

# DORMER PRAMET

## END MILL CATALOG



 **DORMER**



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## Icon Key

<b>HM</b>	<b>HSS</b>	<b>HSS-E</b>	<b>HSS-E PM</b>	$\begin{matrix} +.0001 \\ -.0015 \end{matrix}$	$\begin{matrix} +.003 \\ -.000 \end{matrix}$	$\begin{matrix} +.005 \\ -.000 \end{matrix}$	<b>e8</b>	<b>k10</b>		
Carbide	High Speed Steel	High Speed Cobalt	High Speed Powder Metallurgy Steel	Tolerance	Tolerance	Tolerance	e8 diameter tolerance	k10 diameter tolerance	Slotting, Ramping, Plunging	Slotting, Ramping
Blank space	Ball nose	Finishing (side cutting)	Roughing	Slotting	Slotting P9 tolerance	Extra short cut length	Short cut length	Medium cut length	Long cut length	Extra long cut length
Straight shank	Weldon shank	DIN 1835B	DIN 6535HA	DIN 6535HB Weldon shank	Unequal helix	30° helix angle, 12° rake	30° helix angle	37° helix angle	38° helix angle	45° helix angle
Bright finish	Titanium Carbon Nitride	Aluminum Titanium Nitride	Zirconium	2-flute	3-flute	4-flute	5-flute	4-8 flute		

You may have noticed a change. Although our products are still the same, our style numbers and eCodes are different. To help you find the end mill you are currently using, an EDP number conversion chart can be found on page 60.

# SOLID CARBIDE END MILLS

## INTRODUCTION

Dormer Pramet's new range of Solid Carbide End Mills represent a new direction in our branding of end mill products all under the Dormer brand name. These solid carbide end mills are suited for the most common milling operations such as slotting, plunging, side and face milling, as well as ramping and copy milling in a wide range of materials.

## FEATURES AND BENEFITS

- Consistent performance and repeatability in multiple material applications across a diverse array of machines and conditions.
- This solid carbide end mill family offers ranges of uncoated and coated end mills with options for square end, ball nosed, and radius corners as well as various length options.
- The designs of these products enable them to deliver high quality and performance at an exceptional value. Some styles are specifically designed as material or application specific products. See AMG tables for running parameters in the different materials.

## TOOL MATERIAL

Premium micrograin carbide provides an excellent combination of hardness and toughness, resulting in high wear resistance and long consistent tool life.

## COATINGS

- A Zirconium Nitride (ZrN) coating on some products offer improved performance in milling aluminum (including high silica aluminum).
- Multi-layer Aluminum Titanium Nitride (AlTiN) coating on some products offer improved cutting edge stability, outstanding wear protection, higher hot hardness and increased tool life.

## SHANKS

High precision (h6) shanks are offered as standard on most cutters. Cylindrical shanks are made to DIN 6535 HA but on some of the variable helix designs a Weldon shank design is used. These are made to DIN 6535 HB.

## GEOMETRY

- New 2-flute aluminum cutters introduced offer excellent performance in aluminum, aluminum alloys and other non-ferrous materials. This geometry when coupled with the ZrN coating promotes excellent chip evacuation, improves material removal rates and improves surface finishes.
- New variable helix design cutters introduced with radius corners offer increased stability and lower harmonics during the milling process. This reduces the possibility of vibrations and lowers the risk of chipping at the cutting edges or corners. Increased stability also allows these cutters to be used in a wide variety of materials and applications where conventional type cutters do not perform as well.



# HSS, HSS-E & HSS-E-PM END MILLS

## INTRODUCTION

Dormer Pramet's new range of High Speed Steel End Mills represent a new direction in our branding of end mill products all under the Dormer name. These end mills are suited for most general milling operations such as slotting, plunging, side and face milling, as well as ramping and copy milling depending on the style selected.

## FEATURES AND BENEFITS

- Consistent performance and repeatability in multiple material applications across a diverse array of machines and adverse conditions.
- The designs of these products enable them to deliver good quality and performance at an exceptional value.
- This HSS end mill family offers ranges and length options of mostly uncoated end mills with options for square end and ball nosed end, as well as scalloped fine & roughing profile cutters.

## TOOL MATERIAL

Manufactured from premium grades of HSS, HSS-E and HSS-E-PM materials.

- HSS tools will flex slightly under pressure and absorb more shock which can be advantageous when rigidity or tool holding is not optimal and vibrations are present.
- HSS-E (HSCo) tool substrate is harder and more wear resistant but will not withstand the shock and vibrations that HSS substrates will absorb which can cause chipping or tool breakage if conditions are not stable.
- HSS-E-PM tools are produced with powder metallurgy technology. These substrates have a finer grain structure resulting in a material with superior edge strength and toughness but similar to HSCo a rigid set-up and good tool holding is important to avoid excess shock and vibrations that can cause cutting edges to chip or fracture.

