plug chamfer produces three to five cutting teeth per land and a bottoming chamfer one to two cutting teeth per land. The recommended radial relief behind the cutting edge of the chamfer portion is .004" to .005" relief per 1/16 of land width.



### Tapping Speeds

Correct tapping speeds are very important in obtaining efficient tapping results. There are many factors which affect tapping speeds, some of which are listed below:

#### Material Factors:

- Thermo-conductivity of the material and wall thickness as it affects heat dispersion.
- Variations in carbon content of steel.
- Hard spots in material.
- Depth of hole to be tapped.
- Percentage of full thread to be tapped.

#### Tap Factors:

- Major diameters, pitch and lead.
- Style of tap.
- Width of lands.
- Amount of hook or rake.
- Length of chamfer. Bottoming taps normally require slower speeds than plug chamfered taps

### Mechanical Factors:

- Type of tapping machine and holder; Speeds for small diameter taps are often governed by the limitation of the machine.
- Condition of tapping machine and spindle.
- Type of fixture.
- Vertical or horizontal tapping (faster speeds for vertical tapping).
- Method of feeding the tap.
- Cutting fluid used and method of application.

The optimum speed for tapping is the highest speed that conditions permit, consistent with economic tool life.

Proper tapping speeds are determined best by experiment. In the table below the speeds shown should be used as a guide only, and the suggested surface feet per minute adjusted upward or downward until the best results are obtained.

$$\text{RPM} = \frac{3.82 \times \text{SFM}}{D}$$










$$\text{SFM} = .26 \times \text{RPM} \times D$$



# Technical Section - Threading

## CHAMFER LENGTHS AND SERIAL TAPS

The first group (No. 1, No. 2, No. 3) includes taps with complete thread profile and the difference is in the chamfer length. The second group (No. 4, No. 5) includes taps with incomplete thread profile. They have lower pitch and outer diameter, compared to the complete standard, and longer chamfer. After using them, a finishing tap No. 3, must be used.

No. 1 =		6-8 x P	
No. 2 =		4-6 x P	
No. 3 =		2-3 x P	
No. 4 =		6-8 x P	
No. 5 =		3,5-5 x P	
			
	$\varnothing \leq M10$		$\varnothing \geq M12$

<b>ISO</b>	<b>Set code number</b>	<b>Including tap number</b>
	No. 6	No. 1 + No. 2 + No. 3
	No. 7	No. 2 + No. 3
	No. 8	No. 4 + No. 5 + No. 3
	No. 9	No. 5 + No. 3
<b>DIN</b>	<b>Set code number</b>	<b>Including tap number</b>
	No. 8	No.3 (form C) + No.4 (form A) + No.5 (form B)
	No. 9	No.3 (form C) + No.5 (form B)
<b>ANSI</b>	<b>Set code number</b>	<b>Including tap number</b>
	Hand Tap (No. 6)	Taper(No.1) + Plug(No.2) + Bottoming(No.3)

# Technical Section - Threading

## TAPPING TECHNICAL DATA

### The Relationship Between H-Limit and Class of Fit

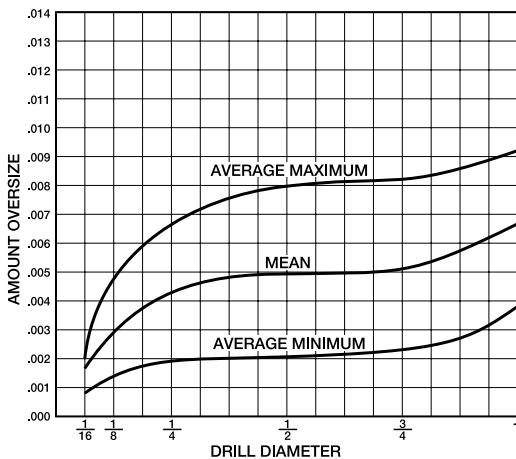
H-limits are used to properly size a tap for the threaded hole to be produced. They are selected based upon the tolerance required for the part. These tolerances are defined by the symbols class 1B, 2B, or 3B. Class 1B has the broadest tolerance and is generally applied to DIY (Do It Yourself) type nuts and bolts. Class 2B is the most common and is used for general fasteners and threaded parts. Class 3B is the tightest tolerance and used for close fit and high strength fastening applications, primarily in the automotive and aerospace industry.

Once the class of thread and part tolerance has been defined, an H-limit is selected to produce a thread that is within the minimum and maximum limits for that class of fit. These limits are the same as the Go and No Go thread plug gage dimensions. The goal is to select a tap with an H-limit that is near the middle of the part tolerance. For instance, if the total tolerance was .005", the tap should be approximately .0025" larger than the minimum limit of the part and .0025" smaller than the maximum. However, to handle the widest variety of tapping conditions, the "40% rule" is commonly used. Using this rule, the tap is placed at 40% of the part tolerance. For example, if the part tolerance is .005", multiplying .005" by 0.40 equals .002". Thus, the tap would be .002" larger than the minimum limit of the part or Go thread gage.

With the position of the tap in relationship to the part tolerance established, the selection of an H-limit number, such as H3, H4, H5, etc. is possible. H-limits are a sequence of size "steps" in .0005" increments beginning at the minimum size limit of the part, starting with H1. In other words, an H1 limit is one .0005" increment larger than the minimum limit of Go gage, an H2 is two .0005" increments (or .001) larger than the minimum limit, an H3 is three .0005" increments (or .0015") and so on. In the example above, a tap that is .002" larger than minimum limit, is four .0005" increments larger, or an H4. This would be the tap H-limit recommendation for this tolerance.

If after selecting the proper H-limit, an oversize or undersized thread exists, or if shrinkage due to heat treating or plating will occur, larger or smaller H-limits may be required to adjust to the condition.

### Probable Oversize Values For Drilled Holes



Drills will normally cut a hole larger in diameter than the drill itself. The amount depends upon the rigidity of the equipment, stiffness of the drill, accuracy of the point, the material being drilled, and many other contributing factors. However, averaging all factors, the chart below shows what might be expected with standard drills without guide bushings in steel or cast iron using good drilling practices and reasonable care in the resharpening of the drills.

Drills as received from our factory will usually drill hole sizes between the minimum and mean lines. Reconditioned drills, however, may produce hole sizes between the minimum and maximum lines depending upon drill wear, margin pick-up, and accuracy of resharpening.

#### PROBABLE OVERSIZE DIAMETERS IN DRILLING

Drill Dia., Inch	Amount Oversize, Inch		
	Average Max	Mean	Average Min.
1/16	.002	.0015	.001
1/8	.0045	.003	.001
1/4	.0065	.004	.002

Drill Dia., Inch	Amount Oversize, Inch		
	Average Max	Mean	Average Min.
1/2	.008	.005	.002
3/4	.008	.005	.003
1	.004	.009	.007

# Technical Section - Threading

## PITCH DIAMETER LIMITS

### Fractional and Machine Screw

All standard Ground Thread Taps will be marked with the letter G to designate Ground Thread. The letter G will be followed by the letter H to designate above basic (L below basic) and a numeral to designate the pitch diameter limits.

Example: G H3 indicates a Ground Thread Tap with pitch diameter limits .0010 to .0015 over basic

Pitch diameter limits for Taps to 1" diameter inclusive:

- L1 = Basic to Basic minus .0005
- H1 = Basic to Basic plus .0005
- H2 = Basic plus .0005 to Basic plus .0010
- H3 = Basic plus .0010 to Basic plus .0015
- H4 = Basic plus .0015 to Basic plus .0020
- H5 = Basic plus .0020 to Basic plus .0025
- H6 = Basic plus .0025 to Basic plus .0030

### Metric I.S.O

Where the tap pitch diameter is over or under basic thread pitch diameter by even multiples of .00052", the tap will be marked with the letter "D" or "DU" respectively, followed by a limit number. The limit number is determined as follows:

D Limit No. = Amt. Tap PD High Limit Is Over Basic PD  
.00052"

DU Limit No. = Amt. Tap PD Low Limit Is Under Basic PD  
.00052"

Examples:

M1.6 x .035 - for D3 limit, max. tap PD = basic plus .0015"  
Tap PD tolerance = minus .0006"

### Specials

Special taps are to be marked with the nominal diameter and number of threads per inch and form of thread as specified by the purchaser on his order or blue print provided such specifications are reasonably correct.

Special Ground Thread taps made to the pitch diameter limits shown will also be marked with the corresponding limit number.

When taps are specified to be a certain amount oversize or undersized, it is standard practice to add or subtract this amount from the basic pitch diameter of the nominal size tap. This dimension then becomes the new minimum pitch diameter for the special tap to which Standard Tolerance for the nominal size is added.

Pitch Diameter limits for Taps over 1" diameter to 1-1/2" diameter inclusive:

H4 = Basic plus .0010 to Basic plus .0020

Pitch Diameter limit numbers for taps not shown above or those over 1-1/2" diameter.

For taps with H or L limit numbers not shown above or over 1-1/2" diameter for example H12 or L10, the H or L limit number divided by 2 indicates in thousandths of an inch the amount the maximum tap pitch diameter is over basic in the H series or the amount the minimum tap pitch diameter is under basic on the L series.

M12 x 1.75-for D6 limit, max. tap PD = basic plus .0030"  
Tap PD tolerance = minus .0012"

M39 x 4-for D10 limit, max. tap PD = basic plus .0050"  
Tap PD tolerance = minus .0020"

M6 x 1-for DU 4 limit, min. tap PD = basic minus .0020"  
Tap PD tolerance = plus .0010"

Metric taps will be marked with a capital M followed by the nominal size in millimeters and the pitch in millimeters separated by the sign "x." For example, M1.6 x 0.35; M6 x 1; M10 x 1.5.

Undersize or oversize taps will be marked with the nominal size and pitch, followed by the amount the minimum pitch diameter is over or under basic. For example, 1/2-13+.010".

Whenever possible, in the case of oversize, undersize, or other special taps, orders should specify the minimum and maximum tap pitch diameter desired.

Left hand taps will be marked "Left Hand" or "LH."

# Technical Section - Threading

The limits and tolerances of external threads for unified screws are designated by the letter "A", which results in class 1A, class 2A, and class 3A screws. The nut (internal thread) limits and tolerances are designated by the letter "B" resulting in class 1B, class 2B, and class 3B.

**Tolerances:** The tolerance of the tapped hole in the unified series is always 1.3 times the tolerance of the screw for the same class of fit. In the American National Standard, pitch diameter tolerances on both the nut and the screw were equal with the nut above basic and the screw below basic.

**Class 1A and 1B:** This class of fit is intended to cover the manufacture of threaded parts where quick and easy assembly is necessary or desired and an allowance is provided to permit ready assembly.

**Class 2A and 2B:** This class of fit is intended to cover screws, bolts and nuts, but it is also suitable for a variety of other applications. An allowance is provided to minimize galling and seizure in assembling and use. It will also accommodate limited amount of plating, coating or finish.

**Class 3A and 3B:** This class of fit is provided for those applications where closeness of fit, accuracy of lead and angle of thread is important. No allowance is provided and these threads are obtained consistently only by use of high quality production equipment and checked by a very efficient system of gaging and inspection.

Unified and American standard threads have substantially the same thread form. Threads of both standards are mechanically interchangeable. The main difference between the two standards are: Variation of tolerance with size, differences in amounts of pitch diameter tolerance for external and internal threads, and differences in thread designations.

**Caution:** Select the proper percent of thread for the material to be tapped.

**Remember:** As the drilled hole becomes smaller the amount of chips to be removed becomes so great that the friction generated may require as much power as does the actual cutting.

## Technical Section - Threading

**TABLE OVER TAP TOLERANCE VS TOLERANCE ON INTERNAL THREAD (NUT)**

Tolerance class, Tap			Tolerance, Internal thread (Nut)					Application
ISO	DIN	ANSI BS						
ISO 1	4 H	3 B	4 H	5 H				Fit without allowance
ISO 2	6 H	2 B	4 G	5 G	6 H			Normal fit
ISO 3	6 G	1 B			6 G	7 H	8 H	Fit with large allowance
-	7 G	-				7 G	8 G	Loose fit for following treatment or coating

Thread tolerances for taps are collected in standard reference DIN 13.

Normal tolerance is ISO 2 (6H) on taps, which generates an average quality fit between screw and nut. Lower tolerance (ISO 1) generates a fine fit without a gap on the flanks between screw and nut. Higher tolerance (ISO 3) generates a rough fit, with large gap. It is used in the case of a nut which will later be coated or if a loose fit is preferred.

Between tolerances 6H (ISO2) and 6G (ISO3), as well as between 6G and 7G, the tap manufacturer produces taps with tolerance 6HX and 6GX. "X" means the tolerance is outside standard and it is used for taps working high strength material or abrasive material such as cast iron. These materials do not cause oversize problems, so higher tolerance can be used in order to increase tool life. The width of the tolerance is equal between, for example, 6H and 6HX.

Forming taps are usually produced with a 6HX or 6GX tolerance.

The tolerance icon for BSW and BSF is medium. This refers to BS 84 "medium fit".

Pipe threads with the tolerance icon "Normal" refer to the following standards:

- G threads to ISO 228-1. One class for internal thread (tap), and class A and B for external thread (die).
- R, Rc and R threads to ISO 7-1.
- NPT and NPSM to ANSI B1.20.1.
- NPTF and NPSF to ANSI B1.20.3.
- PG to DIN 40 430.

# Technical Section - Threading

## SELF-LOCKING THREAD FORM

### Concept

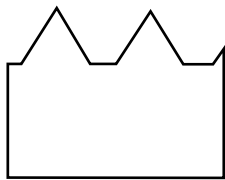
**Designed to produce threads for self-locking operations and put a lock on fastener costs.**

This is not to be confused as just another range of taps for a specific application. It is a thread form. Utilizing the latest generation CNC equipment this thread form can be produced on straight flute, spiral flute, spiral point, roll form and even the range of Applix high performance taps.

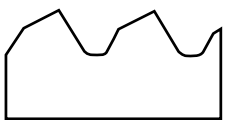
Although this is a made-to-order program, quantities of up to 48 pieces of any style would be delivered in no greater than 10 working days.

The relatively small quantities being produced and the additional thread grinding required does mean that taps featuring this thread form can be marginally more expensive than conventionally ground taps. Depending on the size, quantity, and/or the type of tool being compared, the additional cost will vary. However, before making a pure price decision we recommend a review of the added benefits of the concepts featured in this catalog and how they help in offsetting costs in other areas.

### Self-Locking Threads and How They Work



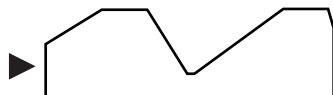
Standard Thread Form



Self-Locking Thread Form

Taps ground to the adjacent self-locking thread form produce a highly efficient female thread form with a 30° inclined wedge that provides optimum locking contact with the crests of the male threads of a standard bolt or screw. The thread form produced is ideal for a wide variety of applications where vibration resistance is a must. Clamping forces are evenly distributed along the entire length of thread engagement providing a capability to resist the forces created by vibration that can loosen ordinary threaded fasteners. The end result is a standard male fastener locked firmly in place without having to resort to the use of costly adhesives, locking devices or inserts.

On the smaller diameters, <8-32 but including 8-36, because of their size, the taps are ground with a modified ramp form.



### Key Features and Benefits

#### Improves Holding Power

A 30° wedge lock on the female thread creates a continuous spiral contact along the entire thread length for improved holding power versus standard thread forms.

#### Clamp Load More Evenly Distributed

Clamp load forces are spread evenly across all threads versus conventional 60° thread forms that

put the clamping force on the first few threads only with the other threads receiving limited or no contact at all.

#### Reduces Fastener Costs

Utilizing this thread form converts standard male fasteners into highly efficient self-locking ones and may eliminate the necessity for costly locking fasteners, chemical bonds, nylon plugs or other devices to maintain tightness.

#### Faster Assembly Operations

The larger tap drill size creates greater clearance with the male fastener than conventionally produced threads. In assembling fasteners produced with this thread form it is clearly noticeable that the fasteners turn more freely irrespective of whether by hand or utilizing assembly machinery. Assembly costs are lower and assembly related rejects are additionally reduced.

#### Holding Power that Lasts and Lasts

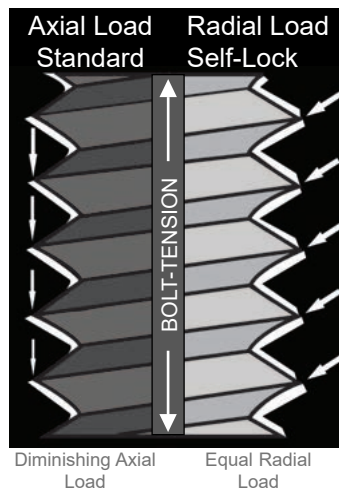
There is no loss of locking power in those applications requiring frequent loosening and tightening of the male fastener. This eliminates time intensive disassembly and assembly procedures. Conventional locking fasteners would be either destroyed or their locking power severely diminished.

#### Threading Solution for Soft Materials

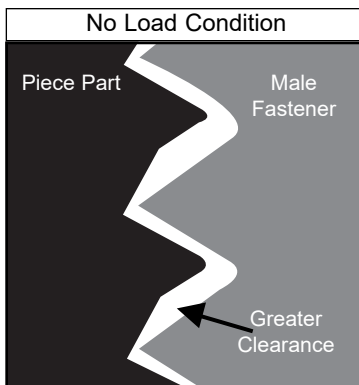
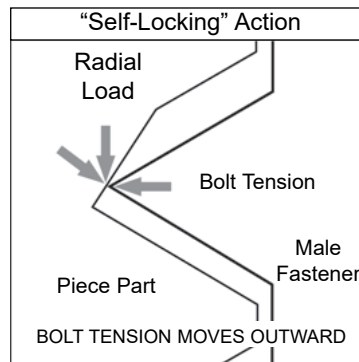
The optimum load distribution provided by this thread form eliminates thread stripping that is typical with thread forms that concentrate clamping load on fewer threads. Ideal for aluminum and other lightweight, soft materials in applications where stripping is frequent.

#### Environmentally Friendly

Because the threads produced permit the male fastener to be locked in place by simply tightening, there is no necessity for bonding materials or chemical agents which eliminates the need for using potentially environmentally harmful products plus saving valuable time and cost.



Diminishing Axial Load Equal Radial Load



# Technical Section - Threading

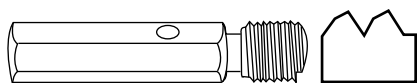
## SELF-LOCKING THREAD FORM

### Gaging for Self-Locking Threads

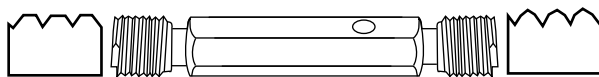
An essential element in high quality thread production is an accurate gaging capability. To facilitate the latter Precision offers a complete gaging system for self-locking threads, which consists of the following:

#### LARGER DIAMETERS

Go-Pitch Diameter and Ramp Gage

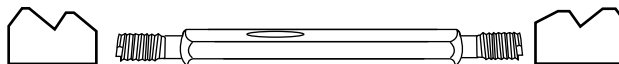


Hi-Pitch Diameter and Ramp Gage



#### SMALLER DIAMETERS

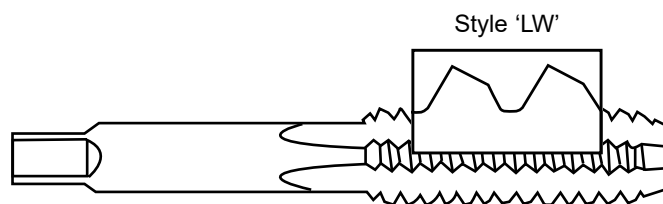
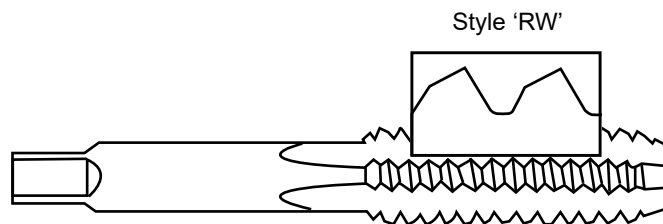
Go-Pitch Diameter and Ramp Gage Hi-Limit Gage



Precision certifies all new gages for self-locking threads to insure their functional accuracy. A certificate of compliance can be provided for a nominal charge. It is highly recommended that they be returned on a periodic basis for recertification.

When placing your inquiry for a self-locking tap, simply advise the type of gage(s) you require and one consistent with whatever size is ordered will be quoted and supplied.

### How to Order



Unless otherwise specified, the taps will be provided featuring a ramp angle in the direction detailed and referred to as style "RW."

When tapping is to be effected from the opposite end of a through hole, the style "LW" must be special ordered. This style features the ramp angle in the opposite direction as detailed, and is generally used in the production of nuts.

There is no requirement to specify an H or D limit. Basically, one size fits all because contact is not made on the thread flanks but on the wedge ramp.

To place an order call or fax Customer Service at:  
TEL: 1-800-877-3745 • FAX: 1-815-459-2804

Simply identify the following:

- The List No. or description of the standard tap.
- The size, number of flutes and chamfer requirements.
- The ramp style (RW or LW).

Should a gage be required, simply indicate the type when placing the order.

# Technical Section - Threading

## TAP DRILL SIZES FOR UNIVERSAL AND M-PROFILE SCREW THREADS

Tap Size	Tap Drill Size	Decimal Equiv. of Tap Drill (inches)	Theoretical Percent of Thread	Probable Mean Oversize (inches)	Probable Hole Size (inches)	Probable % of Thread (inches)	Tap Size	Tap Drill Size	Decimal Equiv. of Tap Drill (inches)	Theoretical Percent of Thread	Probable Mean Oversize (inches)	Probable Hole Size (inches)	Probable % of Thread (inches)
0-80	56	.0465	83	.0015	.0480	74	8-36	29	.1360	78	.0029	.1389	70
—	3/64	.0469	81	.0015	.0484	71	—	3.5mm	.1378	72	.0029	.1407	65
—	1.20mm	.0472	79	.0015	.0487	69	10-24	27	.1440	85	.0032	.1472	79
—	1.25mm	.0492	67	.0015	.0507	57	—	3.70mm	.1457	82	.0032	.1489	76
1-64	54	.0550	89	.0015	.0565	81	—	26	.1470	79	.0032	.1502	74
—	1.45mm	.0571	78	.0015	.0586	71	—	25	.1495	75	.0032	.1527	69
—	53	.0595	67	.0015	.0610	59	—	24	.1520	70	.0032	.1552	64
1-72	1.5mm	.0591	77	.0015	.0606	68	10-32	5/32	.1563	83	.0032	.1595	75
—	53	.0595	75	.0015	.0610	67	—	22	.1570	81	.0032	.1602	73
—	1.55mm	.0610	67	.0015	.0606	68	—	21	.1590	76	.0032	.1622	68
2-56	51	.0670	82	.0017	.0687	74	12-24	11/64	.1719	82	.0035	.1754	75
—	1.75mm	.0689	73	.0017	.0706	66	—	17	.1730	79	.0035	.1765	73
—	50	.0700	69	.0017	.0717	62	—	16	.1770	72	.0035	.1805	66
—	1.80mm	.0709	65	.0017	.0726	58	12-28	16	.1770	84	.0035	.1805	77
2-64	50	.0700	79	.0017	.0717	70	—	15	.1800	78	.0035	.1835	70
—	1.80mm	.0709	74	.0017	.0726	66	—	4.60mm	.1811	75	.0035	.1846	67
—	49	.0730	64	.0017	.0747	56	—	14	.1820	73	.0035	.1855	66
3-48	48	.0760	85	.0019	.0779	78	1/4-20	9	.1960	83	.0038	.1998	77
—	5/64	.0781	77	.0019	.0800	70	—	8	.1990	79	.0038	.2028	73
—	47	.0785	76	.0019	.0804	69	—	7	.2010	75	.0038	.2048	70
—	2.00mm	.0787	75	.0019	.0806	68	—	13/64	.2031	72	.0038	.2069	66
—	46	.0810	67	.0019	.0829	60	1/4-28	5.40mm	.2126	81	.0038	.2164	72
—	45	.0820	63	.0019	.0839	56	—	3	.2130	80	.0038	.2168	72
3-56	46	.0810	78	.0019	.0829	69	5/16-18	F	.2570	77	.0038	.2608	72
—	45	.0820	73	.0019	.0839	65	—	6.60mm	.2598	73	.0038	.2636	68
—	2.10mm	.0827	70	.0019	.0846	62	—	G	.2610	71	.0041	.2651	66
—	2.15mm	.0846	62	.0019	.0865	54	5/16-24	H	.2660	86	.0041	.2701	78
4-40	44	.0860	80	.0020	.0880	74	—	6.80mm	.2677	83	.0041	.2718	75
—	2.20mm	.0866	78	.0020	.0886	72	—	I	.2720	75	.0041	.2761	67
—	43	.0890	71	.0020	.0910	65	3/8-16	7.80mm	.3071	84	.0044	.3115	78
—	2.30mm	.0906	66	.0020	.0926	60	—	7.90mm	.3110	79	.0044	.3154	73
4-48	2.35mm	.0925	72	.0020	.0926	72	—	5/16	.3125	77	.0044	.3169	72
—	42	.0935	68	.0020	.0955	61	—	O	.3160	73	.0044	.3204	68
—	3/32	.0938	68	.0020	.0958	60	3/8-24	21/64	.3281	87	.0044	.3325	79
—	2.40mm	.0945	65	.0020	.0965	57	—	8.40mm	.3307	82	.0044	.3351	74
5-40	40	.0980	83	.0023	.1003	76	—	Q	.3320	79	.0044	.3364	71
—	39	.0995	79	.0023	.1018	71	—	8.50mm	.3346	75	.0044	.3390	67
—	38	.1015	72	.0023	.1038	65	7/16-14	T	.3580	86	.0046	.3626	81
—	2.60mm	.1024	70	.0023	.1047	63	—	23/64	.3594	84	.0046	.3640	79
5-44	38	.1015	79	.0023	.1038	72	—	9.20mm	.3622	81	.0046	.3668	76
—	2.60mm	.1024	77	.0023	.1047	69	—	9.30mm	.3661	77	.0046	.3707	72
—	37	.1040	71	.0023	.1063	63	—	U	.3680	75	.0046	.3726	70
6-32	37	.1040	84	.0023	.1063	78	—	9.40mm	.3701	73	.0046	.3747	68
—	36	.1065	78	.0023	.1088	72	7/16-20	W	.3860	79	.0046	.3906	72
—	7/64	.1094	70	.0026	.1120	64	—	25/64	.3906	72	.0046	.3952	65
—	35	.1100	69	.0026	.1126	63	1/2-13	10.50mm	.4134	87	.0047	.4181	82
—	34	.1100	67	.0026	.1136	60	—	27/64	.4219	78	.0047	.4266	73
6-40	34	.1110	83	.0026	.1136	75	1/2-20	29/64	.4531	72	.0047	.4578	65
—	33	.1130	77	.0026	.1156	69							
—	2.90mm	.1142	73	.0026	.1168	65							
—	32	.1160	68	.0026	.1186	60							
8-32	3.40mm	.1339	74	.0029	.1368	67							
—	29	.1360	69	.0029	.1389	62							

## TAP DRILL SIZES FOR METRIC M-PROFILE SCREW THREADS

Metric of Tap	Tap Drill	Decimal Equiv. of Tap Drill	Theoretical Percent of Thread	Probable Mean Oversize	Probable Hole Size	Probable Percent Thread	Metric of Tap	Tap Drill	Decimal Equiv. of Tap Drill	Theoretical Percent of Thread	Probable Mean Oversize	Probable Hole Size	Probable Percent Thread
M1.6 x 0.35	1.20mm	.0472	88	.0014	.0486	80	M5 x 0.8	4.2mm	.1654	77	.0032	.1686	69
—	1.25mm	.0492	77	.0014	.0506	69	—	19	.1660	75	.0032	.1692	68
M2 x 0.4	1/16	.0625	79	.0015	.0640	72	M6 x 1	10	.1935	84	.0038	.1973	76
—	1.60mm	.0630	77	.0017	.0647	69	—	9	.1960	79	.0038	.1998	71
—	52	.0635	74	.0017	.0652	66	—	5mm	.1969	77	.0038	.2006	70
M2.5 x 0.45	2.05mm	.0807	77	.0019	.0826	69	—	8	.1990	73	.0038	.2028	65
—	46	.0810	76	.0019	.0829	67	M7 x 1	A	.2340	81	.0038	.2378	74
—	45	.0820	71	.0019	.0839	63	—	6mm	.2362	77	.0038	.2400	70
M3 x 0.5	40	.0980	79	.0023	.1003	70	—	B	.2380	74	.0038	.2418	66
—	2.5mm	.0984	77	.0023	.1007	68	M8 x 1.25	6.7mm	.2638	80	.0041	.2679	74
—	39	.0995	73	.0023	.1018	64	—	17/64	.2656	77	.0041	.2697	71
M3.5 x 0.6	33	.1130	81	.0026	.1156	72	—	H	.2660	77	.0041	.2701	70
—	2.9mm	.1142	77	.0026	.1168	68	—	6.8mm	.2677	74	.0041	.2718	68
—	32	.1160	71	.0026	.1186	63	M10 x 1.5	8.4mm	.3307	82	.0044	.3364	.3351
M4 x 0.7	3.2mm	.1260	88	.0029	.1289	80	—	Q	.3320	80	.0044	.3364	75
—	30	.1285	81	.0029	.1314	73	—	8.5mm	.3346	77	.0044	.3390	71
—	3.3mm	.1299	77	.0029	.1328	69	M12 x 1.5	10.4mm	.4094	81	.0047	.4147	.4141
M4.5 x 0.75	3.7mm	.1457	82	.0032	.1489	74	—	Z	.4130	77	.0047	.4177	71
—	26	.1470	79	.0032	.1502	70	M12 x 1.75	10.20mm	.4016	79	.0047	.4047	.4063
—	25	.1495	72	.0032	.1527	64	—	Y	.4040	76	.0047	.4087	71
							—	13/32	.4062	74	.0047	.4109	69

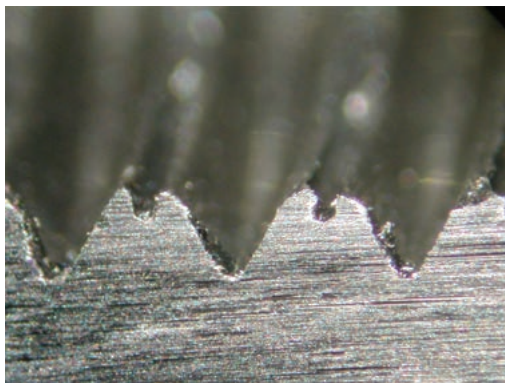
**Note:** "Probable Hole Size" columns listed above apply to HSS/HSCo Drills ONLY. When using Solid Carbide Drills as Tap-Drills you must ADD the average Oversize amount per diameter to the size listed in these "Probable Hole Size" columns.



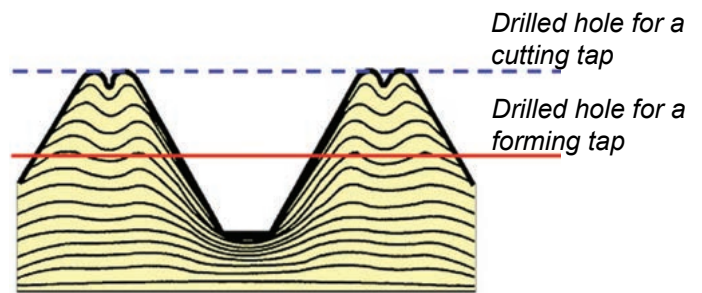
# Technical Section - Threading

## FLOW OF MATERIAL WHEN FORMING A THREAD

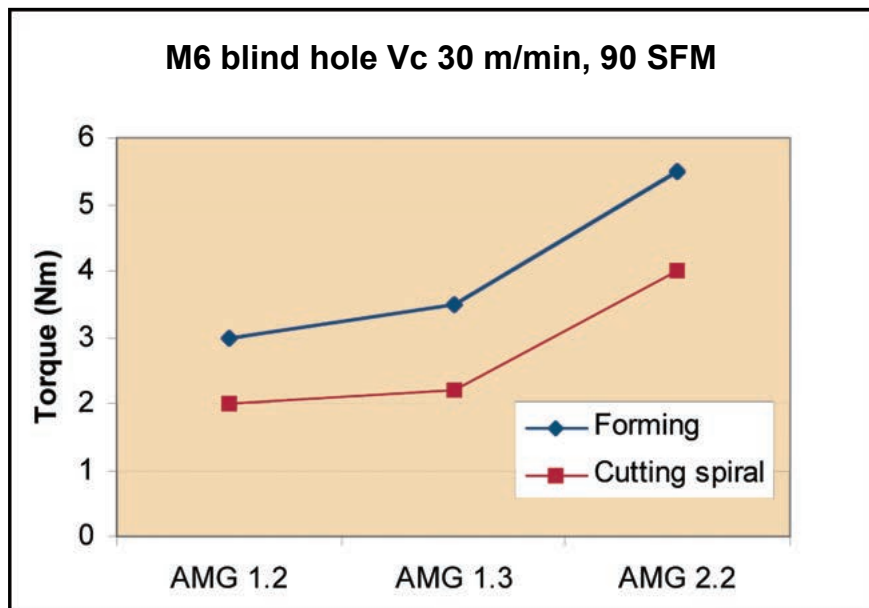
The tapping hole size depends upon the material being drilled, the cutting conditions selected and the condition of the equipment being used. If material is pushed up at the thread entry by the tap and/or the life of the tap is too short, select a slightly larger drill diameter. If on the other hand the profile of the thread formed is insufficient, then select a slightly smaller drill diameter.



Section of thread obtained by forming tap on steel C45



Cold forming taps require more power on the spindle, compared to a cutting tap of the same size, since it generates higher torque.



Torque comparison between forming and cutting taps in different material groups.

# Technical Section - Threading

**Note:** Recommended thread percentage for various (Inch standard) tap sizes is shown in the “60% Thread” columns below. This is also the average percentage that is desirable for metric sizes. Use the “Probable Percent of Thread” column in the “Metric Sizes” tables below.

## TAP DRILL SIZES FOR FORMING TAPS

### Machine Screw Sizes

Tap Size	75% Thread		70% Thread		65% Thread		60% Thread		55% Thread		50% Thread	
	Theor. Hole Size	Nearest Drill Size	Theor. Hole Size	Nearest Drill Size	Theor. Hole Size	Nearest Drill Size	Theor. Hole Size	Nearest Drill Size	Theor. Hole Size	Nearest Drill Size	Theor. Hole Size	Nearest Drill Size
0-80	0.0536	1.35mm	0.0540	1.35mm	0.0545	—	0.0549	54	0.0554	54	0.0558	1.0mm
1-64	0.0650	1.65mm	0.0655	1.65mm	0.0661	—	0.0666	—	0.0672	51	0.0677	51
1-72	0.0659	1.65mm	0.0663	—	0.0669	1.7mm	0.0673	51	0.0679	51	0.0683	—
2-56	0.0769	1.95mm	0.0774	1.95mm	0.0781	23498	0.0787	47	0.0794	2.0mm	0.0799	—
2-64	0.0780	5/64	0.0785	47	0.0791	2.0mm	0.0796	2.0mm	0.0802	—	0.0807	2.05mm
3-48	0.0884	2.25mm	0.0890	43	0.0898	43	0.0905	2.3mm	0.0913	2.3mm	0.0919	—
3-56	0.0899	43	0.0904	—	0.0911	2.3mm	0.0917	2.3mm	0.0924	2.35mm	0.0929	2.35mm
4-40	0.0993	2.5mm	0.1000	39	0.1010	39	0.1018	38	0.1028	2.6mm	0.1035	2.6mm
4-48	0.1014	38	0.1020	38	0.1028	2.6mm	0.1035	2.6mm	0.1043	37	0.1049	37
5-40	0.1123	34	0.1130	33	0.1140	33	0.1148	2.9mm	0.1158	32	0.1165	32
5-44	0.1134	33	0.1141	2.9mm	0.1150	2.9mm	0.1157	—	0.1166	32	0.1173	32
6-32	0.1221	3.1mm	0.1230	3.1mm	0.1243	—	0.1252	40916	0.1264	3.2mm	0.1274	—
6-40	0.1253	1/8	0.1260	3.2mm	0.1270	3.2mm	0.1278	3.25mm	0.1288	30	0.1295	30
8-32	0.1481	3.75mm	0.1490	—	0.1503	25	0.1512	3.8mm	0.1524	24	0.1534	3.9mm
8-36	0.1498	25	0.1507	3.8mm	0.1518	24	0.1526	24	0.1537	3.9mm	0.1546	23
10-24	0.1688	—	0.1700	18	0.1717	23682	0.1729	23682	0.1746	—	0.1758	—
10-32	0.1741	17	0.1750	—	0.1763	—	0.1772	16	0.1784	4.5mm	0.1794	—
12-24	0.1948	10	0.1960	9	0.1977	5.0mm	0.1989	8	0.2006	5.1mm	0.2018	7
12-28	0.1978	5.0mm	0.1989	8	0.2003	8	0.2014	7	0.2028	—	0.2039	13/64

### Fractional Sizes

Tap Size	75% Thread		70% Thread		65% Thread		60% Thread		55% Thread		50% Thread	
	Theor. Hole Size	Nearest Drill Size	Theor. Hole Size	Nearest Drill Size	Theor. Hole Size	Nearest Drill Size	Theor. Hole Size	Nearest Drill Size	Theor. Hole Size	Nearest Drill Size	Theor. Hole Size	Nearest Drill Size
1/4-20	.2245	5.7mm	.2260	—	.2280	1	.2295	1	.2315	—	.2330	5.9mm
1/4-28	.2318	—	.2329	5.9mm	.2343	A	.2354	15/64	.2368	6.0mm	.2379	B
5/16-18	0.2842	7.2mm	.2861	7.25mm	.2879	7.3mm	.2898	L	.2917	7.4mm	.2936	—
5/16-24	0.2912	7.4mm	.2927	—	.2941	M	.2955	7.5mm	.2969	19/64	.2983	7.6mm
3/8-16	.3431	11/32	.3452	8.75mm	.3474	S	.3495	8.9mm	.3516	—	.3537	9.0mm
3/8-24	.3537	9.0mm	.3552	9.0mm	.3566	—	.3580	T	.3594	23/64	.3608	—
7/16-14	.4011	—	.4035	Y	.4059	13/32	.4084	—	.4108	—	.4132	Z
7/16-20	0.4120	Z	.4137	10.5mm	.4154	—	.4171	—	.4188	—	.4205	—
1/2-13	.4608	—	.4634	—	.4660	—	.4686	15/32	.4712	12mm	.4738	12mm
1/2-20	.4745	—	.4762	—	.4779	—	.4796	—	.4813	—	.4830	31/64

### Metric Sizes

Metric Tap Size	Tap Drill Size	Decimal Equiv. of Tap Drill (inches)	Theoretical Percentage of thread %	Probable Mean Oversize (inches)	Probable Hole Size (inches)	Probable Percent of Thread %	Metric Tap Size	Tap Drill Size	Decimal Equiv. of Tap Drill (inches)	Theoretical Percentage of thread %	Probable Mean Oversize (inches)	Probable Hole Size (inches)	Probable Percent of Thread %
M3 x 0.5	36	0.1065	86	.0026	.1091	67	M8 x 1.25	7.4mm	0.2910	71	.0042	.2952	59
—	2.7mm	0.1062	88	.0026	.1088	70	—	L	0.2900	75	.0042	.2942	62
M4 x 0.7	27	0.1440	72	.0032	.1472	54	—	7.3mm	.2874	82	.0042	.2916	70
—	3.6mm	.1417	84	.0032	.1449	67	M10 x 1.5	U	0.3680	64	.0046	.3726	53
—	9/64	.1406	90	.0032	.1438	73	—	9.3mm	0.3660	69	.0046	.3706	58
M5 x 0.8	14	0.1820	69	.0035	.1855	53	—	9.2mm	0.3620	78	.0046	.3666	67
—	4.6mm	.1811	74	.0035	.1846	57	—	23/64	.3594	85	.0046	.3640	74
—	15	.1800	79	.0035	.1835	62	M12 x 1.5	11.3mm	.4449	70	.0047	.4496	57
—	16	0.1770	92	.0035	.1805	76	—	7/16	.4375	86	.0047	.4422	75
M6 x 1	7/32	.2188	65	.0038	.2226	51	M12 x 1.75	7/16	.4375	75	.0047	.4422	65
—	5.4mm	.2126	88	.0038	.2164	74	—	11mm	.4331	84	.0047	.4378	73

\*Probable percent of full thread produced in tapped hole using standard drill sizes.

# Technical Section - Threading

## TAP PROJECTION AND HOLE SIZE FOR PIPE TAPS

Nominal Size	Tap Thread Limits		Taper Per Ft. Limits		Projection				Ream Dia. Large End	Gage Width		A	Tap Drill Size B	Tap Drill Size BB
	$L_2$	$L_2$ Tolerance	Min.	Max.	NPT & NPTF		SAE - Short			$L_1$	$L_3$			
1/16 - 27	0.3120	±1/16	23/32	25/32	.250	0.3750	.222	.259	.2515	0.1600	.1111	.2711	15/64	C
1/8 - 27	0.3120	±1/16	23/32	25/32	.250	.375	.222	.259	.3440	0.1615	.1111	.2726	21/64	Q
1/4 - 18	0.4590	±1/16	23/32	25/32	.397	0.5210	.333	.389	.4472	0.2278	.1667	.3945	27/64	7/16
3/8 - 18	0.4540	±1/16	23/32	25/32	.392	.516	.333	0.3890	.5826	0.2400	.1667	.4067	9/16	37/64
1/2 - 14	0.5790	±1/16	23/32	25/32	.517	.641	.429	0.5000	.7213	0.3200	.2143	.5343	11/16	45/64
3/4 - 14	0.5650	±1/16	23/32	25/32	.503	0.6270	.429	.500	.9317	0.3390	.2143	.5533	57/64	29/32
1 - 11-1/2	0.6780	±3/32	23/32	25/32	.584	.772	—	—	1.1691	0.4000	.2609	.6609	1-1/8	1-9/64
1-1/4 - 11-1/2	0.6860	±3/32	23/32	25/32	.592	0.7800	—	—	1.5138	0.4200	.2609	.6809	1-15/32	1-31/64
1-1/2 - 11-1/2	0.6990	±3/32	23/32	25/32	.606	0.7920	—	—	1.7528	0.4200	.2609	.6809	1-45/64	1-23/32
2 - 11-1/2	0.6670	±3/32	23/32	25/32	.574	.760	—	—	2.2267	0.4360	.2609	.6909	2-11/64	2-3/16

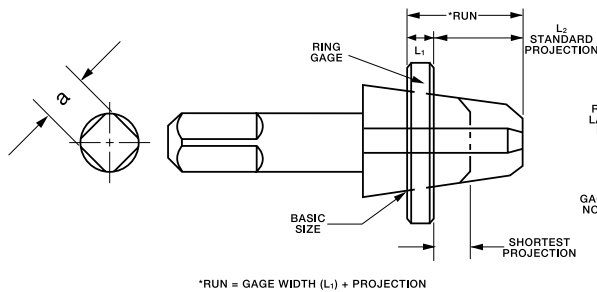
### TOLERANCES

Ground Thread = A maximum lead deviation of plus or minus .0005" within any two threads no further apart than 1" is permitted.

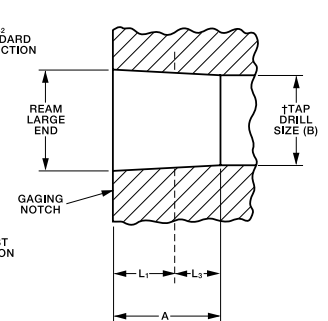
Threads per inch	Angle Tolerance
	Half Angle
8	Ground Thread
	25' Plus or Minus
11-1/2 to 27 inclusive	30' Plus or minus

\*Distance small end of tap projects through  $L_1$  Taper Thread Ring Gage.  
 \*\*Recommended sizes given permit direct tapping without reaming the hole, but only give a full thread for approx.  $L_1$  distance.  
 \*\*\*TAP DRILL SIZE (B) is size for use with a taper reamer. The tap drill size for use without a taper reamer is shown in column BB

Projection thru ring gage



Reamed hole data



## RECOMMENDED MINOR DIAMETERS AND TAP DRILLS FOR STI SPIRAL POINT AND HAND TAPS

Nominal Diameter	T.R.I.		Aluminum				Plastic - Steel - Magnesium			
			Diameter of Tapped Holes		Recommended Minor/ Drill Size		Diameter of Tapped Holes		Recommended Minor/ Drill Size	
	UNC	UNF	Min.	Max.	Tap Drill Size	Dec Eq.	Min.	Max.	Tap Drill Size	Dec. Eq
4	40	—	.1160	.1210	31	.1200	.1190	.1240	31	.1200
6	32	—	.1440	.1500	26	.1470	.1480	.1540	25	.1495
8	32	—	.1700	.1760	17	.1730	.1740	.1800	16	.1770
10	24	—	.1990	.2050	13/64	.2031	.2030	.2090	5	.2055
10	—	32	.1960	.2020	7	.2010	.2000	.2060	13/64	.2031
1/4	20	—	.2610	.2670	H	.2660	.2650	.2710	H	.2660
1/4	—	28	.2570	.2640	G	.2610	.2610	.2680	6.7MM	.2638
5/16	18	—	.3280	.3340	Q	.3320	.3310	.3370	Q	.3320
5/16	—	24	.3230	.3300	21/64	.3281	.3270	.3340	21/64	.3281
3/8	16	—	.3900	.3980	X	.3970	.3960	.4020	X	.3970
3/8	—	24	.3850	.3920	25/64	.3906	.3890	.3960	25/64	.3906
7/16	14	—	.4530	.4630	29/64	.4531	.4610	.4710	29/64	.4531
7/16	—	20	.4500	.4580	29/64	.4531	.4530	.4610	29/64	.4531
1/2	13	—	.5150	.5250	33/64	.5156	.5230	.5330	17/32	.5312
1/2	—	20	.5130	.5220	33/64	.5156	.5150	.5240	17/32	.5312

# Technical Section - Threading

## TAP SIZE RECOMMENDATIONS FOR CLASSES 2B AND 3B

### Machine Screw Sizes

Size	Threads Per Inch		Recommended Tap For Class of Thread		Pitch Diameter Limits for Class of Thread		
	NC	NF	Class 2B	Class 3B	Min. All Classes (Basic)	Max Class 2B	Max Class 3B
0	—	80	H2	H1	.0519	.0542	.0536
1	64	—	H2	H1	.0629	.0655	.0648
1	—	72	H2	H1	.0640	.0665	.0659
2	56	—	H2	H1	.0744	.0772	.0765
2	—	64	H2	H1	.0759	.0786	.0779
3	48	—	H2	H1	.0855	.0885	.0877
3	—	56	H2	H1	.0874	.0902	.0895
4	40	—	H2	H2	.0958	.0991	.0982
4	—	48	H2	H1	.0985	.1016	.1008
5	40	—	H2	H2	.1088	.1121	.1113
5	—	44	H2	H1	.1102	.1134	.1126
6	32	—	H3	H2	.1177	.1214	.1204
6	—	40	H2	H2	.1218	.1252	.1243
8	32	—	H3	H2	.1437	.1475	.1465
8	—	36	H2	H2	.1460	.1496	.1487
10	24	—	H3	H3	.1629	.1672	.1661
10	—	32	H3	H2	.1697	.1736	.1726
12	24	—	H3	H3	.1889	.1933	.1922
12	—	28	H3	H3	.1928	.1970	.1959

### Fractional Sizes

Size	Threads Per Inch		Recommended Tap For Class of Thread		Pitch Diameter Limits for Class of Thread		
	NC	NF	Class 2B	Class 3B	Min. All Classes (Basic)	Max Class 2B	Max Class 3B
1/4	20	—	H5	H3	.2175	.2223	.2211
1/4	—	28	*H4	H3	.2268	.2311	.2300
5/16	18	—	H5	H3	.2764	.2817	.2803
5/16	—	24	*H4	H3	.2854	.2902	.2890
3/8	16	—	H5	H3	.3344	.3401	.3387
3/8	—	24	*H4	H3	.3479	.3528	.3516
7/16	14	—	H5	H3	.3911	.3972	.3957
7/16	—	20	H5	H3	.4050	.4104	.4091
1/2	13	—	H5	H3	.4500	.4565	.4548
1/2	—	20	H5	H3	.4675	.4731	.4717
9/16	12	—	H5	H3	.5084	.5152	.5135
9/16	—	18	H5	H3	.5264	.5323	.5308
5/8	11	—	H5	H3	.5660	.5732	.5714
5/8	—	18	H5	H3	.5889	.5949	.5934
3/4	10	—	H5	H5	.6850	.6927	.6907
3/4	—	16	H5	H3	.7094	.7159	.7143
7/8	9	—	H6	H4	.8028	.8110	.8089
7/8	—	14	H6	H4	.8286	.8356	.8339
1	8	—	H6	H4	.9188	.9276	.9254
1	—	12	H6	H4	.9459	.9535	.9516

\* Note: In cast iron applications we recommend style 1600 (H5 limit) for class 2B fit.

### Metric Sizes for Class 6H

Thread Size		Internal Thread-Class 6H (Inches)				Recommended Tap		
Nominal Dia. (mm)	Pitch (mm)	Minor Dia.		Pitch Dia.		Major Dia.	Tap Size	Limit Number
		Min.	Max.	Min.	Max.			
1.6	0.35	.0481	.0520	.0541	.0574	.0630	M1.6 x 0.35	D-3
2	0.4	.0617	.0661	.0686	.0720	.0788	M2 x 0.4	D-3
2.5	0.45	.0793	.0841	.0870	.0906	.0985	M2.5 x 0.45	D-3
3	0.5	.0969	.1023	.1054	.1092	.1182	M3 x 0.5	D-3
3.5	0.6	.1123	.1185	.1225	.1268	.1378	M3.5 x 0.6	D-4
4	0.7	.1277	.1347	.1396	.1442	.1575	M4 x 0.7	D-4
4.5	0.75	.1452	.1526	.1580	.1626	.1772	M4.5 x 0.75	D-4
5	0.8	.1628	.1706	.1764	.1812	.1969	M5 x 0.8	D-4
6	1.0	.1936	.2028	.2107	.2165	.2363	M6 x 1	D-5
7	1.0	.2330	.2422	.2500	.2559	.2756	M7 x 1	D-5
8	1.25	.2617	.2721	.2830	.2892	.3150	M8 x 1.25	D-5
10	1.5	.3298	.3415	.3554	.3624	.3937	M10 x 1.5	D-6
12	1.75	.3979	.4110	.4277	.4355	.4725	M12 x 1.75	D-6
14	2.0	.4660	.4807	.5001	.5083	.5512	M14 x 2	D-7
16	2.0	.5447	.5594	.5788	.5871	.6300	M16 x 2	D-7
20	2.5	.6809	.6985	.7235	.7322	.7875	M20 x 2.5	D-7
24	3.0	.8171	.8366	.8682	.8785	.9449	M24 x 3	D-8
30	3.5	1.0320	1.0539	1.0917	1.1026	1.1812	M30 x 3.5	D-9
36	4.0	1.2469	1.2704	1.3151	1.3268	1.4174	M36 x 4	D-9

### Forming Type Taps Machine Screw and Fractional Sizes

Tap Size	Basic	Tap Recommendations For Class 2B Fit		Tap Recommendations For Class 3B Fit		Oversize Forming Taps		Tap Size UNC-NF	Basic P.D.	Tap Recommendations For Class 2B Fit		Tap Recommendations For Class 3B Fit		Oversize Forming Taps	
		Styles	Max. PD. Thread	Styles	Max. PD. Thread	Styles	Max. PD. Thread			Styles	Max. PD. Thread	Styles	Max. PD. Thread	Styles	Max. PD. Thread
0-80	.0519	—	—	H-2	.0536	—	—	10-24	.1629	H-6	.1672	H-4	.1661	—	—
1-64	.0629	—	—	H-2	.0648	—	—	10-32	.1697	H-6	.1736	H-4	.1762	—	—
1-72	.0640	—	—	H-2	.0659	—	—	12-24	.1889	H-6	.1933	H-4	.1922	—	—
2-56	.0744	H-3	.0772	H-2	.0765	—	—	12-2 8	.1928	H-6	.1970	H-4	.1959	—	—
2-64	.0759	H-3	.0786	H-2	.0779	—	—	1/4-20	.2175	H-6	.2223	H-4	.2211	H-8	.2215
3-48	.0855	H-3	.0885	H-2	.0877	—	—	1/4-28	.2268	H-6	.2311	H-4	.2300	H-8	.2308
3-56	.0874	H-3	.0902	H-2	.0895	—	—	5/16-18	.2764	H-7	.2817	H-5	.2803	H-9	.2809
4-40	.0958	H-5	.0991	H-3	.0982	—	—	5/16-24	.2854	H-7	.2902	H-5	.2890	H-9	.2899
4-48	.0985	H-5	.1016	H-3	.1008	—	—	3/8-16	.3344	H-7	.3401	H-5	.3387	H-9	.3389
5-40	.1088	H-5	.1121	H-3	.1113	—	—	3/8-24	.3479	H-7	.3528	H-5	.3516	H-9	.3524
5-44	.1102	H-5	.1134	H-3	.1126	—	—	7/16-14	.3911	H-8	.3972	H-5	.3957	—	—
6-32	.1177	H-5	.1214	H-3	.1204	—	—	7/16-20	.4050	H-8	.4104	H-5	.4091	—	—
6-40	.1218	H-5	.1252	H-3	.1243	—	—	1/2-13	.4500	H-8	.4565	H-5	.4548	H-10	.4550
8-32	.1437	H-5	.1475	H-3	.1465	—	—	1/2-20	.4675	H-8	.4731	H-5	.4717	H-10	.4725
8-36	.1460	H-5	.1496	H-3	.1487	—	—								

# Technical Section - Threading

## UNIFIED SCREW THREAD LIMITS

### Diameter - Pitch Combinations for Class of Fit

Nominal Size Threads Per Inch and Series Designation	Class	Internal				Major Diameter Min.
		Minor Diameter		Pitch Diameter		
		Min.	Max.	Min.	Max.	
0-80 UNF	2B	.0465	.0514	.0519	.0542	.0600
—	3B	.0465	.0514	.0519	.0536	.0600
1-64 UNC	2B	.0561	.0623	.0629	.0655	.0730
—	3B	.0561	.0623	.0629	.0648	.0730
1-72 UNF	2B	.0580	.0635	.0640	.0665	.0730
—	3B	.0580	.0635	.0640	.0659	.0730
2-56 UNC	2B	.0667	.0737	.0744	.0772	.0860
—	3B	.0667	.0737	.0744	.0765	.0860
2-64 UNF	2B	.0691	.0753	.0759	.0786	.0860
—	3B	.0691	.0753	.0759	.0779	.0860
3-48 UNC	2B	.0764	.0845	.0855	.0885	.0990
—	3B	.0764	.0845	.0855	.0877	.0990
3-56 UNF	2B	.0797	.0865	.0874	.0902	.0990
—	3B	.0797	.0865	.0874	.0895	.0990
4-40 UNC	2B	.0849	.0939	.0958	.0991	.1120
—	3B	.0849	.0939	.0958	.0982	.1120
4-48 UNF	2B	.0894	.0968	.0985	.1016	.1120
—	3B	.0894	.0968	.0985	.1008	.1120
5-40 UNC	2B	.0979	.1062	.1088	.1121	.1250

Nominal Size Threads Per Inch and Series Designation	Class	Internal				Major Diameter Min.
		Minor Diameter		Pitch Diameter		
		Min.	Max.	Min.	Max.	
—	3B	.0979	.1062	.1088	.1113	.1250
5-44 UNF	2B	.1004	.1079	.1102	.1134	.1250
—	3B	.1004	.1079	.1102	.1126	.1250
6-32 UNC	2B	.1040	.1140	.1177	.1214	.1380
—	3B	.1040	.1140	.1177	.1204	.1380
6-40 UNF	2B	.1110	.1190	.1218	.1252	.1380
—	3B	.1110	.1186	.1218	.1243	.1380
8-32 UNC	2B	.1300	.1390	.1437	.1475	.1640
—	3B	.1300	.1389	.1437	.1465	.1640
8-36 UNF	2B	.1340	.1420	.1460	.1496	.1640
—	3B	.1340	.1416	.1460	.1487	.1640
10-24 UNC	2B	.1450	.1560	.1629	.1672	.1900
—	3B	.1450	.1555	.1629	.1661	.1900
10-32 UNF	2B	.1560	.1640	.1697	.1736	.1900
—	3B	.1560	.1641	.1697	.1726	.1900
12-24 UNC	2B	.1710	.1810	.1889	.1933	.2160
—	3B	.1710	.1807	.1889	.1922	.2160
12-28 UNF	2B	.1770	.1860	.1928	.1970	.2160
—	3B	.1770	.1857	.1928	.1959	.2160

### Fractional Sizes

Nominal Size Threads Per Inch and Series Designation	Class	Internal				Major Diameter Min.
		Minor Diameter		Pitch Diameter		
		Min.	Max.	Min.	Max.	
1/4-20 UNC	1B	.1960	.2070	.2175	.2248	.2500
—	2B	.1960	.2070	.2175	.2224	.2500
—	3B	.1960	.2067	.2175	.2211	.2500
1/4-28 UNF	1B	.2110	.2200	.2268	.2333	.2500
—	2B	.2110	.2200	.2268	.2311	.2500
—	3B	.2110	.2190	.2268	.2300	.2500
5/16-18 UNC	1B	.2520	.2650	.2764	.2843	.3125
—	2B	.2520	.2650	.2764	.2817	.3125
—	3B	.2520	.2630	.2764	.2803	.3125
5/16-24 UNF	1B	.2670	.2770	.2854	.2925	.3125
—	2B	.2670	.2770	.2854	.2902	.3125
—	3B	.2670	.2754	.2854	.2890	.3125
3/8-16 UNC	1B	.3070	.3210	.3344	.3429	.3750
—	2B	.3070	.3210	.3344	.3401	.3750
—	3B	.3070	.3182	.3344	.3387	.3750

Nominal Size Threads Per Inch and Series Designation	Class	Internal				Major Diameter Min.
		Minor Diameter		Pitch Diameter		
		Min.	Max.	Min.	Max.	
3/8-24 UNF	1B	.3300	.3400	.3479	.3553	.3750
—	2B	.3300	.3400	.3479	.3528	.3750
—	3B	.3300	.3372	.3479	.3516	.3750
7/16-14 UNC	1B	.3600	.3760	.3911	.4003	.4375
—	2B	.3600	.3760	.3911	.3972	.4375
—	3B	.3600	.3717	.3911	.3957	.4375
7/16-20 UNF	1B	.3830	.3950	.4050	.4131	.4375
—	2B	.3830	.3950	.4050	.4104	.4375
—	3B	.3830	.3916	.4050	.4091	.4375
1/2-13 UNC	1B	.4170	.4340	.4500	.4597	.5000
—	2B	.4170	.4340	.4500	.4565	.5000
—	3B	.4170	.4284	.4500	.4548	.5000
1/2-20 UNF	1B	.4460	.4570	.4675	.4759	.5000
—	2B	.4460	.4570	.4675	.4731	.5000
—	3B	.4460	.4537	.4675	.4717	.5000

### Metric Sizes (ANSA B1.13M-1983) All dimensions are in millimeters.

Basic Thread Description	Tol. Class	Minor Diameter		Pitch Diameter			Major Diameter Min.	
		Min.	Max.	Min.	Max.	Tol.	Min.	Max.
		M1.6 x 0.35	6H	1.221	1.321	1.373	1.458	.085
M2 x 0.4	6H	1.567	1.679	1.740	1.830	.090	2.000	2.148
M2.5 x 0.45	6H	2.013	2.138	2.208	2.303	.095	2.500	2.660
M3 x 0.5	6H	2.459	2.599	2.675	2.775	.100	3.000	3.172
M3.5 x 0.6	6H	2.850	3.010	3.110	3.222	.112	3.500	3.699
M4 x 0.7	6H	3.242	3.422	3.545	3.663	.118	4.000	4.219
M5 x 0.8	6H	4.134	4.334	4.480	4.605	.125	5.000	5.240
M6 x 1	6H	4.917	5.153	5.350	5.500	.150	6.000	6.294
M8 x 1.25	6H	6.647	6.912	7.188	7.348	.160	8.000	8.340

Basic Thread Description	Tol. Class	Minor Diameter		Pitch Diameter			Major Diameter Min.	
		Min.	Max.	Min.	Max.	Tol.	Min.	Max.
		M8 x 1	6H	6.917	7.153	7.350	7.500	.150
M10 x 1.5	6H	8.376	8.676	9.026	9.206	.180	10.000	10.396
M10 x 1.25	6H	8.647	8.912	9.188	9.348	.160	10.000	10.340
M10 x 0.75	6H	9.188	9.378	9.513	9.645	.132	10.000	10.240
M12 x 1.75	6H	10.106	10.441	10.863	11.063	.200	12.000	12.453
M12 x 1.5	6H	10.376	10.676	11.026	11.216	.190	12.000	12.406
M12 x 1.25	6H	10.647	10.912	11.188	11.368	.180	12.000	12.360
M12 x 1	6H	10.917	11.153	11.350	11.510	.160	12.000	12.304

\*Internal Thread Minor Diameter Tolerances. Internal thread minor diameter tolerances are based on a length of engagement equal to the nominal diameter. For general applications these tolerances are suitable for lengths of engagement up to 1-1/2 diameters. However, some thread applications have lengths of engagement which are greater than 1-1/2 diameters or less than the nominal diameter. For such applications it may be advantageous to increase or decrease the tolerance, respectively.

# Technical Section - Threading

## TAPPING SPEEDS

### Conventional Table (Surface Feet Per Minute to Revolutions Per Minute)

Tap Sizes UNC/ UNF	Pipe	Surface Feet Per Minute																	
		5'	10'	15'	20'	25'	30'	40'	50'	60'	70'	80'	90'	100'	110'	120'	130'	140'	150'
		Revolutions Per Minute																	
0	—	318	637	955	1273	1592	1910	2546	3183	3820	4456	5093	5729	6366	7003	7639	8276	8913	9549
1	—	273	546	819	1046	1308	1570	2093	2617	3140	3663	4186	4710	5233	5756	6279	6805	7326	7849
2	—	212	424	637	888	1110	1333	1777	2221	2665	3109	3554	3999	4442	4886	5330	5774	6218	6662
3	—	191	382	573	772	964	1157	1543	1929	2315	2701	3086	3472	3858	4244	4629	5015	5401	5787
4	—	174	347	521	682	853	1023	1364	1705	2046	2387	2728	3069	3411	3751	4092	4434	4775	5116
5	—	147	294	441	611	764	917	1222	1528	1833	2139	2445	2750	3056	3361	3667	3973	4278	4584
6	—	136	273	409	553	691	829	1106	1382	1659	1935	2212	2488	2766	3042	3318	3595	3871	4148
8	—	119	239	358	466	583	699	932	1165	1398	1631	1864	2097	2330	2563	2796	3029	3262	3495
10	—	101	201	302	402	502	603	804	1005	1205	1406	1607	1808	2009	2210	2411	2612	2813	3014
12	—	87	174	260	354	442	531	707	884	1061	1238	1415	1592	1769	1945	2122	2300	2476	2653
1/4	—	76	153	229	306	382	458	611	764	917	1070	1222	1375	1528	1681	1833	1986	2139	2292
5/16	—	62	123	185	245	306	367	489	611	733	856	978	1100	1222	1345	1467	1589	1711	1833
3/8	—	50	101	151	204	255	305	407	509	611	713	815	917	1019	1120	1222	1324	1426	1528
7/16	1/8	43	87	130	175	219	262	349	437	524	611	698	786	873	960	1048	1135	1222	1310
1/2	—	38	76	115	153	191	229	305	382	458	535	611	688	764	840	917	993	1070	1146
9/16	1/4	34	68	102	137	172	206	274	342	410	478	547	616	683	752	820	888	952	1020
5/8	—	32	64	96	122	153	183	244	306	367	428	489	550	611	672	733	794	856	917
11/16	3/8	28	55	83	111	138	167	222	278	333	389	444	500	556	611	667	722	778	833
3/4	—	25	51	76	102	128	153	203	255	305	357	407	458	509	560	611	662	713	764
7/8	1/2	22	43	65	87	109	131	175	218	262	306	350	392	437	480	524	568	611	655
1	—	19	38	57	76	96	115	153	191	230	268	305	344	382	420	458	497	535	573
1-1/8	3/4	17	34	51	68	84	102	136	170	204	238	272	306	340	373	407	441	475	509
1-1/4	—	15	31	46	61	76	92	122	153	183	214	244	275	305	336	367	397	428	458
1-3/8	1	14	28	42	56	69	83	111	139	167	194	222	250	278	306	333	361	389	417
1-1/2	—	13	25	38	51	63	76	102	127	153	178	204	229	255	280	305	331	356	382
1-5/8	—	12	23	35	47	59	71	94	118	141	165	188	212	235	259	282	306	329	353
1-3/4	—	11	22	33	44	55	65	87	109	131	153	175	196	218	240	262	284	306	327
1-7/8	—	10	20	30	41	51	61	81	102	122	143	163	183	204	224	244	265	285	306
2	—	9	19	29	38	48	57	76	96	115	134	153	172	191	210	229	248	267	287

## Metric Sizes

Tap Sizes Metric	Surface Feet Per Minute																	
	5'	10'	15'	20'	25'	30'	40'	50'	60'	70'	80'	90'	100'	110'	120'	130'	140'	150'
		Revolutions Per Minute																
M 1	490	979	1469	1959	2449	2938	3918	4897	5877	6856	7836	8815	9795	10774	11754	12733	13713	14692
M 2	242	484	725	967	1209	1451	1934	2418	2901	3385	3868	4352	4835	5319	5803	6286	6770	7253
M 3	162	324	486	647	809	971	1295	1619	1942	2266	2590	2914	3237	3561	3885	4208	4532	4856
M 3.5	138	277	415	554	692	830	1107	1384	1661	1938	2214	2491	2768	3045	3322	3599	3875	4152
M 4	122	243	365	487	608	730	973	1217	1460	1703	1946	2190	2433	2676	2920	3163	3406	3650
M 5	97	194	291	388	485	582	776	970	1163	1357	1551	1745	1939	2133	2327	2521	2715	2909
M 6	81	162	243	324	405	486	647	809	971	1133	1295	1457	1619	1781	1942	2104	2266	2428
M 7	69	138	208	277	346	415	554	692	830	969	1107	1246	1384	1522	1661	1799	1938	2076
M 8	61	121	182	243	303	364	485	606	728	849	970	1091	1213	1334	1455	1577	1698	1819
M 10	48	97	145	194	242	291	388	485	582	679	776	873	970	1067	1163	1260	1357	1454
M 12	40	81	121	162	202	243	324	405	486	567	647	728	809	890	971	1052	1133	1214
M 14	35	69	104	139	173	208	277	347	416	485	555	624	693	763	832	901	971	1040
M 16	30	61	91	121	152	182	243	303	364	424	485	546	606	667	728	788	849	910
M 18	27	54	81	108	135	162	216	269	323	377	431	485	539	593	647	700	754	808
M 20	24	49	73	97	121	146	194	243	291	340	388	437	485	534	582	631	680	728
M 22	22	44	66	88	110	132	176	221	265	309	353	397	441	485	529	573	618	662
M 24	20	40	61	81	101	121	162	202	243	283	323	364	404	445	485	526	566	606
M 27	18	36	54	72	90	108	144	180	216	252	287	323	359	395	431	467	503	539
M 30	16	32	49	65	81	97	129	162	194	226	259	291	323	356	388	420	453	485

# Technical Section - Threading

## TYPICAL TAPPING PROBLEMS

<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
<b>DIMENSIONAL ACCURACY</b>		
<b>Oversize Pitch Diameter</b>		
	Incorrect Tap	<ol style="list-style-type: none"> <li>Use correct H limit</li> <li>Use longer chamfered taps</li> <li>Consider less free cutting NR style</li> </ol>
	Chip packing	<ol style="list-style-type: none"> <li>Use spiral pointed or spiral fluted taps</li> <li>Reduce number of flutes to create extra chip space</li> <li>Use larger drill size</li> <li>In blind hole applications, allow deeper holes where applicable or shorten the thread length of the parts</li> <li>Use recommended lubricant</li> </ol>
	Galling	<ol style="list-style-type: none"> <li>Apply surface treatment such as steam oxide, TiN, TiCN or CrN</li> <li>Use recommended lubricant</li> <li>Reduce tapping speed</li> <li>Use correct tap for the material being tapped</li> </ol>
	Operating Conditions	<ol style="list-style-type: none"> <li>Ensure correct tapping speeds to avoid torn threads</li> <li>Check alignment of tap and drilled hole</li> <li>Use lead screw tapper</li> <li>Use tapping machine with adequate horsepower</li> <li>Check misalignment of tap and drilled hole due to loose spindle or worn holder</li> </ol>
	Tool Condition	<ol style="list-style-type: none"> <li>Check accuracy of chamfer lead grinding</li> <li>Ensure correct cutting angles</li> <li>Land widths too narrow</li> <li>Check burrs from regrinding not present</li> </ol>
<b>Oversize Internal Diameter</b>		
	Hole Size	<ol style="list-style-type: none"> <li>Use smaller drill size</li> <li>Avoid tapered hole</li> <li>Use taps with correct chamfer</li> </ol>
	Galling	See solutions prescribed under Oversize Pitch Diameter
<b>Undersized Pitch Diameter</b>		
	Incorrect Tap	<ol style="list-style-type: none"> <li>Use oversize taps                             <ul style="list-style-type: none"> <li>» For cutting materials such as copper alloy, aluminum alloy and cast iron</li> <li>» For cutting tubing which will have "spring back" action after tapping</li> </ul> </li> <li>Use taps with correct chamfer angle</li> <li>Use taps with higher cutting angle</li> </ol>
	Damaged Thread	Use proper reversing speed to avoid damaging tapped thread on the existing hole
	Leftover Chips	<ol style="list-style-type: none"> <li>Improve operating conditions to eliminate leftover chips in the hole</li> <li>Remove left over chips prior to gage checking</li> </ol>
<b>Undersized Internal Diameter</b>		
	Hole Size	Use larger drill size
<b>SURFACE FINISH</b>		
<b>Torn or Rough Threads</b>		
	Dull Tap	Resharpen
	Chamfer too short	Increase chamfer length
	Incorrect rake angle	Use correct rake angle suitable for material tapped
	Galling	<ol style="list-style-type: none"> <li>Use thread relieved taps</li> <li>Reduce land width</li> <li>Apply surface treatment such as steam oxide, TiN, or chrome</li> <li>Use recommended lubricant</li> <li>Reduce tapping speed</li> <li>Use larger drill size</li> <li>Check alignment between tap and hole</li> </ol>

# Technical Section - Threading

<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
	Chip Packing	<ol style="list-style-type: none"> <li>1. Use spiral pointed or spiral fluted taps</li> <li>2. Use larger drill size</li> </ol>
<b>Chattering on Tapped Thread</b>		
	Too Positive	<ol style="list-style-type: none"> <li>1. Use lower rake angle</li> <li>2. Reduce amount of thread relief - consider NR style</li> <li>3. Use taps with wider land</li> </ol>
	Tool Condition	Use taps with wider land
<b>TOOL LIFE</b>		
<b>Breakage</b>		
	Incorrect Tap Selection	<ol style="list-style-type: none"> <li>1. Tapping too deep. Avoid chip packing in the flutes or bottom of the hole. Use spiral pointed, spiral fluted or cold forming tap.</li> <li>2. Use correct surface treatment such as steam oxide, TiN, TiCN or CrN</li> </ol>
	Excessive Tapping Torque	<ol style="list-style-type: none"> <li>1. Hole too small - use correct size drill</li> <li>2. Shorten thread length</li> <li>3. Increase rake angle</li> <li>4. Use a tap with more thread relief and reduced land width</li> <li>5. Use spiral pointed or spiral fluted taps</li> </ol>
	Operating Conditions	<ol style="list-style-type: none"> <li>1. Reduce tapping speed</li> <li>2. Avoid misalignment between tap and the hole and tapered hole</li> <li>3. Use floating type of tapping holder</li> <li>4. Use tapping holder with torque adjustment</li> <li>5. Avoid hitting bottom of the hole</li> </ol>
	Tool Condition	<ol style="list-style-type: none"> <li>1. Use taps with wider land width</li> <li>2. Remove all worn sections when regrinding the flutes</li> <li>3. Regrind tool more frequently</li> </ol>
<b>Chipping</b>		
	Incorrect Tap Selection	<ol style="list-style-type: none"> <li>1. Use tap with lower rake angle</li> <li>2. Consider different tool steel</li> <li>3. Reduce hardness of the tap</li> <li>4. Increase chamfer length</li> <li>5. Avoid chip packing in the flutes or in the bottom of the hole by using spiral fluted or spiral pointed taps</li> </ol>
	Operating Conditions	<ol style="list-style-type: none"> <li>1. Reduce tapping speed</li> <li>2. Avoid misalignment between tap and hole</li> <li>3. Avoid sudden reverse in blind hole tapping</li> <li>4. Avoid galling</li> <li>5. Use larger drill size</li> <li>6. Ensure adequate lubricant</li> <li>7. Check for hard spots in the workpiece</li> </ol>
<b>Excessive Wear</b>		
	Incorrect Tap Selection	<ol style="list-style-type: none"> <li>1. Consider specially designed taps</li> <li>2. Change to an Applix style of tap made from PM material</li> <li>3. Apply special surface treatment such as steam oxide, TiN, TiCN or CrN</li> <li>4. Increase chamfer length</li> </ol>
	Operating Conditions	<ol style="list-style-type: none"> <li>1. Reduce tapping speed</li> <li>2. Apply adequate lubrication</li> <li>3. Avoid work hardening the material being tapped</li> <li>4. Use larger drill size</li> </ol>
	Tool Condition	<ol style="list-style-type: none"> <li>1. Ensure correct rake angle</li> <li>2. Minimize heat in grinding process to avoid de-tempering</li> </ol>



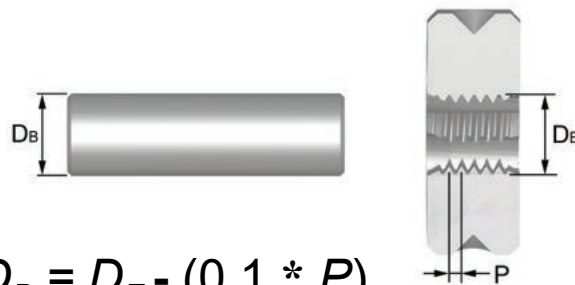
# Technical Section - Threading

## TECHNICAL TIPS ON THREADING WITH DIES

1. Before starting the die or dienut, chamfer the end of the bar at an angle of 45 degrees to eliminate sudden loading of the leading edges. Ensure the die or dienut is presented to the bolt squarely.
2. Make use of the large tolerances associated with the major diameter of the bolt, by reducing the diameter of the bar (see below). This will reduce the cutting force to a minimum.
3. Use the gun nose type of die, as this ensures the chips are directed away from the cutting area.
4. Ensure a good supply of the correct lubricant is aimed at the cutting area.
5. When adjusting split dies, avoid opening out as this will cause rubbing. Split dies may be closed down by approximately 0.15mm, by turning the adjustment screws equally. Pressure on one side of the die only may cause breakage.
6. Generally speaking, dienuts are used for reclaiming or cleaning out existing threads by hand. They tend to be of a more robust construction and should only be used in exceptional circumstances to cut a thread from solid.

## PRE-MACHINING DIMENSIONS

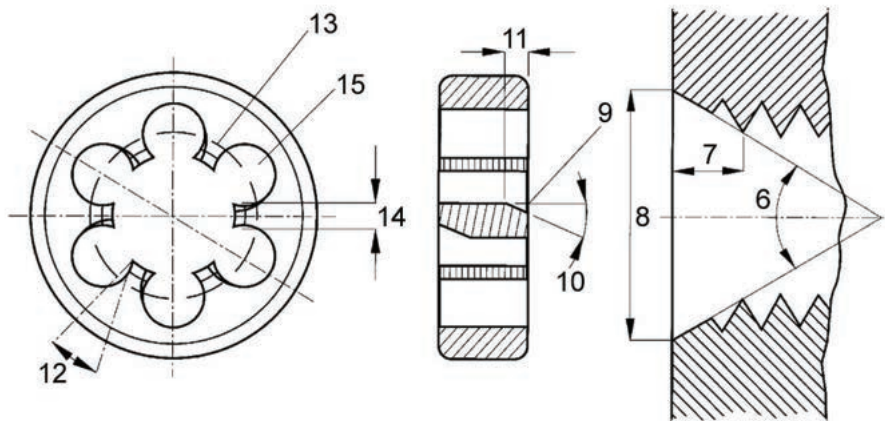
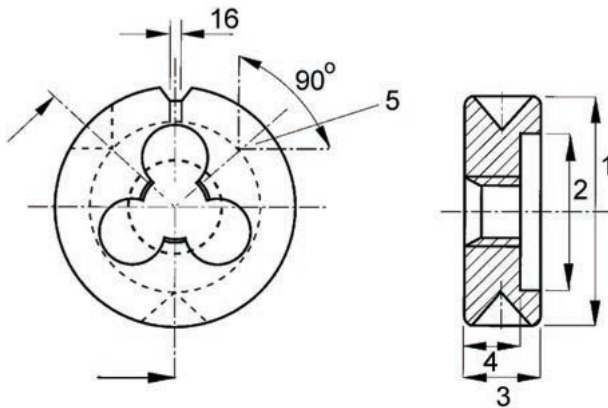
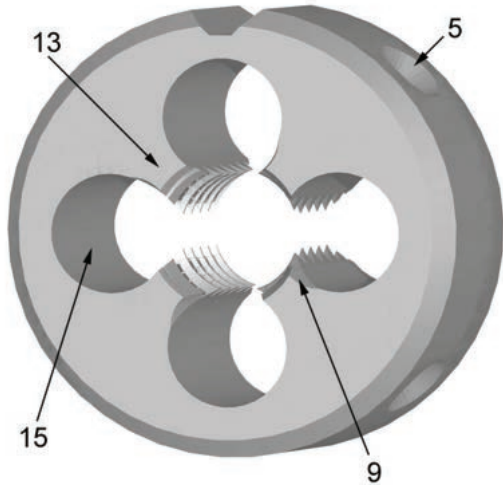
The diameter of the bolt blank must be smaller than the max. external diameter of the screw thread.



# Technical Section - Threading

## DIE DEFINITIONS/NOMENCLATURE

- 1 Outside Diameter
- 2 Recess Diameter
- 3 Thickness
- 4 Thread Length
- 5 Conical Hole for Fixing Screw
- 6 Chamfer Angle
- 7 Chamfer Length
- 8 Chamfer Diameter
- 9 Gun-nose
- 10 Spiral Angle
- 11 Spiral Length
- 12 Rake Angle
- 13 Land
- 14 Width of Land
- 15 Clearance Hole
- 16 Split of Adjustment



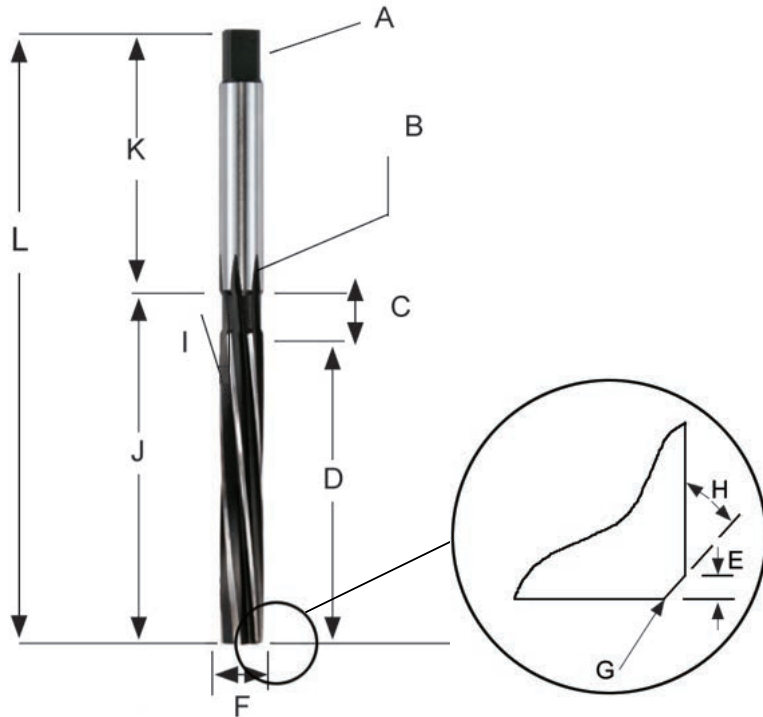
# Technical Section - Threading

## TROUBLE SHOOTING WHEN THREADING WITH DIES

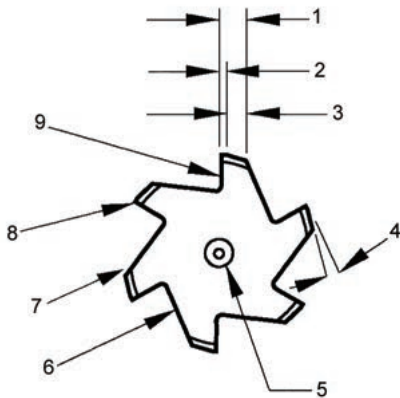
<i>Problem</i>	<i>Cause</i>	<i>Solution</i>
<b>Oversize / Undersize</b>		
	Misalignment	Correct alignment, ensure cleanliness
	Incorrect axial feed rate	Ensure axial feed rate is controlled accurately
<b>Poor finish</b>		
	Incorrect rake angle for the material	Try alternative dies or special die
	Incorrect/lack of lubricant	See lubricants section
	Incorrect speed	Follow recommendations in Catalog
	Bar diameter too large	Reduce to appropriate size
	Bar end not chamfered	Ensure bar end is chamfered
<b>Chipping / Breakage</b>		
	Wrong type of die	Follow recommendations in Catalog
	Speed too high	Follow recommendations in Catalog
	Bar diameter too large	Reduce to appropriate size
	Bar end not chamfered	Ensure bar end is chamfered
	Misalignment	Correct alignment, ensure cleanliness
<b>Rapid wear</b>		
	Incorrect/lack of lubricant	See lubricants section
	Speed too high	Follow recommendations in Catalog
<b>Built up edge</b>		
	Incorrect/lack of lubricant	See section lubricants
	Bar diameter too large	Reduce to appropriate size
	Speed too low	Follow recommendations in Catalog

# Technical Section - Reaming

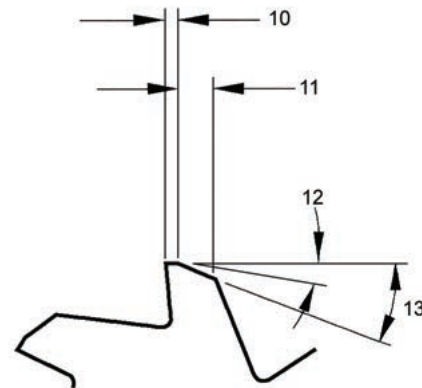
## REAMER DEFINITIONS / NOMENCLATURE



- A Tang
- B Recess
- C Recess Length
- D Cut Length
- E Bevel Lead Length
- F Diameter
- G Bevel Lead
- H Bevel Lead Angle
- I Helix Angle
- J Body Length
- K Shank Length
- L Overall Length



- 1 Width of Land
- 2 Circular Land
- 3 Clearance
- 4 Clearance Angle
- 5 Centre Hole
- 6 Flute
- 7 Heel
- 8 Cutting Edge
- 9 Face



- 10 Width of Primary Clearance
- 11 Width of Secondary Clearance
- 12 Primary Clearance Angle
- 13 Secondary Clearance Angle

# Technical Section - Reaming

## TECHNICAL TIPS ON REAMING

To obtain the best results when using reamers it is essential to make them 'work'. It is a common fault to prepare holes for reaming with too little stock left in. If insufficient stock is left in the hole before reaming, then the reamer will rub, quickly show wear and will result in loss of diameter. It is equally important for performance not to leave too much stock in the hole. (See Stock Removal on next page).

1. Select the optimum type of reamer and the optimum speeds and feeds for the application. Ensure that pre-drilled holes are the correct diameter.
2. The workpiece must be held rigid and the machine spindle should have no play.
3. The chuck in which a straight shank reamer is held must be good quality. If the reamer slips in the chuck and the feed is automatic, breakage of the reamer may occur.
4. When driving a Morse Taper Shank reamer into a socket, sleeve or machine spindle, always use a soft faced hammer. Make sure there is a good fit between the reamer shank and the sleeve or socket otherwise misalignment will occur and the reamer may cut oversize.
5. Keep tool overhang from machine spindle to a minimum.
6. Use recommended lubricants to enhance the life of the reamer and ensure the fluid reaches the cutting edges. As reaming is not a heavy cutting operation, soluble oil 40:1 dilution is normally satisfactory. Air blasting may be used with grey cast iron, if dry machining.
7. Do not allow the flutes of a reamer to become blocked with chips.
8. Before the reamer is reground, check concentricity between centers. In most instances only the bevel lead will need regrinding.
9. Keep reamers sharp. Frequent regrinding is good economy, but it is important to understand that reamers cut only on the bevel and taper leads and not on the lands. Consequently only these leads need regrinding. Accuracy of regrinding is important to hole quality and tool life.

## HAND / MACHINE REAMERS

Although both hand and machine reamers offer the same capability regarding finished hole size, the use of each must be considered according to application. A hand reamer, for reasons of alignment, has a long taper lead, whereas a machine reamer has only a 45 degree bevel lead. A machine reamer cuts only on the bevel lead, a hand reamer cuts on the bevel lead and also on the taper lead.