## SHANKS

All cutters in this range are offered with standard Weldon shanks. Weldon type holders are typically used for most HSS cutters but higher quality tool holding with HSS-E or HSS-E-PM cutters can provide better results.

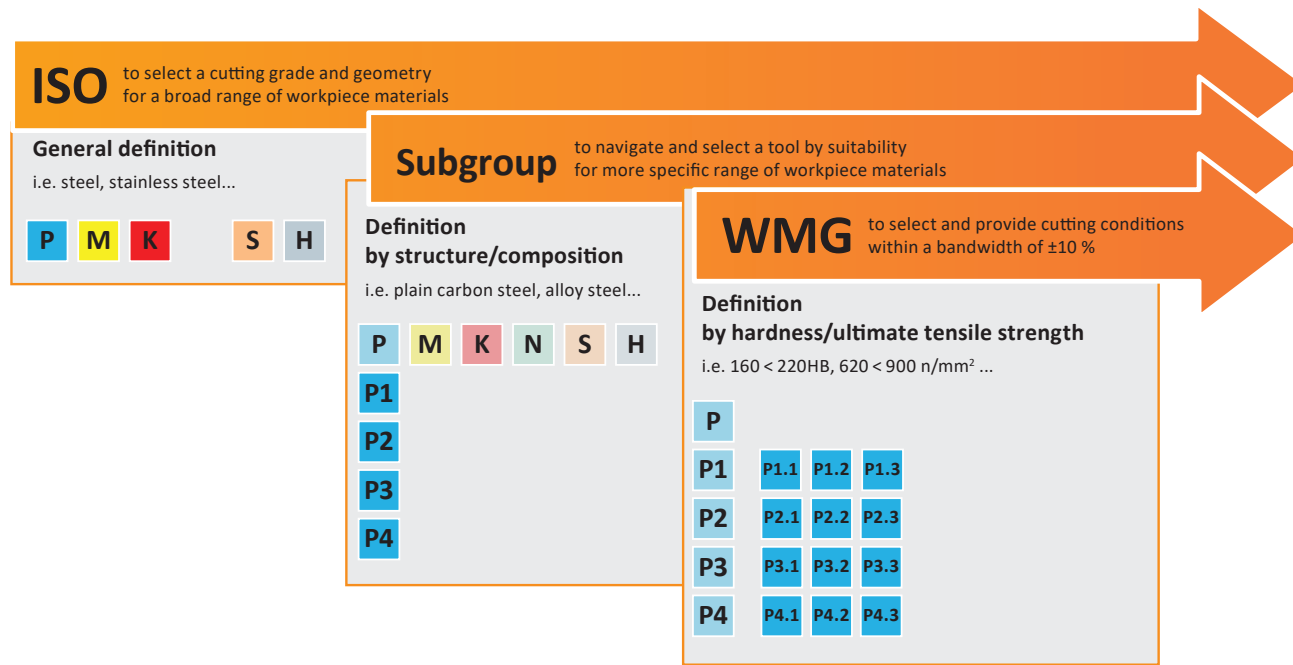
## GEOMETRY

- 2-flute, 3-flute, 4-flute and multi-flute end mills are offered in various tool substrates.
- Most end mills in this range have a 30° helix angle for general purpose milling in a wide variety of materials.
- Some styles have a higher 38° Helix to facilitate chip flow when milling aluminum and other non-ferrous materials.
- Various lengths are available to offer longer than standard cut-lengths for milling deeper pockets.
- P9 slotting tolerance end mills are offered in 2-flute and 3-flute options. HSS-E scalloped roughing cutters are available in coarse and fine profile styles to allow for maximum metal removal in a single pass.

## COATINGS

- Most HSS, HSS-E & HSS-E-PM end mills in this range are offered as uncoated products.
- Some of our scalloped roughing coarse and fine profile cutters are also offered as coated products.
- The Titanium Carbon Nitride (TiCN) coating on these products will lower the coefficient of friction and improve wear resistance which allows for better chip flow and longer tool life.

# WORKPIECE MATERIAL GROUPS (WMG)



## ABOUT DORMER PRAMET'S WORKPIECE MATERIAL CLASSIFICATION

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.

The table on the next page includes a description of each workpiece material group, as well as examples of commonly used designations.