# Technical Section - Reaming

## APPLICATIONS

The results obtained in reaming are to a great extent dependent upon the condition of the drilled hole. If deep scores or form deviations are inherent in the hole, reaming is probably not going to rectify these inaccuracies or produce a finish within tolerance requirements. A reamer can also be mounted in a floating holder with enough clearance to permit the reamer to move freely along the existing hole.

## Suggested Stock Removal

Material ≥	Core-Drilled Hole Diameter (inches)					
	5/32	> 5/32 – 3/8	> 3/8 – 5/8	> 5/8 – 1	> 1 – 1-1/2	> 1-1/2 – 2-1/2
Steel*	.004	.004 – .008	.006 – .010	.008 – .014	.010 – .018	.016 – .025
Hard cast-iron						
Soft cast-iron	.005	.005 – .012	.008 – .016	.010 – .020	.016 – .024	.024 – .031
Light alloys*						
Copper, soft						
Copper, alloys						
Plastics (Duro plastics)	.007	.007 – .012	.010 – .016	.013 – .020	.016 – .024	.020 – .031

\* For soft materials and quick spiral machine reamers add 50% of allowance.

## Table of Speeds and Feeds

Type of Material	Speed Range (sfm)		Type of Feed
	HSS	Carbide	
Magnesium	200 – 400	500 – 1000	M-H
Aluminum	150 – 300	500 – 1000	M-H
Brass and Bronze – Free Mach. – Tough	125 – 200	250 – 400	M
	75 – 125	150 – 250	M
Copper and Hard Bronze	50 – 75	100 – 150	L
Cast Iron – Soft (Ferritic) – Medium (Pearlitic) – Hard (Mart. or Acicular)	50 – 100	150 – 250	H
	25 – 50	75 – 150	L-M
	15 – 25	50 – 75	L
Steel – Under 200 BHN – 200 - 300 BHN – 300 - 400 BHN – 400 - 500 BHN – 500 - BHN Plus	55 – 80	200 – 300	M-H
	30 – 55	125 – 200	M
	20 – 30	50 – 125	L
	10 – 20	35 – 50	L
	—	15 – 35	L
Stainless – Free Mach. and 400 Ann. – 300 Series – P.H. and H.T. 400 series	40 – 60	150 – 250	M
	20 – 30	80 – 120	M
	15 – 25	60 – 100	L-M
High Temp Alloy – Nickel Base – Cobalt Base	10 – 20	40 – 70	L
	10 – 15	30 – 45	L
Titanium – Pure – Alloys	35 – 50	50 – 100	M
	10 – 20	35 – 50	L-M

Diameter Range	Feed (ipr) for Diameter Range		
	Light (L)	Medium (M)	Heavy (H)
≥ 1/16"	.0002" – .001"	.0005" – .002"	.001" – .003"
> 1/16" – 1/8"	.001" – .002"	.002" – .004"	.003" – .006"
> 1/8" – 1/4"	.002" – .004"	.004" – .006"	.006" – .010"
> 1/4" – 1/2"	.004" – .006"	.006" – .010"	.010" – .015"
> 1/2" – 1"	.006" – .010"	.010" – .020"	.015" – .030"
> 1"	.010" – .020"	.020" – .040"	.030" – .050"

# Technical Section - Reaming

## APPLICATION REAMERS

As with most cutting tools, the substrate and geometric configuration of reamers differs, dependent on the material they are intended to cut. As such, care should be taken to ensure that the correct choice of reamer is made.

CNC reamers are manufactured with a shank tolerance of h6. This enables the reamer to be used in hydraulic and heat shrink tool holding systems, offering enhanced accuracy and concentricity.

## ADJUSTABLE REAMERS

Several types of adjustable reamers are available, all offering varying degrees of diameter adjustment. It is an important aspect of adjustable reamers to follow this set procedure:

- Adjust the reamer to the required diameter.
- Check the reamer between centers for concentricity and lip height variation.
- If required, grind the reamer to eliminate any eccentricity or lip height variation.
- Re-check the diameter.

## STOCK REMOVAL

The recommended stock removal in reaming is dependent on the application material and the surface finish of the pre-drilled hole. General guidelines for stock removal are shown in the following tables:

Size of reamed hole (mm)	When pre-drilled	When pre-core-drilled	Size of reamed hole (inches)	When pre-drilled	When Pre-core-drilled
Below 4	0.1	0.1	Below 3/16	0.004	0.004
Over 4 to 11	0.2	0.15	3/16 to 1/2	0.008	0.006
Over 11 to 3	0.3	0.2	1/2 to 1. 1/2	0.010	0.008
Over 39 to 50	0.4	0.3	1. 1/2 to 2	0.016	0.010

## SELECTION OF REAMER TYPES

Reaming is a recognized method of producing dimensionally accurate holes of fine surface finish. Dormer offers a range of reamers for producing holes to H7 tolerance.

Reamers are classified into various types:

- Solid - available in two shank types, Straight (cylindrical) and Morse Taper.
- Shell - for use on arbors.
- Expanding - with adjustable HSS blades and used for light work.

# Technical Section - Reaming

## Applications - Reamer Selection

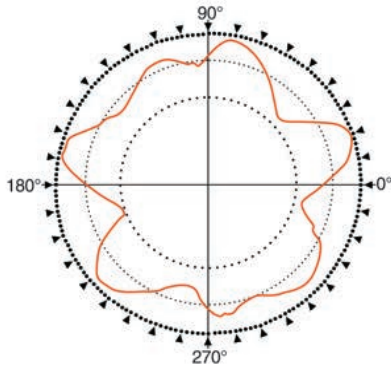
The most common types of reamers have a left-hand spiral because the main applications involve through holes requiring chips to be pushed forward. For blind holes, reamers with straight flutes or right hand spirals are recommended.

The most efficient reaming conditions depend on the application, material, quality of hole required, stock removal, lubrication and other factors. A general guide to surface speeds and feeds for machine reamers is shown in the reamer AMG and feed charts (see Dormer catalogue or Product Selector) and stock removal tables.

Extremely unequal spacing on reamers means that the divide is not the same for each tooth. As there are no two teeth diametrically opposite each other, the reamer produces a hole with a roundness variance of between 1 and 2  $\mu\text{m}$ . This compared with a variance of up to 10 $\mu\text{m}$  with unequal spacing.

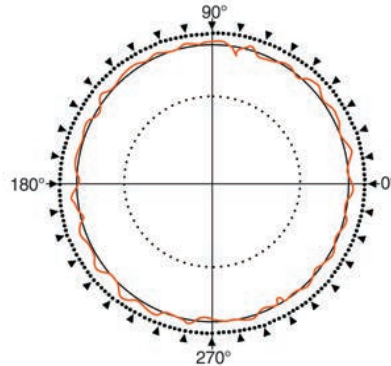
## CARBIDE REAMERS - COMPARISON SPACING / EU SPACING

unequal spacing  
roundness error up to 10  $\mu\text{m}$



Results of roundness

extremely unequal spacing  
roundness error up to 1 - 2  $\mu\text{m}$



Results of roundness



# Technical Section - Reaming

## TROUBLE SHOOTING WHEN REAMING

<i>Problem</i>	<i>Cause</i>	<i>Solution</i>
<b>Broken or twisted tangs</b>		
	Incorrect fit between shank and socket	Ensure the shank and the socket are clean and free from damage
<b>Rapid Tool Wear</b>		
	Insufficient stock to remove	Increase the amount of stock to be removed
<b>Oversize Hole</b>		
	Excessive lip height variation	Regrind to correct specification
	Displacement in the machine spindle	Repair and rectify spindle displacement
	Defects on the tool holder	Replace tool holder
	Tool shank is damaged	Replace or regrind the shank
	Ovality of the tool	Replace or regrind the tool
	Asymmetric bevel lead angle	Regrind to correct specification
	Too high feed or cutting speed	Adjust cutting conditions in accordance with Catalog or Product Selector
<b>Undersize hole</b>		
	Insufficient stock to remove	Increase the amount of stock to be removed
	Too much heat generated while reaming. The hole widens and shrinks.	Increase coolant flow
	The tool diameter is worn and is undersize.	Regrind to correct specification.
	Too low feed or cutting speed	Adjust cutting conditions in accordance with the Dormer Product Selector.
	Pre-drilled hole is too small	Decrease the amount of stock to be removed.
<b>Oval and conical holes</b>		
	Displacement in the machine spindle	Repair and rectify spindle displacement
	Misalignment between tool and hole	Use a bridge reamer
	Asymmetric bevel lead angle	Regrind to correct specification
<b>Bad Hole finish</b>		
	Excessive stock to remove	Decrease the amount of stock to be removed
	Worn out tool	Regrind to specification
	Too small cutting rake angle	Regrind to specification
	Too diluted emulsion or cutting oil	Increase % concentration
	Feed and/or speed too low	Adjust cutting conditions in accordance with Catalog/ Product Selector
	Cutting speed too high	Adjust cutting conditions in accordance with Catalog/ Product Selector
<b>The tool clamps and breaks</b>		
	Worn out tool	Regrind to correct specification
	Back taper of the tool is too small	Check and replace / modify the tool
	The width of the land is too wide	Check and replace / modify the tool
	Workpiece material tend to squeeze	Use an adjustable reamer to compensate for the displacement
	Pre-drilled hole is too small	Decrease the amount of stock to be removed
	Heterogeneous material with hard inclusions	Use solid carbide reamer

# Technical Section - Counterboring and Countersinking

## GENERAL HINTS ON COUNTERBORING AND COUNTERSINKING

### COUNTERBORING

The counterbore is an end cutting tool which is used to enlarge a preformed hole when a flat bottom is required or to spotface when a machine finish is required. It may have a fixed pilot (solid pattern) Fig.1 or be designed Fig.2 for an interchangeable pilot Fig. 3.



Fig.1



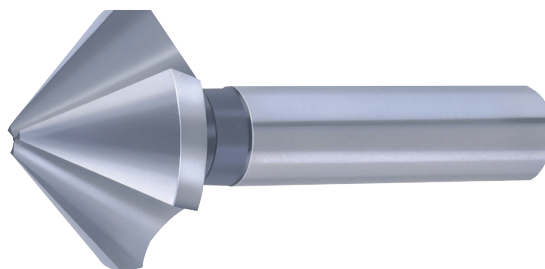
Fig.2



Fig. 3

### COUNTERSINKING

The countersink is an conical cutting tool, usually made with angular relief, having one or more flutes with specific size angle cutting edges. It is used for chamfering and countersinking holes. The countersink may have a straight shank, tapered shank, bit stock shank or special shank requiring a special holder, for holding in a power or hand operated machine.



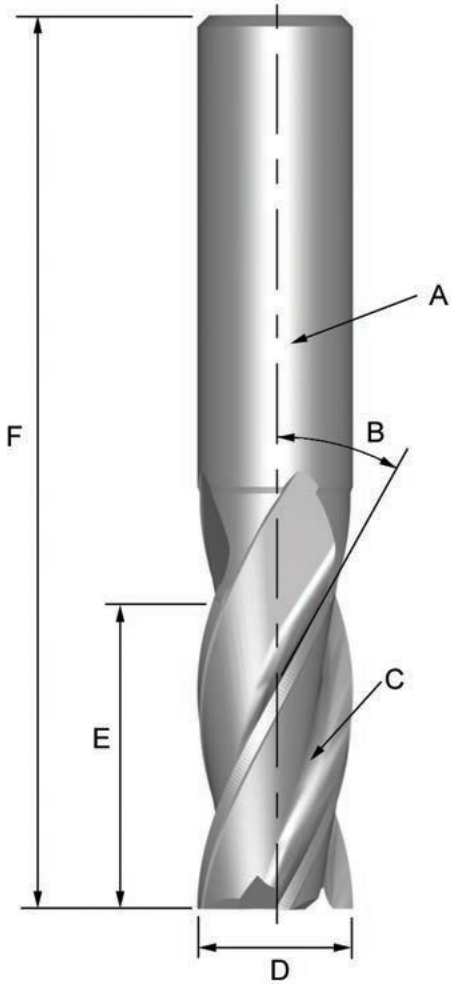
# Technical Section - Counterboring and Countersinking

## TROUBLE SHOOTING WHEN COUNTERBORING

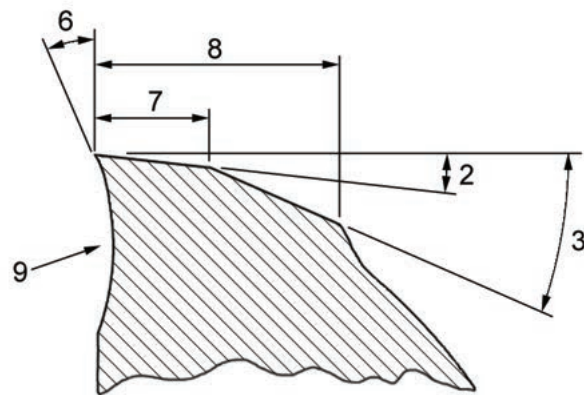
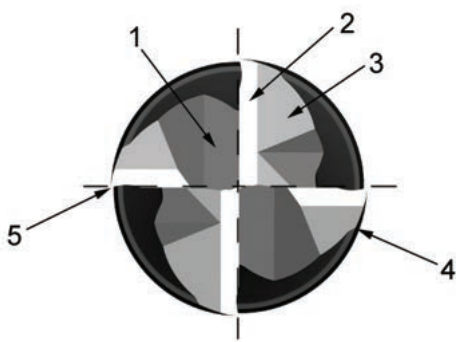
<i>Problem</i>	<i>Cause</i>	<i>Solution</i>
<b>Excessive Cutting Edge Wear</b>		
	Incorrect feeds & speeds	Increase feed - especially when machining ductile or free machining materials. Also try reducing speed
	Rough cutting edge	Lightly hone cutting edge with fine grit diamond hone
	Insufficient coolant	Increase coolant flow - review type of coolant
<b>Chipping</b>		
	Poor chip removal	Use tool with larger flute space - larger diameter or fewer flutes
	Recutting work hardened chips	Increase coolant flow
	Vibration	Increase rigidity of set-up, especially worn tool holders
<b>Short Tool Life</b>		
	Excessive cratering	Increase speed or decrease feed
	Abrasive material	Decrease speed and increase feed Increase coolant flow
	Hard materials	Reduce speed - rigidity very important
	Insufficient chip room	Use larger diameter tool
	Delayed resharpening	Prompt resharpening to original geometry will increase tool life
<b>Glazed Finish</b>		
	Feed too light	Increase feed
	Dull cutting edge	Resharpen tool to original geometry
	Insufficient clearance	Resharpen tool with more clearance
<b>Rough Finish</b>		
	Dull cutting edge	Resharpen to original tool geometry
	Wrong feeds & speeds	Increase speed - also try reducing feed
<b>Chattering</b>		
	Insufficient machine horsepower	Use tool with fewer flutes as correct feeds & speeds must be maintained
	Vibration	Resharpen tool with more clearance

# Technical Section - Milling

## NOMENCLATURE



- A Shank
- B Helix Angle
- C Flute
- D Outside Diameter
- E Cutting Length
- F Overall Length



- 1 Gash
- 2 Primary Relief Angle
- 3 Secondary Relief Angle
- 4 Heel
- 5 Cutting Edge

- 6 Rake Angle
- 7 Width of Primary Relief Land
- 8 Width of Secondary Relief Land
- 9 Undercut Face

# Technical Section - Milling

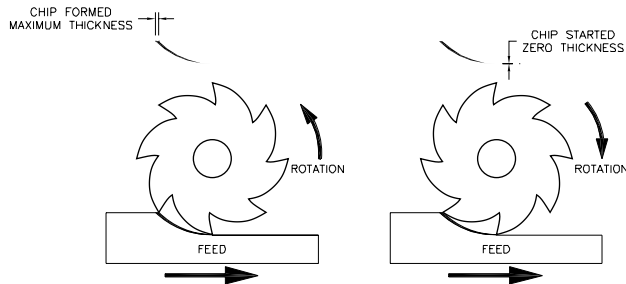
## MILLING EFFECTIVELY

### Types Of Cuts

#### Climb Milling Versus Conventional Milling

##### CLIMB MILLING

##### CONVENTIONAL MILLING



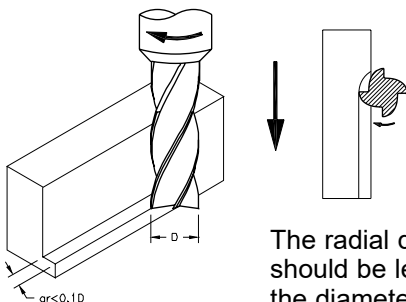
In conventional milling, the cutter revolves opposite to the direction of table feed. Therefore the width of the chip starts at zero and increases to a maximum at the end of the cut. This can lead to accelerated tool wear under some conditions. Conventional milling may be advantageous when milling hot rolled steel, surface hardened and steels with a surface scale.

In climb milling, the cutter revolves in the same direction as the table feed. The tooth meets the work at the top of the cut, producing the thickest part of the chip first. In horizontal applications the resultant force created by climb milling can act as a clamping force, acting towards the machine table.

It is important to make sure that the machine tool has no leadscrew backlash. Normally climb milling improves product surface finish and increases tool life.

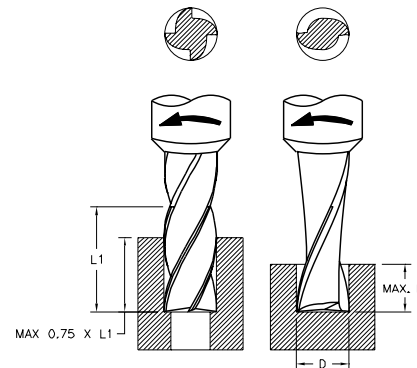
**Peripheral Milling** The milling of a surface which is parallel to the end mill axis.

#### Peripheral (Cylindrical, Slab) Milling



The radial depth of cut should be less than 0.1 of the diameter of the mill:  
 $a_r < 0.1 D$ .

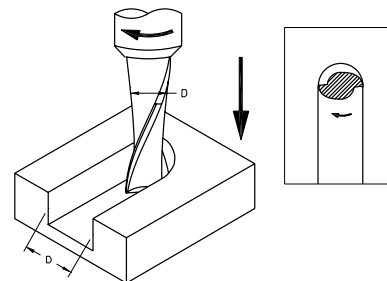
**Plunge Milling** The direct movement between the workpiece and the center line of the end mill when the end mill sinks directly into the workpiece.



In order to be able to "drill," i.e. mill with axial feed, an end mill must have an end face cutting edge that goes all the way to the center. An example of such a solid drilling operation is keyway milling in the middle of a shaft.

In boring, the depth of a hole may be up to 75% of the cutting edge length. In solid drilling, however, it should not exceed 0.5-1 D.

#### Slot Milling



003-00-A

The radial depth of cut is equal to the diameter of the mill:  $a_r = D$ .

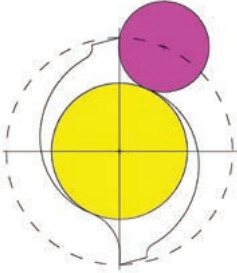
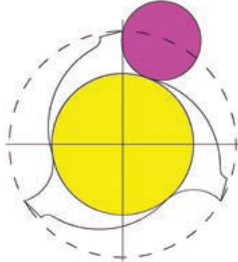
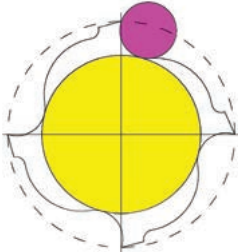
All slotting applications are a combination of conventional and climb milling. Refer to adjacent section.

# Technical Section - Milling

## FEATURES OF THE END MILL - CHOOSING THE NUMBER OF FLUTES

Number of flutes should be determined by:

- Milled material
- Dimension of workpiece
- Milling conditions

	2 Flutes	3 Flutes	4 Flutes (or multi-flutes)
			
Flexural strength	Low		High
Chip space	Big		Small
	<ul style="list-style-type: none"> <li>• Large chip space.</li> <li>• Easy chip ejection.</li> <li>• Good for slot milling.</li> <li>• Good for heavy duty milling.</li> <li>• Less rigidity due to small section area.</li> <li>• Lower quality surface finish</li> </ul>	<ul style="list-style-type: none"> <li>• Chip space almost as large as for 2 flutes.</li> <li>• Larger section area - higher rigidity than 2 flutes</li> <li>• Improved surface finish</li> </ul>	<ul style="list-style-type: none"> <li>• Highest rigidity.</li> <li>• Largest section area – small chip space.</li> <li>• Gives best surface finish.</li> <li>• Recommended for profiling, side milling and shallow slotting.</li> </ul>

## FEATURES OF THE END MILL – HELIX ANGLE

Increasing the number of flutes makes the load on the single tooth more homogeneous and consequently, this allows for a better finish. But with a high helix angle, the load (FV) along the cutter axis is increased too. A high FV can give:

- Load problems on the bearings
- Cutter movement along the spindle axis. To avoid this problem it is necessary to use Weldon or screwed shanks.



# Technical Section - Milling

## DIRECTION OF USE OF THE CUTTER

We can split the range of the cutters in relationship to the possible working directions to the workpiece surface. There are three different types:

3 Directions	2 Directions	1 Direction
		

Please note that the axial direction is possible only with center cutting end mills.

## MRR (MATERIAL REMOVAL RATE) Q

We can calculate material removal rate Q as the volume of material removed divided by the time taken to cut. The volume removed is the initial volume of the workpiece minus the final volume. The cutting time is the time needed for the tool to move through the length of the workpiece. This parameter strongly influences the finishing grade of the workpiece.

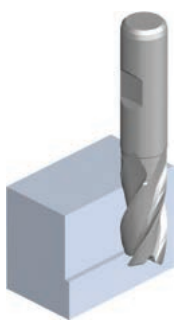
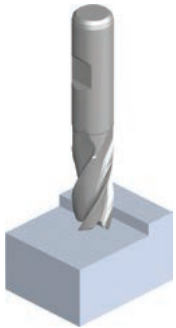
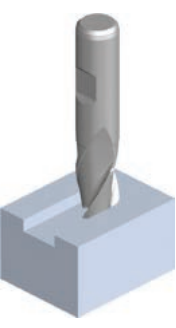
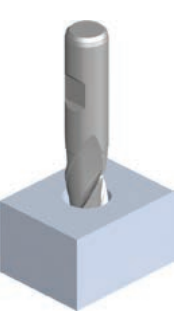
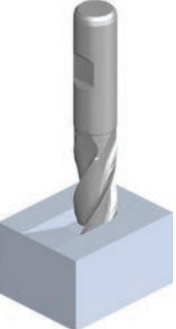
$$Q = \frac{a_p * a_e * v_f}{1000}$$

Q = MRR (cm<sup>3</sup>/min)    a<sub>e</sub> = radial depth (mm)

a<sub>p</sub> = axial depth (mm)    v<sub>f</sub> = feed rate mm/min

## APPLICATIONS

The MRR and the applications are strongly related. For each different application we have a different MRR that increases with the engagement section of the cutter on the workpiece. The recent Dormer Catalogue was produced with simple icons that show the different applications.

Side Milling	Face Milling	Slot Milling	Plunge Milling	Ramping
				
The radial depth of cut should be less than 0.25 of the diameter of the end mill.	The radial depth of cut should be no more than 0.9 of the diameter, axial depth of cut less than 0.1 of the diameter.	Machining of a slot for keyways. The radial depth of cut is equal to the diameter on the end mill.	It is possible to drill the workpiece with an end mill only with the cutting centre. In this operation the feed has to be halved.	Both axial and radial entering into the workpiece.

# Technical Section - Milling

## MILLING EFFECTIVELY

### End Mill Selection

Utilize the shortest possible tool available for the application with the largest diameter permissible and the shortest flute length as depth of cut allows. Extra length end mills have excessive overhang, thus a reduction in feed up to 25% may be required. Stub length end mills, due to their short overall and flute length, have more rigidity, thus an increase in feed rates of up to 25% may be required.

### Speeds

Solid Carbide end mills must be run at higher speeds than High Speed Steel end mills. Many times, lighter cuts at higher speeds can improve the finish of the workpiece.

When the application is a slotting cut, the speed should be reduced by approximately 20%. Speeds should be decreased when milling hard or tough materials or when taking heavy cuts. Speeds should be increased when milling softer materials or when taking lighter cuts. Speeds should also be increased for finishing cuts.

### Coolants

Coolants are recommended when milling mild steel and high temperature alloys. The purpose of the coolant media is to direct the chips away from the cutting tool and workpiece. This prevents damage to the cutting edges due to recutting the chips. When machining titanium, coolant flow must be heavy and directed at the area of cut to prevent overheating and assist in chip removal.

## Milling Terminology/Operating Formulas

The following terms and formulas can be used to determine the appropriate operating parameters.

Terms	Formulas
<b>SFM</b> = Surface Feet Per Minute	$D \times \text{RPM} \times .26 = \text{SFM}$
<b>RPM</b> = Revolutions Per Minute	$\frac{\text{SFM} \times 3.82}{D} = \text{RPM}$
<b>F</b> = Feed in Inches Per Minute	$\text{Ft} \times \text{T} \times \text{RPM} = \text{F}$
<b>Ft</b> = Feed Per Tooth	$\frac{F}{\text{T} \times \text{RPM}} = \text{Ft}$
<b>D</b> = Cutting Diameter	
<b>T</b> = Number of Teeth	



# Technical Section - Milling

## TABLE OF CUTTING SPEEDS

### Conversion Table (Surface Feet Per Minute to Revolutions Per Minute)

DIA. In Inches	Surface Feet Per Minute																DIA. In Inches	
	15'	20'	25'	30'	35'	40'	45'	50'	60'	70'	80'	90'	100'	110'	120'	130'		140'
	Revolutions Per Minute																	
1/64	3667	4890	6112	7334	8559	9779	11002	12224	14669	17114	19558	22003	24448	26893	29338	31782	34227	1/64
1/32	1834	2445	3056	3667	4278	4890	5501	6112	7334	8557	9779	11002	12224	13446	14669	15891	17114	1/32
3/64	1222	1630	2037	2445	2852	3260	3667	4075	4890	5705	6519	7334	8149	8964	9779	10594	11409	3/64
1/16	917	1222	1528	1833	2139	2445	2750	3056	3667	4278	4889	5500	6112	6723	7333	7945	8556	1/16
3/32	611	815	1019	1222	1426	1630	1834	2037	2445	2852	3260	3667	4075	4482	4890	5297	5705	3/32
1/8	458	611	764	917	1070	1222	1375	1528	1833	2139	2445	2750	3056	3361	3667	3973	4278	1/8
5/32	367	489	611	733	856	978	1100	1222	1467	1711	1956	2200	2445	2689	2934	3178	3423	5/32
3/16	306	407	509	611	713	815	917	1019	1222	1426	1620	1833	2037	2241	2445	2648	2852	3/16
1/4	229	306	382	458	535	611	688	764	917	1070	1222	1375	1528	1681	1833	1986	2139	1/4
5/16	183	244	306	367	428	489	550	611	733	856	978	1100	1222	1345	1467	1589	1711	5/16
3/8	153	204	255	306	357	407	458	509	611	713	815	917	1019	1120	1222	1324	1426	3/8
7/16	131	175	218	262	306	349	393	437	524	611	698	786	873	960	1048	1135	1222	7/16
1/2	115	153	191	229	267	306	344	382	458	535	611	688	764	840	917	993	1070	1/2
5/8	92	122	153	183	214	244	275	306	367	428	489	550	611	672	733	794	856	5/8
3/4	76	102	127	153	178	204	229	255	306	357	407	458	509	560	611	662	713	3/4
7/8	66	87	109	131	153	175	196	218	262	306	349	393	473	480	524	568	611	7/8
1	57	76	96	115	134	153	172	191	229	267	306	344	382	420	458	479	535	1
1-1/8	51	68	85	102	119	136	153	170	204	238	272	306	340	373	407	441	475	1-1/8
1-1/4	46	61	76	92	107	122	138	153	183	214	244	275	306	336	367	397	428	1-1/4
1-3/8	42	56	70	83	97	111	125	139	167	194	222	250	278	306	333	361	389	1-3/8
1-1/2	38	51	64	76	89	102	115	127	153	178	204	229	255	280	309	331	357	1-1/2
1-5/8	35	47	59	71	82	94	106	118	141	165	188	212	235	259	282	306	329	1-5/8
1-3/4	33	44	55	66	76	87	98	109	131	153	175	196	218	240	262	284	306	1-3/4
1-7/8	31	41	51	61	71	82	92	102	122	143	163	183	204	224	244	265	285	1-7/8
2	29	38	48	57	67	76	86	96	115	134	153	172	191	210	229	248	267	2
2-1/4	26	34	42	51	59	68	76	85	102	119	136	153	170	187	204	221	238	2-1/4
2-1/2	23	31	38	46	54	61	69	76	92	107	122	138	153	168	183	199	214	2-1/2
2-3/4	21	28	35	42	49	56	62	70	83	97	111	125	139	153	167	181	194	2-3/4
3	19	26	32	38	45	51	57	64	76	89	102	115	127	140	153	166	178	3
3-1/4	18	24	29	35	41	47	53	59	71	82	94	106	118	129	141	153	165	3-1/4
3-1/2	16	22	27	33	38	44	49	55	66	76	87	98	109	120	131	142	153	3-1/2
3-3/4	15	20	26	31	36	41	46	51	61	71	81	92	102	112	122	132	143	3-3/4
4	14	19	24	29	33	38	43	48	57	67	76	86	96	105	115	124	134	4
4-1/2	13	17	21	26	30	34	38	42	51	59	68	76	85	93	102	110	119	4-1/2
5	12	15	19	23	27	31	34	38	46	54	61	69	76	84	92	99	107	5
5-1/2	10	14	17	21	24	28	31	35	42	49	56	63	70	76	83	90	97	5-1/2
6	10	13	16	19	22	26	29	32	38	45	51	57	64	70	76	83	89	6
6-1/2	9	12	15	18	21	24	26	29	35	41	47	53	59	65	71	76	82	6-1/2
7	8	11	14	16	19	22	25	27	33	38	44	49	55	60	66	71	76	7
7-1/2	8	10	13	15	18	20	23	26	31	36	41	46	51	56	61	66	71	7-1/2
8	7	10	12	14	17	19	22	24	29	33	38	43	48	53	57	62	67	8
8-1/2	7	9	11	14	16	18	20	23	27	32	36	40	45	49	54	58	63	8-1/2
9	6	9	11	13	15	17	19	21	26	30	34	38	42	47	51	55	59	9
9-1/2	6	8	10	12	14	16	18	20	24	28	32	36	40	44	48	52	56	9-1/2
10	6	8	10	12	13	15	17	19	23	27	31	34	38	42	46	50	54	10
11	5	7	9	10	12	14	16	17	21	24	28	31	35	38	42	45	49	11
12	5	6	8	10	11	13	14	16	19	22	26	29	32	35	38	41	45	12
	15'	20'	25'	30'	35'	40'	45'	50'	60'	70'	80'	90'	100'	110'	120'	130'	140'	

# Technical Section - Milling

## CUTTING DATA

### S400HA SLOTING

Materials:	AMG 7.1 - 7.4 Aluminum & Non-Ferrous Metals			
"D" Tool Dia.	RPM	IPM	SFM	IPR
1/16	15,600	29.44	255	0.0019
3/32	15,600	35.98	383	0.0039
1/8	15,600	42.52	511	0.0027
3/16	15,600	61.42	766	0.0039
1/4	15,600	70.87	1022	0.0045
5/16	12,000	85.05	983	0.0071
3/8	12,000	103.93	1179	0.0087
1/2	12,000	127.56	1572	0.0106
5/8	9,600	118.12	1572	0.0123
3/4	6,000	89.76	1179	0.0150

Axial DOC (maximum) = 0.5 x D

Using Table Above...

For AMG 6.1 & 6.4 — Use RPM & SFM x 0.3

For AMG 8.1 - 8.3 — Use RPM & SFM x 0.3

### S400HA SIDE CUTTING

Materials	AMG 7.1 - 7.4 Aluminum & Non-Ferrous Metals			
"D" Tool Dia.	RPM	IPM	SFM	IPR
1/16	12,000	40.01	197	0.0033
3/32	12,000	48.35	295	0.0040
1/8	12,000	56.69	393	0.0047
3/16	12,000	80.32	590	0.0067
1/4	12,000	94.49	786	0.0079
5/16	9,600	108.66	786	0.0113
3/8	9,600	127.56	943	0.0133
1/2	9,600	160.56	1258	0.0167
5/8	7,200	146.52	1179	0.0204
3/4	4,800	113.39	943	0.0236

Axial DOC (maximum) = 1.0 x D

Radial DOC (maximum) = 0.25 x D (up to ø 3/8)

Radial DOC (maximum) = 0.5 x D (ø 1/2 - ø 3/4)

### S401HA SLOTING

Materials:	AMG 7.1 - 7.4 Aluminum & Non-Ferrous Metals			
"D" Tool Dia.	RPM	IPM	SFM	IPR
5/32	12,400	36.4	508	0.0029
1/4	12,400	45.4	812	0.0037
5/16	9,920	54.5	812	0.0055
3/8	9,920	66.6	975	0.0067
1/2	9,920	81.8	1300	0.0082
5/8	7,440	75.7	1218	0.0102
3/4	4,960	60.6	975	0.0122

Axial DOC (maximum) = 0.5 x D

Using Table Above...

For AMG 8.1 - 8.3 — Use RPM & SFM x 0.3

### S401HA SIDE CUTTING

Materials	AMG 7.1 - 7.4 Aluminum & Non-Ferrous Metals			
"D" Tool Dia.	RPM	IPM	SFM	IPR
5/32	12,400	42.4	508	0.0034
1/4	12,400	60.6	812	0.0049
5/16	9,920	69.6	812	0.0070
3/8	9,920	81.8	975	0.0082
1/2	9,920	103	1300	0.0104
5/8	7,440	93.9	1218	0.0126
3/4	4,960	75.7	975	0.0153

Axial DOC (maximum) = 1.0 x D

Radial DOC (maximum) = 0.25 x D (up to ø 3/8)

Radial DOC (maximum) = 0.5 x D (ø 1/2 - ø 3/4)

Materials:	AMG 6.1 - 6.4 Copper Alloys			
"D" Tool Dia.	RPM	IPM	SFM	IPR
5/32	3,720	9.1	152	0.0024
1/4	3,720	11.5	244	0.0031
5/16	2,852	13.6	234	0.0048
3/8	2,852	16.6	280	0.0058
1/2	2,852	20.5	374	0.0072
5/8	2,232	19.1	365	0.0086
3/4	1,426	15.2	280	0.0107

Axial DOC (maximum) = 0.5 x D

Materials	AMG 6.1 - 6.4 Copper Alloys			
"D" Tool Dia.	RPM	IPM	SFM	IPR
5/32	3,720	10.6	152	0.0028
1/4	3,720	15.2	244	0.0041
5/16	2,852	17.6	234	0.0062
3/8	2,852	20.6	280	0.0072
1/2	2,852	25.8	374	0.0090
5/8	2,232	23.6	365	0.0106
3/4	1,426	19.1	280	0.0134

Axial DOC (maximum) = 1.0 x D

Radial DOC (maximum) = 0.25 x D (up to ø 3/8)

Radial DOC (maximum) = 0.5 x D (ø 1/2 - ø 3/4)

RPM = Revolutions per Minute

IPM = Inches per Minute

SFM = Surface Feet per Minute

IPR = Inches per Revolution

DOC = Depth of Cut

FT (Feet per Tooth) = IPR / # of Teeth

# Technical Section - Milling

## CUTTING DATA

### S402HA PROFILING

Materials:	<b>AMG 7.1 - 7.4</b> Aluminum & Non-Ferrous Metals			
"D" Tool Dia.	RPM	IPM	SFM	IPR
1/4	14,500	71.65	950	0.0049
5/16	11,200	81.9	917	0.0073
3/8	11,200	96.2	1100	0.0086
1/2	11,200	122.85	1467	0.0110
5/8	8,800	110.5	1441	0.0126
3/4	5,600	104	1100	0.0186
<b>Using Table Above...</b>				
For AMG 6.1 & 6.4 — Use RPM & SFM x 0.3				
For AMG 8.1 - 8.3 — Use RPM & SFM x 0.3				

Axial Depth of Cut (DOC) recommendation = 0.2 x D  
 Radial Depth of Cut (DOC) recommendation = 0.5 x D  
 Note: Reduce the Feed in "Long Length" options by 50%

### S403HA & S404HA SLOTTING

Materials:	<b>AMG 7.1 - 7.4</b> Aluminum & Non-Ferrous Metals			
"D" Tool Dia.	RPM	IPM	SFM	IPR
1/8	15,600	43	511	0.0028
3/16	15,600	61.4	766	0.0039
1/4	15,600	73.7	1022	0.0047
5/16	12,000	86	983	0.0072
3/8	12,000	104.4	1179	0.0087
7/16	12,000	116.65	1376	0.0097
1/2	12,000	128.9	1572	0.0107
5/8	9,600	116.65	1572	0.0122
3/4	6,000	92.15	1179	0.0154
1"	6,000	98.3	1572	0.0164
Axial DOC (maximum) = 0.5 x D				
<b>Using Table Above...</b>				
For AMG 6.1 & 6.4 — Use RPM & SFM x 0.3				
For AMG 8.1 - 8.3 — Use RPM & SFM x 0.3				

### S403HA & S404HA SIDE CUTTING

Materials:	<b>AMG 7.1 - 7.4</b> Aluminum & Non-Ferrous Metals			
"D" Tool Dia.	RPM	IPM	SFM	IPR
1/8	12,000	55.25	393	0.0046
3/16	12,000	79.8	590	0.0067
1/4	12,000	92.2	786	0.0077
5/16	9,600	110.55	786	0.0115
3/8	9,600	129	943	0.0134
7/16	9,600	144.4	1100	0.0150
1/2	9,600	159.8	1258	0.0166
5/8	7,200	147.4	1179	0.0205
3/4	4,800	113.6	943	0.0237
1"	4,800	116.65	1258	0.0243
Axial DOC (maximum) = 1.0 x D				
Radial DOC (maximum) = 0.25 x D (up to ø 3/8)				
Radial DOC (maximum) = 0.5 x D (ø 1/2 - ø 1")				

### S405HA

#### HIGH SPEED CUTTING (FINISHING)

Materials:	<b>AMG 1.3-1.6</b> Carbon Steels, Alloy Steels			
	<b>AMG 3.4</b> Cast Iron (up to 50 HRC)			
"D" Tool Dia.	RPM	IPM	SFM	IPR
1/4	16,800	240	1100	0.0143
5/16	12,600	240	1032	0.0190
3/8	10,000	235	983	0.0235
1/2	8,400	200	1100	0.0238
5/8	6,300	150	1032	0.0238
3/4	5,000	120	983	0.0240
Axial DOC (maximum) = 1.5 x D				
Radial DOC (maximum) = 0.05 x D				

Materials:	<b>AMG 1.7 - 1.8</b> Alloy Steels & Tool Steels (from 50 HRC up to 60 HRC)			
"D" Tool Dia.	RPM	IPM	SFM	IPR
1/4	8,400	120	550	0.0143
5/16	6,300	120	516	0.0190
3/8	5,000	120	491	0.0240
1/2	4,200	100	550	0.0238
5/8	3,150	75	516	0.0238
3/4	2,500	58	491	0.0232
Axial DOC (maximum) = 1.5 x D				
Radial DOC (maximum) = 0.05 x D				

RPM = Revolutions per Minute  
 IPM = Inches per Minute  
 SFM = Surface Feet per Minute  
 IPR = Inches per Revolution  
 DOC = Depth of Cut  
 FT (Feet per Tooth) = IPR / # of Teeth

Materials:	<b>AMG 1.8</b> Hardened Steels (from 60 HRC up to 65 HRC)			
"D" Tool Dia.	RPM	IPM	SFM	IPR
1/4	4,200	58	275	0.0138
5/16	3,200	58	262	0.0181
3/8	2,500	58	246	0.0232
1/2	2,100	50	275	0.0238
5/8	1,600	37	262	0.0231
3/4	1,260	30	248	0.0238
Axial DOC (maximum) = 1.5 x D				
Radial DOC (maximum) = 0.05 x D				

# Technical Section - Milling

## S406HA & S406HB SLOTING & SIDE CUTTING

Materials:		AMG 1.1-1.5 Carbon Steels, Alloy Steels, and Cast Iron (under 40 HRC)			
"D" Tool Dia.	RPM	IPM	SFM	IPR	
1/8	12,735	10.2	417	0.0008	
3/16	8,490	10.9	417	0.0013	
1/4	6,370	11.5	417	0.0018	
5/16	5,100	13	418	0.0025	
3/8	4,245	18.4	417	0.0043	
7/16	4,010	24.5	460	0.0061	
1/2	3,500	25.9	459	0.0074	
9/16	3,110	26	458	0.0084	
5/8	2,800	26.1	459	0.0093	
3/4	2,340	24	460	0.0103	
1"	1,755	17.4	460	0.0099	

Axial DOC (maximum) = 1 x D (Slotting)  
 Axial DOC (maximum) = 1.5 x D (Side Cutting)  
 Radial DOC (maximum) = 0.5 x D (Side Cutting)

## SLOTING & SIDE CUTTING

Materials:		AMG 2.2-2.4 Stainless Steels (300 Series)			
"D" Tool Dia.	RPM	IPM	SFM	IPR	
1/8	9,625	7.3	315	0.0008	
3/16	6,385	8.3	314	0.0013	
1/4	4,810	9.6	315	0.0020	
5/16	3,850	10.7	315	0.0028	
3/8	3,210	15.4	315	0.0048	
7/16	2,750	20.9	315	0.0076	
1/2	2,400	21	314	0.0088	
9/16	2,140	21.2	315	0.0099	
5/8	1,925	21.2	315	0.0110	
3/4	1,600	19.4	314	0.0121	
1"	1,200	14.7	314	0.0123	

Axial DOC (maximum) = 1 x D (Slotting)  
 Axial DOC (maximum) = 1.5 x D (Side Cutting)  
 Radial DOC (maximum) = 0.5 x D (Side Cutting)

## SLOTING & SIDE CUTTING

Materials:		AMG 2.1-2.3 Stainless Steels (400 Series)			
"D" Tool Dia.	RPM	IPM	SFM	IPR	
1/8	13,475	7.6	441	0.0006	
3/16	12,000	8.4	590	0.0007	
1/4	6,815	9.6	446	0.0014	
5/16	5,390	10.7	441	0.0020	
3/8	4,490	15.4	441	0.0034	
7/16	3,850	20.9	441	0.0054	
1/2	3,370	21	441	0.0062	
9/16	2,990	21.2	441	0.0071	
5/8	2,700	21.2	442	0.0079	
3/4	2,250	19.4	442	0.0086	
1"	1,685	15.1	441	0.0090	

Axial DOC (maximum) = 1 x D (Slotting)  
 Axial DOC (maximum) = 1.5 x D (Side Cutting)  
 Radial DOC (maximum) = 0.5 x D (Side Cutting)

## SLOTING & SIDE CUTTING

Materials:		AMG 4.1-4.3 Titanium			
"D" Tool Dia.	RPM	IPM	SFM	IPR	
1/8	8,320	7.6	272	0.0009	
3/16	5,550	8.4	273	0.0015	
1/4	4,160	9.6	272	0.0023	
5/16	3,330	10.7	273	0.0032	
3/8	2,770	15.4	272	0.0056	
7/16	2,380	20.7	273	0.0087	
1/2	2,080	21	272	0.0101	
9/16	1,850	21.2	273	0.0115	
5/8	1,660	21.2	272	0.0128	
3/4	1,390	19.4	273	0.0140	
1"	1,040	15.1	272	0.0145	

Axial DOC (maximum) = 1 x D (Slotting)  
 Axial DOC (maximum) = 1.5 x D (Side Cutting)  
 Radial DOC (maximum) = 0.5 x D (Side Cutting)

## SLOTING & SIDE CUTTING

Materials:		AMG 5.1-5.3 Nickel Alloys, Inconel, Hastelloy			
"D" Tool Dia.	RPM	IPM	SFM	IPR	
1/8	2,565	2.1	84	0.0008	
3/16	1,685	1.8	83	0.0011	
1/4	1,285	2.5	84	0.0019	
5/16	1,025	2.8	84	0.0027	
3/8	855	4.1	84	0.0048	
7/16	735	5.5	84	0.0075	
1/2	640	5.6	84	0.0088	
9/16	570	5.7	84	0.0100	
5/8	510	5.6	84	0.0110	
3/4	425	5.2	84	0.0122	
1"	315	4.3	83	0.0137	

Axial DOC (maximum) = 0.5 x D (Slotting)  
 Axial DOC (maximum) = 1.0 x D (Side Cutting)  
 Radial DOC (maximum) = 0.35 x D (Side Cutting)

RPM = Revolutions per Minute  
 IPM = Inches per Minute  
 SFM = Surface Feet per Minute  
 IPR = Inches per Revolution  
 DOC = Depth of Cut  
 FT (Feet per Tooth) = IPR / # of Teeth

# Technical Section - Milling

## CUTTING DATA

### S407HA

#### SLOTING & SIDE CUTTING

Materials:	AMG 1.1-1.4 Alloy Steels			
	AMG 3.1-3.3 Cast Iron (up to 30 HRC)			
"D" Tool Dia.	RPM	IPM	SFM	IPR
1/8	12,735	10.2	417	0.0008
3/16	8,490	10.9	417	0.0013
1/4	6,370	11.5	417	0.0018
5/16	5,100	13	418	0.0025
3/8	4,245	18.4	417	0.0043
7/16	4,010	24.5	460	0.0061
1/2	3,500	25.9	459	0.0074
9/16	3,110	26	458	0.0084
5/8	2,800	26.1	459	0.0093
3/4	2,340	24	460	0.0103
1"	1,755	17.4	460	0.0099
Axial DOC (maximum) = 1 x D (Slotting) Axial DOC (maximum) = 1.5 x D (Side Cutting) Radial DOC (maximum) = 0.5 x D (Side Cutting)				

#### SLOTING & SIDE CUTTING

Materials:	AMG 1.4-1.6 Alloy Steels			
	AMG 3.2-3.4 Cast Iron (from 30 HRC to 40 HRC)			
"D" Tool Dia.	RPM	IPM	SFM	IPR
1/8	8,910	7.1	292	0.0008
3/16	5,940	7.6	292	0.0013
1/4	4,460	8.1	292	0.0018
5/16	3,560	9.1	291	0.0026
3/8	2,970	12.7	292	0.0043
7/16	2,800	17	321	0.0061
1/2	2,460	18	322	0.0073
9/16	2,180	18.1	321	0.0083
5/8	1,960	18.3	321	0.0093
3/4	1,640	16.7	322	0.0102
1"	1,230	12.2	322	0.0099
Axial DOC (maximum) = 1 x D (Slotting) Axial DOC (maximum) = 1.5 x D (Side Cutting) Radial DOC (maximum) = 0.5 x D (Side Cutting)				

# Technical Section - Milling

## MILLING TROUBLESHOOTING GUIDE

<i>Problem</i>	<i>Solution</i>	
<b>Chipping of the Cutting Edge</b>	<ul style="list-style-type: none"> <li>• Apply hone .0005" to .001"</li> <li>• Try air blow or coolant</li> <li>• Reduce depth of cut</li> <li>• Check amount of wear on collet</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce feed per tooth</li> <li>• If wet cutting, change to dry cutting</li> <li>• Check tool runout</li> <li>• Improve the stability of the work-holding</li> </ul>
<b>Extreme Flank Wear</b>	<ul style="list-style-type: none"> <li>• Use coated end mill</li> <li>• If conventional milling, change to climb</li> <li>• If using water soluble cutting fluid, change to non-water soluble cutting fluid</li> </ul>	<ul style="list-style-type: none"> <li>• Increase helix angle</li> <li>• If conventional milling, change to climb</li> </ul>
<b>Vibration / Chattering</b>	<ul style="list-style-type: none"> <li>• Use larger diameter end mill</li> <li>• Increase feed per tooth</li> <li>• Increase helix angle</li> <li>• Reduce length of flutes or overhang</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce cutting speed</li> <li>• Check or change the holder</li> <li>• Increase number of flutes</li> <li>• Tighten chuck or use stronger chuck</li> </ul>
<b>Deflection</b>	<ul style="list-style-type: none"> <li>• Reduce depth of cut</li> <li>• Increase feed per tooth</li> <li>• Increase helix angle</li> <li>• If using water soluble cutting fluid, change to non-water soluble cutting fluid</li> </ul>	<ul style="list-style-type: none"> <li>• Use larger diameter end mill</li> <li>• Reduce length of flutes or overhang</li> <li>• If using 2-flute type, change to 4-flute type</li> <li>• If climb milling, change to conventional milling</li> </ul>
<b>Poor Surface Finish</b>	<ul style="list-style-type: none"> <li>• Reduce end mill runout</li> <li>• Increase cutting speed</li> <li>• Reduce feed per tooth</li> <li>• Use small hone .0003" to .0006"</li> <li>• Increase helix angle</li> </ul>	<ul style="list-style-type: none"> <li>• Increase number of flutes</li> <li>• Increase volume of air or cutting fluid</li> <li>• Reduce depth of cut</li> <li>• If dry cutting, change to wet cutting</li> </ul>
<b>Waviness</b>	<ul style="list-style-type: none"> <li>• Reduce helix angle</li> <li>• Check end mill runout</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce depth of cut</li> <li>• Check or change the holder</li> </ul>
<b>End Mill Fracturing</b>	<ul style="list-style-type: none"> <li>• Reduce depth of cut</li> <li>• Reduce feed per tooth</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce length of flutes or overhang</li> <li>• If chip jamming occurs, reduce the number of flutes</li> </ul>
<b>Poor Chip Disposal</b>	<ul style="list-style-type: none"> <li>• Use air blow</li> <li>• Reduce depth of cut</li> <li>• Reduce feed per tooth</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce the number of flutes</li> <li>• Increase volume of air or cutting fluid</li> <li>• Increase cutting speed</li> </ul>
<b>Burring Workpiece Chipping</b>	<ul style="list-style-type: none"> <li>• Reduce helix angle</li> <li>• Reduce feed per tooth</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce depth of cut</li> </ul>
<b>Chip Welding</b>	<ul style="list-style-type: none"> <li>• Use coolant</li> <li>• Use coated end mill</li> </ul>	<ul style="list-style-type: none"> <li>• Increase volume of cutting fluid</li> <li>• Increase helix angle</li> </ul>

# Technical Section - General



# Technical Section - General

## APPLICATION MATERIAL GROUP (AMG) CHART WITH MATERIAL EXAMPLES

Application Material Groups (AMG)			Hardness HRC
1. Steel	1.1 Magnetic soft steel	12L14, 12L15	<120 HB
	1.2 Structural Steel/ case carburising steel	1005-1025, 1214, 1215, A36	<200 HB
	1.3 Plain Carbon steel	1030-1060, 1050-1060, 1144-1146	<24
	1.4 Alloy steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	<24
	1.5 Alloy steel/ Hardened and tempered steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	>24<38
	1.6 Alloy steel/ Hardened and tempered steel	4140,4340,52100,8620 H11-H41,A2,D2,01,P20,420	>38
	1.7 Alloy steel Hardened	A2-D2, H10-H41, L1-L6, M1-M42, T1	49-55
	1.8 Alloy steel Hardened	A2-D2, H10-H41, L1-L6, M1-M42, T1	55-63
2. Stainless Steel	2.1 Free machining Stainless Steel	200, 303, 416, 420F, 430F, 440	<24
	2.2 Austenitic	301, 302, 304, 316, 321, 330, CUSTOM 455, AM-350	<24
	2.3 Ferritic + Austenitic, Martensitic	318-329, 400-446, DUPLEX	<32
	2.4 Precipitation Hardened	15-5PH, Custom 450 17-4PH	<32
3. Cast Iron	3.1 Lamellar graphite	Grey, G10, Gg40, J431C, A48 CLASS 20	<150 HB
	3.2 Lamellar graphite	Grey, GG25-Gg40, J158, A48 CLASS 40-60	>150 HB<32
	3.3 Nodular graphite/ Malleable Cast Iron	A220, A436, A439, A602, Black, GGG40-GGG70	<200 HB
	3.4 Nodular graphite/ Malleable Cast Iron	Black Gts/Gtw, J434C	>200 HB<32
4. Titanium	4.1 Titanium, unalloyed	Commercially Pure	<200 HB
	4.2 Titanium, alloyed	6Al4V, 6A14V-2Sn, Monel, Monel K	<28
	4.3 Titanium, alloyed	6Al4V-4Mo, 7A14V-4Mo, 4911-4967	>28<38
5. Nickel	5.1 Nickel, unalloyed	Commercially Pure, 17644, 200, 5553	<150 HB
	5.2 Nickel, alloyed	Monel 400, Hastelloy C, Inconel 625, Waspaloy	<28
	5.3 Nickel, alloyed	Inconel 718, Nimonic 75-95, Rene 41, Inconel 825, A286	>28<38
6. Copper	6.1 Copper	Commercially Pure	<100 HB
	6.2 $\beta$ -Brass, Bronze	314-340, 350-370	<200 HB
	6.3 $\alpha$ -Brass	Alloyed Cu + Al + Fe, Long Chipping	<200 HB
	6.4 High Strength Bronze	Ampco 18-25	<49
7. Aluminium Magnesium	7.1 Al, Mg, unalloyed	Commercially Pure	<100 HB
	7.2 Al alloyed, Si<0.5%	6061 T6, 7075, 314-340	<150 HB
	7.3 Al alloyed, Si>0.5%<10%	6061 T6, 380-390	<120 HB
	7.4 Al alloyed, Si>10% Mg alloys	Magnesium Whisker Reinforced	<120 HB
8. Synthetic Materials	8.1 Thermoplastics	Ultramid, Polystrol	---
	8.2 Thermosetting plastics	Bakelit, Pertinax	---
	8.3 Reinforced plastic materials	CFK, GFKAFK	---
9. Hard Mat.	9.1 Cermets (Metal-ceramics)	Ferrotic	<54
10. Graphite	10.1 Standard graphite		---



# APPLICATION MATERIAL GROUPS - DRILLS

## SURFACE FEET PER MINUTE (SFM)

### Feed Rate Chart - Drills

How To Use This Chart to Find Cutting Feed Rate (IPR):

1. Find your Alpha Code on the AMG Chart (example: 279 U : U is the Alpha Code)
2. Find the closest diameter for your cutting application on the chart to find your IPR

Alpha Code	Feed in Inches per Revolution (IPR) ± 25%														Ø Diameter	
	1mm/ 1/32"	2mm/ 3/32"	3mm/ 1/8"	4mm/ 5/32"	5mm/ 3/16"	6mm/ 1/4"	8mm/ 5/16"	10mm/ 3/8"	12mm/ 1/2"	15mm/ 9/16"	16mm/ 5/8"	20mm/ 3/4"	25mm/ 1"	30mm/ 1.1/8"	40mm/ 1.5/8"	50mm/ 2"
A	0.0004	0.0009	0.0011	0.0013	0.0014	0.0017	0.0021	0.0024	0.0027	0.0032	0.0034	0.0043	0.0049	0.0053	0.0061	0.0069
B	0.0006	0.0011	0.0015	0.0016	0.0018	0.0021	0.0026	0.0031	0.0035	0.0041	0.0043	0.0053	0.0060	0.0065	0.0074	0.0082
C	0.0006	0.0013	0.0017	0.0020	0.0022	0.0025	0.0031	0.0039	0.0043	0.0049	0.0051	0.0063	0.0071	0.0077	0.0087	0.0094
D	0.0006	0.0015	0.0021	0.0024	0.0027	0.0031	0.0039	0.0047	0.0051	0.0059	0.0061	0.0074	0.0083	0.0090	0.0100	0.0108
E	0.0007	0.0017	0.0024	0.0028	0.0031	0.0037	0.0045	0.0055	0.0059	0.0068	0.0071	0.0085	0.0094	0.0102	0.0112	0.0122
F	0.0007	0.0020	0.0029	0.0033	0.0037	0.0043	0.0054	0.0065	0.0070	0.0080	0.0083	0.0098	0.0108	0.0116	0.0126	0.0135
G	0.0007	0.0022	0.0033	0.0038	0.0043	0.0050	0.0063	0.0075	0.0081	0.0091	0.0094	0.0110	0.0122	0.0130	0.0140	0.0148
H	0.0008	0.0026	0.0040	0.0046	0.0051	0.0059	0.0075	0.0090	0.0096	0.0107	0.0110	0.0126	0.0140	0.0148	0.0157	0.0165
I	0.0008	0.0030	0.0047	0.0053	0.0059	0.0068	0.0087	0.0104	0.0110	0.0122	0.0126	0.0142	0.0157	0.0165	0.0173	0.0181
J	0.0009	0.0033	0.0053	0.0060	0.0067	0.0078	0.0098	0.0117	0.0124	0.0137	0.0142	0.0159	0.0175	0.0183	0.0191	0.0198
K	0.0010	0.0036	0.0059	0.0067	0.0075	0.0087	0.0110	0.0130	0.0138	0.0153	0.0157	0.0177	0.0193	0.0201	0.0209	0.0215
L	0.0011	0.0040	0.0065	0.0073	0.0082	0.0094	0.0120	0.0142	0.0152	0.0165	0.0169	0.0191	0.0207	0.0215	0.0224	0.0231
M	0.0012	0.0043	0.0071	0.0080	0.0089	0.0102	0.0130	0.0154	0.0165	0.0177	0.0181	0.0205	0.0220	0.0228	0.0238	0.0248
N	0.0013	0.0047	0.0077	0.0086	0.0095	0.0110	0.0140	0.0165	0.0179	0.0189	0.0193	0.0219	0.0234	0.0242	0.0253	0.0265
S	0.0003	0.0006	0.0008	0.0010	0.0012	0.0015	0.0020	0.0031	0.0039	0.0048	0.0051	0.0059	0.0070	0.0070	0.0090	
T	0.0006	0.0011	0.0016	0.0020	0.0024	0.0028	0.0035	0.0043	0.0051	0.0063	0.0067	0.0075	0.0080	0.0090	0.0100	
U	0.0010	0.0019	0.0028	0.0031	0.0035	0.0042	0.0055	0.0067	0.0079	0.0088	0.0091	0.0094	0.0110	0.0120	0.0140	
V	0.0015	0.0027	0.0039	0.0045	0.0051	0.0060	0.0079	0.0098	0.0110	0.0122	0.0126	0.0134	0.0160	0.0170	0.0200	
W	0.0019	0.0035	0.0051	0.0059	0.0067	0.0079	0.0102	0.0130	0.0150	0.0165	0.0169	0.0177	0.0190	0.0190	0.0200	
X	0.0022	0.0041	0.0059	0.0071	0.0083	0.0098	0.0130	0.0165	0.0189	0.0210	0.0217	0.0228				
Y	0.0027	0.0049	0.0071	0.0087	0.0102	0.0125	0.0169	0.0217	0.0276	0.0276	0.0276	0.0291				
Z	0.0037	0.0068	0.0098	0.0128	0.0157	0.0210	0.0315	0.0394	0.0433	0.0463	0.0472	0.0472				

**Calculations:**  
(inch)

- RPM = SFM/D x 3.82
- SFM = RPM x D x .262
- IPM = IPR x RPM
- IPR = IPM ÷ RPM
- Inch = mm x .0394

**Terms:**

- D = Drill Diameter
- RPM = Revolutions Per Minute
- SFM = Surface Feet per Minute
- IPM = Inches Per Minute
- IPR = Inches Per Revolution

# APPLICATION MATERIAL GROUPS - DRILLS

## SURFACE FEET PER MINUTE (SFM)

\*Feed rate chart - see page 573. For material examples, see page 567.

	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	4.1
209	115I	98I	82F	66F	39E	30D			49E	30G	33C		98I	79E	66E	46E	75F
0860	79E	72E	52C	49C	20A	16A			30C	13E	26A		72G	59D	43C	30C	36D
1290	79E	72E	52C	49C	20A	16A			30C	13E	26A		72G	59D	43C	30C	36D
1511	79E	72E	52C	49C	20A	16A			30C	13E	26A		72G	59D	43C	30C	36D
1813	79E	72E	52C	49C	20A	16A			30C	13E	26A		72G	59D	43C	30C	36D
209CO	115J	98H	89G	75F	56E	33D			79E	36G	56C		115J	92G	72E	56E	92G
2A	115H	98H	82F	66F	43E	30D			49E	26G	30C		98H	79F	66E	46E	75E
2AB	115H	98H	82F	66F	43E	30D			49E	26G	30C		98H	79F	66E	46E	75E
2ACO	115J	98H	89G	79F	56E	33D			72E	36G	49C		115H	92D	72E	56E	92F
4ASM	115J	98J	89G	69G	46F	33E			52F	30H	33D		105J	89G	66F	52F	89G
4ASMCO	125K	108H	98G	89G	59F	36E			72F	36H	49D		112K	98F	72F	56F	98G
500-12			82F	66F	43E	30D			49E	26G	30C		98I	79F	66E	46E	75F
500-6			82F	66F	43E	30D			49E	26G	30C		98I	79F	66E	46E	75F
501-12			82F	66F	43E	30D			49E	26G	30C		98I	79F	66E	46E	75F
501-6			82F	66F	43E	30D			49E	26G	30C		98I	79F	66E	46E	75F
502-12			82F	66F	43E	30D			49E	26G	30C		98I	79F	66E	46E	75F
502-6			82F	66F	43E	30D			49E	26G	30C		98I	79F	66E	46E	75F
5ATL	89G	82G	66E	52E	30D	20B			33D	20F	13B		92H	69E	49D	43D	56E
5ATS	115I	98I	82F	66F	39E	30D			49E	30G	33C		98I	79E	66E	46E	75F
76HA	115I	98I	82G	66F	43E	30D			49E	26G	33C		98I	79F	66E	46E	79F
A002	154J	131J	115F	98F	59F	33E			66F	39G	52C		131J	98E	92E	85E	75F
A012	154J	131J	115F	98F	59F	33E			66F	39G	52C		131J	98E	92E	85E	75F
A022	115K	105K	82I	75H	52G	33E			49G	26I	30E		105K	82I	66G	52G	82I
A100	115H	98H	82F	66F	43E	30D			49E	26G	30C		98H	79F	66E	46E	75E
A101	35H	30H	25F	20F	13E	9D			15E	8G	9C		30H	24F	20E	14E	23E
A108	115I	98I	82G	66F	43E	30D			49E	30G	33D		98H	79F	66E	46E	82G
A125	79E	72E	52C	49C	20A	16A			30C	13E	26A		72G	59D	43C	30C	36D
A160	197E	197E	180D	164D	131C	121A			131B	115C	115A		164C	131A	115A	98A	115A
A170	115H	98H	82F	66E	43D	30C			49D	23F	23B		89H	72E	62D	39D	56E
A217	115I	98I	82G	66F	43E	30D			49E	26G	33C		98I	79F	66E	46E	79F
A218	115I	98I	82G	66F	43E	30D			49E	26G	33C		98I	79F	66E	46E	79F
A221	115I	98I	82G	66F	43E	30D			49E	26G	33C		98I	79F	66E	46E	79F
A225	115I	98I	82G	66F	43E	30D			49E	26G	33C		98I	79F	66E	46E	79F
A243			82F	66F	43E	30D			49E	26G	30C		98I	79F	66E	46E	75F
A244			82F	66F	43E	30D			49E	26G	30C		98I	79F	66E	46E	75F
A345	79G	72G	56E	49D	20C	16B			39C	13E	26A		72G	59D	43C	30C	49D
A350	89I	82I	66G	52F	33E	20D			43E	13G	26C		85I	66F	59E	36E	52F
A510	187M	154M	131K	98H	69F	36D			92G	46I	62G		138K	105J	92J	82F	105G
A520	187M	154M	131K	105I	69G	36E			98I	52I	66G		157M	121K	98J	85F	112I
A530	154I	131I	98F	89F	66E	33D			79E	43G	66C		118I	92E	89E	72E	105F
A553	279L	230L	197L	148H	92F	49D			131G	62I	89G		230K	164J	148J	138F	148G
A720	115A	98A	89A	75A	56A	33A			72A	33A	49A		98A	79A	66A	46A	75A
A730	115J	98H	89G	75F	56E	33D			79E	36G	56C		115J	92G	72E	56E	92G
A900	125H	108H	85H	85H	69E	52E			49E	23E	30C		79J	62J	62J	46I	72E
A901	197J	164J	144I	144I	108G	85G			56E	30E	36C		190I	154I	112J	92I	115G
A920	131J	112J	105I	105I	75E	62E			49F	23F	30D		112L	85L	85L	62J	98G
A921	197M	171M	174J	174J	125G	98G			56F	30F	36D		174L	138L	138L	118J	157I
A940	125F	108F	72G	72G	56C	39C			49C	23E	30B			52I	52I	39H	59E
A941	174G	151G	118G	118G	75D	56D			56C	30E	36B		118I	98I	98I	79H	82F
A951	89G	72G	62E	49D	26C	20B			39C	20E	39A		72G	52D	43C	30C	59D
A952	89G	72G	62E	49D	26C	20B			39C	20E	39A		72G	52D	43C	30C	59D
A976	102C	85C	72C	72C	39A	33A			39B	23C	26A			75C	52C	36A	49C
A977	102B	85B	72B	72B	39A	33A			39B	23B	26A			75B	52B	36A	49B
A978	102A	85A	72A	72A	39A	33A			39A	23A	26A			75A	52A	36A	49A
ATR41			82F	66F	43E	30D			49E	26G	30C		98I	79F	66E	46E	75F
CO500-12						20B			95H	56F	56D	30D	161H	85H	85F	56D	
CO500-6						20B			95H	56F	56D	30D	161H	85H	85F	56D	
CO501-12						20B			95H	56F	56D	30D	161H	85H	85F	56D	
CO501-6						20B			95H	56F	56D	30D	161H	85H	85F	56D	
D33F	279S	246S	246S	230S	148S	148S	98S	98S	98S				246T	246T	180T	180T	
D33L	279S	246S	246S	230S	148S	148S	98S	98S	98S				246T	246T	180T	180T	
D33M	279S	246S	246S	230S	148S	148S	98S	98S	98S				246T	246T	180T	180T	
D33W	279S	246S	246S	230S	148S	148S	98S	98S	98S				246T	246T	180T	180T	
D444	197E	197E	180D	164D	131C	121A			131B	115C	115A		164C	131A	115A	98A	115A
DC	279S	246S	246S	230S	148S	148S	98S	98S					246T	246T	180T	180T	
DS-90	279S	246S	246S	230S	148S	148S	98S	98S	174S	148S			246T	246T	180T	180T	148T
DS-120	279S	246S	246S	230S	148S	148S	98S	98S	174S	148S			246T	246T	180T	180T	148T

# APPLICATION MATERIAL GROUPS - DRILLS

## SURFACE FEET PER MINUTE (SFM)

\*Feed rate chart - see page 573. For material examples, see page 567.

	4.2	4.3	5.1	5.2	5.3	6.1	6.2	6.3	6.4	7.1	7.2	7.3	7.4	8.1	8.2	8.3	9.1	10.1
209	43D	23B	33G	23E	13A	108F	115I	115H	52F	85J	98I	92H	75H	98K	92J	46H	10B	
0860	30B	16A	16E	13C	10A	79D	108G	72F	52D	79H	72G	72F	66E	98H	85F	33D	10A	
1290	30B	16A	16E	13C	10A	79D	108G	72F	52D	79H	72G	72F	66E	98H	85F	33D	10A	
1511	30B	16A	16E	13C	10A	79D	108G	72F	52D	79H	72G	72F	66E	98H	85F	33D	10A	
1813	30B	16A	16E	13C	10A	79D	108G	72F	52D	79H	72G	72F	66E	98H	85F	33D	10A	
209CO	66D	36C	49G	23E	20B	125L	131J	89H	69F	108J	98I	98H	89F	115K	92J	66H	16C	
2A	39D	20B	33G	20E	10A	108G	115I	89H	52G	108J	98I	89H	79F	98J	92H	46F	10B	
2AB	39D	20B	33G	20E	10A	108G	115I	89H	52G	108J	98I	89H	79F	98J	92H	46F	10B	
2ACO	66D	36C	49G	23E	20B	125H	131F	89H	69F	108J	98I	98H	89F				20C	
4ASM	52E	26C	43H	26F	13B	118H	125J	89I	52H	108K	98J	98I	82I	98K	115I	56G	13C	
4ASMCO	59F	33C	49H	30F	20C	125I	131K	89J	52I	115K	108J	102I	98G	115M	92K	56I	20C	
500-12	39D	20B	33G	20E	10A			89H	52G				79F				10B	
500-6	39D	20B	33G	20E	10A			89H	52G				79F				10B	
501-12	39D	20B	33G	20E	10A			89H	52G				79F				10B	
501-6	39D	20B	33G	20E	10A			89H	52G				79F				10B	
502-12	39D	20B	33G	20E	10A			89H	52G				79F				10B	
502-6	39D	20B	33G	20E	10A			89H	52G				79F				10B	
5ATL	30C	13A	26F	13D	10A	98E	105H	89G	52E	105I	89H	89G	82E	115I	85G	39E	10A	
5ATS	43D	23B	33G	23E	13A	108F	115I	115H	52F	85J	98I	92H	75H	98K	92J	46H	10B	
76HA	43D	23B	33G	16E	13A	115G	108I	89H	52G	108J	98I	89H	72H	98J	92H	46F	10B	
A002	43D	23B	43G	23E	10A	164G	108I	128H	98G	134K	125J	108I	108I	98I	164H	115F	10B	
A012	43D	23B	43G	23E	10A	164G	108I	128H	98G	134K	125J	108I	108I	98I	164H	115F	10B	
A022	46F	26C	43H	26F	13B	118H	125K	89I	52I	131F	105K	105J	82J	98K	115I	56G	13C	
A100	39D	20B	33G	20E	10A	108G	115I	89H	52G	108J	98I	89H	79F	98J	92H	46F	10B	
A101	12D	6B	10G	6E	3A	33G	35I	27H	16G	33J	30I	27H	24F	30J	28H	14F	3B	
A108	52E	23B	39G	23G	20E	108G	115I	102H	52G	108J	98I	89H	79F	98J	92H	46F	10B	
A125	30B	16A	16E	13C	10A	79D	108G	72F	52D	79H	72G	72F	66E	98H	85F	33D	10A	
A160	115A	82A	98A	82A	66A	180D	230G	197C	164C	164I	148H	131G	115F		197E		30C	
A170	30C	16A	26F	13D	10A	115F	108H	89G	52F	108I	98H	89G	72G	98I	92G	46E	10A	
A217	43D	23B	33G	16E	13A	115G	108I	89H	52G	108J	98I	89H	72H	98J	92H	46F	10B	
A218	43D	23B	33G	16E	13A	115G	108I	89H	52G	108J	98I	89H	72H	98J	92H	46F	10B	
A221	43D	23B	33G	16E	13A	115G	108I	89H	52G	108J	98I	89H	72H	98J	92H	46F	10B	
A225	43D	23B	33G	16E	13A	115G	108I	89H	52G	108J	98I	89H	72H	98J	92H	46F	10B	
A243	39D	20B	33G	20E	10A			89H	52G				79F				10B	
A244	39D	20B	33G	20E	10A			89H	52G				79F				10B	
A345	30B	16A	26E	13C	10A	89D	108G	89F	52D	108H	89G	89F	79F	98J	98H	33F	10A	
A350	30D	16B	26G	13E	10A	108F	115I	115H	52F	108J	82I	89H	82H	115L	85J	39H	10B	
A510	66H	13B	56I	30E	20E	131D	164I	148I	66F	164G	164M	102I	108I	213G	164G	115F		
A520	66G	13B	56I	36G	23E	131E	164I	148K	66F	180I	164M	121K	115I	213G	164G	115F		
A530	59D	43B	43G	20E	10A	197G	180I	131G	115E	180I	148I	115G	92G	164J	164H	115F	10B	
A553	98E	26C	82I	49E	33G	230G	279I	262I	115G	230H	328M	180I	180J	295G				
A720	56A	26A	33A	23A	13A	115A	131A	115A	89A	115A	98A	89A	89A	157A	82A			
A730	66D	36C	49G	23E	20B	125L	131J	89H	69F	108J	98I	98H	89F	115K	92J	66H	16C	
A900	49E	20C	46G	23G	20C	213G	174I	112H	98G	197J	148N	131N	92I	180I	131G			
A901	79G	33E	72I	36I	33E			184I	157I				157I					
A920	59G	33C	49I	30G	20E	213H	216J	131J	102G	246L	148N	131N	118J	180J	131H			
A921	95I	52E	79L	46I	33G			233J	164I				157J					
A940	43C	20C				213F	230F	112G	98G	174H	148N	131N	98G	180H	131F			
A941	59D	26D						157H	138H				138H					
A951	33B	20A	23E	16C	10A	72D	108G	72F	52D	98H	89G	79F	72F	98J	98H	33F	10A	
A952	33B	20A	23E	16C	10A	72D	108G	72F	52D	98H	89G	79F	72F	98J	98H	33F	10A	
A976	36A	16A						98D	89D				89D					
A977	36A	16A						98C	89C				89C					
A978	36A	16A						98B	89B				89B					
ATR41	39D	20B	33G	20E	10A			89H	52G				79F				10B	
CO500-12		20D		20B	16B													
CO500-6		20D		20B	16B													
CO501-12		20D		20B	16B													
CO501-6		20D		20B	16B													
D33F							820V	820V		656V	656V	367V	197V	197X	328V			
D33L							820V	820V		656V	656V	367V	197V	197X	328V			
D33M							820V	820V		656V	656V	367V	197V	197X	328V			
D33W							820V	820V		656V	656V	367V	197V	197X	328V			
D444	115A	82A	98A	82A	66A	180D	230G	197C	164C	164I	148H	131G	115F		197E		30C	
DC							820V	820V		656V	656V	367V	197V	197X	328V			
DS-90	115T	82S	148T	98S	66S	902V	820V	820V	230T	656V	656V	367V	197V	197X	328V			
DS-120	115T	82S	148T	98S	66S	902V	820V	820V	230T	656V	656V	367V	197V	197X	328V			

# APPLICATION MATERIAL GROUPS - DRILLS

## SURFACE FEET PER MINUTE (SFM)

\*Feed rate chart - see page 573. For material examples, see page 567.

	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	4.1
<b>DS-142</b>	279S	246S	246S	230S	148S	148S	98S	98S	174S	148S			246T	246T	180T	180T	148T
<b>HX10</b>	115H	69H	75I	69H	56F				105I	59H	56F		171L	89I	95H	59F	95H
<b>HX15</b>	115H	69H	75I	69H	56F				105I	59H	56F		171L	89I	95H	59F	95H
<b>HX18</b>	115H	69H	75I	69H	56F				105I	59H	56F		171L	89I	95H	59F	95H
<b>L10</b>	115H	98H	82F	66F	43E	30D			49E	26G	30C		98H	79F	66E	46E	75E
<b>M40CO</b>	125K	108H	98G	89G	59F	36E			72F	36H	49D		112K	98F	72F	56F	98G
<b>M41CO</b>	125K	108H	98G	89G	59F	36E			72F	36H	49D		112K	98F	72F	56F	98G
<b>M42CO</b>	125K	108H	98G	89G	59F	36E			72F	36H	49D		112K	98F	72F	56F	98G
<b>M51CO</b>	89G	82G	66E	52E	30D	20B			33D	20F	13B		92H	69E	49D	43D	56E
<b>M52CO</b>	89G	82G	66E	52E	30D	20B			33D	20F	13B		92H	69E	49D	43D	56E
<b>QC0860P</b>	98F	59F	66H	59F	46D				89H	49F	49D		151H	79H	79F		
<b>QC1290P</b>	98F	59F	66H	59F	46D				89H	49F	49D		151H	79H	79F		
<b>QC21G</b>	115F	69F	75H	69F	56D				105H	59F	59D		171H	89H	95F	59D	
<b>QC21GM</b>	115F	69F	75H	69F	56D				105H	59F	59D		171H	89H	95F	59D	
<b>QC21P</b>	98F	59F	66H	59F	46D				89H	49F	49D		151H	79H	79F		89H
<b>QC21PM</b>	98F	59F	66H	59F	46D				89H	49F	49D		151H	79H	79F		89H
<b>QC41G</b>	115F	69F	75H	69F	56D				105H	59F	59D		171H	89H	95F	59D	
<b>QC41P</b>	98F	59F	66H	59F	46D				89H	49F	49D		151H	79H	79F		89H
<b>QC91G</b>	115F	69F	75H	69F	56D				105H	59F	59D		171H	89H	95F	59D	
<b>QC91GM</b>	115F	69F	75H	69F	56D				105H	59F	59D		171H	89H	95F	59D	
<b>QC91P</b>	98F	59F	66H	59F	46D				89H	49F	49D		151H	79H	79F		89H
<b>QC91PM</b>	98F	59F	66H	59F	46D				89H	49F	49D		151H	79H	79F		89H
<b>R10</b>	115H	98H	82F	66F	43E	30D			49E	26G	30C		98H	79F	66E	46E	75E
<b>R10A</b>	115J	98H	89G	79F	56E	33D			72E	36G	49C		115H	92D	72E	56E	92F
<b>R10B</b>	115J	98H	89G	79F	56E	33D			72E	36G	49C		115H	92D	72E	56E	92F
<b>R10CO</b>	115J	98H	89G	79F	56E	33D			72E	36G	49C		115H	92D	72E	56E	92F
<b>R10H</b>	108I	92I											82F	66D	52C	33C	49C
<b>R10P</b>	115H	98H	82F	66F	43E	30D			49E	26G	30C		98H	79F	66E	46E	75E
<b>R15</b>	115H	98H	82F	66F	43E	30D			49E	26G	30C		98H	79F	66E	46E	75E
<b>R15A</b>	115J	98H	89G	79F	56E	33D			72E	36G	49C		115H	92D	72E	56E	92F
<b>R15B</b>	115J	98H	89G	79F	56E	33D			72E	36G	49C		115H	92D	72E	56E	92F
<b>R15CO</b>	115J	98H	89G	79F	56E	33D			72E	36G	49C		115H	92D	72E	56E	92F
<b>R15P</b>	115H	98H	82F	66F	43E	30D			49E	26G	30C		98H	79F	66E	46E	75E
<b>R18</b>	115H	98H	82F	66F	43E	30D			49E	26G	30C		98H	79F	66E	46E	75E
<b>R18A</b>	115J	98H	89G	79F	56E	33D			72E	36G	49C		115H	92D	72E	56E	92F
<b>R18B</b>	115J	98H	89G	79F	56E	33D			72E	36G	49C		115H	92D	72E	56E	92F
<b>R18CO</b>	115J	98H	89G	79F	56E	33D			72E	36G	49C		115H	92D	72E	56E	92F
<b>R18H</b>	108I	92I											82F	66D	52C	33C	49C
<b>R18P</b>	115H	98H	82F	66F	43E	30D			49E	26G	30C		98H	79F	66E	46E	75E
<b>R40</b>	115J	98J	89G	69G	46F	33E			52F	30H	33D		105J	89G	66F	52F	89G
<b>R40C</b>	115J	98J	89G	69G	46F	33E			52F	30H	33D		105J	89G	66F	52F	89G
<b>R41</b>	115J	98J	89G	69G	46F	33E			52F	30H	33D		105J	89G	66F	52F	89G
<b>R41C</b>	115J	98J	89G	69G	46F	33E			52F	30H	33D		105J	89G	66F	52F	89G
<b>R42</b>	115J	98J	89G	69G	46F	33E			52F	30H	33D		105J	89G	66F	52F	89G
<b>R42C</b>	115J	98J	89G	69G	46F	33E			52F	30H	33D		105J	89G	66F	52F	89G
<b>R453</b>	443V	394V	361V	328V	262V	213U	98U	82U	246V	115V	98U		394W	394W	262V	262V	180V
<b>R454</b>	410V	361V	295V	262V	197V	164U	98U	82U	148U	131T	115T	115T	295W	295W	230V	230V	164U
<b>R457</b>	443W	394W	361W	328W	262W	213U	98U	82U	246V	115V	98U		394W	394W	262V	262V	180V
<b>R458</b>	410W	361W	295W	262V	197V	164U	98U	82U	148U	131T	115T	115T	295W	295W	230V	230V	164U
<b>R459</b>	443V	394V	361U	328U	262U	180T			246V	115V	98U		394W	394W	262V	262V	
<b>R463</b>									279G	246G	197F						180V
<b>R467</b>									279G	246G	197F						180V
<b>R51</b>	89G	82G	66E	52E	30D	20B			33D	20F	13B		92H	69E	49D	43D	56E
<b>R510</b>	328W	295W	295W	262W	180V	148V	115T	98S	164V				295X	295X	213W	213W	148V
<b>R51FS</b>																	
<b>R52</b>	89G	82G	66E	52E	30D	20B			33D	20F	13B		92H	69E	49D	43D	56E
<b>R520</b>	328X	295X	295X	262X	180X	148W	115U	98T	164W				295Y	295Y	213X	213X	197W
<b>R55</b>	89G	82G	66E	52E	30D	20B			33D	20F	13B		92H	69E	49D	43D	56E
<b>R56</b>	115H	98H	82F	66E	43D	30C			49D	23F	23B		89H	72E	62D	39D	56E
<b>R56CO</b>	115H	98H	82F	66E	43D	30C			49D	23F	23B		89H	72E	62D	39D	56E
<b>R57</b>	115H	98H	82F	66E	43D	30C			49D	23F	23B		89H	72E	62D	39D	56E
<b>R58</b>	98F	59F	66H	59F	46D				89H	49F	49D		151H	79H	79F		89H
<b>R88CO</b>	115J	98H	89G	79F	56E	33D			72E	36G	49C		115H	92D	72E	56E	92F
<b>R89CO</b>	115J	98H	89G	79F	56E	33D			72E	36G	49C		115H	92D	72E	56E	92F
<b>R950 1.5x</b>			361W	307W	307W	217T						127T			318U	318U	
<b>R950 3x</b>			328W	279W	279W	230U						115T			289V	289V	
<b>R950 5x</b>			328V	279V	279V	213U						115S			279V	279V	
<b>R950 8x</b>			295U	246U	246U	197T						98S			262U	262U	

# APPLICATION MATERIAL GROUPS - DRILLS

## SURFACE FEET PER MINUTE (SFM)

\*Feed rate chart - see page 573. For material examples, see page 567.

	4.2	4.3	5.1	5.2	5.3	6.1	6.2	6.3	6.4	7.1	7.2	7.3	7.4	8.1	8.2	8.3	9.1	10.1
DS-142	115T	82S	148T	98S	66S	902V	820V	820V	230T	656V	656V	367V	197V	197X	328V			
HX10	75H		59H															
HX15	75H		59H															
HX18	75H		59H															
L10	39D	20B	33G	20E	10A	108G	115I	89H	52G	108J	98I	89H	79F	98J	92H	46F	10B	
M40CO	59F	33C	49H	30F	20C	125I	131K	89J	52I	115K	108J	102I	98G	115M	92K	56I	20C	
M41CO	59F	33C	49H	30F	20C	125I	131K	89J	52I	115K	108J	102I	98G	115M	92K	56I	20C	
M42CO	59F	33C	49H	30F	20C	125I	131K	89J	52I	115K	108J	102I	98G	115M	92K	56I	20C	
M51CO	30C	13A	26F	13D	10A	98E	105H	89G	52E	105I	89H	89G	82E	115I	85G	39E	10A	
M52CO	30C	13A	26F	13D	10A	98E	105H	89G	52E	105I	89H	89G	82E	115I	85G	39E	10A	
QC0860P			49F				79H	75H		348H	325H		276H	151D	125D			
QC1290P			49F				79H	75H		348H	325H		276H	151D	125D			
QC21G			59H			98I	89H	89H		400H	351H		315H					
QC21GM			59H			98I	89H	89H		400H	351H		315H					
QC21P	49F		49F			89I	79H	79H		351H	325H		276H					
QC21PM	49F		49F			89I	79H	79H		351H	325H		276H					
QC41G			59H			98I	89H	89H										
QC41P	49F		49F			89I	79H	79H		351H	325H		276H					
QC91G			59H			98I	89H	89H		400H	351H		315H					
QC91GM			59H			98I	89H	89H		400H	351H		315H					
QC91P	49F		49F			89I	79H	79H		351H	325H		276H					
QC91PM	49F		49F			89I	79H	79H		351H	325H		276H					
R10	39D	20B	33G	20E	10A	108G	115I	89H	52G	108J	98I	89H	79F	98J	92H	46F	10B	
R10A	66D	36C	49G	23E	20B	125H	131F	89H	69F	108J	98I	98H	89F				20C	
R10B	66D	36C	49G	23E	20B	125H	131F	89H	69F	108J	98I	98H	89F				20C	
R10CO	66D	36C	49G	23E	20B	125H	131F	89H	69F	108J	98I	98H	89F				20C	
R10H			23E			115H	118G			148J	115J	98G	95G	138J	131I	66G		
R10P	39D	20B	33G	20E	10A	108G	115I	89H	52G	108J	98I	89H	79F	98J	92H	46F	10B	
R15	39D	20B	33G	20E	10A	108G	115I	89H	52G	108J	98I	89H	79F	98J	92H	46F	10B	
R15A	66D	36C	49G	23E	20B	125H	131F	89H	69F	108J	98I	98H	89F				20C	
R15B	66D	36C	49G	23E	20B	125H	131F	89H	69F	108J	98I	98H	89F				20C	
R15CO	66D	36C	49G	23E	20B	125H	131F	89H	69F	108J	98I	98H	89F				20C	
R15P	39D	20B	33G	20E	10A	108G	115I	89H	52G	108J	98I	89H	79F	98J	92H	46F	10B	
R18	39D	20B	33G	20E	10A	108G	115I	89H	52G	108J	98I	89H	79F	98J	92H	46F	10B	
R18A	66D	36C	49G	23E	20B	125H	131F	89H	69F	108J	98I	98H	89F				20C	
R18B	66D	36C	49G	23E	20B	125H	131F	89H	69F	108J	98I	98H	89F				20C	
R18CO	66D	36C	49G	23E	20B	125H	131F	89H	69F	108J	98I	98H	89F				20C	
R18H			23E			115H	118G			148J	115J	98G	95G	138J	131I	66G		
R18P	39D	20B	33G	20E	10A	108G	115I	89H	52G	108J	98I	89H	79F	98J	92H	46F	10B	
R40	52E	26C	43H	26F	13B	118H	125J	89I	52H	108K	98J	98I	82I	98K	115I	56G	13C	
R40C	52E	26C	43H	26F	13B	118H	125J	89I	52H	108K	98J	98I	82I	98K	115I	56G	13C	
R41	52E	26C	43H	26F	13B	118H	125J	89I	52H	108K	98J	98I	82I	98K	115I	56G	13C	
R41C	52E	26C	43H	26F	13B	118H	125J	89I	52H	108K	98J	98I	82I	98K	115I	56G	13C	
R42	52E	26C	43H	26F	13B	118H	125J	89I	52H	108K	98J	98I	82I	98K	115I	56G	13C	
R42C	52E	26C	43H	26F	13B	118H	125J	89I	52H	108K	98J	98I	82I	98K	115I	56G	13C	
R453	148V	131U				410W	722W	722W	328V	820W	820W	656V	492V					
R454	131U	115T				328V	656V	656V	262U	738W	738W	590V	394V					
R457	148V	131U				410W	722W	722W	328V	820W	820W	656V	492V					
R458	131U	115T				328V	656V	656V	262U	738W	738W	590V	394V					
R459						410V	722V	722V	328U	935W	935W	623V	312V					
R463	148V	131U	180U	148U	131U													
R467	148V	131U	180U	148U	131U													
R51	30C	13A	26F	13D	10A	98E	105H	89G	52E	105I	89H	89G	82E	115I	85G	39E	10A	
R510			164V							738Y	738Y	492X	213X	246X	377V			
R51FS						89I				348H	325H		276H					
R52	30C	13A	26F	13D	10A	98E	105H	89G	52E	105I	89H	89G	82E	115I	85G	39E	10A	
R520	148V	115U	164W							738Z	738Z	492Y	213Y	246Z	377V			
R55	30C	13A	26F	13D	10A	98E	105H	89G	52E	105I	89H	89G	82E	115I	85G	39E	10A	
R56	30C	16A	26F	13D	10A	115F	108H	89G	52F	108I	98H	89G	72G	98I	92G	46E	10A	
R56CO	30C	16A	26F	13D	10A	115F	108H	89G	52F	108I	98H	89G	72G	98I	92G	46E	10A	
R57	30C	16A	26F	13D	10A	115F	108H	89G	52F	108I	98H	89G	72G	98I	92G	46E	10A	
R58	49F		49F	23F	13B	108F	115H	115H	52F	85I	98H	92H	75H	98I	92I	46H	10B	
R88CO	66D	36C	49G	23E	20B	125H	131F	89H	69F	108J	98I	98H	89F				20C	
R89CO	66D	36C	49G	23E	20B	125H	131F	89H	69F	108J	98I	98H	89F				20C	
R950 1.5x																		
R950 3x																		
R950 5x																		
R950 8x																		

# APPLICATION MATERIAL GROUPS - DRILLS

## SURFACE FEET PER MINUTE (SFM)

\*Feed rate chart - see page 573. For material examples, see page 567.

	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	4.1	
<b>R950 12x</b>			262U	223U	223U	158S						92S				231U	231U	
<b>R960 1.5x</b>	397W	361W							217V	180T	144T		433V	418V				163T
<b>R960 3x</b>	361W	328W							197V	164T	131T		394V	380V				148T
<b>R960 5x</b>	361V	328V							164V	164S	131S		374V	354V				148T
<b>R960 8x</b>	328U	295U							148U	131S	115S		348U	328U				115S
<b>R960 12x</b>	289U	262U							157U	131S	92S		315U	304U				118S
<b>R970 1.5x</b>	397W	361W											433V	418V	318U	318U		
<b>R970 3x</b>	361W	328W											394V	380V	289U	289U		
<b>R970 5x</b>	361V	328V											374V	354V	279V	279V		
<b>R970 8x</b>	328U	295U											346U	328U	262U	262U		
<b>R970 12x</b>	289U	262U											315U	314U	231U	231U		
<b>S209</b>	115I	98I	82F	66F	39E	30D			49E	30G	33C		98I	79E	66E	46E	75F	
<b>SPL-120</b>	115E	98E	89C	69C	46C	33B			52C	30D	33B		105E	89C	66C	52B	89C	
<b>SPL-90</b>	115E	98E	89C	69C	46C	33B			52C	30D	33B		105E	89C	66C	52B	89C	
<b>SPLG-120</b>	115E	98E	89C	69C	46C	33B			52C	30D	33B		105E	89C	66C	52B	89C	
<b>SPLG-90</b>	115E	98E	89C	69C	46C	33B			52C	30D	33B		105E	89C	66C	52B	89C	
<b>SPR-120</b>	115E	98E	89C	69C	46C	33B			52C	30D	33B		105E	89C	66C	52B	89C	
<b>SPR-90</b>	115E	98E	89C	69C	46C	33B			52C	30D	33B		105E	89C	66C	52B	89C	
<b>SPRG-120</b>	115E	98E	89C	69C	46C	33B			52C	30D	33B		105E	89C	66C	52B	89C	
<b>SPRG-90</b>	115E	98E	89C	69C	46C	33B			52C	30D	33B		105E	89C	66C	52B	89C	
<b>SPS-120</b>	115E	98E	89C	69C	46C	33B			52C	30D	33B		105E	89C	66C	52B	89C	
<b>SPS-90</b>	115E	98E	89C	69C	46C	33B			52C	30D	33B		105E	89C	66C	52B	89C	
<b>SPSG-120</b>	115E	98E	89C	69C	46C	33B			52C	30D	33B		105E	89C	66C	52B	89C	
<b>SPSG-90</b>	115E	98E	89C	69C	46C	33B			52C	30D	33B		105E	89C	66C	52B	89C	
<b>T400</b>	75F	46F	49F	49D	36D				66F	39D	39D		108E	59H	59F			69F
<b>TS10CO</b>	125K	108H	98G	89G	59F	36E			72F	36H	49D		112K	98F	72F	56F	98G	
<b>TS15CO</b>	125K	108H	98G	89G	59F	36E			72F	36H	49D		112K	98F	72F	56F	98G	
<b>TS18CO</b>	125K	108H	98G	89G	59F	36E			72F	36H	49D		112K	98F	72F	56F	98G	
<b>TS40CO</b>	125K	108H	98G	89G	59F	36E			72F	36H	49D		112K	98F	72F	56F	98G	
<b>TS41CO</b>	125K	108H	98G	89G	59F	36E			72F	36H	49D		112K	98F	72F	56F	98G	
<b>TS42CO</b>	125K	108H	98G	89G	59F	36E			72F	36H	49D		112K	98F	72F	56F	98G	
<b>TS51CO</b>	125K	108H	98G	89G	59F	36E			72F	36H	49D		112K	98F	72F	56F	98G	
<b>TS52CO</b>	125K	108H	98G	89G	59F	36E			72F	36H	49D		112K	98F	72F	56F	98G	
<b>TS55CO</b>	125K	108H	98G	89G	59F	36E			72F	36H	49D		112K	98F	72F	56F	98G	
<b>TS10HS</b>	115J	98J	89G	69G	46F	33E			52F	30H	33D		105J	89G	66F	52F	89G	
<b>TS15HS</b>	115J	98J	89G	69G	46F	33E			52F	30H	33D		105J	89G	66F	52F	89G	
<b>TS18HS</b>	115J	98J	89G	69G	46F	33E			52F	30H	33D		105J	89G	66F	52F	89G	
<b>TS40HS</b>	115J	98J	89G	69G	46F	33E			52F	30H	33D		105J	89G	66F	52F	89G	
<b>TS41HS</b>	115J	98J	89G	69G	46F	33E			52F	30H	33D		105J	89G	66F	52F	89G	
<b>TS42HS</b>	115J	98J	89G	69G	46F	33E			52F	30H	33D		105J	89G	66F	52F	89G	
<b>TS51HS</b>	115J	98J	89G	69G	46F	33E			52F	30H	33D		105J	89G	66F	52F	89G	
<b>TS52HS</b>	115J	98J	89G	69G	46F	33E			52F	30H	33D		105J	89G	66F	52F	89G	
<b>TS55HS</b>	115J	98J	89G	69G	46F	33E			52F	30H	33D		105J	89G	66F	52F	89G	

# APPLICATION MATERIAL GROUPS - DRILLS

## SURFACE FEET PER MINUTE (SFM)

\*Feed rate chart - see page 573. For material examples, see page 567.

	4.2	4.3	5.1	5.2	5.3	6.1	6.2	6.3	6.4	7.1	7.2	7.3	7.4	8.1	8.2	8.3	9.1	10.1
R950 12x																		
R960 1.5x	127T	108S	127T	108S	90S													
R960 3x	115T	98S	115T	98S	82S													
R960 5x	115T	98S	115T	98S	82S													
R960 8x	98S	82S	98S	82S	66S													
R960 12x	92S	78S	92S	78S	66S													
R970 1.5x																		
R970 3x																		
R970 5x																		
R970 8x																		
R970 12x																		
S209	43D	23B	33G	23E	13A	108F	115I	115H	52F	85J	98I	92H	75H	98K	92J	46H	10B	
SPL-120	39B	23A	43D	26C	13A	89D	108E	89D	52D	108E	98E	98D	82D	98F	115E	56D	39A	
SPL-90	39B	23A	43D	26C	13A	89D	108E	89D	52D	108E	98E	98D	82D	98F	115E	56D	39A	
SPLG-120	39B	23A	43D	26C	13A	89D	108E	89D	52D	108E	98E	98D	82D	98F	115E	56D	39A	
SPLG-90	39B	23A	43D	26C	13A	89D	108E	89D	52D	108E	98E	98D	82D	98F	115E	56D	39A	
SPR-120	39B	23A	43D	26C	13A	89D	108E	89D	52D	108E	98E	98D	82D	98F	115E	56D	39A	
SPR-90	39B	23A	43D	26C	13A	89D	108E	89D	52D	108E	98E	98D	82D	98F	115E	56D	39A	
SPRG-120	39B	23A	43D	26C	13A	89D	108E	89D	52D	108E	98E	98D	82D	98F	115E	56D	39A	
SPRG-90	39B	23A	43D	26C	13A	89D	108E	89D	52D	108E	98E	98D	82D	98F	115E	56D	39A	
SPS-120	39B	23A	43D	26C	13A	89D	108E	89D	52D	108E	98E	98D	82D	98F	115E	56D	39A	
SPS-90	39B	23A	43D	26C	13A	89D	108E	89D	52D	108E	98E	98D	82D	98F	115E	56D	39A	
SPSG-120	39B	23A	43D	26C	13A	89D	108E	89D	52D	108E	98E	98D	82D	98F	115E	56D	39A	
SPSG-90	39B	23A	43D	26C	13A	89D	108E	89D	52D	108E	98E	98D	82D	98F	115E	56D	39A	
T400	36D		49D															
TS10CO	59F	33C	49H	30F	20C	125I	131K	89J	52I	115K	108J	102I	98G	115M	92K	56I	20C	
TS15CO	59F	33C	49H	30F	20C	125I	131K	89J	52I	115K	108J	102I	98G	115M	92K	56I	20C	
TS18CO	59F	33C	49H	30F	20C	125I	131K	89J	52I	115K	108J	102I	98G	115M	92K	56I	20C	
TS40CO	59F	33C	49H	30F	20C	125I	131K	89J	52I	115K	108J	102I	98G	115M	92K	56I	20C	
TS41CO	59F	33C	49H	30F	20C	125I	131K	89J	52I	115K	108J	102I	98G	115M	92K	56I	20C	
TS42CO	59F	33C	49H	30F	20C	125I	131K	89J	52I	115K	108J	102I	98G	115M	92K	56I	20C	
TS51CO	59F	33C	49H	30F	20C	125I	131K	89J	52I	115K	108J	102I	98G	115M	92K	56I	20C	
TS52CO	59F	33C	49H	30F	20C	125I	131K	89J	52I	115K	108J	102I	98G	115M	92K	56I	20C	
TS55CO	59F	33C	49H	30F	20C	125I	131K	89J	52I	115K	108J	102I	98G	115M	92K	56I	20C	
TS10HS	52E	26C	43H	26F	13B	118H	125J	89I	52H	108K	98J	98I	82I	98K	115I	56G	13C	
TS15HS	52E	26C	43H	26F	13B	118H	125J	89I	52H	108K	98J	98I	82I	98K	115I	56G	13C	
TS18HS	52E	26C	43H	26F	13B	118H	125J	89I	52H	108K	98J	98I	82I	98K	115I	56G	13C	
TS40HS	52E	26C	43H	26F	13B	118H	125J	89I	52H	108K	98J	98I	82I	98K	115I	56G	13C	
TS41HS	52E	26C	43H	26F	13B	118H	125J	89I	52H	108K	98J	98I	82I	98K	115I	56G	13C	
TS42HS	52E	26C	43H	26F	13B	118H	125J	89I	52H	108K	98J	98I	82I	98K	115I	56G	13C	
TS51HS	52E	26C	43H	26F	13B	118H	125J	89I	52H	108K	98J	98I	82I	98K	115I	56G	13C	
TS52HS	52E	26C	43H	26F	13B	118H	125J	89I	52H	108K	98J	98I	82I	98K	115I	56G	13C	
TS55HS	52E	26C	43H	26F	13B	118H	125J	89I	52H	108K	98J	98I	82I	98K	115I	56G	13C	

# APPLICATION MATERIAL GROUPS - TAPS

## SURFACE FEET PER MINUTE (SFM)

For material examples, see page 567.

	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	4.1
1500	60	45	30	30	20	10			25	15	15		50	30	30	15	20
1500A	60	45	30	30	20	10			25	15	15		50	30	30	15	20
1500L	60	45	30	30	20	10			25	15	15		50	30	30	15	20
1500OV	60	45	30	30	20	10			25	15	15		50	30	30	15	20
1505	60	45	30	30	20	10			25	15	15		50	30	30	15	20
1508	60	45	30	30	20	10			25	15	15		50	30	30	15	20
1519	60	45	30	30	20	10			25	15	15		50	30	30	15	20
1528	60	45	30	30	20	10			25	15	15		50	30	30	15	20
1534	65	60	40	40	25	15			30	20	20		50	30	30	20	20
1534NE	65	60	40	40	25	15			30	20	20		50	30	30	20	20
1534NR	65	60	40	40	25	15			30	20	20		50	30	30	20	20
1541	60	45	30	30	20	10			25	15	15		50	30	30	15	20
1542	60	45	30	30	20	10			25	15	15		50	30	30	15	20
1543	60	45	30	30	20	10			25	15	15		50	30	30	15	20
1544													65	40	40	25	
1545	60	45	30	30	20	10			25	15	15		50	30	30	15	20
1545A	60	45	30	30	20	10			25	15	15						20
1548	60	50	35	35					25	20	20						20
1549	60	50	35	35					25	20	20						20
1567	60	45	30	30	20	10			25	15	15		50	30	30	15	20
1568	45	35	25	15	10				25	15	15						20
1572	60	45	30	30	20	10			25	15	15		50	30	30	15	20
1578	65	60	40	40	25	15			30	20	20		50	30	30	20	20
1580	120	100	60	60	40				50	30	40						40
1582	60	50	35	35					25	20	20						20
1585	65	60	40	40	25	15			30	20	20		50	30	30	20	20
1585A	65	60	40	40	25	15			30	20	20		50	30	30	20	20
1585NR	65	60	40	40	25	15			20	13	10		50	30	30	20	20
1585OV	65	60	40	40	25	15			30	20	20		50	30	30	20	20
1586	60	50	35	35					26	20	20						20
1587																	
1588																	
1590	70	60	40	40	30				30	26	20						20
1591	70	60	40	40	30				30	26	20						20
1592	60	45	30	30	20	10			25	15	15		50	30	30	15	20
1593	65	60	40	40	25	15			30	20	20		50	30	30	20	20
1595	60	45	30	30	20	10			25	15	15		50	30	30	15	20
1599													65	40	40	25	
1599SB													65	40	40	25	
1600													65	40	40	25	
1629AP					45	25						30	90	70	65	35	
1630AP					45	25						30	90	70	65	35	
1634	65	60	40	40	25	15			30	20	20		50	30	30	20	20
1641	150	125	90	90					70	60	50						60
1659AP					45	25						30	90	70	65	35	
1660AP					45	25						30	90	70	65	35	
1671	150	125	90	90					70	60	50						60
1672AP	110	90	55	55	45				50	40	40						35
1673AP	110	90	55	55	45				50	40	40						35
1674	120	100	65	65	50				60	40	45						40
1675	120	100	65	65	50				60	40	45						40
1676AP	100	80	50	50	40				45	30	35						30
1677AP	100	80	50	50	40				45	30	35						30
1678	110	90	55	55	45				50	40	40						35
1679	110	90	55	55	45				50	40	40						35
1681AP	150	125	90	90					70	50	60						60
1687AP	150	125	90	90					70	50	60						60
1691AP	165	135	100	100					80	70	60						70
1697AP	165	135	100	100					80	70	60						70
1700M	60	45	30	30	20	10			25	15	15		50	30	30	15	20
1785M	65	60	40	40	25	15			30	20	20		50	30	30	20	20
1785NR	66	59	46	33	16	10			20	13	10		46	26	26	16	



# APPLICATION MATERIAL GROUPS - TAPS

## SURFACE FEET PER MINUTE (SFM)

For material examples, see page 567.

	4.2	4.3	5.1	5.2	5.3	6.1	6.2	6.3	6.4	7.1	7.2	7.3	7.4	8.1	8.2	8.3	9.1	10.1
1500	15		20	10		25	80	60	10	50	100	75	20	25	15			
1500A	15		20	10		25	80	60	10	50	100	75	20	25	15			
1500L	15		20	10		25	80	60	10	50	100	75	20	25	15			
1500OV	15		20	10		25	80	60	10	50	100	75	20	25	15			
1505	15		20	10		25	80	60	10	50	100	75	20	25	15			
1508	15		20	10		25	80	60	10	50	100	75	20	25	15			
1519	15		20	10		25	80	60	10	50	100	75	20	25	15			
1528	15		20	10		25	80	60	10	50	100	75	20	25	15			
1534	15	5	25	10		30	90	70	10	70	100	75	20	90	25			
1534NE	15	5	25	10		30	90	70	10	70	100	75	20	90	25			
1534NR	15	5	25	10		30	90	70	10	70	100	75	20	90	25			
1541	15		20	10		25	80	60	10	50	100	75	20	25	15			
1542	15		20	10		25	80	60	10	50	100	75	20	25	15			
1543	15		20	10		25	80	60	10	50	100	75	20	25	15			
1544									15									
1545	15		20	10		25	80	60	10	50	100	75	20	25	15			
1545A	15		20	10		25	80	60	10	50	100	75	20	25	15			
1548	15	5	20	15														
1549	15	5	20	15														
1567	15		20	10		25	80	60	10	50	100	75	20	25	15			
1568	10		20	10		30	50	50		50	75	50		25	15			
1572	15		20	10		25	80	60	10	50	100	75	20	25	15			
1578	15	5	25	10		30	90	70	10	70	100	75	20	90	25			
1580	30		40			50	150	120		100	200	125						
1582	15	5	20	15														
1585	15	5	25	10		30	90	70	10	70	100	75	20	90	25			
1585A	15	5	25	10		30	90	70	10	70	100	75	20	90	25			
1585NR	15	5	25	10		30	90	70	10	70	100	75	20	90	25			
1585OV	15	5	25	10		30	90	70	10	70	100	75	20	90	25			
1586	15	5	20	15														
1587						30	80	60		50	60	60						
1588						30	80	60		50	60	60						
1590	15	5			10													
1591	15	5			10													
1592	15		20	10		25	80	60	10	50	100	75	20	25	15			
1593	15	5	25	10		30	90	70	10	70	100	75	20	90	25			
1595	15		20	10		25	80	60	10	50	100	75	20	25	15			
1599									15									
1599SB									15									
1600									15									
1629AP		10			15				25									
1630AP		10			15				25									
1634	16	7	26	10		30	89	69	10	49	98	66	20	98	26			
1641			45			55	180	130		180	200	230						
1659AP		10			15				25									
1660AP		10			15				25									
1671			45			55	180	130		180	200	230						
1672AP	25		35	20		45	120	100		85	100	85	30					
1673AP	25		35	20		45	120	100		85	100	85	30					
1674	30		40	25		50	125	110		95	120	95	40					
1675	30		40	25		50	125	110		95	120	95	40					
1676AP	20		30	15		40	100	90		80	95	80	30					
1677AP	20		30	15		40	100	90		80	95	80	30					
1678	25		35	20		45	120	100		85	100	85	30					
1679	25		35	20		45	120	100		85	100	85	30					
1681AP			45			55	180	130		180	200	230						
1687AP			45			55	180	130		180	200	230						
1691AP			55			70	200	160		200	240	260						
1697AP			55			70	200	160		200	240	260						
1700M	15		20	10		25	80	60	10	50	100	75	20	25	15			
1785M	15	5	25	10		30	90	70	10	70	100	75	20	90	25			
1785NR		10	33	13		33		49		33	82	43	33	66				

# APPLICATION MATERIAL GROUPS - TAPS

## SURFACE FEET PER MINUTE (SFM)

For material examples, see page 567.

	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	4.1
1788(M)																	
1985	75	69	49	49	30	16			36	20							20
1994	82	72	59	49										26			
3300	98	79	49	49	30				39	30							30
3306E	98	79	49	49	30				39	30							30
6541	16	16	23	20	13								23	16	23	16	
E000	82	72	59	52	33	16							49	26	49	26	33
E000TIN	131	131	105	89	43	36			26	23	16		72	23	16		49
E001	82	72	59	52	33	16			23	20	13		49	26	49	26	
E002	82	72	59	52	33												33
E003	82	72	59	52	33				23	20	13						
E005	82	72	59	52	33	16							49	26	49	26	33
E006	82	72	59	52	33	16			26	23	16		49	26	49	26	
E007	82	72	59	52	33												33
E008	82	72	59	52	33				23	20	13						
E011	82	72	59	52	33	16			23	20	13		49	26	49	26	
E013	82	72	59	52	33				23	20	13						
E016	82	72	59	52	33	16			26	23	16		49	26	49	26	
E018	82	72	59	52	33				23	20	13						
E021	82	72	59	52	33	16			23	20	13		49	26	49	26	
E023	82	72	59	52	33				23	20	13						
E025	82	72	59	52	33	16							49	26	49	26	33
E026	82	72	59	52	33	16			26	23	16		49	26	49	26	
E027	82	72	59	52	33												33
E028	82	72	59	52	33				23	20	13						
E033	82	72	59	52	33	16			23	20	13						
E035	82	72	59	52	33	16							49	26	49	26	33
E036	82	72	59	52	33	16			26	23	16		49	26	49	26	
E037	82	72	59	52	33	16											33
E038	82	72	59	52	33	16			23	20	13						
E061	72	66	52	39	23	13							39	23	33	16	
E071	72	66	52	39	23	13							39	23	33	16	
E201													49	26	49	26	
E252													49	26	49	26	
E500	23	20	16	13	10								39	23	33	16	
E501	23	20	16	13	10								39	23	33	16	
E504	46	39	33	26	20								59	39	72	39	
E513	23	20	16	13	10								39	23	33	16	
E547	23	20	16	13	10								39	23	33	16	
E550	72	66	52	39	23	13			23	16	23		39	23	33	16	
E620	23	20	16	13	10								39	23	33	16	
E621		59	46	33	16				20	13	10						
E624	108	95	75	69	43												
E625	108	95	75	69	43												
E626				98	66	36											
E627				98	66	36											
E628		72	59	52	33				46	33	20						
E629		72	59	52	33				46	33	20						
E630													98	82	115	82	
E631													98	82	115	82	
E650	82	72	59	49										26			
E651	82	72	59	49										26			
E653	82	72	59	49										26			
E654	82	72	59	49										26			
E710	13	13	20	16	10								20	13	20	13	
E711	13	13	20	16	10								20	13	20	13	
E712	13	13	20	16	10								20	13	20	13	
E721	13	13	20	16	10								20	13	20	13	
E764	108	95	75	69	43												
E765	108	95	75	69	43												
E766				98	66	36											
E767				98	66	36											
E768		72	59	52	33				46	33	20						

# APPLICATION MATERIAL GROUPS - TAPS

## SURFACE FEET PER MINUTE (SFM)

For material examples, see page 567.

	4.2	4.3	5.1	5.2	5.3	6.1	6.2	6.3	6.4	7.1	7.2	7.3	7.4	8.1	8.2	8.3	9.1	10.1
1788(M)						30	79	79		49	66	66						
1985	16	7	30	16	10													
1994							98	66		59	115				98			
3300	26		30			39	121	98		79	161	98						
3306E	26		30			39	121	98		79	161	98						
6541							39					39	26		16			
E000	16		39	16		39	98	66		52	115	66	49		98			
E000TIN	23		59	26		59	148	115				98	72		148			
E001																		
E002	16		39	16						52	115	66	49					
E003																		
E005	16		39	16		39	98	66		52	115	66	49		98			
E006																		
E007	16		39	16						52	115	66	49					
E008																		
E011																		
E013																		
E016																		
E018																		
E021																		
E023																		
E025	16		39	16		39	98	66		52	115	66	49		98			
E026																		
E027	16		39	16		39	98	66		52	115	66	49		98			
E028																		
E033																		
E035	16		39	16		39	98	66		52	115	66	49		98			
E036																		
E037	16		39	16						52	115	66	49		98			
E038																		
E061						39	98	66				66	49		39	23		
E071						39	98	66				66	49		39	23		
E201							66		16				49		33			
E252							66		16				49		33			
E500						13	33	23	7		39	23	16		16	10		
E501						13	33	23	7		39	23	16		16	10		
E504							66	46	13		79	46	33		33	20		
E513						13	33	23	7		39	23	16		16	10		
E547						13	33	23	7		39	23	16		16	10		
E550						39	98	66	13		115	66	49		39	23		
E620						13	33	23	7		39	23	16		16	10		
E621				13						33	82	43	33					
E624						39	98	66										
E625						39	98	66										
E626	33			33														
E627	33			33														
E628																		
E629																		
E630							98		16				66		49			
E631							98		16				66		49			
E650							98	66		59	115				98			
E651							98	66		59	115				98			
E653							98	66		59	115				98			
E654							98	66		59	115				98			
E710							36					36	23		13			
E711							36					36	23		13			
E712							36					36	23		13			
E721							36					36	23		13			
E764						39	98	66										
E765						39	98	66										
E766	33			33														
E767	33			33														
E768																		

# APPLICATION MATERIAL GROUPS - TAPS

## SURFACE FEET PER MINUTE (SFM)

For material examples, see page 567.

	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	4.1
E769		72	59	52	33				46	33	20						
E770													98	82	115	82	
E771													98	82	115	82	
E805					55	42	22										
E806					55	42	22										
E808	108	95	75	69	43												
E809	108	95	75	69	43												
E810				98	66	36											
E811				98	66	36											
E812		72	59	52	33				46	33	20						
E813		72	59	52	33				46	33	20						
E814													98	82	115	82	
E815													98	82	115	82	
E816					55	42	22										
E817					55	42	22										
E905					55	42	22										
E906					55	42	22										
E908	108	95	75	69	43												
E909	108	95	75	69	43												
E910				98	66	36											
E911				98	66	36											
E912		72	59	52	33				46	33	20						
E913		72	59	52	33				46	33	20						
E914													98	82	115	82	
E915													98	82	115	82	
E916					55	42	22										
E917					55	42	22										
EP006H	82	72	59	52	33	16							49	26	49	26	33
EP016H	82	72	59	52	33	16			23	20	13		49	26	49	26	
EP10	82	72	59	52	33	16							49	26	49	26	33
EP11	82	72	59	52	33	16			23	20	13		49	26	49	26	
EP20	82	72	59	52	33	16							49	26	49	26	33
EP21	82	72	59	52	33	16			23	20	13		49	26	49	26	
EP30	82	72	59	52	33	16							49	26	49	26	33
EP31	82	72	59	52	33	16			23	20	13		49	26	49	26	
EP40	82	72	59	52	33	16							49	26	49	26	33
EP41	82	72	59	52	33	16			23	20	13		49	26	49	26	
EX006H	82	72	59	52	33												33
EX016H	82	72	59	52	33				23	20	13						
EX10	82	72	59	52	33												33
EX11	82	72	59	52	33				23	20	13						
EX20	82	72	59	52	33												33
EX21	82	72	59	52	33				23	20	13						
EX30	82	72	59	52	33												33
EX31	82	72	59	52	33				23	20	13						
EX40	82	72	59	52	33												33
EX41	82	72	59	52	33				23	20	13						
TN1500	59	46	30	30	20	10			26	26	16		49	30	30	16	20
TN1534	79	75	49	49	30	20			39	26	26		49	30	30	20	
TN1541	16	16	23	20	13								23	16	23	16	
TN1543	16	16	23	20	13								23	16	23	16	
TN1585	79	75	49	49	30	20			39	26	26		49	30	30	20	
TN1785	79	75	49	49	30	20			39	26	26		49	30	30	20	
U1511	39	33	26	20	16								46	26	39		

# APPLICATION MATERIAL GROUPS - TAPS

## SURFACE FEET PER MINUTE (SFM)

For material examples, see page 567.

	4.2	4.3	5.1	5.2	5.3	6.1	6.2	6.3	6.4	7.1	7.2	7.3	7.4	8.1	8.2	8.3	9.1	10.1
E769																		
E770							98		16				66			49		
E771							98		16				66			49		
E805	42	26		16	10													
E806	42	26		16	10													
E808						39	98		66									
E809						39	98		66									
E810	33			33														
E811	33			33														
E812																		
E813																		
E814							98		16				66			49		
E815							98		16				66			49		
E816	42	26		16	10													
E817	42	26		16	10													
E905	42	26		16	10													
E906	42	26		16	10													
E908						39	98		66									
E909						39	98		66									
E910	33			33														
E911	33			33														
E912																		
E913																		
E914							98		16				66			49		
E915							98		16				66			49		
E916	42	26		16	10													
E917	42	26		16	10													
EP006H	16		39	16		39	98		66	52	115	66	49	98				
EP016H																		
EP10	16		39	16		39	98		66	52	115	66	49	98				
EP11																		
EP20	16		39	16		39	98		66	52	115	66	49	98				
EP21																		
EP30	16		39	16		39	98		66	52	115	66	49	98				
EP31																		
EP40	16		39	16		39	98		66	52	115	66	49	98				
EP41																		
EX006H	16		39	16						52	115	66	49					
EX016H																		
EX10	16		39	16						52	115	66	49					
EX11																		
EX20	16		39	16						52	115	66	49					
EX21																		
EX30	16		39	16						52	115	66	49					
EX31																		
EX40	16		39	16						52	115	66	49	98				
EX41																		
TN1500	16		20	10		26	79	59	10	49	98	75	20	30	16			
TN1534			30	13		39	115	89	13	66	125	79	26	121	30			
TN1541						39						39	26	16				
TN1543						39						39	26	16				
TN1585			30	13		39	115	89	13	66	125	79	26	121	30			
TN1785			30	13		39	115	89	13	66	125	79	26	121	30			
U1511							52	39			66	39			26			

# APPLICATION MATERIAL GROUPS - DIES

## SURFACE FEET PER MINUTE (SFM)

*For material examples, see page 567.*

	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	4.1
<b>2010</b>	26	23	20	16					13	7			26	23	20	16	
<b>2025</b>	26	23	20	16					13	7			26	23	20	16	
<b>2325M</b>	26	23	20	16					13	7			26	23	20	16	
<b>2510</b>	26	23	20	16					13	7			26	23	20	16	
<b>2710M</b>	26	23	20	16					13	7			26	23	20	16	
<b>F201</b>	26	23	20	16					13	7			26	23	20	16	
<b>F302</b>	26	23	20	16					13	7			26	23	20	16	
<b>F312</b>	26	23	20	16					13	7			26	23	20	16	
<b>F320</b>	26	23	20	16					13	7			26	23	20	16	
<b>F330</b>	26	23	20	16					13	7			26	23	20	16	
<b>F370</b>	26	23	20	16					13	7			26	23	20	16	

## APPLICATION MATERIAL GROUPS - DIES SURFACE FEET PER MINUTE (SFM)

For material examples, see page 567.

	4.2	4.3	5.1	5.2	5.3	6.1	6.2	6.3	6.4	7.1	7.2	7.3	7.4	8.1	8.2	8.3	9.1	10.1
<b>2010</b>	7	30	7	7	30	26	23			33	49	49	33	49	33	16		
<b>2025</b>	7	30	7	7	30	26	23			33	49	49	33	49	33	16		
<b>2325M</b>	7	30	7	7	30	26	23			33	49	49	33	49	33	16		
<b>2510</b>	7	30	7	7	30	26	23			33	49	49	33	49	33	16		
<b>2710M</b>	7	30	7	7	30	26	23			33	49	49	33	49	33	16		
<b>F201</b>	7	30	7	7	30	26	23			33	49	49	33	49	33	16		
<b>F302</b>	7	30	7	7	30	26	23			33	49	49	33	49	33	16		
<b>F312</b>	7	30	7	7	30	26	23			33	49	49	33	49	33	16		
<b>F320</b>	7	30	7	7	30	26	23			33	49	49	33	49	33	16		
<b>F330</b>	7	30	7	7	30	26	23			33	49	49	33	49	33	16		
<b>F370</b>	7	30	7	7	30	26	23			33	49	49	33	49	33	16		

# APPLICATION MATERIAL GROUPS - END MILLS

## SURFACE FEET PER MINUTE (SFM)

\*Feed rate chart - see pages 582 & 583. For material examples, see page 567.

	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	4.1
C110	197A	164A	131B	115B					98F				115A	98A	164B	98B	115D
C123	180A	148A	131B	115B					82F				98A	82A	148B	98B	98D
C247	180S	148S	131T	115T					82Y				98S	82S	148T	82T	98V
C273	164S	164S	115T	98T					33Y				82S	66S	131T	82T	82V
C346	148A	115A	98B	82B					66F				82A	66A	115B	66B	82D
C600	98A	89A	75B										82A	66A	82B		59D
C601	98A	89A	75B										82A	66A	82B		59D
C602	98A	89A	75B										82A	66A	82B		59D
C603	164A	131A	115B	98B					75F				92A	75A	131B	82B	92D
C604	112S	89S	79T										89S	72S	89T		62V
C605	164A	131A	115B						75F	62F							92D
C606	148A	118A	102B						66F	56F							82D
C607		131A	115B	98B	66C					62F				75A	131B	82B	92D
C608	164G	131G	115H	98H					75L				92G	75G	131H	82H	92J
C609	197G	184G	161H	138H					105L				128G	105G	184H	128H	128J
C610	164G	131G	115H	98H					75L				92G	75G	131H	82H	92J
C611	197G	184G	161H	138H					105L				128G	105G	184H	128H	128J
C612	148G	118G	102H	89H					66L				82G	66G	118H	72H	82J
C613	148G	118G	102H	89H					66L				82G	66G	118H	72H	82J
C614	115S	92S	79T	69T					52Y				92S	75S	92T	56T	62V
C615	164S	131S	115T	98T					75Y				92S	75S	131T	82T	92V
C617	115S	92S	79T	69T					52Y				92S	75S	92T	56T	62V
C618	164S	131S	115T	98T					75Y				92S	75S	131T	82T	92V
S106																	
S108	289B	223B	223B	180B	161B	148B			200A	141A	108A	89A	374B	318B	318B	249B	
S109	289B	223B	223B	180B	161B	148B			200A	141A	108A	89A	374B	318B	318B	249B	
S110	269B	212B	212B	171B	152B	140B			190A	125A	103A	78A	336B	284B	284B	225B	
S111	249B	200B	200B	161B	144B	131B			180A	108A	98A	66A	298B	249B	249B	200B	
S112	289B	223B	223B	180B	161B	148B			200A	141A	108A	89A	374B	318B	318B	249B	
S113	289B	223B	223B	180B	161B	148B			200A	141A	108A	89A	374B	318B	318B	249B	
S114	269B	212B	212B	171B	152B	140B			190A	125A	103A	78A	336B	284B	284B	225B	
S115	249B	200B	200B	161B	144B	131B			180A	108A	98A	82A	298B	249B	249B	200B	
S116	289B	223B	223B	180B	161B	148B			200A	141A	108A	89A	374B	318B	318B	249B	
S121	289B	223B	223B	180B	161B	148B			200A	141A	108A		374B	318B	318B	249B	
S129	361B	325B	325B	298B	249B	230B			239A	171A	131A	105A	449B	377B	377B	279B	
S134	361B	325B	325B	298B	249B	230B			239A	171A	131A	105A	449B	377B	377B	279B	
S135	361B	325B	325B	298B	249B	230B			239A	171A	131A	105A	449B	377B	377B	279B	
S136	343B	312B	312B	287B	238B	205B			220A	156A	123A	97A	405B	338B	338B	254B	
S137	325B	298B	298B	276B	226B	180B			200A	141A	115A	89A	361B	298B	298B	230B	
S138	361B	325B	325B	298B	249B	230B			239A	171A	131A	98A	449B	377B	377B	279B	
S139	361B	325B	325B	298B	249B	230B			239A	171A	131A	98A	449B	377B	377B	279B	
S146	343B	312B	312B	287B	238B	205B			220A	156A	123A	97A	405B	338B	338B	254B	
S147	325B	298B	298B	276B	226B	180B			200A	141A	115A		361B	298B	298B	230B	
S206																	
S207																	
S208	400B	298B	298B	259B	230B	200B			325A	223A	174A	131A	551B	525B	525B	374B	230B
S211	361B	269B	269B	239B	200B	180B			298A	180A	171A	131A	499B	400B	400B	341B	200B
S212	400B	298B	298B	259B	230B	200B			325A	223A	174A	131A	551B	525B	525B	374B	230B
S213	400B	298B	298B	259B	230B	200B			325A	223A	174A	131A	551B	525B	525B	374B	230B
S215	361B	269B	269B	239B	200B	180B			298A	180A	171A	89A	499B	400B	400B	341B	200B
S221	400B	298B	298B	259B	230B	200B			325A	223A	174A		551B	525B	525B	374B	230B
S223HA	801C	778C	522C	463B	328B	285A	187A	125A	489B	400B	302B	256B	456C	381B	305B	256B	255B
S223HB	801C	778C	522C	463B	328B	285A	187A	125A	489B	400B	302B	256B	456C	381B	305B	256B	255B
S234	499B	449B	449B	423B	400B	328B			351A	276A	200A	164A	699B	649B	649B	430B	259B
S235	499B	449B	449B	423B	400B	328B			351A	276A	200A	164A	699B	649B	649B	430B	259B
S236	474B	425B	425B	406B	380B	313B			338A	251A	182A	140A	650B	578B	578B	415B	245B



# APPLICATION MATERIAL GROUPS - END MILLS

## SURFACE FEET PER MINUTE (SFM)

\*Feed rate chart - see pages 582 & 583. For material examples, see page 567.

	4.2	4.3	5.1	5.2	5.3	6.1	6.2	6.3	6.4	7.1	7.2	7.3	7.4	8.1	8.2	8.3	9.1	10.1
C110	82D		197D	49C		279C	279C	279C		722E	722E	279E		295C				
C123	82D		164D	49C		262C	262C	262C		656E	656E	262E		262C				
C247	82V		164V	49U		262U	262U	262U		656X	656X	262X		262U				
C273	66V		148V	33U		230U	230U	230U		590X	590X	230X		230U				
C346	66D		148D	33C		230C	230C	230C		590E	590E			230C				
C600	49D		98D	20C		180C	197C	197C		197E	180E	115E		197C				
C601	49D		98D	20C		180C	197C	197C		197E	180E	115E		197C				
C602	49D		98D	20C		180C	197C	197C		197E	180E	115E		197C				
C603	75D		157D	43C		410C	410C	410C		984E	984E	295E		410C				
C604	49V		108V	20U		200U	223U	223U		243X	194X	144X		200U				
C605			157D			410C				984E	984E	295E		410C				
C606			141D			367C				886E	886E	266E		367C				
C607	75D	33D		43C	20D		410C	410C	49C			295E	197A		410C			
C608	75J		157J	43I		410I	410I	410I			984K	295K		410I				
C609	105J		220J	59I		574I	574I	574I			1378K	413K		574I				
C610	75J		157J	43I		410I	410I	410I			984K	295K		410I				
C611	105J		220J	59I		574I	574I	574I			1378K	413K		574I				
C612	66J		141J	36I		367I	367I	367I			886K	266K		367I				
C613	66J		141J	36I		367I	367I	367I			886K	266K		367I				
C614	52V		108V	20U		203U	223U	223U			197X	148X		203U				
C615	75V		157V	43U		410U	410U	410U		984X	984X	295X		410U				
C617	52V		108V	20U		203U	223U	223U			197X	148X		203U				
C618	75V		157V	43U		410U	410U	410U		984X	984X	295X		410U				
S106										2326C	1749C	1171C	751B					
S108						649C	499C	499C	125B	1499C	1499C	649C	400B					
S109						649C	499C	499C	125B	1499C	1499C	649C	400B					
S110						617C	474C	474C	117B	1424C	1424C	617C	380B					
S111						584C	449C	449C	108B	1348C	1348C	584C	361B					
S112						649C	499C	499C	125B	1499C	1499C	649C	400B					
S113						649C	499C	499C	125B	1499C	1499C	649C	400B					
S114						617C	474C	474C	117B	1424C	1424C	617C	380B					
S115			148B			584C	449C	449C	108B	1348C	1348C	584C	361B					
S116						649C	499C	499C	125B	1499C	1499C	649C	400B					
S121						649C	499C	499C	125B	1499C	1499C	649C	400B					
S129						679C	574C	574C	144B	1601C	1601C	708C	479B					
S134						679C	574C	574C	144B	1601C	1601C	708C	479B					
S135						679C	574C	574C	144B	1601C	1601C	708C	479B					
S136						646C	546C	546C	138B	1525C	1525C	674C	455B					
S137						613C	518C	518C	131B	1450C	1450C	640C	430B					
S138						679C	574C	574C	144B	1601C	1601C	708C	479B					
S139						679C	574C	574C	144B	1601C	1601C	708C	479B					
S146						646C	546C	546C	138B	1525C	1525C	674C	455B					
S147						613C	518C	518C	131B	1450C	1450C	640C	430B					
S206										2326C	1749C	1171C	751B					
S207										2093C	1575C	1056C	676B					
S208	200B	190B	230B	161A	98A													
S211	180B	174B	200B	141A	85A													
S212	200B	190B	230B	161A	98A													
S213	200B	190B	230B	161A	98A													
S215	180B	174B	200B	141A	85A													
S221	200B	190B	230B	161A	98A													
S223HA	463B	387A	358B	269A	223A													
S223HB	463B	387A	358B	269A	223A													
S234	230B	200B	266B	200A	131A													
S235	230B	200B	266B	200A	131A													
S236	220B	190B	251B	190A	123A													
S237	210B	180B	236B	180A	115A													

# APPLICATION MATERIAL GROUPS - END MILLS

## SURFACE FEET PER MINUTE (SFM)








\*Feed rate chart - see pages 582 & 583. For material examples, see page 567.

	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	4.1
S237	449B	400B	400B	390B	361B	298B			325A	226A	164A	115A	600B	508B	508B	400B	230B
S238	499B	449B	449B	423B	400B	328B			351A	276A	200A	148A	699B	649B	649B	430B	259B
S239	499B	449B	449B	423B	400B	328B			351A	276A	200A	148A	699B	649B	649B	430B	259B
S246	450B	412B	412B	387B	363B	288B			288A	233A	176A	135A	500B	540B	540B	384B	230B
S247	400B	374B	374B	351B	325B	249B			226A	190A	151A	121A	499B	430B	430B	338B	200B
S248HA	801C	778C	522C	463B	328B	285A	364A	240A	489B	400B	302B	256A	771C	571B	538B	433B	1017B
S248HB	801C	778C	522C	463B	328B	285A	364A	240A	489B	400B	302B	256A	771C	571B	538B	433B	1017B

### Feed Rate Chart - Solid Carbide End Mills

#### How To Use This Chart to Find Cutting Feed Rate (IPR):

1. Find your Alpha Code on the AMG Chart (example: 279 U : U is the Alpha Code).
2. Find the closest diameter for your cutting application on the chart.
3. Select the type of cut and # Flutes to find your Ft Range.

# of Flutes	Type of Cut	Depth/Width of Cut	Alpha Code	Feed Per Tooth (Ft) Dia Inches											
				1/8	5/32	3/16	1/4	5/16	13/32	1/2	9/16	5/8	11/16	3/4	
>4		↑ 1,5 ↔ 0,05	A				0.0010	0.0015	0.0015	0.0015	0.0015	0.0015	0.0020	0.0020	0.0025
			B				0.0020	0.0020	0.0025	0.0030	0.0035	0.0040	0.0040	0.0045	
			C				0.0030	0.0035	0.0040	0.0045	0.0050	0.0055	0.0060	0.0070	
3-4		↑ 1,5 ↔ 0,1	A	0.0010	0.0015	0.0020	0.0020	0.0025	0.0025	0.0030	0.0035	0.0040	0.0045	0.0050	
			B	0.0015	0.0020	0.0025	0.0030	0.0035	0.0040	0.0045	0.0050	0.0055	0.0060	0.0070	
			C	0.0015	0.0020	0.0025	0.0030	0.0040	0.0050	0.0060	0.0065	0.0070	0.0080	0.0090	
3-4		↑ 1 ↔ 0,5	A	0.0005	0.0005	0.0005	0.0010	0.0010	0.0015	0.0015	0.0020	0.0020	0.0025	0.0025	
			B	0.0005	0.0005	0.0010	0.0015	0.0015	0.0020	0.0020	0.0025	0.0030	0.0035	0.0040	
			C	0.0005	0.0010	0.0015	0.0015	0.0020	0.0025	0.0030	0.0035	0.0040	0.0045	0.0050	
2-3		↑ 0,5 ↔ 1	A	0.0005	0.0010	0.0010	0.0010	0.0015	0.0015	0.0020	0.0020	0.0025	0.0025	0.0030	
			B	0.0010	0.0010	0.0010	0.0015	0.0015	0.0020	0.0025	0.0030	0.0035	0.0035	0.0040	
			C	0.0015	0.0015	0.0015	0.0020	0.0025	0.0030	0.0035	0.0040	0.0045	0.0050	0.0050	
3-4		↑ 0,5 ↔ 1 ↑ 1 ↔ 0,5	B				0.0010	0.0020	0.0030	0.0030	0.0035	0.0040	0.0040	0.0040	
2 & 4		↑ 0,1 - 0,5mm ↔ 0,1 - 0,5mm	A	0.0010	0.0010	0.0015	0.0015	0.0020	0.0020	0.0025	0.0030	0.0030			
			BC	0.0010	0.0010	0.0015	0.0020	0.0020	0.0025	0.0030	0.0035	0.0040			
4		↑ 0,01 - 0,1 ↔ ≤ 1	A				0.0020	0.0020	0.0025	0.0030		0.0030			
			BC				0.0020	0.0025	0.0030	0.0035		0.0040			

# APPLICATION MATERIAL GROUPS - END MILLS

## SURFACE FEET PER MINUTE (SFM)





\*Feed rate chart - see pages 582 & 583. For material examples, see page 567.

	4.2	4.3	5.1	5.2	5.3	6.1	6.2	6.3	6.4	7.1	7.2	7.3	7.4	8.1	8.2	8.3	9.1	10.1
S238	230B	200B	266B	200A	131A													
S239	230B	200B	266B	200A	131A													
S246	210B	180B	238B	176A														
S247	190B		210B			699C	571C	571C	180B	1650C	1650C	708C	410B					
S248HA	902B	755B	614B	525A	436A													
S248HB	902B	755B	614B	525A	436A													

### Feed Rate Chart - HSS End Mills

#### How To Use This Chart to Find Cutting Feed Rate (IPR):

1. Find your Alpha Code on the AMG Chart (example: 279 U : U is the Alpha Code).
2. Find the closest diameter for your cutting application on the chart.
3. Select the type of cut and # Flutes to find your Ft Range.

		Feed per Tooth (Ft) Dia Inches																
Type of Cut	Alpha Code	0.078	1/8	5/32	3/16	1/4	5/16	13/32	1/2	9/16	5/8	11/16	3/4	7/8	1"	1.1/4	1.1/2	
	A	0.0003	0.0005	0.0007	0.0009	0.0011	0.0017	0.0024	0.0028	0.0033	0.0038	0.0038	0.0038	0.0039	0.0041	0.0042	0.0043	
	B	0.0003	0.0005	0.0006	0.0009	0.0010	0.0015	0.0021	0.0026	0.0030	0.0034	0.0034	0.0034	0.0035	0.0037	0.0037	0.0038	
	C	0.0003	0.0004	0.0006	0.0007	0.0009	0.0014	0.0019	0.0023	0.0027	0.0031	0.0031	0.0031	0.0031	0.0031	0.0033	0.0034	0.0034
	D	0.0003	0.0004	0.0006	0.0008	0.0009	0.0015	0.0020	0.0024	0.0028	0.0032	0.0032	0.0032	0.0032	0.0033	0.0035	0.0038	0.0040
	↓ 0,5D	E	0.0005	0.0007	0.0009	0.0014	0.0017	0.0025	0.0034	0.0041	0.0048	0.0055	0.0056	0.0060	0.0060	0.0060	0.0066	0.0069
	↔ D	F	0.0004	0.0005	0.0007	0.0008	0.0010	0.0013	0.0016	0.0020	0.0022	0.0025	0.0028	0.0031	0.0031	0.0033	0.0033	0.0033
	G					0.0010	0.0013	0.0014	0.0017	0.0020	0.0022	0.0025	0.0028	0.0028	0.0021	0.0021	0.0022	
	H					0.0009	0.0012	0.0013	0.0015	0.0018	0.0020	0.0023	0.0026	0.0026	0.0019	0.0019	0.0020	
	I					0.0008	0.0011	0.0011	0.0014	0.0016	0.0018	0.0020	0.0023	0.0023	0.0017	0.0017	0.0018	
	J					0.0009	0.0012	0.0013	0.0015	0.0018	0.0020	0.0023	0.0026	0.0026	0.0019	0.0019	0.0020	
	↓ D	K					0.0014	0.0019	0.0026	0.0031	0.0036	0.0059	0.0035	0.0039	0.0038	0.0043	0.0043	0.0046
	↔ 0,8D	L					0.0004	0.0005	0.0007	0.0008	0.0010	0.0011	0.0012	0.0013	0.0013	0.0013	0.0015	0.0017
	M	0.0003	0.0005	0.0007	0.0009	0.0012	0.0016	0.0022	0.0027	0.0031	0.0036	0.0041	0.0045	0.0035	0.0041	0.0038	0.0042	
	N	0.0003	0.0004	0.0006	0.0008	0.0011	0.0015	0.0020	0.0024	0.0028	0.0032	0.0037	0.0041	0.0024	0.0037	0.0034	0.0038	
	O	0.0002	0.0004	0.0006	0.0007	0.0010	0.0013	0.0018	0.0022	0.0026	0.0029	0.0033	0.0036	0.0029	0.0033	0.0031	0.0034	
	P	0.0003	0.0004	0.0006	0.0008	0.0011	0.0014	0.0019	0.0023	0.0027	0.0031	0.0015	0.0039	0.0031	0.0035	0.0033	0.0036	
	↓ 1,5D	Q	0.0004	0.0006	0.0008	0.0010	0.0015	0.0019	0.0026	0.0031	0.0036	0.0041	0.0035	0.0039	0.0039	0.0044	0.0050	0.0055
	↔ 0,25D	R	0.0005	0.0006	0.0008	0.0010	0.0011	0.0015	0.0019	0.0022	0.0026	0.0029	0.0033	0.0036	0.0036	0.0036	0.0041	0.0043
	S	0.0004	0.0006	0.0009	0.0011	0.0015	0.0020	0.0028	0.0034	0.0039	0.0045	0.0051	0.0056	0.0044	0.0051	0.0048	0.0052	
	T	0.0004	0.0006	0.0008	0.0010	0.0014	0.0018	0.0025	0.0030	0.0035	0.0051	0.0046	0.0051	0.0040	0.0046	0.0043	0.0047	
	U	0.0003	0.0005	0.0007	0.0009	0.0013	0.0016	0.0023	0.0028	0.0032	0.0036	0.0041	0.0046	0.0036	0.0041	0.0039	0.0043	
	V	0.0004	0.0005	0.0008	0.0010	0.0013	0.0017	0.0024	0.0029	0.0034	0.0039	0.0043	0.0048	0.0038	0.0043	0.0041	0.0045	
	↓ 1,5D	X	0.0005	0.0007	0.0010	0.0013	0.0018	0.0023	0.0032	0.0039	0.0045	0.0052	0.0044	0.0049	0.0048	0.0055	0.0062	0.0068
	↔ 0,1D	Y	0.0006	0.0008	0.0010	0.0012	0.0014	0.0019	0.0023	0.0028	0.0024	0.0036	0.0041	0.0045	0.0045	0.0045	0.0051	0.0054

#### Easy Calculations: (inch)

RPM = SFM/D x 3.82      F = Ft x T x RPM  
 RPM = [(m/min.) x 1000] ÷ (3.14 x D)

Terms: RPM = Revolutions Per Minute    F = Feed Inches Per Minute  
 Ft = Feed Per Tooth    T = Number of Teeth    D = Cutting Dia.  
 SFM = Surface Feet per Minute

# APPLICATION MATERIAL GROUPS - REAMERS

## SURFACE FEET PER MINUTE (SFM)

For material examples, see page 567.

	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	4.1
4500	82C	66C	52C	49B	30B	16A			36C	20B	26B	20B	52E	49D	43C	36C	49C
4531	82C	66C	52C	49B	30B	16A			36C	20B	26B	20B	52E	49D	43C	36C	49C
4532	82C	66C	52C	49B	30B	16A			36C	20B	26B	20B	52E	49D	43C	36C	49C
4533	82C	66C	52C	49B	30B	16A			36C	20B	26B	20B	52E	49D	43C	36C	49C
4535	82C	66C	52C	49B	30B	16A			36C	20B	26B	20B	52E	49D	43C	36C	49C
4536	82C	66C	52C	49B	30B	16A			36C	20B	26B	20B	52E	49D	43C	36C	49C
4537	82C	66C	52C	49B	30B	16A			36C	20B	26B		52E	49D	43C	36C	49C
4579	59C	46C	36C	33B	16B	13A			26C	16B	20B		46E	36D	33C	30C	36C
4587	59C	46C	36C	33B	16B	13A			26C	16B	20B		46E	36D	33C	30C	36C
4588	59C	46C	36C	33B	16B	13A			26C	16B	20B		46E	36D	33C	30C	36C
4591	59C	46C	36C	33B	16B	13A			26C	16B	20B		46E	36D	33C	30C	36C
4600	59C	46C	36C	33B	16B	13A			26C	16B	20B	20B	46E	36D	33C	30C	36C
4608	82C	66C	52C	49B	30B	16A			36C	20B	26B		52E	49D	43C	36C	49C
B100	59C	46C	36C	33B	16B	13A			26F				46E	36D	33C	30C	36C
B101	59C	46C	36C	33B	16B	13A			26C				46E	36D	33C	30C	36C
B121	59C	46C	36C	33B	16B	13A							46E	36D	33C	30C	36C
B122	59C	46C	36C	33B	16B	13A			26C	16B	20B		46E	36D	33C	30C	36C
B157	82C	66C	52C	49B	30B	16A			36C	20B	26B						49C
B170	82C	66C	52C	49B	30B	16A			36C	20B	26B		52E	49D	43C	36C	49C
B301	59C	46C	36C	33B	16B	13A			26C	16B	20B		46E	36D	33C	30C	36C
B334	59C	46C	36C	33B	16B	13A			26F				46E	36D	33C	30C	36C
B400	59B	59B	46B	46B	33C	33C							56D	56D	56D	46D	46C
B411	59B	59B	46B	46B	33C	33C							56D	56D	56D	46D	46C
B441	59B	59B	46B	46B	33C	33C							56D	56D	56D	46D	46C
B442	59B	59B	46B	46B	33C	33C							56D	56D	56D	46D	46C
B481	59B	59B	46B	46B	33C	33C							56D	56D	56D	46D	46C
B901	59C	46C	36C	33B	16B	13A			26C				46E	36D	33C	30C	36C

# APPLICATION MATERIAL GROUPS - COUNTERSINKS

Feed rate chart see page 584. **SURFACE FEET PER MINUTE (SFM)**

	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	4.1
4602	98F	82E	66D	49D	33B	20A			26C	20B	13A		82F	49D	39C	26C	39C
4603	98F	82E	66D	49D	33B	20A			26C	20B	13A		82F	49D	39C	26C	39C
4702	82C	66C	52C	49B	30B	16A			36C	20B	26B		52E	49D	43C	36C	49C
4703	82C	66C	52C	49B	30B	16A			36C	20B	26B		52E	49D	43C	36C	49C
4705	82C	66C	52C	49B	30B	16A			36C	20B	26B		52E	49D	43C	36C	49C
4706	82C	66C	52C	49B	30B	16A			36C	20B	26B		52E	49D	43C	36C	49C
G171	164E	131E	98D	66D	49B	33B							148F	115D	98C	98C	66C
G132			66E	49D	33D	20B					13B					26D	
G135	98F	82E	66D	49D	33B	20A			26C	20B	13A		82F	49D	39C	26C	39C
G136	98F	82E	66D	49D	33B	20A			26C	20B	13A		82F	49D	39C	26C	39C
G137	98F	82E	66D	49D	33B	20A			26C	20B	13A		82F	49D	39C	26C	39C
G138	98F	82E	66D	49D	33B	20A			26C	20B	13A		82F	49D	39C	26C	39C
G142	98F	82E	66D	49D					26C	20B	13A						39C
G149	98D	82D	66C	49B	33A	20A			26B	20A			82D	49C	39A	26A	39B
G154	98F	82E	66D	49D	33B	20A			26C	20B	13A		82F	49D	39C	26C	39C
G335	164E	131E	98D	66D	49B	33B							148F	115D	98C	98C	66C
G338	164F	131E	98D	66D	49B	33A							148F	115D	98C	98C	66C
G400	98F	82E	66D	49D	33B	20A			26C	20B	13A		82F	49D	39C	26C	39C
G560	164E	131E	98D	66D	49B	33B							148F	115D	98C	98C	66C
G570	148E	118E	89D	72D	56B	39B			56C	39B	49A	33A	131C	105C	89C	79C	
G600	72F	56E	49D	39D	26B	20A			26C	20B	13A		82F	49D	39C		

## Feed Rate Chart - Reamers

Alpha Code	Reamers - Feed in Inches per Revolution													
	Ø Diameter													
	1/16	5/64	1/8	3/16	5/16	25/64	1/2	5/8	25/32	1"	1-13/16	1-1/2	2"	
A	0.002	0.002	0.003	0.004	0.006	0.007	0.007	0.009	0.010	0.011	0.013	0.015	0.017	
B	0.002	0.003	0.004	0.006	0.007	0.008	0.009	0.011	0.012	0.014	0.016	0.020	0.022	
C	0.003	0.003	0.005	0.007	0.009	0.010	0.011	0.013	0.015	0.017	0.019	0.024	0.027	
D	0.031	0.004	0.006	0.008	0.011	0.013	0.014	0.016	0.019	0.021	0.024	0.029	0.033	
E	0.004	0.006	0.007	0.010	0.014	0.015	0.017	0.020	0.021	0.025	0.030	0.036	0.043	
F	0.006	0.007	0.010	0.014	0.017	0.020	0.022	0.025	0.028	0.031	0.037	0.047	0.059	

# APPLICATION MATERIAL GROUPS - REAMERS

## SURFACE FEET PER MINUTE (SFM)

\*Feed rate chart - see pages 584. For material examples, see page 567

	4.2	4.3	5.1	5.2	5.3	6.1	6.2	6.3	6.4	7.1	7.2	7.3	7.4	8.1	8.2	8.3	9.1	10.1
4500	30B	16B	26D	16C	10C	82D	92E	82D	46D									
4531	30B	16B	26D	16C	10C	82D	92E	82D	46D									
4532	30B	16B	26D	16C	10C	82D	92E	82D	46D									
4533	30B	16B	26D	16C	10C	82D	92E	82D	46D									
4535	30B	16B	26D	16C	10C	82D	92E	82D	46D									
4536	30B	16B	26D	16C	10C	82D	92E	82D	46D									
4537	30B	16B	26D	16C	10C	82D	92E	82D	46D									
4579	16B	13B	16D			59D	66E	59D	36D	75F	59F	49E	46D		69B			
4587	16B	13B	16D			59D	66E	59D	36D	75F	59F	49E	46D		69B			
4588	16B	13B	16D			59D	66E	59D	36D	75F	59F	49E	46D		69B			
4591	16B	13B	16D			59D	66E	59D	36D	75F	59F	49E	46D		69B			
4600	16B	13B	16D			59D	66E	59D	36D	75F	59F	49E	46D		69B			
4608	30B	16B	26D	16C	10C	82D	92E	82D	46D									
B100	16B	13B	16D	10C	7C	59D	66E	59D	36D	75F	59F				69B			
B101	16B	13B	16D	10C	7C	59D	66E	59D	36D	75F	59F				69B			
B121																		
B122	16B	13B	16D			59D	66E	59D	36D	75F	59F	49E	46D		69B			
B157	30B	16B	26D	16C	10C	82D	92E			92F	82F	66E	52D	98B				10A
B170	30B	16B	26D	16C	10C	82D	92E	82D	46D									
B301	16B	13B	16D			59D	66E	59D	36D	75F	59F	49E	46D		69B			
B334	16B	13B	16D	10C	7C	59D	66E	59D	36D	75F	59F				69B			
B400	46C	33B	33C	33B	33B	125E	125E	125E	125D	197D	197D	82D	82D	82C	43C			
B411	46C	33B	33C	33B	33B	125E	125E	125E	125D	197D	197D	82D	82D	82C	43C			
B441	46C	33B	33C	33B	33B	125E	125E	125E	125D	197D	197D	82D	82D	82C	43C			
B442	46C	33B	33C	33B	33B	125E	125E	125E	125D	197D	197D	82D	82D	82C	43C			
B481	46C	33B	33C	33B	33B	125E	125E	125E	125D	197D	197D	82D	82D	82C	43C			
B901	16B	13B	16D	10C	7C	59D	66E	59D	36D	75F	59F				69B			

# APPLICATION MATERIAL GROUPS - COUNTERSINKS

Material examples page 585. **SURFACE FEET PER MINUTE (SFM)**

	4.2	4.3	5.1	5.2	5.3	6.1	6.2	6.3	6.4	7.1	7.2	7.3	7.4	8.1	8.2	8.3	9.1	10.1
4602	33A	26A	39C	20B	13A	82D	66F	82F	33D	98G	82F	66F	33F	98G	66G			
4603	33A	26A	39C	20B	13A	82D	66F	82F	33D	98G	82F	66F	33F	98G	66G			
4702	30B	16B	26D	16C	10C	82D	92E	82D	46D									
4703	30B	16B	26D	16C	10C	82D	92E	82D	46D									
4705	30B	16B	26D	16C	10C	82D	92E	82D	46D									
4706	30B	16B	26D	16C	10C	82D	92E	82D	46D									
G171	49A	33A	66C	33B	20A	131D	98F	131F	49D	164G	131F	98F	49F	164G	98G			
G132	26A	26A		20C	13B				33F							16G		
G135	33A	26A	39C	20B	13A	82D	66F	82F	33D	98G	82F	66F	33F	98G	66G			
G136	33A	26A	39C	20B	13A	82D	66F	82F	33D	98G	82F	66F	33F	98G	66G			
G137	33A	26A	39C	20B	13A	82D	66F	82F	33D	98G	82F	66F	33F	98G	66G			
G138	33A	26A	39C	20B	13A	82D	66F	82F	33D	98G	82F	66F	33F	98G	66G			
G142	33A		39C	20B		82D	66F	82F		98G	82F	66F	33F	98G	66G			
G149	33A	26A	39B	20A	13A	82B	66C	82C	33B	98D	82C	66C	33C	98D	66D			
G154	33A	26A	39C	20B	13A	82D	66F	82F	33D	98G	82F	66F	33F	98G	66G			
G335	49A	33A	66C	33B	20A	131D	98F	131F	49D	164G	131F	98F	49F	164G	98G			
G338	49A	33A	66C	33B	20A	131D	98F	131F	49D	164G	131F	98F	49F	164G	98G			
G400	33A	26A	39C	20B	13A	82D	66F	82F	33D	98G	82F	66F	33F	98G	66G			
G560	49A	33A	66C	33B	20A	131D	98F	131F	49D	164G	131F	98F	49F	164G	98G			
G570				20A	13A	131D	98F	131F	49D	148G	118F	89F	43F					
G600						82D	66F	82F	33D	98G	82F	66F	33F					

## Feed Rate Chart - Countersinks, Counterbores

Alpha Code	Countersinks, Counterbores - Feed in Inches per Revolution										Ø Diameter
	1/4	5/16	5/64	5/8	25/32	1"	1-1/4	1-1/2	2-3/8	3"	
A	0.001	0.002	0.002	0.002	0.003	0.004	0.004	0.005	0.006	0.006	
B	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.006	0.007	0.008	
C	0.002	0.002	0.003	0.004	0.005	0.006	0.006	0.007	0.008	0.009	
D	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009	0.010	0.011	
E	0.003	0.004	0.005	0.006	0.007	0.008	0.010	0.011	0.012	0.013	
F	0.004	0.004	0.005	0.006	0.007	0.008	0.010	0.011	0.013	0.014	
G	0.004	0.005	0.006	0.007	0.008	0.009	0.011	0.013	0.014	0.016	
H	0.005	0.006	0.007	0.008	0.009	0.010	0.012	0.014	0.016	0.018	

# EDP NUMBER INDEX - 000021 - 003342

EDP#	E-Code	Page #	EDP#	E-Code	Page #	EDP#	E-Code	Page #	EDP#	E-Code	Page #
0000021	A100.2	95	0000823	A10012.1	100	0001622	A1003.15	97	0002421	A1008.25	99
0000038	A100.25	95	0000830	A10012.2	100	0001639	A1003.2	97	0002438	A1008.3	99
0000045	A100.3	95	0000847	A10012.25	100	0001646	A1003.25	97	0002445	A1008.4	99
0000052	A100.32	95	0000854	A10012.3	100	0001653	A1003.3	97	0002452	A1008.5	99
0000069	A100.35	95	0000861	A10012.4	100	0001660	A1003.4	97	0002469	A1008.6	99
0000076	A100.38	95	0000878	A10012.5	101	0001677	A1003.5	98	0002476	A1008.7	99
0000083	A100.4	95	0000885	A10012.6	101	0001684	A1003.6	98	0002483	A1008.75	100
0000090	A100.42	95	0000892	A10012.7	101	0001691	A1003.7	98	0002490	A1008.8	100
0000106	A100.45	95	0000908	A10012.75	101	0001707	A1003.75	98	0002506	A1008.9	100
0000113	A100.48	96	0000915	A10012.8	101	0001714	A1003.8	98	0002513	A1009.0	100
0000120	A100.5	96	0000922	A10012.9	101	0001721	A1003.9	98	0002520	A1009.1	100
0000137	A100.52	96	0000939	A10013.0	101	0001738	A1003/16	98	0002537	A1009.2	100
0000144	A100.55	96	0000946	A10013.1	101	0001745	A10031/64	100	0002544	A1009.25	100
0000151	A100.58	96	0000953	A10013.2	101	0001752	A1003/32	97	0002551	A1009.3	100
0000168	A100.6	96	0000960	A10013.25	101	0001769	A10033/64	101	0002568	A1009.4	100
0000175	A100.62	96	0000977	A10013.3	101	0001776	A10035/64	101	0002575	A1009.5	100
0000182	A100.65	96	0000984	A10013.4	101	0001783	A1003/64	96	0002582	A1009.6	100
0000199	A100.68	96	0000991	A10013.5	101	0001790	A10037/64	101	0002599	A1009.7	100
0000205	A100.7	96	0001004	A10013.6	101	0001806	A1003/8	100	0002605	A1009.75	100
0000212	A100.72	96	0001011	A10013.7	101	0001813	A10039/64	101	0002612	A1009.8	100
0000229	A100.75	96	0001028	A10013.75	101	0001820	A1004.0	98	0002629	A1009.9	100
0000236	A100.78	96	0001035	A10013.8	101	0001837	A1004.1	98	0002636	A1009/16	101
0000243	A100.8	96	0001042	A10013.9	101	0001844	A1004.2	98	0002643	A1009/32	99
0000250	A100.82	96	0001059	A1001/32	96	0001851	A1004.25	98	0002650	A1009/64	98
0000267	A100.85	96	0001066	A10013/32	100	0001868	A1004.3	98	0002667	A1011.0	103
0000274	A100.88	96	0001073	A10013/64	98	0001875	A1004.4	98	0002674	A1011.1	103
0000281	A100.9	96	0001080	A1001/4	99	0001882	A1004.5	98	0002681	A1011.2	103
0000298	A100.92	96	0001097	A10014.0	101	0001899	A1004.6	98	0002698	A1011.25	103
0000304	A100.95	96	0001103	A10014.25	101	0001905	A1004.7	98	0002704	A1011.3	103
0000311	A100.98	96	0001110	A10014.5	101	0001912	A1004.75	98	0002711	A1011.4	103
0000328	A1001.0	96	0001127	A10014.75	101	0001929	A1004.8	98	0002728	A1011.5	103
0000335	A1001.05	96	0001134	A10015.0	101	0001936	A1004.9	98	0002735	A1011.6	103
0000342	A1001.1	96	0001141	A10015.25	101	0001943	A1004/164	101	0002742	A1011.7	103
0000359	A1001.15	96	0001158	A10015.5	101	0001950	A10043/64	101	0002766	A1011.8	103
0000366	A1001.2	96	0001165	A10015.75	101	0001967	A1005.0	98	0002773	A1011.9	103
0000373	A1001.25	96	0001172	A10015/32	100	0001974	A1005.1	98	0002780	A10110.0	104
0000380	A1001.3	96	0001189	A10015/64	99	0001981	A1005.2	98	0002797	A10112.0	104
0000397	A1001.35	96	0001196	A10016.0	101	0001998	A1005.25	98	0002803	A1012.0	103
0000403	A1001.4	96	0001202	A10016.5	101	0002001	A1005.3	98	0002810	A1012.1	103
0000410	A1001.45	96	0001219	A1001/64	95	0002018	A1005.4	98	0002827	A1012.2	103
0000427	A1001.5	96	0001226	A10017.0	101	0002025	A1005.5	98	0002834	A1012.3	103
0000434	A1001.55	96	0001233	A10017.5	101	0002032	A1005.6	98	0002841	A1012.4	103
0000441	A1001.6	96	0001240	A10017/32	101	0002049	A1005.7	98	0002858	A1012.5	103
0000458	A1001.65	97	0001257	A10017/64	99	0002056	A1005.75	98	0002865	A1012.6	103
0000465	A1001.7	97	0001264	A1001/8	97	0002063	A1005.8	99	0002872	A1012.7	103
0000472	A1001.75	97	0001271	A10018.0	101	0002070	A1005.9	99	0002889	A1012.8	103
0000489	A1001.8	97	0001288	A10018.5	101	0002087	A1005/16	98	0002896	A1012.9	103
0000496	A1001.85	97	0001295	A10019.0	101	0002094	A1005/32	99	0002902	A1013.0	103
0000502	A1001.9	97	0001301	A10019.5	101	0002100	A1005/64	97	0002919	A1013.2	103
0000519	A1001.95	97	0001318	A10019/32	101	0002117	A1005/8	97	0002926	A1013.3	103
0000526	A10010.0	100	0001325	A10019/64	101	0002124	A1006.0	99	0002933	A1013.5	103
0000533	A10010.1	100	0001332	A1002.0	97	0002131	A1006.1	99	0002940	A1013.8	103
0000540	A10010.2	100	0001349	A1002.05	97	0002148	A1006.2	99	0002957	A1014.0	103
0000557	A10010.25	100	0001356	A1002.1	97	0002155	A1006.25	99	0002964	A1014.2	103
0000564	A10010.3	100	0001363	A1002.15	97	0002162	A1006.3	99	0002971	A1014.5	103
0000571	A10010.4	100	0001370	A1002.2	97	0002179	A1006.4	99	0002988	A1014.8	103
0000588	A10010.5	100	0001387	A1002.25	97	0002186	A1006.5	99	0002995	A1015.0	103
0000595	A10010.6	100	0001394	A1002.3	97	0002193	A1006.6	99	0003008	A1015.1	103
0000601	A10010.7	100	0001400	A1002.35	97	0002209	A1006.7	99	0003015	A1015.2	103
0000618	A10010.75	100	0001417	A1002.4	97	0002216	A1006.75	99	0003022	A1015.5	104
0000625	A10010.8	100	0001424	A1002.45	97	0002223	A1006.8	99	0003039	A1016.0	104
0000632	A10010.9	100	0001431	A1002.5	97	0002230	A1006.9	99	0003046	A1016.5	104
0000649	A10011.0	100	0001448	A1002.55	97	0002247	A1007.0	99	0003053	A1017.0	104
0000656	A10011.1	100	0001455	A1002.6	97	0002254	A1007.1	99	0003060	A1017.5	104
0000663	A10011.2	100	0001462	A1002.65	97	0002261	A1007.2	99	0003077	A1018.0	104
0000670	A10011.25	100	0001479	A1002.7	97	0002278	A1007.25	99	0003084	A1018.5	104
0000687	A10011.3	100	0001486	A1002.75	97	0002285	A1007.3	99	0003091	A1019.0	104
0000694	A10011.4	100	0001493	A1002.8	97	0002292	A1007.4	99	003251	DCN0	211
0000700	A10011.5	100	0001509	A1002.85	97	0002308	A1007.5	99	003252	DCN1	211
0000717	A10011.6	100	0001516	A1002.9	97	0002315	A1007.6	99	003253	DCN2	211
0000724	A10011.7	100	0001523	A1002.95	97	0002322	A1007.7	99	003254	DCN3	211
0000731	A10011.75	100	0001530	A10020.0	101	0002339	A1007.75	99	003255	DCN4	211
0000748	A10011.8	100	0001547	A10021/32	101	0002346	A1007.8	99	003256	DCN5	211
0000755	A10011.9	100	0001554	A10021/64	99	0002353	A1007.9	99	003257	DCN6	211
0000762	A10011/16	101	0001561	A10023/64	100	0002360	A1007/16	100	003332	DS901/8	207
0000779	A10011/32	99	0001578	A10025/64	100	0002377	A1007/32	98	003334	DS903/16	207
0000786	A1001/16	96	0001585	A10027/64	100	0002384	A1007/64	97	003336	DS901/4	207
0000793	A10011/64	98	0001592	A10029/64	100	0002391	A1008.0	99	003338	DS905/16	207
0000809	A1001/2	101	0001608	A1003.0	97	0002407	A1008.1	99	003340	DS903/8	207
0000816	A10012.0	100	0001615	A1003.1	97	0002414	A1008.2	99	003342	DS901/2	207

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EDP#	E-Code	Page #	EDP#	E-Code	Page #	EDP#	E-Code	Page #	EDP#	E-Code	Page #
003472	D33M1.0	206	003557	D33WN20	204	0007624	A1081.8	115	0008508	A1086.2	116
003473	D33M1.5	206	003558	D33WN19	204	0007631	A1081.9	115	0008515	A1086.3	116
003474	D33M2.0	206	003559	D33WN18	204	0007648	A10810.0	117	0008522	A1086.4	116
003475	D33M2.05	206	003560	D33F11/64	204	0007655	A10810.2	117	0008539	A1086.5	117
003476	D33M2.5	206	003561	D33WN17	204	0007662	A10810.5	117	0008546	A1086.6	117
003477	D33M3.0	206	003562	D33WN16	204	0007679	A10810.8	117	0008553	A1086.7	117
003478	D33M3.5	206	003563	D33WN15	204	0007686	A10811.0	117	0008560	A1086.8	117
003479	D33M4.5	206	003564	D33WN14	204	0007693	A10811.5	117	0008577	A1086.9	117
003480	D33M5.5	206	003565	D33WN13	204	0007709	A10811.8	118	0008584	A1087.0	117
003481	D33M6.0	206	003566	D33F3/16	204	0007716	A10811/32	117	0008591	A1087.1	117
003482	D33M6.5	206	003567	D33WN12	204	0007723	A10811/16	115	0008607	A1087.2	117
003483	D33M7.0	206	003568	D33WN11	204	0007730	A10811/64	116	0008614	A1087.3	117
003484	D33M7.5	206	003569	D33WN10	204	0007747	A1081/2	118	0008621	A1087.4	117
003485	D33M8.0	206	003570	D33WN9	204	0007754	A10812.0	118	0008638	A1087.5	117
003486	D33M8.5	206	003571	D33WN8	204	0007761	A10812.2	118	0008645	A1087.6	117
003487	D33M9.0	206	003572	D33WN7	204	0007778	A10812.5	118	0008652	A1087.7	117
003488	D33M9.5	206	003573	D33F13/64	204	0007785	A10812.8	118	0008669	A1087.8	117
003489	D33M10.5	206	003574	D33WN6	204	0007792	A10812.9	118	0008676	A1087.9	117
003490	D33M10.75	206	003575	D33WN5	204	0007808	A10813.0	118	0008683	A1087/16	117
003491	D33M11.0	206	003576	D33WN4	204	0007815	A10813.5	118	0008690	A1087/32	116
003492	D33M11.5	206	003577	D33WN3	204	0007822	A10813/32	117	0008706	A1087/64	115
003493	D33M12.0	206	003578	D33F7/32	204	0007839	A10813/64	116	0008713	A1088.0	117
003500	D33WN68	203	003579	D33WN2	204	0007846	A1081/4	116	0008720	A1088.1	117
003501	D33F1/32	203	003580	D33WN1	204	0007853	A10814.0	118	0008737	A1088.2	117
003502	D33WN67	203	003581	D33LA	204	0007860	A10814.5	118	0008744	A1088.3	117
003503	D33WN66	203	003582	D33F15/64	204	0007877	A10815.0	118	0008751	A1088.4	117
003504	D33WN65	203	003583	D33LB	204	0007884	A10815.25	118	0008768	A1088.5	117
003505	D33WN64	203	003584	D33LC	204	0007891	A10815.5	118	0008775	A1088.6	117
003506	D33WN63	203	003585	D33LD	204	0007907	A10815/32	118	0008782	A1088.7	117
003507	D33WN62	203	003586	D33F1/4	204	0007921	A10816.0	118	0008799	A1088.8	117
003508	D33WN61	203	003587	D33LF	204	0007945	A1081/8	115	0008805	A1088.9	117
003509	D33WN60	203	003588	D33LG	204	0007969	A1082.0	115	0008812	A1089.0	117
003510	D33WN59	203	003589	D33F17/64	204	0007976	A1082.1	115	0008829	A1089.1	117
003511	D33WN58	203	003590	D33LH	204	0007983	A1082.2	115	0008836	A1089.2	117
003512	D33WN57	203	003591	D33LI	204	0007990	A1082.3	115	0008843	A1089.3	117
003513	D33WN56	203	003592	D33LJ	204	0008003	A1082.4	115	0008850	A1089.4	117
003514	D33F3/64	203	003593	D33LK	204	0008010	A1082.5	115	0008867	A1089.5	117
003515	D33WN55	203	003594	D33F9/32	204	0008027	A1082.6	115	0008874	A1089.6	117
003516	D33WN54	203	003595	D33LL	204	0008034	A1082.7	115	0008881	A1089.7	117
003517	D33WN53	203	003596	D33LM	204	0008041	A1082.8	115	0008898	A1089.8	117
003518	D33F1/16	203	003597	D33F19/64	204	0008058	A1082.9	115	0008904	A1089.9	117
003519	D33WN52	203	003598	D33LN	204	0008119	A1083.0	115	0008911	A1089/32	117
003520	D33WN51	203	003599	D33F5/16	205	0008126	A1083.1	115	0008928	A1089/64	115
003521	D33WN50	203	003600	D33LO	205	0008133	A1083.2	115	010001	R101/64	87
003522	D33WN49	203	003601	D33LP	205	0008140	A1083.3	115	010002	R101/32	88
003523	D33WN48	203	003602	D33F21/64	205	0008157	A1083.4	115	010003	R103/64	88
003524	D33F5/64	203	003603	D33LQ	205	0008164	A1083.5	115	010004	R101/16	88
003525	D33WN47	203	003604	D33LR	205	0008171	A1083.6	115	010005	R105/64	88
003526	D33WN46	203	003605	D33F11/32	205	0008188	A1083.7	115	010006	R103/32	88
003527	D33WN45	203	003606	D33LS	205	0008195	A1083.8	115	010007	R107/64	88
003528	D33WN44	203	003607	D33LT	205	0008201	A1083.9	116	010008	R101/8	88
003529	D33WN43	203	003608	D33F23/64	205	0008218	A1083/16	116	010009	R109/64	88
003530	D33WN42	203	003609	D33LU	205	0008232	A1083/32	115	010010	R105/32	88
003531	D33F3/32	203	003610	D33F3/8	205	0008249	A1083/8	117	010011	R101/64	88
003532	D33WN41	203	003611	D33LV	205	0008256	A1084.0	116	010012	R103/16	89
003533	D33WN40	204	003612	D33LW	205	0008263	A1084.1	116	010013	R1013/64	89
003534	D33WN39	204	003613	D33F25/64	205	0008270	A1084.2	116	010014	R107/32	89
003535	D33WN38	204	003614	D33LX	205	0008287	A1084.3	116	010015	R1015/64	89
003536	D33WN37	204	003615	D33LY	205	0008294	A1084.4	116	010016	R101/4	89
003537	D33WN36	204	003616	D33F13/32	205	0008300	A1084.5	116	010017	R1017/64	89
003538	D33F7/64	204	003617	D33LZ	205	0008317	A1084.6	116	010018	R109/32	89
003539	D33WN35	204	003618	D33F27/64	205	0008324	A1084.7	116	010019	R1019/64	89
003540	D33WN34	204	003619	D33F7/16	205	0008331	A1084.8	116	010020	R105/16	89
003541	D33WN33	204	003620	D33F29/64	205	0008348	A1084.9	116	010021	R1021/64	89
003542	D33WN32	204	003621	D33F15/32	205	0008355	A1085.0	116	010022	R1011/32	89
003543	D33WN31	204	003622	D33F31/64	205	0008362	A1085.1	116	010023	R1023/64	89
003544	D33F1/8	204	003623	D33F1/2	205	0008379	A1085.2	116	010024	R103/8	89
003545	D33WN30	204	003624	D33M3.3	206	0008386	A1085.3	116	010025	R1025/64	89
003546	D33WN29	204	003626	D33M4.0	206	0008393	A1085.4	116	010026	R1013/32	89
003547	D33WN28	204	003630	D33M5.0	206	0008409	A1085.5	116	010027	R1027/64	89
003548	D33F9/64	204	003631	D33M10.0	206	0008416	A1085.6	116	010028	R107/16	89
003549	D33WN27	204	0007549	A1081.0	114	0008423	A1085.7	116	010029	R1029/64	89
003550	D33WN26	204	0007556	A1081.1	114	0008430	A1085.8	116	010030	R1015/32	89
003551	D33WN25	204	0007563	A1081.2	114	0008447	A1085.9	116	010031	R1031/64	89
003552	D33WN24	204	0007570	A1081.3	114	0008454	A1085/16	117	010032	R101/2	89
003553	D33WN23	204	0007587	A1081.4	115	0008461	A1085/32	116	010033	R1033/64	89
003554	D33F5/32	204	0007594	A1081.5	115	0008478	A1085/64	115	010034	R1017/32	90
003555	D33WN22	204	0007600	A1081.6	115	0008485	A1086.0	116	010035	R1035/64	90
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010038	R1019/32	90	010315	R10CO15/64	125	010615	R10P15/64	89	0011379	R9505/8	22
010039	R1039/64	90	010316	R10CO1/4	126	010616	R10P1/4	89	0011386	R95016.0	22
010040	R105/8	90	010317	R10CO17/64	126	010617	R10P17/64	89	0011393	R95041/64	22
010041	R1041/64	90	010318	R10CO9/32	126	010618	R10P9/32	89	0011409	R95016.5	22
010042	R1021/32	90	010319	R10CO19/64	126	010619	R10P19/64	89	0012161	R95021/32	22
010043	R1043/64	90	010320	R10CO5/16	126	010620	R10P5/16	89	0012185	R95017.0	22
010044	R1011/16	90	010321	R10CO21/64	126	010621	R10P21/64	89	0012215	R95043/64	22
010044	R10A1/16	108	010322	R10CO11/32	126	010622	R10P11/32	89	0012239	R95011/16	22
010105	R10A5/64	108	010323	R10CO23/64	126	010623	R10P23/64	89	0012253	R95017.5	22
010106	R10A3/32	108	010324	R10CO3/8	126	010624	R10P3/8	89	0012260	R95045/64	22
010107	R10A7/64	108	010325	R10CO25/64	126	010625	R10P25/64	89	0012277	R95018.0	22
010108	R10A1/8	108	010326	R10CO13/32	126	010626	R10P13/32	89	0012284	R95023/32	22
010109	R10A9/64	108	010327	R10CO27/64	126	010627	R10P27/64	89	0012307	R95018.5	22
010110	R10A5/32	109	010328	R10CO7/16	127	010628	R10P7/16	89	0012321	R95047/64	22
010111	R10A11/64	109	010329	R10CO29/64	127	010629	R10P29/64	89	0012338	R95019.0	22
010112	R10A3/16	109	010330	R10CO15/32	127	010630	R10P15/32	89	0012345	R9503/4	22
010113	R10A13/64	109	010331	R10CO31/64	127	010631	R10P31/64	89	0012376	R95049/64	22
010114	R10A7/32	109	010332	R10CO1/2	127	010632	R10P1/2	89	0012383	R95019.5	22
010115	R10A15/64	109	010333	R10CO33/64	127	010633	R10P33/64	89	0012406	R95025/32	22
010116	R10A1/4	109	010334	R10CO17/32	127	010634	R10P17/32	90	0012413	R95020.0	22
010117	R10A17/64	109	010335	R10CO35/64	127	010635	R10P35/64	90	0012437	R95051/64	22
010118	R10A9/32	109	010336	R10CO9/16	127	010636	R10P9/16	90	0012451	R95020.5	22
010119	R10A19/64	109	010337	R10CO37/64	127	010637	R10P37/64	90	0012468	R95013/16	22
010120	R10A5/16	109	010338	R10CO19/32	127	010638	R10P19/32	90	0012475	R95021.0	22
010121	R10A21/64	109	010339	R10CO39/64	127	010639	R10P39/64	90	0012536	R95053/64	22
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010124	R10A3/8	109	010342	R10CO21/32	127	010642	R10P21/32	90	0012604	R95055/64	22
010125	R10A25/64	109	010343	R10CO43/64	127	010643	R10P43/64	90	0012628	R95022.0	22
010126	R10A13/32	110	010344	R10CO11/16	127	010644	R10P11/16	90	0012635	R9507/8	22
010127	R10A27/64	110	0010396	E0212-56	283	0010860	R95015/32	21	0012642	R95057/64	22
010128	R10A7/16	110	0010419	E0215-40	283	0010877	R95012.0	21	0012666	R95023.0	22
010129	R10A29/64	110	0010440	E0232-56	297	0010884	R95031/64	21	0012673	R95029/32	22
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010204	R10B1/16	111	010504	R10H1/16	115	010905	L105/64	102	0012741	R95061/64	23
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010206	R10B3/32	111	010506	R10H3/32	115	0010907	R95012.5	21	0012819	R95025.0	23
010207	R10B7/64	111	010507	R10H7/64	115	010907	L107/64	102	0012826	R95063/64	23
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010209	R10B9/64	111	010509	R10H9/64	115	010909	L109/64	102	0012840	R9501.1/64	23
010210	R10B5/32	112	010510	R10H5/32	116	010910	L105/32	102	0013090	R95026.0	23
010211	R10B11/64	112	010511	R10H11/64	116	010911	L1011/64	102	013115	QC21PM1.5	122
010212	R10B3/16	112	010512	R10H3/16	116	010912	L103/16	102	0013120	R9501.1/32	23
010213	R10B13/64	112	010513	R10H13/64	116	010913	L1013/64	102	013120	QC21PM2.0	122
010214	R10B7/32	112	010514	R10H7/32	116	0010914	R9501/2	21	013125	QC21PM2.5	122
010215	R10B15/64	112	010515	R10H15/64	116	010914	L107/32	102	013130	QC21PM3.0	122
010216	R10B1/4	112	010516	R10H1/4	116	010915	L1015/64	102	013135	QC21PM3.5	122
010217	R10B17/64	112	010517	R10H17/64	117	010916	L101/4	102	013140	QC21PM4.0	122
010218	R10B9/32	112	010518	R10H9/32	117	010917	L1017/64	102	013145	QC21PM4.5	122
010219	R10B19/64	112	010519	R10H19/64	117	010918	L109/32	102	013150	QC21PM5.0	122
010220	R10B5/16	112	010520	R10H5/16	117	010919	L1019/64	102	013152	QC21PM5.2	122
010221	R10B21/64	112	010521	R10H21/64	117	010920	L105/16	102	013155	QC21PM5.5	122
010222	R10B11/32	112	010522	R10H11/32	117	0010921	R95013.0	21	013156	QC21PM5.6	122
010223	R10B23/64	112	010523	R10H23/64	117	010921	L1021/64	102	013160	QC21PM6.0	122
010224	R10B3/8	112	010524	R10H3/8	117	010922	L1011/32	102	013165	QC21PM6.5	122
010225	R10B25/64	112	010525	R10H25/64	117	010923	L1023/64	102	013168	QC21PM6.8	122
010226	R10B13/32	113	010526	R10H13/32	117	010924	L103/8	102	013170	QC21PM7.0	122
010227	R10B27/64	113	010527	R10H27/64	117	010925	L1025/64	102	013175	QC21PM7.5	122
010228	R10B7/16	113	010528	R10H7/16	117	010926	L1013/32	102	013180	QC21PM8.0	122
010229	R10B29/64	113	010529	R10H29/64	118	010927	L1027/64	102	013182	QC21PM8.2	122
010230	R10B15/32	113	010530	R10H15/32	118	010928	L107/16	102	013185	QC21PM8.5	122
010231	R10B31/64	113	010531	R10H31/64	118	010929	L1029/64	102	013186	QC21PM8.6	122
010232	R10B1/2	113	010532	R10H1/2	118	010930	L1015/32	102	013190	QC21PM9.0	122
010301	R10CO1/64	123	010601	R10P1/64	87	010931	L1031/64	102	013195	QC21PM9.5	122
010302	R10CO1/32	123	010602	R10P1/32	88	010932	L101/2	102	0013229	R9501.3/64	23
010303	R10CO3/64	123	010603	R10P3/64	88	0010938	R95033/64	21	0013243	R9501.1/16	23
010304	R10CO1/16	124	010604	R10P1/16	88	0010945	R95017/32	21	0013267	R95027.0	23
010305	R10CO5/64	124	010605	R10P5/64	88	0010952	R95013.5	21	0013274	R9501.5/64	23
010306	R10CO3/32	124	010606	R10P3/32	88	0010969	R95035/64	21	0013281	R9501.3/32	23
010307	R10CO7/64	124	010607	R10P7/64	88	0010983	R95014.0	21	0013304	R95028.0	23
010308	R10CO1/8	124	010608	R10P1/8	88	0011003	R9509/16	21	0013311	R9501.7/64	23
010309	R10CO9/64	125	010609	R10P9/64	88	0011010	R95014.5	21	0013328	R9501.1/8	23
010310	R10CO5/32	125	010610	R10P5/32	88	0011140	R95037/64	21	0013342	R9501.9/64	23
010311	R10CO11/64	125	010611	R10P11/64	88	0011201	R95015.0	21	0013366	R95029.0	23
010312	R10CO3/16	125	010612	R10P3/16	89	0011218	R95019/32	21	0013380	R9501.5/32	23
010313	R10CO13/64	125	010613	R10P13/64	89	0011232	R95039/64	22	0013427	R9501.11/64	23



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0013441	R9501.3/16	23	015204	R15BD	112	015811	QC21P11/64	120	016048	2A4.8	98
0013465	R95030.5	23	015206	R15BF	112	015812	QC21P3/16	120	016050	2A5.0	98
0013472	R96015/32	24	015207	R15BG	112	015813	QC21P13/64	120	016051	2A5.1	98
0013489	R96012.0	24	015208	R15BH	112	015814	QC21P7/32	120	016052	2A5.2	98
0013496	R96031/64	24	015209	R15BI	112	015815	QC21P15/64	120	0016053	R9609/16	24
0013519	R96012.5	24	015210	R15BJ	112	015816	QC21P1/4	120	016053	2A5.3	98
0013526	R9601/2	24	015211	R15BK	112	015817	QC21P17/64	120	016054	2A5.4	98
0013533	R96013.0	24	015212	R15BL	112	015818	QC21P9/32	120	016055	2A5.5	98
0013540	R96033/64	24	015213	R15BM	112	015819	QC21P19/64	120	016056	2A5.6	98
0013557	R96017/32	24	015214	R15BN	112	015820	QC21P5/16	120	016057	2A5.7	98
014900	QC21PM10.0	122	015215	R15BO	112	015821	QC21P21/64	120	016058	2A5.8	98
014905	QC21PM10.5	122	015216	R15BP	112	015822	QC21P11/32	120	0016060	R96014.5	24
014910	QC21PM11.0	122	015217	R15BQ	112	015823	QC21P23/64	120	016060	2A6.0	99
014915	QC21PM11.5	122	015218	R15BR	112	015824	QC21P3/8	120	016061	2A6.1	99
014920	QC21PM12.0	122	015219	R15BS	112	015825	QC21P25/64	120	016062	2A6.2	99
014925	QC21PM12.5	122	015220	R15BT	112	015826	QC21P13/32	120	016063	2A6.3	99
014930	QC21PM13.0	122	015221	R15BU	112	015827	QC21P27/64	121	016064	2A6.4	99
014935	QC21PM13.5	122	015222	R15BV	112	015828	QC21P7/16	121	016065	2A6.5	99
014940	QC21PM14.0	122	015223	R15BW	112	015829	QC21P29/64	121	016066	2A6.6	99
014945	QC21PM14.5	122	015224	R15BX	112	015830	QC21P15/32	121	016067	2A6.7	99
014950	QC21PM15.0	122	015225	R15BY	113	015831	QC21P31/64	121	016068	2A6.8	99
014955	QC21PM15.5	122	015226	R15BZ	113	015832	QC21P1/2	121	016070	2A7.0	99
014960	QC21PM16.0	122	015301	R15COA	125	015833	QC21P33/64	121	016072	2A7.2	99
014965	QC21PM16.5	122	015302	R15COB	125	015834	QC21P17/32	121	016073	2A7.3	99
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014975	QC21PM17.5	122	015304	R15COD	125	015836	QC21P9/16	121	016075	2A7.5	99
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015003	R15C	89	015308	R15COH	126	015839	QC21P39/64	121	016078	2A7.8	99
015004	R15D	89	015309	R15COI	126	015840	QC21P5/8	121	016079	2A7.9	99
015006	R15F	89	015310	R15COJ	126	015841	QC21P41/64	121	016080	2A8.0	99
015007	R15G	89	015311	R15COK	126	015842	QC21P21/32	121	016081	2A8.1	99
015008	R15H	89	015312	R15COL	126	015843	QC21P43/64	121	016082	2A8.2	99
015009	R15I	89	015313	R15COM	126	015844	QC21P11/16	121	0016084	R96015.0	24
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015011	R15K	89	015315	R15COO	126	016003	2A.3	95	016085	2A8.5	99
015012	R15L	89	015316	R15COP	126	016004	2A.4	95	016086	2A8.6	99
015013	R15M	89	015317	R15COQ	126	016005	2A.5	96	016087	2A8.7	99
015014	R15N	89	015318	R15COR	126	016006	2A.6	96	016088	2A8.8	100
015015	R15O	89	015319	R15COS	126	016007	2A.7	96	016089	2A8.9	100
015016	R15P	89	015320	R15COT	126	016008	2A.8	96	016090	2A9.0	100
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015019	R15S	89	015323	R15COW	126	016011	2A1.1	96	016094	2A9.4	100
015020	R15T	89	015324	R15COX	126	016012	2A1.2	96	016095	2A9.5	100
015021	R15U	89	015325	R15COY	126	016013	2A1.3	96	016096	2A9.6	100
015022	R15V	89	015326	R15COZ	126	016014	2A1.4	96	016097	2A9.7	100
015023	R15W	89	015601	R15PA	89	016015	2A1.5	96	016098	2A9.8	100
015024	R15X	89	015602	R15PB	89	016016	2A1.6	96	016099	2A9.9	100
015025	R15Y	89	015603	R15PC	89	016017	2A1.7	97	016100	2A10.0	100
015026	R15Z	89	015604	R15PD	89	016018	2A1.8	97	016102	2A10.2	100
015101	R15AA	109	015606	R15PF	89	016019	2A1.9	97	016103	2A10.3	100
015102	R15AB	109	015607	R15PG	89	016020	2A2.0	97	016105	2A10.5	100
015103	R15AC	109	015608	R15PH	89	016021	2A2.1	97	016106	2A10.6	100
015104	R15AD	109	015609	R15PI	89	0016022	R96013.5	24	0016107	R96039/64	25
015106	R15AF	109	015610	R15PJ	89	016022	2A2.2	97	016108	2A10.8	100
015107	R15AG	109	015611	R15PK	89	016023	2A2.3	97	016109	2A10.9	100
015108	R15AH	109	015612	R15PL	89	016024	2A2.4	97	016110	2A11.0	100
015109	R15AI	109	015613	R15PM	89	016025	2A2.5	97	016112	2A11.2	100
015110	R15AJ	109	015614	R15PN	89	016026	2A2.6	97	016113	2A11.3	100
015111	R15AK	109	015615	R15PO	89	016027	2A2.7	97	0016114	R96015.5	25
015112	R15AL	109	015616	R15PP	89	016029	2A2.9	97	016114	2A11.4	100
015113	R15AM	109	015617	R15PQ	89	016030	2A3.0	97	016115	2A11.5	100
015114	R15AN	109	015618	R15PR	89	016031	2A3.1	97	016117	2A11.7	100
015115	R15AO	109	015619	R15PS	89	016032	2A3.2	97	016118	2A11.8	100
015116	R15AP	109	015620	R15PT	89	016033	2A3.3	97	016120	2A12.0	100
015117	R15AQ	109	015621	R15PU	89	016034	2A3.4	97	0016121	R9605/8	25
015118	R15AR	109	015622	R15PV	89	016035	2A3.5	98	016121	2A12.1	100
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015120	R15AT	109	015624	R15PX	89	016037	2A3.7	98	016125	2A12.5	101
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016229	2A.29	95	016427	2ACO2.7	124	0017241	R96055/64	25	018062	R18N62	88
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016266	2A2.15	97	016453	2ACO5.3	125	018006	R18N6	89	018105	R18AN5	109
016267	2A2.25	97	016455	2ACO5.5	125	018007	R18N7	89	018106	R18AN6	109
016268	2A2.35	97	016456	2ACO5.6	125	018008	R18N8	89	018107	R18AN7	109
016270	2A2.75	97	016457	2ACO5.7	125	018009	R18N9	89	018108	R18AN8	109
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016359	2ACO1.45	124	016488	2ACO8.8	126	018032	R18N32	88	018131	R18AN31	108
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026370	5ATS37.0	182	029037	2AB3.7	98	029127	2AB12.7	101	0029732	A1604.5	202
026380	5ATS38.0	182	0029039	A100N4	98	029128	2AB12.8	101	0029749	A1605.0	202
026400	5ATS40.0	182	029040	2AB4.0	98	029129	2AB12.9	101	0029756	A1605.5	202
026420	5ATS42.0	182	029041	2AB4.1	98	029130	2AB13.0	101	0029763	A1606.0	202
026440	5ATS44.0	182	029042	2AB4.2	98	0029138	A100N49	97	0029770	A1606.5	202
026500	5ATS50.0	182	029043	2AB4.3	98	0029145	A100N5	98	0029787	A1606.8	202
0028568	A100A	99	029044	2AB4.4	98	0029152	A100N50	97	0029794	A1607.0	202
0028575	A100B	99	029045	2AB4.5	98	0029169	A100N51	97	0029800	A1607.5	202
0028582	A100C	99	0029046	A100N40	97	0029176	A100N52	97	0029817	A1608.0	202
0028599	A100D	99	029046	2AB4.6	98	0029183	A100N53	96	0029824	A1608.5	202
0028605	A100E	99	029048	2AB4.8	98	0029190	A100N54	96	0029831	A1609.0	202
0028612	A100F	99	029050	2AB5.0	98	0029206	A100N55	96	0029848	A1609.5	202
0028629	A100G	99	029051	2AB5.1	98	0029213	A100N56	96	0030134	A1701	193
0028636	A100H	99	029052	2AB5.2	98	0029220	A100N57	96	0030141	A17011/16	192
0028643	A100I	99	0029053	A100N41	97	0029237	A100N58	96	0030165	A17013.0	192
0028650	A100J	99	029053	2AB5.3	98	0029244	A100N59	96	0030172	A17013.5	192
0028667	A100K	99	029054	2AB5.4	98	0029251	A100N6	98	0030189	A17013/16	193
0028674	A100L	99	029055	2AB5.5	98	029256	2AB1.15	96	0030196	A17014.0	192
0028681	A100M	99	029056	2AB5.6	98	029257	2AB1.25	96	0030202	A17014.5	192
0028698	A100N	99	029057	2AB5.7	98	029258	2AB1.35	96	0030219	A17015.0	192
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0028711	A100N10	98	0029060	A100N42	97	029260	2AB1.55	96	0030233	A17015/16	193
0028728	A100N11	98	029060	2AB6.0	99	029262	2AB1.75	97	0030240	A17016.0	192
0028735	A100N12	98	029061	2AB6.1	99	029264	2AB1.95	97	0030257	A17016.5	192
0028742	A100N13	98	029062	2AB6.2	99	0029268	A100N60	96	0030264	A17017.0	192
0028759	A100N14	98	029063	2AB6.3	99	029268	2AB2.35	97	0030271	A17017.5	192
0028766	A100N15	98	029064	2AB6.4	99	029271	2AB3.25	97	0030288	A17045/64	192
0028773	A100N16	98	029065	2AB6.5	99	0029275	A100N61	96	0030295	A17017/32	192
0028780	A100N17	98	029066	2AB6.6	99	029276	2AB5.75	98	0030301	A17018.0	192
0028797	A100N18	98	029067	2AB6.7	99	029278	2AB6.75	99	0030318	A17018.5	192
0028803	A100N19	98	029068	2AB6.8	99	029279	2AB7.25	99	0030325	A17019.0	192
0028810	A100N2	98	029070	2AB7.0	99	029281	2AB7.85	99	0030332	A17019.5	192
0028827	A100N20	98	029072	2AB7.2	99	0029282	A100N62	96	0030349	A17019/32	192
0028834	A100N21	98	029073	2AB7.3	99	029282	2AB8.25	99	0030356	A17020.0	192
0028841	A100N22	98	029074	2AB7.4	99	029283	2AB8.75	100	0030363	A17021.0	193
0028858	A100N23	98	029075	2AB7.5	99	0029299	A100N63	96	0030370	A17021/32	192
0028865	A100N24	98	029076	2AB7.6	99	0029305	A100N64	96	0030387	A17022.0	193
0028872	A100N25	98	0029077	A100N43	97	0029312	A100N65	96	0030394	A17023.0	193
0028889	A100N26	98	029078	2AB7.8	99	0029329	A100N66	96	0030400	A17023/32	192
0028896	A100N27	98	029079	2AB7.9	99	0029336	A100N67	96	0030417	A17024.0	193
0028902	A100N28	98	029080	2AB8.0	99	0029343	A100N68	96	0030424	A17025.0	193
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0028926	A100N3	98	029082	2AB8.2	99	0029367	A100N7	98	0030448	A17027/32	193
0028933	A100N30	97	0029084	A100N44	97	0029374	A100N70	96	0030455	A17031/32	193
0028940	A100N31	97	029084	2AB8.4	99	0029381	A100N71	96	0030462	A1703/4	192
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0029008	A100N37	97	029090	2AB9.0	100	0029442	A100N77	95	0030523	A1709/16	192
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029013	2AB1.3	96	029095	2AB9.5	100	0029480	A100N80	95	0030578	A190204	228
029014	2AB1.4	96	029096	2AB9.6	100	0029497	A100N9	98	0030585	A190206	228
0029015	A100N38	97	029097	2AB9.7	100	0029503	A100O	99	0030608	A191413	228
029015	2AB1.5	96	029098	2AB9.8	100	0029510	A100P	99	0030615	A191419	228
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029020	2AB2.0	97	029105	2AB10.5	100	0029565	A100U	100	0032282	R95016.3	22
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0032411	R96019.35	25	0033654	A35019.75	181	034425	D44425/64	201	0036358	A51011.8	75
032420	4ASMC04.2	147	0033661	A35020.0	181	034426	D44413/32	201	0036365	A51011.9	75
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032470	4ASMC04.7	147	0033692	A35021.0	181	034429	D44429/64	201	0036396	A51012.2	75
032480	4ASMC04.8	147	0033708	A35021.5	181	034430	D44415/32	201	0036402	A51012.3	75
032490	4ASMC04.9	147	0033715	A35022.0	181	034431	D44431/64	201	0036419	A51012.4	75
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032640	4ASMC06.4	147	0033777	A35025.0	182	034508	D444H	201	0036471	A51013.0	75
032650	4ASMC06.5	147	0033784	A35025.5	182	034509	D444I	201	0036488	A51014.0	75
032680	4ASMC06.8	147	0033791	A35026.0	182	034510	D444J	201	0036495	A5103.0	73
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033002	4ASMC10.2	147	0033869	A35030.5	182	034518	D444R	201	0036563	A5103.7	73
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0033319	A35011.0	180	034145	2A14.5	101	0034804	H85551/64	37	0036853	A5106.6	74
0033333	A35011.5	181	0034149	A3506.8	180	0034811	H85527/32	37	0036860	A5106.7	74
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0033357	A35011.8	181	0034156	A3507.0	180	0034842	H85559/64	37	0036884	A5106.9	74
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0041994	R457N14	48	042323	M42COW	146	0045114	A720.5	143	046100	4ASM1.0	139
042001	R42A	131	042324	M42COX	146	0045121	A720.6	143	046125	4ASM1.25	139
042002	R42B	131	042325	M42COY	146	0045190	A73010.0	189	046130	4ASM1.3	139
042003	R42C	131	042326	M42COZ	146	0045206	A73010.2	189	046165	4ASM1.65	139
042004	R42D	131	0042328	R458N24	47	0045213	A73010.5	189	046200	4ASM2.0	139
042006	R42F	131	0042335	R458N23	47	0045220	A73010.8	189	046230	4ASM2.3	139
0042007	R457N13	48	0042342	R458N22	47	0045237	A73011.0	189	046240	4ASM2.4	139
042007	R42G	131	0042359	R458N21	47	0045244	A73011.5	189	046250	4ASM2.5	139
042008	R42H	131	0042366	R458N20	47	0045251	A73011.8	189	0046289	A9001.0	78
042009	R42I	131	0042373	R458N19	47	0045268	A73012.0	189	0046296	A9001.1	78
042010	R42J	131	0042380	R458N18	47	0045275	A73012.2	189	046300	4ASM3.0	139
042011	R42K	131	0042397	R458N17	47	0045282	A73012.5	189	0046302	A9001.2	78
042012	R42L	131	0042403	R458N16	48	0045299	A73012.8	189	046310	4ASM3.1	139
042013	R42M	131	0042410	R458N15	48	0045305	A73013.0	189	0046319	A9001.3	78
0042014	R457N12	48	0042427	R458N14	48	0045312	A73013.5	189	046320	4ASM3.2	139
042014	R42N	131	0042434	R458N13	48	0045329	A73013.8	189	0046326	A9001.4	78
042015	R42O	131	0042441	R458N12	48	0045336	A73014.0	189	046330	4ASM3.3	139
042016	R42P	131	0042458	R458N11	48	0045343	A73014.25	189	0046333	A9001.5	78
042017	R42Q	131	0042465	R458N10	48	0045350	A73014.5	189	0046340	A9001/16	78
042018	R42R	131	0042472	R458N9	48	0045367	A73014.75	189	046340	4ASM3.4	139
042019	R42S	131	0042489	R458N8	48	0045374	A73015.0	189	046350	4ASM3.5	139
042020	R42T	132	0042496	R458N7	48	0045381	A73015.25	189	0046357	A9001.6	78
0042021	R457N11	48	0042502	R458N6	48	0045398	A73015.5	189	0046364	A9001.7	78
042021	R42U	132	0042519	R458N5	48	0045404	A73015.75	189	046370	4ASM3.7	139
042022	R42V	132	0042526	R458N4	48	0045411	A73016.0	189	0046371	A9001.8	78
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042026	R42Z	132	0042564	R458A	48	0045466	A73017.25	189	0046401	A9002.0	78
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0042045	R457N9	48	0042588	R458H	48	0045480	A73017.75	189	046420	4ASM4.2	139
0042052	R457N8	48	0042595	R458L	48	0045497	A73018.0	189	0046425	A9002.2	78
0042069	R457N7	48	0042601	R458M	48	0045503	A73018.25	189	0046432	A9002.3	78
0042076	R457N6	48	0042618	R458N	49	0045510	A73018.5	189	0046449	A9003/32	78

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0046456	A9002.4	78	0047002	A9006.7	79	0047750	A90018.0	80	0048542	B10013.0	486
0046463	A9002.5	78	047002	4ASM10.2	140	0047767	A90019.0	80	0048559	B10014.0	486
0046470	A9002.6	78	047005	4ASM10.5	140	0047774	A90020.0	80	0048566	B10015.0	486
0046487	A9002.7	78	047008	4ASM10.8	140	0047781	A9011.5	78	0048573	B10016.0	486
0046494	A9007/64	78	0047019	A90017/64	79	0047798	A9012.0	78	0048580	B10017.0	486
0046500	A9002.8	78	0047026	A9006.8	79	0047804	A9012.5	78	0048597	B10018.0	486
046500	4ASM5.0	139	0047033	A9006.9	79	0047811	A9012.6	78	0048603	B10019.0	486
0046517	A9002.9	78	0047057	A9007.0	79	0047828	A9013.0	78	0048610	B1002.0	485
0046524	A9003.0	78	0047064	A9007.1	79	0047835	A9013.1	78	0048627	A9019.9	80
0046531	A9003.1	78	0047071	A9009/32	79	0047842	A9013.2	78	0048634	B1002.5	485
0046548	A9001/8	78	0047088	A9007.2	79	0047859	A9013.3	78	0048641	A90110.0	80
046550	4ASM5.5	139	0047095	A9007.3	79	0047866	A9013.4	79	0048658	B10020.0	486
0046555	A9003.2	78	0047101	A9007.4	79	0047873	A9013.5	79	0048665	B10022.0	486
0046562	A9003.3	78	047110	4ASM11.0	140	0047880	A9013.6	79	0048672	B10024.0	486
046570	4ASM5.7	139	047112	4ASM11.2	140	0047897	A9013.7	79	0048689	B10025.0	486
0046579	A9003.4	79	047115	4ASM11.5	140	0047903	A9013.8	79	0048696	B10026.0	486
046580	4ASM5.8	139	0047118	A9007.5	79	0047910	A9013.9	79	0048702	B10028.0	486
0046586	A9003.5	79	047118	4ASM11.8	140	0047927	A9014.0	79	0048719	B1003.0	485
0046593	A9009/64	79	0047125	A90019/64	79	0047934	A9014.1	79	0048726	B1003.2	485
046600	4ASM6.0	139	0047132	A9007.6	79	0047941	A9014.2	79	0048733	B1003.5	485
0046609	A9003.6	79	0047149	A9007.7	79	0047958	A9014.3	79	0048740	B10030.0	486
0046616	A9003.7	79	0047156	A9007.8	79	0047965	A9014.4	79	0048757	B10032.0	486
046620	4ASM6.2	139	0047163	A9007.9	79	0047972	A9014.5	79	0048764	B10034.0	486
0046623	A9003.8	79	0047170	A9005/16	79	0047989	A9014.6	79	0048771	B10035.0	486
0046630	A9003.9	79	0047187	A9008.0	79	0047996	A9014.7	79	0048788	B10036.0	486
046640	4ASM6.4	139	0047194	A9008.1	79	0048009	A9014.8	79	0048795	B10038.0	486
0046647	A9005/32	79	0047200	A9008.2	79	0048016	A9014.9	79	0048801	B1004.0	485
046650	4ASM6.5	139	047200	4ASM12.0	140	0048023	A9015.0	79	0048818	B1004.5	485
0046654	A9004.0	79	0047217	A9008.3	79	0048030	A9015.1	79	0048825	B10040.0	486
046660	4ASM6.6	139	047220	4ASM12.2	140	0048047	A9015.2	79	0048856	B10045.0	486
0046661	A9004.1	79	0047224	A90021/64	79	0048054	A9015.3	79	0048863	A90110.2	80
0046678	A9004.2	79	0047231	A9008.4	79	0048061	A9015.4	79	0048870	A90110.3	80
046680	4ASM6.8	139	047250	4ASM12.5	140	0048078	A9015.5	79	0048887	B1005.0	485
0046685	A9004.3	79	0047255	A9008.5	79	0048085	A9015.6	79	0048894	B1005.5	485
046690	4ASM6.9	139	0047262	A9008.6	79	0048092	A9015.7	79	0048900	B10050.0	486
0046692	A90011/64	79	0047286	A9008.7	80	0048108	A9015.8	79	0048917	B1006.0	485
046700	4ASM7.0	139	0047293	A90011/32	80	0048115	A9015.9	79	0048924	B1007.0	485
0046708	A9004.4	79	0047309	A9008.8	80	0048122	A9016.0	79	0048931	B1008.0	485
0046715	A9004.5	79	0047316	A9008.9	80	0048139	A9016.1	79	0048948	B1009.0	486
046720	4ASM7.2	139	0047323	A9009.0	80	0048146	A9016.2	79	0048955	A90110.4	80
0046722	A9004.6	79	0047330	A9009.1	80	0048153	A9016.3	79	0049013	A90110.5	80
0046739	A9004.7	79	0047347	A90023/64	80	0048160	A9016.4	79	0049020	B12110.0	477
0046746	A9003/16	79	0047354	A9009.2	80	0048177	A9016.5	79	0049037	B12111.0	477
046750	4ASM7.5	139	0047361	A9009.3	80	0048184	A9016.6	79	0049044	B12112.0	477
0046753	A9004.8	79	0047378	A9009.4	80	0048191	A9016.7	79	0049051	B12113.0	477
0046760	A9004.9	79	0047385	A9009.5	80	0048207	A9016.8	79	0049068	B12114.0	477
0046777	A9005.0	79	0047392	A9003/8	80	0048214	A9016.9	79	0049075	B12115.0	477
0046784	A9005.1	79	0047408	A9009.6	80	0048221	A9017.0	79	0049082	B12116.0	477
046800	4ASM8.0	140	0047415	A9009.7	80	0048238	A9017.1	79	0049099	B12117.0	477
0046807	A90013/64	79	0047422	A9009.8	80	0048245	A9017.2	79	0049105	B12118.0	477
046810	4ASM8.1	140	0047439	A9009.9	80	0048252	A9017.3	79	0049112	B12119.0	477
0046814	A9005.2	79	0047446	A90025/64	80	0048269	A9017.4	79	0049129	B12120.0	477
0046821	A9005.3	79	0047453	A90010.0	80	0048276	A9017.5	79	0049136	B12121.0	477
0046838	A9005.4	79	0047460	A90010.2	80	0048283	A9017.6	79	0049143	B12122.0	477
046840	4ASM8.4	140	0047477	A90010.3	80	0048290	A9017.7	79	0049150	B12123.0	477
0046845	A9005.5	79	0047484	A90013/32	80	0048306	A9017.8	79	0049167	B12124.0	477
046850	4ASM8.5	140	0047491	A90010.4	80	0048313	A9017.9	79	0049174	B12125.0	477
0046852	A9007/32	79	0047507	A90010.5	80	0048320	A9018.0	79	0049181	B12126.0	477
0046869	A9005.6	79	0047514	A90027/64	80	0048337	A9018.1	79	0049198	A90110.8	80
046870	4ASM8.7	140	0047521	A90010.8	80	0048344	A9018.2	79	0049211	B12130.0	477
0046876	A9005.7	79	0047538	A90011.0	80	0048351	A9018.3	79	0049235	A90111.0	80
0046883	A9005.8	79	0047545	A9007/16	80	0048368	A9018.4	79	0049280	A90111.5	80
0046890	A9005.9	79	0047569	A90011.5	80	0048375	A9018.5	79	0049297	A90111.8	80
046900	4ASM9.0	140	0047576	A90029/64	80	0048382	A9018.6	79	0049303	A90112.0	80
0046906	A90015/64	79	0047583	A90011.8	80	0048399	A9018.7	80	0049594	A90112.5	80
046910	4ASM9.1	140	0047590	A90015/32	80	0048405	A9018.8	80	0049617	B15710.0	472
0046913	A9006.0	79	0047606	A90012.0	80	0048412	A9018.9	80	0049624	B15711.0	472
0046920	A9006.1	79	0047620	A90031/64	80	0048429	A9019.0	80	0049631	B15712.0	472
046920	4ASM9.2	140	0047637	A90012.5	80	0048436	A9019.1	80	0049648	B1572.0	472
046930	4ASM9.3	140	0047644	A9001/2	80	0048443	A9019.2	80	0049655	A90113.0	80
0046937	A9006.2	79	0047668	A90013.0	80	0048450	A9019.3	80	0049662	A90113.5	80
0046944	A9006.3	79	0047675	A90013.5	80	0048467	A9019.4	80	0049679	B1574.0	472
046950	4ASM9.5	140	0047682	A90014.0	80	0048474	A9019.5	80	0049686	A90114.0	80
0046951	A9001/4	79	0047699	A90014.5	80	0048481	A9019.6	80	0049693	B1575.0	472
0046968	A9006.4	79	0047705	A90015.0	80	0048498	A9019.7	80	0049709	A90114.5	80
046970	4ASM9.7	140	0047712	A90015.5	80	0048504	A9019.8	80	0049716	B1576.0	472
0046975	A9006.5	79	0047729	A90016.0	80	0048511	B10010.0	486	0049723	A90115.0	80
0046999	A9006.6	79	0047736	A90017.0	80	0048528	B10011.0	486	0049730	B1577.0	472

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0049754	B1579.0	472	0050828	A9202.7	69	051017	R5117/64	150	051136	R511.9/16	151
050015	QC91PM1.5	157	0050835	A9207/64	69	051018	R519/32	150	0051139	A9205.1	70
050020	QC91PM2.0	157	0050842	A9202.8	69	051019	R5119/64	150	051140	R511.5/8	151
050025	QC91PM2.5	157	0050859	A9202.9	69	051020	R515/16	150	0051146	A92013/64	70
050030	QC91PM3.0	157	0050866	A9203.0	69	051021	R5121/64	150	051148	R511.3/4	151
050035	QC91PM3.5	157	0050873	A9203.1	69	051022	R5111/32	150	0051153	A9205.2	70
050040	QC91PM4.0	157	0050880	A9201/8	70	0051023	A9204.2	70	0051160	A9205.3	70
050045	QC91PM4.5	157	0050897	A9203.2	70	051023	R5123/64	150	0051177	A9205.4	70
050050	QC91PM5.0	157	050902	QC91GN2	156	051024	R513/8	150	0051191	A9205.5	70
050052	QC91PM5.2	157	0050903	A9203.3	70	051025	R5125/64	150	0051207	A9207/32	70
050055	QC91PM5.5	157	050903	QC91GN3	156	051026	R5113/32	150	0051214	A9205.6	70
050060	QC91PM6.0	157	050904	QC91GN4	156	051027	R5127/64	150	0051221	A9205.7	70
050065	QC91PM6.5	157	050905	QC91GN5	156	051028	R517/16	150	0051238	A9205.8	70
050068	QC91PM6.8	157	050906	QC91GN6	156	051029	R5129/64	150	0051245	A9205.9	70
050070	QC91PM7.0	157	050907	QC91GN7	156	0051030	A9204.3	70	0051269	A92015/64	70
050080	QC91PM8.0	157	050908	QC91GN8	156	051030	R5115/32	150	0051276	A9206.0	70
050082	QC91PM8.2	157	050909	QC91GN9	156	051031	R5131/64	150	0051283	A9206.1	70
050085	QC91PM8.5	157	0050910	A9203.4	70	051032	R511/2	150	0051290	A9206.2	70
050086	QC91PM8.6	157	050911	QC91GN11	156	051033	R5133/64	150	051304	M51CO1/16	158
050090	QC91PM9.0	157	050913	QC91GN13	156	051034	R5117/32	150	051305	M51CO5/64	158
050095	QC91PM9.5	157	050914	QC91GN14	156	051035	R5135/64	150	0051306	A9206.3	70
050100	QC91PM10.0	157	050915	QC91GN15	156	051036	R519/16	150	051306	M51CO3/32	158
050105	QC91PM10.5	157	050916	QC91GN16	156	051037	R5137/64	150	051307	M51CO7/64	158
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050135	QC91PM13.5	157	050924	QC91GN24	156	051043	R5143/64	150	0051313	A9201/4	70
050140	QC91PM14.0	157	050925	QC91GN25	156	051044	R5111/16	150	051313	M51CO13/64	159
050150	QC91PM15.0	157	050926	QC91GN26	155	051045	R5145/64	150	051314	M51CO7/32	159
050155	QC91PM15.5	157	0050927	A9203.5	70	051046	R5123/32	150	051315	M51CO15/64	159
050160	QC91PM16.0	157	050928	QC91GN28	155	0051047	A92011/64	70	051316	M51CO1/4	159
0050170	A90116.0	80	050929	QC91GN29	155	051047	R5147/64	150	051317	M51CO17/64	159
050170	QC91PM17.0	157	050930	QC91GN30	155	051048	R513/4	150	051318	M51CO9/32	159
050215	QC91GM1.5	157	050931	QC91GN31	155	051049	R5149/64	150	051319	M51CO19/64	159
0050217	A9201.0	69	050932	QC91GN32	155	051050	R5125/32	150	0051320	A9206.4	70
050220	QC91GM2.0	157	0050934	A9209/64	70	051051	R5151/64	150	051320	M51CO5/16	159
050225	QC91GM2.5	157	050934	QC91GN34	155	051052	R5113/16	150	051321	M51CO21/64	159
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050290	QC91GM9.0	157	050949	QC91GN49	155	0051085	A9204.7	70	051336	M51CO9/16	159
050300	QC91GM10.0	157	050950	QC91GN50	155	0051092	A9203/16	70	0051337	A9206.5	70
050305	QC91GM10.5	157	050951	QC91GN51	155	051100	R511	151	051337	M51CO37/64	159
0050309	A9201.2	69	050952	QC91GN52	155	051101	R511.1/64	151	051338	M51CO19/32	159
0050316	A9201.3	69	0050958	A9203.7	70	051102	R511.1/32	151	051339	M51CO39/64	159
050320	QC91GM12.0	157	0050965	A9203.8	70	051103	R511.3/64	151	051340	M51CO5/8	159
0050323	A9201.4	69	0050972	A9203.9	70	051104	R511.1/16	151	051341	M51CO41/64	159
050325	QC91GM12.5	157	0050989	A9205/32	70	051105	R511.5/64	151	051342	M51CO21/32	159
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0053461	A92111.0	71	0053751	A9401.4	81	0055631	QC0860P31/64	168	0056600	5ATL6.0	153
0053485	A92111.5	71	0053751	CO501-6N51	175	0055632	A9403.7	82	0056615	A9404.9	82
0053492	A92111.8	71	0053752	CO501-6N52	175	0055632	QC0860P1/2	168	0056640	5ATL6.4	153
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0053546	A92113.0	71	0054253	A9401.6	81	0055906	QC91G3/32	155	0056680	5ATL6.8	153
0053553	A92113.5	71	0054260	A9401.7	81	0055907	QC91G7/64	155	0056720	5ATL7.2	153
0053560	A92114.0	71	0054383	A9401.8	81	0055908	QC91G1/8	155	0056750	5ATL7.5	153
0053577	A92114.5	71	0054390	A9401.9	81	0055909	QC91G9/64	155	0056770	5ATL7.0	153
0053584	A92115.0	71	0054406	A9405/64	81	0055910	QC91G5/32	156	0056780	5ATL7.8	153
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0053604	CO500-611/16	175	0054611	A9402.1	81	0055912	QC91G3/16	156	0056820	A9405.1	82
0053605	CO500-65/64	175	0054628	A9402.2	81	0055913	QC91G13/64	156	0056820	5ATL8.2	153
0053606	CO500-63/32	175	0054710	A9402.3	81	0055914	QC91G7/32	156	0056850	5ATL8.5	153
0053607	A92116.0	71	0054727	A9403/32	81	0055915	QC91G15/64	156	0056882	A94013/64	82
0053607	CO500-67/64	175	0054734	A9402.4	81	0055916	QC91G1/4	156	0056900	5ATL9.0	153
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0053610	CO500-65/32	176	0054802	A9402.7	81	0055919	QC91G19/64	156	0056974	A9405.2	82
0053611	CO500-611/64	176	0054833	A9407/64	81	0055920	QC91G5/16	156	0056980	5ATL9.8	153
0053612	CO500-63/16	176	0054840	A9402.8	81	0055921	QC91G21/64	156	0057001	A9405.3	82

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057120	5ATL12.0	153	057922	QC91P11/32	156	058130	501-6N30	171	058310	QC41P5/32	141
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087964	SPR-1201/2	209	091453	R5653/64	194	091579	R571.15/64	197	0094303	E500M20NO8	319
087965	SPR-1205/8	209	091454	R5627/32	194	091580	R571.1/4	197	0094310	E500M22NO2	320
087966	SPR-1203/4	209	091455	R5655/64	194	091582	R571.5/16	197	0094327	E500M22NO3	320
087967	SPR-1201	209	091456	R567/8	194	091583	R571.3/8	197	0094341	E500M24NO2	320
087968	SPRG-1201/4	209	091457	R5657/64	194	091584	R571.7/16	197	0094358	E500M24NO3	320
087969	SPRG-1203/8	209	091458	R5629/32	194	091585	R571.1/2	197	0094365	E500M27NO2	320
087970	SPRG-1201/2	209	091459	R5659/64	194	091586	R571.1/32	197	0094372	E500M27NO3	320
087974	SPL-1201/4	210	091460	R5615/16	194	091587	R571.5/32	197	0094402	E500M3.5NO1	319
087975	SPL-1203/8	210	091461	R5661/64	194	091588	R571.7/32	197	0094419	E500M3.5NO2	319

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0094440	E500M3NO2	319	0096314	E513M18X2.0NO3	322	0099445	E5501	366	0105757	F302M8	394
0094457	E500M3NO3	319	0096321	E513M18X2.0NO7	322	0099452	E5501.1/2	366	0108260	G13212.5	505
0094464	E500M3NO6	319	0096338	E513M20X1.5NO3	322	0099469	E5501.1/4	366	0108277	G13216.0	505
0094471	E500M3NO8	319	0096345	E513M20X1.0NO2	322	0099476	E5501/2	366	0108284	G13220.0	505
0094488	E500M30NO2	320	0096352	E513M20X1.0NO3	322	0099483	E5501/4	366	0108291	G1328.0	505
0094495	E500M30NO3	320	0096369	E513M20X1.0NO7	322	0099490	E5501/8	366	0108444	G13512.5	497
0094525	E500M33NO3	320	0096376	E513M20X2.0NO2	322	0099506	E5502	366	0108451	G13516.0	497
0094549	E500M36NO2	320	0096383	E513M20X2.0NO3	322	0099513	E5503/4	366	0108468	G13520.0	497
0094556	E500M36NO3	320	0096390	E513M22X1.5NO3	322	0099520	E5503/8	366	0108475	G13525.0	497
0094587	E500M39NO3	320	0096406	E513M22X1.0NO2	322	099701	C21R10COSET	234	0108482	G1356.3	497
0094617	E500M4.5NO2	319	0096413	E513M22X1.0NO3	322	099705	C114COMBCSET	235	0108499	G1358.0	497
0094624	E500M4.5NO3	319	0096420	E513M22X2.0NO2	322	099706	C115COMBCSET	235	0108505	G13610.0	500
0094648	E500M4NO2	319	0096437	E513M22X2.0NO3	322	0099834	E7101	354	0108512	G13610.4	500
0094655	E500M4NO3	319	0096444	E513M22X2.0NO7	322	0099841	E7101.1/2	354	0108529	G13611.5	500
0094662	E500M4NO6	319	0096451	E513M24X1.5NO3	322	0099858	E7101.1/4	354	0108536	G13612.4	500
0094679	E500M4NO8	319	0096468	E513M24X1.5NO7	322	0099865	E7101/2	354	0108543	G13613.4	500
0094686	E500M42NO3	320	0096475	E513M24X1.0NO2	322	0099872	E7101/4	354	0108550	G13615.0	500
0094709	E500M45NO3	320	0096482	E513M24X1.0NO3	322	0099889	E7101/8	354	0108567	G13616.5	500
0094730	E500M48NO3	320	0096499	E513M24X2.0NO2	322	0099896	E7102	354	0108574	G13619.0	500
0094761	E500M5NO2	319	0096505	E513M24X2.0NO3	322	0099902	E7103/4	354	0108581	G13620.5	500
0094778	E500M5NO3	319	0096512	E513M25X1.5NO3	322	099903	C29R40CSET	238	0108598	G13623.0	500
0094785	E500M5NO8	319	0096529	E513M26X1.5NO2	322	0099919	E7103/8	354	0108604	G13625.0	500
0094792	E500M52NO3	320	0096536	E513M26X1.5NO3	322	0099926	E7111	360	0108611	G13626.0	500
0094808	E500M6NO1	319	0096543	E513M28X1.5NO2	322	099930	C60R41CSET	238	0108628	G13628.0	500
0094815	E500M6NO2	319	0096550	E513M28X1.5NO3	322	0099933	E7111/2	360	0108635	G13630.0	500
0094822	E500M6NO3	319	0096567	E513M3X.35NO3	322	099935	C29L10SET	231	0108642	G13631.0	500
0094839	E500M6NO8	319	0096574	E513M30X1.5NO2	322	0099940	E7111/4	360	0108659	G1364.3	500
0094846	E500M7NO3	319	0096581	E513M30X1.5NO3	322	099944	C13R10COSET	234	0108666	G1365.0	500
0094853	E500M7NO6	319	0096598	E513M32X1.5NO3	322	099955	C15L10SET	231	0108673	G1365.3	500
0094877	E500M8NO2	319	0096604	E513M33X2.0NO2	322	0099957	E7111/8	360	0108680	G1365.8	500
0094884	E500M8NO3	319	0096611	E513M33X2.0NO3	322	099960	C60M41COSET	239	0108697	G1366.0	500
0094891	E500M8NO6	319	0096628	E513M35X1.5NO2	322	099961	C26M42COSET	239	0108703	G1366.3	500
0094907	E500M8NO8	319	0096635	E513M35X1.5NO3	322	099962	C29M40COSET	239	0108710	G1367.0	500
0094914	E500M9NO3	319	0096642	E513M36X2.0NO3	322	0099964	E7113/4	360	0108727	G1367.3	500
0094938	E501M10NO2	327	0096659	E513M36X3.0NO2	322	0099971	E7113/8	360	0108734	G1368.0	500
0094945	E501M10NO3	327	0096666	E513M36X3.0NO3	322	099976	C60R18SET	225	0108741	G1368.3	500
0094952	E501M12NO2	327	0096673	E513M39X3.0NO3	322	099977	C29R10SET	224	0108758	G1369.4	500
0094969	E501M12NO3	327	0096680	E513M4X.5NO3	322	099978	C15R10SET	224	0108765	G13716.0	506
0094976	E501M14NO2	327	0096697	E513M40X1.5NO3	322	099981	C20R18SET	225	0108772	G13720.0	506
0094983	E501M14NO3	327	0096703	E513M42X1.5NO3	322	099982	C115COMBSET	227	0108789	G13725.0	506
0094990	E501M16NO2	327	0096710	E513M45X1.5NO3	322	099983	C26R15SET	226	0108796	G13731.5	506
0095003	E501M16NO3	327	0096727	E513M5X.5NO2	321	099985	C502ABSET	228	0108802	G13740.0	506
0095010	E501M18NO3	327	0096734	E513M5X.5NO3	321	099987	C252ASET	228	0108819	G13750.0	506
0095027	E501M20NO2	327	0096741	E513M5X.5NO7	321	0099988	E7121	364	0108826	G13763.0	506
0095034	E501M20NO3	327	0096758	E513M50X1.5NO3	322	099988	C252ABSET	228	0108833	G13780.0	506
0095041	E501M24NO3	327	0096765	E513M6X.75NO3	321	099990	C114COMBSET	227	0108895	G13825.0	507
0095058	E501M3NO2	327	0096772	E513M6X.75NO7	321	0099995	E7121.1/4	364	0108925	G13830.0	507
0095065	E501M3NO3	327	0096789	E513M7X.75NO2	321	0100004	E7121/16	364	0108932	G13831.0	507
0095072	E501M4NO2	327	0096796	E513M7X.75NO3	321	0100011	E7121/2	364	0108949	G13834.0	507
0095089	E501M4NO3	327	0096802	E513M8X.75NO3	321	0100028	E7121/4	364	0108956	G13837.0	507
0095096	E501M5NO2	327	0096819	E513M8X.75NO7	321	0100035	E7121/8	364	0108963	G13840.0	507
0095102	E501M5NO3	327	0096826	E513M8X1.0NO3	321	0100042	E7123/4	364	0108970	G13850.0	507
0095119	E501M6NO2	327	0096833	E513M9X1.0NO3	321	0100059	E7123/8	364	0108987	G13863.0	507
0095126	E501M6NO3	327	097601	76HAN1	212	0104996	F201M10	391	0108994	G13880.0	507
0095133	E501M8NO2	327	097602	76HAN2	212	0105009	F201M12	391	0109038	G14910	499
0095140	E501M8NO3	327	097603	76HAN3	212	0105016	F201M14	391	0109045	G14915	499
0096079	E513M10X1.25NO3	321	097604	76HAN4	212	0105023	F201M16	391	0109052	G14920	499
0096086	E513M10X1.0NO3	321	097605	76HAN5	212	0105030	F201M4	391	0109069	G14925	499
0096093	E513M11X1.0NO2	321	097606	76HAN6	212	0105047	F201M5	391	0109076	G14930	499
0096109	E513M11X1.0NO3	321	097607	76HAN7	212	0105054	F201M6	391	0109083	G14935	499
0096116	E513M12X1.25NO3	321	097608	76HAN8	212	0105061	F201M8	391	0109090	G14940	499
0096123	E513M12X1.25NO7	321	097610	76HAN0	212	0105528	F302M10	394	0109106	G1495	499
0096130	E513M12X1.5NO2	321	097620	76HAN00	212	0105535	F302M11	394	0109113	G14950	499
0096147	E513M12X1.5NO3	321	097630	76HAN000	212	0105542	F302M12	394	0109502	G33825.0	507
0096154	E513M12X1.0NO3	321	0099193	E5471.1/2NO2	367	0105559	F302M14	394	0109519	G33831.0	507
0096161	E513M14X1.25NO3	321	0099209	E5471.1/2NO3	367	0105566	F302M16	394	0109526	G33837.0	507
0096178	E513M14X1.5NO3	321	0099216	E5471.1/4NO2	367	0105573	F302M18	394	0109533	G33840.0	507
0096185	E513M14X1.0NO3	321	0099223	E5471.1/4NO3	367	0105580	F302M20	394	0109540	G33850.0	507
0096192	E513M15X1.5NO2	321	0099254	E5471NO3	367	0105597	F302M22	394	0109557	G33863.0	507
0096208	E513M15X1.5NO3	321	0099261	E5471/2NO3	367	0105603	F302M24	394	0109632	G56010.4	500
0096222	E513M16X1.5NO3	321	0099278	E5471/4NO3	367	0105610	F302M27	394	0109649	G56010.4	500
0096239	E513M16X1.5NO7	321	0099285	E5471/8NO3	367	0105627	F302M3	394	0109656	G56012.4	500
0096246	E513M16X1.0NO3	321	0099292	E5472NO3	367	0105634	F302M30	394	0109663	G56016.5	500
0096253	E513M16X1.0NO7	321	0099308	E5473/4NO3	367	0105641	F302M33	394	0109670	G56020.5	500
0096260	E513M18X1.5NO3	322	0099315	E5473/8NO3	367	0105658	F302M36	394	0109687	G56025.0	500
0096277	E513M18X1.0NO2	322	0099322	E5475/8NO2	367	0105672	F302M4	394	0109694	G5606.3	500
0096284	E513M18X1.0NO3	322	0099339	E5475/8NO3	367	0105719	F302M5	394	0110171	K52010.0X100.0	519
0096291	E513M18X1.0NO7	322	0099353	E5477/8NO2	367	0105733	F302M6	394	0110195	K52010.0X160.0	519

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0110225	K52012.OX100.0	519	0115879	R5108.5	55	0121979	A17061/64	193	0129883	B17010.98	465
0110249	K52012.OX160.0	519	0115886	R5109.0	55	0121986	A17063/64	193	0129890	B17010.99	465
0110256	K52012.OX200.0	519	0115893	R5109.2	55	0122198	B1573.0	472	0129906	B17011.0	465
0110294	K52014.OX160.0	519	0115909	R5109.3	55	0122297	C3463.0	440	0129913	B17011.01	465
0110300	K52014.OX200.0	519	0115916	R5109.5	55	0122303	C3464.0	440	0129920	B17011.02	465
0110317	K52016.OX100.0	519	0115923	R52010.0	46	0122310	C3465.0	440	0129937	B17011.03	465
0110324	K52016.OX160.0	519	0115930	R52010.2	46	0122327	C3466.0	440	0129944	B17011.04	465
0110331	K52016.OX200.0	519	0115947	R52010.4	46	0122440	E500M2.6NO3	319	0129951	B17011.05	465
0110379	K52020.OX160.0	519	0115954	R52010.5	46	0122457	E500M56NO3	320	0130384	B17011.49	465
0110386	K52020.OX200.0	519	0115961	R52011.0	46	0122464	E500M1NO3	319	0130391	B17011.5	465
0110409	K52025.OX200.0	519	0115978	R52011.5	46	0122471	E500M1.2NO3	319	0130407	B17011.51	465
0110478	K5206.OX100.0	519	0115985	R52012.0	46	0122488	E500M1.4NO3	319	0130414	B17011.52	465
0110485	K5206.OX160.0	519	0115992	R52012.5	46	0122495	E501M22NO3	327	0130865	B17011.98	465
0110492	K5206.OX200.0	519	0116005	R52013.0	46	0122501	E504M5NO3	332	0130872	B17011.99	465
0110546	K5208.OX100.0	519	0116012	R52014.0	46	0122518	E504M6NO3	332	0130889	B17012.0	465
0110553	K5208.OX160.0	519	0116029	R52014.5	46	0122525	E504M8NO3	332	0130896	B1702.0	463
0110560	K5208.OX200.0	519	0116036	R52015.0	46	0122532	E504M10NO3	332	0130902	B1702.01	463
0110607	K52110.OX100.0	519	0116043	R52016.0	46	0122556	E504M4NO3	332	0130919	B1702.02	463
0110638	K52110.OX200.0	519	0116050	R52016.5	46	0122563	E504M3NO3	332	0130926	B1702.03	463
0110645	K52112.OX100.0	519	0116067	R5203.0	45	0123003	E513M30X2.0NO3	322	0130933	B1702.04	463
0110669	K52112.OX200.0	519	0116074	R5203.1	45	0123010	E513M27X1.5NO3	322	0130940	B1702.05	463
0110720	K52116.OX200.0	519	0116081	R5203.2	45	0123027	E513M5X.75NO3	321	0131367	B1702.49	463
0110782	K52120.OX200.0	519	0116098	R5203.3	45	0123034	E513M6X.5NO3	321	0131374	B1702.5	463
0110799	K5213.OX100.0	519	0116104	R5203.4	45	0123041	E513M27X2.0NO3	322	0131381	B1702.51	463
0110805	K5214.OX100.0	519	0116111	R5203.5	45	0123058	E513M8X.5NO3	321	0131398	B1702.52	463
0110843	K5216.OX100.0	519	0116128	R5203.6	45	0123065	E513M10X.75NO3	321	0131848	B1702.98	463
0110850	K5216.OX160.0	519	0116135	R5203.7	45	0123072	E513M11X.75NO3	321	0131855	B1702.99	463
0110881	K5218.OX100.0	519	0116142	R5203.8	45	0124079	E7111.1/2	360	0131862	B1703.0	463
0110904	K5218.OX160.0	519	0116159	R5203.9	45	0126233	C34610.0	440	0131879	B1703.02	463
0110911	K5218.OX200.0	519	0116166	R5204.0	45	0126240	C34611.0	440	0131886	B1703.03	463
0111604	L1101	397	0116173	R5204.1	45	0126257	C34612.0	440	0131893	B1703.04	463
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0111628	L1102B	397	0116197	R5204.3	45	0126288	C34615.0	440	0132302	B1703.49	463
0111635	L1103	397	0116203	R5204.4	45	0126295	C34616.0	440	0132319	B1703.5	464
0111642	L1104	397	0116210	R5204.5	45	0126318	C34620.0	440	0132326	B1703.51	464
0111659	L1105F	397	0116227	R5204.6	45	0126325	C3467.0	440	0132333	B1703.52	464
0111666	L1105	397	0116234	R5204.7	45	0126332	C3468.0	440	0132784	B1703.98	464
0111673	L1106F	397	0116241	R5204.8	45	0126349	C3469.0	440	0132791	B1703.99	464
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0111697	L1107F	397	0116265	R5205.0	45	0127520	E650M12	374	0132814	B1704.01	464
0111703	L1107	397	0116272	R5205.1	45	0127537	E650M14	374	0132821	B1704.02	464
0111710	L1108F	397	0116289	R5205.2	45	0127544	E650M16	374	0132838	B1704.03	464
0111727	L1108	397	0116296	R5205.3	45	0127551	E650M4	374	0132845	B1704.04	464
0111734	L1109F	397	0116302	R5205.4	45	0127568	E650M5	374	0132852	B1704.05	464
0111741	L1109	397	0116319	R5205.5	45	0127575	E650M6	374	0133286	B1704.49	464
0111758	L11010F	397	0116326	R5205.6	45	0127582	E650M8	374	0133293	B1704.5	464
0111765	L11010	397	0116333	R5205.7	45	0127711	G5608.0	500	0133309	B1704.51	464
0115558	R51010.0	55	0116340	R5205.8	45	0127728	G5608.3	500	0133316	B1704.52	464
0115565	R51010.2	55	0116357	R5205.9	45	0127735	G56031.0	500	0133767	B1704.98	464
0115572	R51010.4	55	0116364	R5206.0	45	0127957	B170.98	463	0133774	B1704.99	464
0115589	R51010.5	55	0116371	R5206.1	45	0127964	B170.99	463	0133781	B1705.0	464
0115596	R51011.0	55	0116388	R5206.2	46	0127971	B1701.0	463	0133798	B1705.01	464
0115602	R51011.5	55	0116395	R5206.3	46	0127988	B1701.01	463	0133804	B1705.02	464
0115619	R51012.0	55	0116401	R5206.4	46	0127995	B1701.02	463	0133811	B1705.03	464
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0115657	R5103.0	54	0116449	R5207.0	46	0128459	B1701.49	463	0134207	R4534.8	57
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0115749	R5104.9	54	0116531	R5209.3	46	0128787	G4006.3	494	0134290	B1705.52	464
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0115763	R5105.1	54	0121863	A17029/32	193	0128916	B1701.98	463	0134313	R4537.9	58
0115770	R5105.5	54	0121870	A17033/64	192	0128923	B1701.99	463	0134320	R4538.2	58
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0173770	A1259/64X160	162	0179765	B10021/64	486	0181522	B1011.3/4	476	0179743	K5201/4X4	519
0173787	A1259/64X200	162	0179772	B10011/32	486	181546	B10150.80	476	0179750	K5205/8X4	519
0173794	A1255/32X160	162	0179789	B10023/64	486	0181546	B1012	476	0179767	K5203/8X4	519
0173800	A1255/32X200	163	0179796	B1003/8	486	0181560	B1013.0	475	0179774	K5201/2X4	519
0173817	A1255/32X250	163	0179802	B10025/64	486	0181577	B1013.5	475	0179781	K5201/2X6	519
0173824	A1255/32X315	163	0179819	B10013/32	486	0181584	B1014.0	475	0179798	K5205/8X4.1/2	519
0173831	A12511/64X160	163	0179826	B1007/16	486	0181591	B1014.5	475	0206331	F312M8X.75	395
0173848	A12511/64X200	163	0179840	B1001/2	486	0181607	B1015.0	475	0206348	F312M8X1.0	395
0173855	A1253/16X160	163	0179857	B10017/32	486	0181614	B1015.5	475	0206379	F312M10X1.0	395
0173862	A1253/16X200	163	0179864	B1009/16	486	0181621	B1016.0	475	0206386	F312M10X1.25	395
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0173886	A1253/16X315	163	0179888	B1005/8	486	0181645	B1017.0	475	0206409	F312M12X1.25	395
0173893	A1253/16X400	163	0179895	B10011/16	486	0181669	B1018.0	475	0206416	F312M12X1.5	395
0173909	A12513/64X200	163	0179901	B1003/4	486	0181676	B1018.5	475	0206430	F312M14X1.5	395
0173916	A12513/64X250	163	0179925	B10013/16	486	0181683	B1019.0	475	0206454	F312M16X1.5	395
0173923	A12513/64X315	163	0179949	B1007/8	486	0181690	B1019.5	475	0206461	F312M18X1.5	395
0173930	A1257/32X200	163	0179970	B1001	486	0181706	B10110.0	475	0206485	F312M20X1.5	395
0173947	A1257/32X250	163	0179987	B1001.5	485	0181713	B10110.5	475	0206508	F312M22X1.5	395
0173954	A1257/32X315	163	0179994	B1001.6	485	0181720	B10111.0	475	0206522	F312M24X1.5	395
0173961	A12515/64X200	163	0180006	B10010.5	486	0181744	B10112.0	475	0206539	F312M24X2.0	395
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0173992	A1251/4X250	163	0180037	B10013.5	486	0181775	B10113.5	475	0206645	F3206-32X13/16	387
0174005	A1251/4X315	163	0180044	B10014.5	486	0181782	B10114.0	475	0206669	F3208-32X13/16	387
0174012	A1251/4X400	163	0180051	B10021.0	486	0181799	B10114.5	475	0206676	F3208-32X1	387
0174029	A1251/4X500	163	0180068	B10023.0	486	0181805	B10115.0	475	0206683	F32010-24X13/16	387
0174036	A12517/64X200	163	0180075	B10027.0	486	0181812	B10115.5	475	0206690	F32010-24X1	387
0174043	A12517/64X250	163	0180082	B10029.0	486	0181829	B10116.0	476	0206706	F32012-24X13/16	387
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0348345	E0618-32NO3	324	0349724	E0717/16NO3	324	0351079	A0027.0	99	0353189	C1101.8	428
0348352	E0618-32NO6	324	0349731	E0717/16NO6	324	0351086	A0027.1	99	0353196	C1101.0	429
0348369	E06110-24NO1	324	0349748	E0711/2NO1	324	0351093	A0029/32	99	0353202	C1101.5	429
0348376	E06110-24NO2	324	0349755	E0711/2NO2	324	0351109	A0027.2	99	0353219	C1101.0	429
0348383	E06110-24NO3	324	0349762	E0711/2NO3	324	0351116	A0027.3	99	0353226	C1101.2	429
0348390	E06110-24NO6	324	0349779	E0711/2NO6	324	0351123	A0027.4	99	0353233	C1101.3	429
0348406	E06112-24NO1	324	0349786	E0719/16NO1	324	0351130	A0027.5	99	0353240	C1101.4	429
0348413	E06112-24NO2	324	0349793	E0719/16NO2	324	0351147	A00219/64	99	0353257	C1101.5	429
0348420	E06112-24NO3	324	0349809	E0719/16NO3	324	0351154	A0027.6	99	0353264	C1101.6	429
0348437	E06112-24NO6	324	0349816	E0719/16NO6	324	0351161	A0027.7	99	0353271	C1101.7	429
0348444	E0611/4NO1	324	0349823	E0715/8NO1	324	0351178	A0027.8	99	0353288	C1101.8	429
0348451	E0611/4NO2	324	0349830	E0715/8NO2	324	0351185	A0027.9	99	0353295	C1101.9	429
0348468	E0611/4NO3	324	0349847	E0715/8NO3	324	0351192	A0025/16	99	0353301	C1102.0	428
0348475	E0611/4NO6	324	0349854	E0715/8NO6	324	0351208	A0028.0	99	0353318	C1102.5	428
0348482	E0615/16NO1	324	0349861	E0713/4NO1	324	0351215	A0028.1	99	0353325	C1102.8	428
0348499	E0615/16NO2	324	0349878	E0713/4NO2	324	0351222	A0028.2	99	0353332	C1102.0	429
0348505	E0615/16NO3	324	0349885	E0713/4NO3	324	0351239	A0028.3	99	0353349	C1102.2	429
0348512	E0615/16NO6	324	0349892	E0717/8NO1	324	0351246	A00221/64	99	0353356	C1102.5	429
0348529	E0613/8NO1	324	0349908	E0717/8NO2	324	0351253	A0028.4	99	0353363	C1102.8	429
0348536	E0613/8NO2	324	0349915	E0717/8NO3	324	0351260	A0028.5	99	0353370	C1103.0	428
0348543	E0613/8NO3	324	0349922	E0717/8NO6	324	0351277	A0028.6	99	0353387	C1103.5	428
0348550	E0613/8NO6	324	0349939	E0711X12NO1	324	0351284	A0028.7	99	0353394	C1103.8	428
0348567	E0617/16NO1	324	0349946	E0711X12NO2	324	0351291	A00211/32	99	0353400	C1103.0	429
0348574	E0617/16NO2	324	0349953	E0711X12NO3	324	0351307	A0028.8	100	0353417	C1103.2	429
0348581	E0617/16NO3	324	0349960	E0711X12NO6	324	0351314	A0028.9	100	0353424	C1104.0	428
0348598	E0617/16NO6	324	0349977	E0711X14NO1	324	0351321	A0029.0	100	0353431	C1104.5	428
0348604	E0611/2NO1	324	0349984	E0711X14NO2	324	0351338	A0029.1	100	0353448	C1104.8	428
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0348628	E0611/2NO3	324	0350003	E0711X14NO6	324	0351352	A0029.2	100	0353462	C1105.5	428
0348635	E0611/2NO6	324	0350577	A0023.0	97	0351369	A0029.3	100	0353479	C1105.75	428
0348642	E0619/16NO2	324	0350584	A0023.1	97	0351376	A0029.4	100	0353486	C1106.0	428
0348659	E0619/16NO3	324	0350591	A0021/8	97	0351383	A0029.5	100	0353493	C1106.5	428
0348666	E0619/16NO6	324	0350607	A0023.2	97	0351390	A0023/8	100	0353509	C1107.0	428
0348673	E0615/8NO1	324	0350614	A0023.3	97	0351406	A0029.6	100	0353516	C1107.5	428
0348680	E0615/8NO2	324	0350621	A0023.4	97	0351413	A0029.7	100	0353523	C1108.0	428
0348697	E0615/8NO3	324	0350638	A0023.5	98	0351420	A0029.8	100	0353530	C1108.5	428
0348703	E0615/8NO6	324	0350645	A0029/64	98	0351437	A0029.9	100	0353547	C1109.0	428
0348710	E0613/4NO1	324	0350652	A0023.6	98	0351444	A00225/64	100	0353554	C1109.5	429
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0355015	C27328.0	450	0385227	A00213.8	101	0391198	A55320.0	77	0418642	A95124.0	186
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0355039	C2733.5	449	0385241	A00214.5	101	0391228	A5535.2	76	0418666	A95126.0	186
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0420010	A95217.5	186	0421833	B48112.04	461	0567654	E000M12	288	0568873	E013M12X1.0	302
0420027	A95218.0	186	0421840	B48112.05	462	0567661	E000M14	288	0568880	E013M12X1.25	302
0420034	A95218.5	186	0421840	B48112.05	461	0567678	E000M16	288	0568897	E013M12X1.5	302
0420041	A95219.0	186	0421857	B4812.00	461	0567685	E000M18	289	0568903	E013M14X1.5	302
0420058	A95219.5	186	0421864	B4812.01	461	0567692	E000M20	289	0568910	E013M16X1.0	302
0420065	A95220.0	186	0421871	B4812.02	461	0567708	E000M22	289	0568927	E013M16X1.5	302
0420072	A95221.0	186	0421888	B4812.03	461	0567715	E000M24	289	0568934	E013M18X1.5	302
0420089	A95222.0	186	0421895	B4812.48	461	0567722	E001M3	288	0568941	E013M20X1.5	302
0420096	A95223.0	186	0421901	B4812.49	461	0567739	E001M3.5	288	0568958	E013M22X1.5	302
0420102	A95224.0	186	0421918	B4812.50	461	0567746	E001M4	288	0569108	E0214-40	283
0420119	A95225.0	186	0421925	B4812.51	461	0567753	E001M5	288	0569115	E0216-32	283
0420126	A95226.0	186	0421932	B4812.52	461	0567760	E001M6	288	0569122	E0218-32	283
0420133	A95227.0	186	0421949	B4812.53	461	0567777	E001M8	288	0569139	E02110-24	283
0420140	A95228.0	186	0421956	B4812.97	461	0567784	E001M10	288	0569146	E02112-24	283
0420157	A95229.0	186	0421963	B4812.98	461	0567791	E001M12	288	0569153	E0211/4	283
0420164	A95230.0	186	0421970	B4812.99	461	0567807	E001M14	288	0569160	E0215/16	283
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0420188	A95213.0	186	0421994	B4813.01	461	0567821	E001M18	288	0569184	E0217/16	283
0420195	A95216.0	186	0422007	B4813.02	461	0567838	E001M20	288	0569191	E0211/2	283
0420201	A3459.5	183	0422014	B4813.03	461	0567845	E001M22	288	0569207	E0215/8	283
0421086	B44110.0	457	0422021	B4813.97	461	0567852	E001M24	288	0569214	E0213/4	283
0421093	B44111.0	457	0422038	B4813.98	461	0567869	E002M3	302	0569221	E0217/8	283
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0421154	B44118.0	457	0422090	B4814.97	462	0567937	E002M12	302	0569429	E02312-24	297
0421161	B44119.0	457	0422106	B4814.98	462	0567944	E002M14	302	0569436	E0231/4	297
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0421185	B44210.0	459	0422120	B4815.00	462	0567968	E002M18	302	0569450	E0233/8	297
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0582442	E0381/4	295	0589359	A0225.5	134	0600504	A0221.7	133	0614419	R4541.5	59
0582459	E0385/16	295	0589366	A0225.6	134	0600511	A0221.8	133	0614426	R4541.6	59
0582466	E0383/8	295	0589373	A0225.7	134	0600528	A0221.9	133	0614433	R4543.0	56
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0582527	E0387/8	295	0589434	A0226.0	134	0609309	C27340.0	450	0614495	R4544.3	56
0582541	E0381-14	295	0589441	A0226.1	134	0609316	C24717.0	448	0614501	R4544.5	57
0583180	E006M43FL	285	0589458	A0226.2	134	0609323	C24719.0	448	0614518	R4545.0	57
0583197	E006M83FL	285	0589465	A0226.3	134	0609330	C24721.0	448	0614525	R4545.1	57
0583203	E0262-56	281	0589472	A0226.4	134	0609347	C24723.0	448	0614532	R4545.5	57
0588697	A0223.0	134	0589489	A0226.5	134	0609354	C24724.0	448	0614549	R4546.0	57
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0588727	A0221/8	134	0589519	A0226.8	134	0609385	C24740.0	448	0614570	R4546.8	57
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0588758	A02210.2	135	0589540	A0227.1	134	0612071	A720.62	143	0614600	R4547.4	57
0588765	A02210.3	135	0589557	A0227.2	134	0612088	A720.65	143	0614617	R4547.5	58
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0588789	A02210.5	135	0589571	A0227.4	134	0612125	A720.85	143	0614631	R4548.5	58
0588796	A02210.6	135	0589588	A0227.5	134	0612149	A720.95	143	0614648	R4548.6	58
0588802	A02210.7	135	0589595	A0227.6	134	0612163	A7201.05	143	0614655	R4548.7	58
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0588826	A02210.9	135	0589618	A0227.8	134	0613887	R45310.2	58	0614679	R4549.3	58
0588833	A02211.0	135	0589625	A0227.9	134	0613894	R45310.3	58	0614686	R4549.5	58
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0588888	A02211.6	135	0589670	A0228.2	134	0613948	R45312.0	59	0614730	R45710.5	49
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0614792	R45712.5	50	0615584	A720.8	143	0624173	R45423/64	58	0624968	R45821/32	50
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0626207	R4574.7	48	0633465	A92119/32	71	0635797	A94025/32	83	0640302	C2731/2	449
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7624974	R4634.5	60	7625053	R46313/32	62	7625116	R4674.1	51	7625155	R4676.9	52
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7624984	R46313/64	60	7625063	R46311.3	62	7625121	R4674.5	51	7625160	R4677.3	52
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7648498	S2065/16	405	7648577	S1101/4	410	7648656	S1161/2	407	7648735	S1343/64	418
7648499	S2063/8	405	7648578	S1103/8	410	7648657	S1211/16	416	7648736	S1347/32	418
7648500	S2061/2	405	7648579	S1101/2	410	7648658	S1213/32	416	7648737	S1341/4	418
7648501	S2065/8	405	7648580	S1111/8	411	7648659	S1211/8	416	7648738	S1345/16	418
7648502	S2063/4	405	7648581	S1113/16	411	7648660	S1215/32	416	7648739	S1343/8	418
7648503	S2061	405	7648582	S1111/4	411	7648661	S1213/16	416	7648740	S1347/16	418
7648504	S2071/8X1/2	406	7648583	S1115/16	411	7648662	S1211/4	416	7648741	S1341/2	418
7648505	S2071/8X3/4	406	7648584	S1113/8	411	7648663	S1215/16	416	7648742	S1349/16	418
7648506	S2075/32X9/16	406	7648585	S1111/2	411	7648664	S1213/8	416	7648743	S1345/8	418
7648507	S2073/16X3/4	406	7648586	S2111/8	211	7648665	S1211/2	416	7648744	S13411/16	418
7648508	S2073/16X1.1/8	406	7648587	S2113/16	211	7648666	S2211/16	416	7648745	S1343/4	418
7648509	S2071/4X1	406	7648588	S2111/4	211	7648667	S2213/32	416	7648746	S1347/8	418
7648510	S2071/4X1.1/2	406	7648589	S2113/8	211	7648668	S2211/8	416	7648747	S1341	418
7648511	S2075/16X3/4	406	7648590	S2111/2	211	7648669	S2215/32	416	7648748	S2341/16	418
7648512	S2075/16X1.5/8	406	7648591	S1121/16	412	7648670	S2213/16	416	7648749	S2345/64	418
7648513	S2073/8X1	406	7648592	S1123/32	412	7648671	S2211/4	416	7648750	S2343/32	418
7648514	S2073/8X2	406	7648593	S1121/8	412	7648672	S2215/16	416	7648751	S2347/64	418
7648515	S2077/16X1	406	7648594	S1125/32	412	7648673	S2213/8	416	7648752	S2341/8	418
7648516	S2077/16X2	406	7648595	S1123/16	412	7648674	S2211/2	416	7648753	S2349/64	418
7648517	S2071/2X1	406	7648596	S1127/32	412	7648675	S223HA1/8XR.015	426	7648754	S2345/32	418
7648518	S2071/2X3	406	7648597	S1121/4	412	7648676	S223HA1/8XR.030	426	7648755	S23411/64	418
7648519	S2079/16X1.1/4	406	7648598	S1125/16	412	7648677	S223HA3/16XR.015	426	7648756	S2343/16	418
7648520	S2075/8X1.5/8	406	7648599	S1123/8	412	7648678	S223HA3/16XR.030	426	7648757	S2343/64	418
7648521	S2075/8X2.1/4	406	7648600	S1121/2	412	7648679	S223HA1/4XR.015	426	7648758	S2347/32	418
7648522	S2073/4X1.3/4	406	7648601	S2121/16	412	7648680	S223HA1/4XR.030	426	7648759	S2341/4	418
7648523	S2073/4X3	406	7648602	S2121/8	412	7648681	S223HA5/16XR.015	426	7648760	S2345/16	418
7648524	S2071X1.1/2	406	7648603	S2123/16	412	7648682	S223HA5/16XR.030	426	7648761	S2343/8	418
7648525	S2071X4	406	7648604	S2127/32	412	7648683	S223HA3/8XR.015	426	7648762	S2347/16	418
7648526	S1081/16	408	7648605	S2121/4	412	7648684	S223HA3/8XR.030	426	7648763	S2341/2	418
7648527	S1085/64	408	7648606	S2125/16	412	7648685	S223HA7/16XR.020	426	7648764	S2349/16	418
7648528	S1083/32	408	7648607	S2123/8	412	7648686	S223HA7/16XR.045	426	7648765	S2345/8	418
7648529	S1081/8	408	7648608	S2121/2	412	7648687	S223HA1/2XR.030	426	7648766	S23411/16	418
7648530	S1089/64	408	7648609	S1132.0	413	7648688	S223HA1/2XR.060	426	7648767	S2343/4	418
7648531	S1085/32	408	7648610	S1132.5	413	7648689	S223HA9/16XR.045	426	7648768	S2347/8	418
7648532	S10811/64	408	7648611	S1133.0	413	7648690	S223HA9/16XR.060	426	7648769	S2341	418
7648533	S1083/16	408	7648612	S1134.0	413	7648691	S223HA5/8XR.060	426	7648770	S1352.0	419
7648534	S1087/32	408	7648613	S1135.0	413	7648692	S223HA5/8XR.090	426	7648771	S1352.5	419
7648535	S1081/4	408	7648614	S1136.0	413	7648693	S223HA3/4XR.030	426	7648772	S1353.0	419
7648536	S1085/16	408	7648615	S1137.0	413	7648694	S223HA3/4XR.060	426	7648773	S1353.5	419
7648537	S1083/8	408	7648616	S1138.0	413	7648695	S223HA1XR.030	426	7648774	S1354.0	419
7648538	S1087/16	408	7648617	S1139.0	413	7648696	S223HA1XR.090	426	7648775	S1354.5	419
7648539	S1081/2	408	7648618	S11310.0	413	7648697	S223HB1/8XR.015	426	7648776	S1355.0	419
7648540	S1089/16	408	7648619	S11312.0	413	7648698	S223HB1/8XR.030	426	7648777	S1356.0	419
7648541	S1085/8	408	7648620	S11316.0	413	7648699	S223HB3/16XR.015	426	7648778	S1357.0	419
7648542	S1083/4	408	7648621	S11320.0	413	7648700	S223HB3/16XR.030	426	7648779	S1358.0	419
7648543	S1081	408	7648622	S2133.0	413	7648701	S223HB1/4XR.015	426	7648780	S1359.0	419
7648544	S2081/16	408	7648623	S2134.0	413	7648702	S223HB1/4XR.030	426	7648781	S13510.0	419
7648545	S2085/64	408	7648624	S2135.0	413	7648703	S223HB5/16XR.015	426	7648782	S13511.0	419
7648546	S2083/32	408	7648625	S2136.0	413	7648704	S223HB5/16XR.030	426	7648783	S13512.0	419
7648547	S2081/8	408	7648626	S2137.0	413	7648705	S223HB3/8XR.015	426	7648784	S13514.0	419
7648548	S2085/32	408	7648627	S2138.0	413	7648706	S223HB3/8XR.030	426	7648785	S13516.0	419
7648549	S2083/16	408	7648628	S2139.0	413	7648707	S223HB7/16XR.020	426	7648786	S13518.0	419
7648550	S2087/32	408	7648629	S21310.0	413	7648708	S223HB7/16XR.045	426	7648787	S13520.0	419
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7648805	S23518.0	419	7648884	S23910.0	423	7812109	E9165/16	265	7833356	H8511.3/16	32
7648806	S23520.0	419	7648885	S23912.0	423	7812110	E9163/8	265	7833357	H85124.0	32
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7648808	S1363/16	420	7648887	S1463/8	424	7812112	E9161/2	265	7833359	H85126.0	32
7648809	S1361/4	420	7648888	S1461/2	424	7812113	E9165/8	265	7833360	H85127.0	32
7648810	S1365/16	420	7648889	S1465/8	424	7812114	E9163/4	265	7833361	H85128.0	32
7648811	S1363/8	420	7648890	S2461/4	424	7812115	E817M3	269	7833362	H85129.0	32
7648812	S1367/16	420	7648891	S2463/8	424	7812116	E817M4	269	7833363	H85130.0	32
7648813	S1361/2	420	7648892	S2461/2	424	7812117	E817M5	269	7833364	H851213.5	42
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7648815	S1363/4	420	7648894	S1471/8	425	7812119	E817M8	269	7833366	H851215.6	42
7648816	S2361/8	420	7648895	S1473/16	425	7812120	E817M10	269	7833367	H851216.6	43
7648817	S2363/16	420	7648896	S1471/4	425	7812121	E817M12	269	7833368	H851217.6	43
7648818	S2361/4	420	7648897	S1475/16	425	7812122	E917M8X1.0	269	7833369	H851218.6	43
7648819	S2365/16	420	7648898	S1473/8	425	7812123	E917M10X1.25	269	7833370	H851219.6	43
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7648833	S1373/4	421	7648912	S248HA7/16XR.020	427	7812137	E90510-32	274	7877915	TS41HSN35	215
7648834	S1371	421	7648913	S248HA7/16XR.045	427	7812138	E9051/4	274	7877916	TS41HSN34	215
7648835	S2371/8	421	7648914	S248HA1/2X1XR.030	427	7812139	E9055/16	274	7877917	TS41HSN33	215
7648836	S2373/16	421	7648915	S248HA1/2X1.1/4XR.030	427	7812140	E9053/8	274	7877918	TS41HSN32	216
7648837	S2371/4	421	7648916	S248HA1/2X1.1/4XR.060	427	7812141	E9057/16	274	7877919	TS41HSN31	216
7648838	S2375/16	421	7648917	S248HA9/16XR.020	427	7812142	E9051/2	274	7877920	TS40HS1/8	216
7648839	S2373/8	421	7648918	S248HA9/16XR.045	427	7812143	E9055/8	274	7877921	TS41HSN30	216
7648840	S2377/16	421	7648919	S248HA9/16XR.060	427	7812144	E9053/4	274	7877922	TS41HSN29	216
7648841	S2371/2	421	7648920	S248HA5/8XR.045	427	7812145	E806M3	278	7877923	TS41HSN28	216
7648842	S2375/8	421	7648921	S248HA5/8XR.060	427	7812146	E806M4	278	7877924	TS40HS9/64	216
7648843	S2373/4	421	7648922	S248HA5/8XR.090	427	7812147	E806M5	278	7877925	TS41HSN27	216
7648844	S2371	421	7648923	S248HA3/4XR.030	427	7812148	E806M6	278	7877926	TS41HSN26	216
7648845	S1381/16	422	7648924	S248HA3/4XR.060	427	7812149	E806M8	278	7877927	TS41HSN25	216
7648846	S1383/32	422	7648925	S248HA1XR.030	427	7812150	E806M10	278	7877928	TS41HSN24	216
7648847	S1381/8	422	7648926	S248HA1XR.090	427	7812151	E806M12	278	7877929	TS41HSN23	216
7648848	S1385/32	422	7648927	S248HB5/16XR.015	427	7812152	E906M8X1.0	278	7877930	TS40HS5/32	216
7648849	S1383/16	422	7648928	S248HB5/16XR.030	427	7812153	E906M10X1.25	278	7877931	TS41HSN22	216
7648850	S1381/4	422	7648929	S248HB3/8XR.015	427	7812154	E906M12X1.25	278	7877932	TS41HSN21	216
7648851	S1385/16	422	7648930	S248HB3/8XR.030	427	7812155	E906M12X1.5	278	7877933	TS41HSN20	216
7648852	S1383/8	422	7648931	S248HB7/16XR.020	427	7833294	H85131/64	30	7877934	TS41HSN19	216
7648853	S1387/16	422	7648932	S248HB7/16XR.045	427	7833295	H8511/2	30	7877935	TS41HSN18	216
7648854	S1381/2	422	7648933	S248HB1/2X1XR.030	427	7833296	H85117/32	30	7877936	TS40HS11/64	216
7648855	S1385/8	422	7648934	S248HB1/2X1.1/4XR.030	427	7833297	H85112.0	30	7877937	TS41HSN17	216
7648856	S1383/4	422	7648935	S248HB1/2X1.1/4XR.060	427	7833298	H85112.5	30	7877938	TS41HSN16	217
7648857	S2381/16	422	7648936	S248HB9/16XR.020	427	7833299	H85113.0	30	7877939	TS41HSN15	217
7648858	S2383/32	422	7648937	S248HB9/16XR.045	427	7833300	H85114.0	30	7877940	TS41HSN14	217
7648859	S2381/8	422	7648938	S248HB9/16XR.060	427	7833301	H8519/16	30	7877941	TS41HSN13	217
7648860	S2385/32	422	7648939	S248HB5/8XR.045	427	7833302	H85139/64	30	7877942	TS40HS3/16	217
7648861	S2383/16	422	7648940	S248HB5/8XR.060	427	7833303	H85141/64	31	7877943	TS41HSN12	217
7648862	S2381/4	422	7648941	S248HB5/8XR.090	427	7833304	H85111/16	31	7877944	TS41HSN11	217
7648863	S2385/16	422	7648942	S248HB3/4XR.030	427	7833305	H85123/32	31	7877945	TS41HSN10	217
7648864	S2383/8	422	7648943	S248HB3/4XR.060	427	7833306	H85115.0	30	7877946	TS41HSN9	217
7648865	S2387/16	422	7648944	S248HB1XR.030	427	7833307	H85116.0	31	7877947	TS41HSN8	217
7648866	S2381/2	422	7648945	S248HB1XR.090	427	7833308	H85117.0	31	7877948	TS41HSN7	217
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46104482	R95031.0	23	46204801	1629AP6X32	290	46204892	1676AP1/4X20	294	46204984	1691AP5/16X18	308
46104483	R9501.1/4	23	46204804	1629AP7/8X9	290	46204893	1676AP1/4X28	294	46204985	1691AP5/16X24	308
46104484	R95032.0	23	46204805	1629AP8X32	290	46204894	1676AP10X24	294	46204986	1691AP5/8X11	308
46104485	R95032.5	23	46204806	1630AP1/2X13	303	46204895	1676AP10X32	294	46204989	1691AP7/16X20	308
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46104488	R95033.5	23	46204809	1630AP1/4X28	303	46204899	1676AP3/4X16	294	46204997	1697APM16X2.0	309
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# SIMPLY RELIABLE

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