## HOW TO USE THE WMG CHART

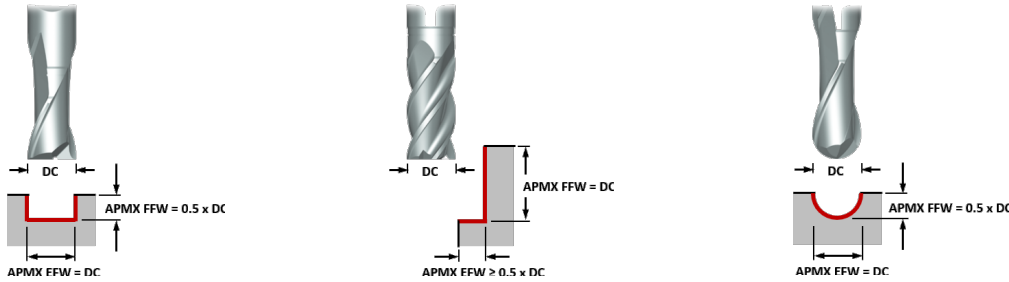
**To find speeds and feeds:**

- Select the product you want in our catalog or brochure
- Find the appropriate ISO work material group (WMG) at the top of the page
  - ≥ This will let you know if the tool is suitable for your operation and provides the speed (SFM) and alpha character for feed rate (IPR)
- Use the corresponding alpha character to find your cutting feed rate (IPR) in the chart provided in the WMG section of the catalog or brochure (usually near the front of the publication)



ISO	WMG (Workpiece Material Groups)		Hardness HB or HRC	Ultimate tensile strength Mpa	Examples of material (AISI-SAE, ASTM, UNS)	Old Dormer AMG	Old Pramet ISO		
P	P1	P1.1	Free machining steel	sulfurized	< 240 HB	≤ 760	1108, 1109, 1113, 1117, 1118, 1132, 1137, 1139, 1140, 1141...	1.1	P1
		P1.2	(carbon steels with increased machinability)	sulfurized and phosphorized	< 180 HB	≤ 620	1211, 1212, 1213, 1215...	1.1	P1
		P1.3		sulfurized/phosphorized and leaded	< 180 HB	≤ 550	12L13, 12L14, 12L15...	1.1	P1
	P2	P2.1	Plain carbon steel (steels comprised of mainly iron and carbon)	containing <0.25%C	< 180 HB	≤ 620	1005, 1006, 1008, 1012, 1013, 1513, 1015, 1020, 1022, 1025, 1024, 1025	1.2	P2
		P2.2		containing <0.55%	< 240 HB	≤ 830	1026, 1526, 1030, 1035, 1536, 1040, 1541, 1042, 1045, 1548, 1050, 1055	1.3	P2
		P2.3		containing >0.55%	< 300 HB	≤ 1030	1059, 1060, 1561, 1064, 1565, 1065, 1070, 1074, 1078, 1080, 1086, 1090	1.5	P3
	P3	P3.1	Alloy steel (carbon steels with an alloying content ≤ 10%)	annealed	< 180 HB	≤ 620	1330 -1345... A2317, A2515... 3140... 4023 - 4047... 4118, 4130 - 4137, 4140 - 4147, 4150, 4161... 4320, 4340... 4419, 4422, 4427... 4615 - 4626...	1.4	P3
		P3.2		hardened and tempered	180 - 260 HB	> 620 ≤ 900	4718, 4720... 4815 - 4820... E50100	1.4	P3
		P3.3			260 - 360 HB	> 900 ≤ 1240		1.5	P4
	P4	P4.1	Tool steel (special alloy steel for tools, dies and molds)	annealed	< 26 HRC	≤ 900	A-2, D4, F-1, H-13, P-2...	1.4	P3
P4.2		hardened and tempered		26 - 39 HRC	> 900 ≤ 1240	1.1520, 1.1645, 1.2008, 1.2319, 1.2378...	1.5	P4	
P4.3				39 - 45 HRC	> 1250 ≤ 1450	100CrMo5, 38CrCoWV18-17-17, 40CrMoS4, X40CrMoV5-1	1.6	H1	
M	M1	M1.1	Ferritic stainless steel	annealed	< 160 HB	≤ 520	405, 409, 429, 430, 430F, 434, 436, 439, 441, 442, 443, 444, 446	2.1	M1
		M1.2	(straight chromium non-hardenable alloys)	160 - 220 HB	> 520 ≤ 700	1.4516, 1.4002, 1.4589, 1.4595, 1.4017, 1.4590, 1.4749, 1.4713, 1.4724	2.1	M1	
	M2	M2.1	Martensitic stainless steel (straight chromium hardenable alloys)	annealed	< 200 HB	≤ 670	403, 410, 420, 422, 455, 490 1.4000, 1.4021, 1.4024, 1.4028, 1.4031, 1.4034, 1.4110, 1.4122, 1.4313, 1.4418, 1.4419, 1.4422, 1.4423, 1.4592, 1.4762	2.3	M2
		M2.2		quenched and tempered	200 - 280 HB	> 670 ≤ 950		2.3	M2
		M2.3		precipitation-hardened	280 - 380 HB	> 950 ≤ 1300		2.4	M2
	M3	M3.1	Austenitic stainless steel (chromium-nickel and chromium-nickel-manganese alloys)	< 200 HB	≤ 750	201, 202, 204, 205, 301, 3012, 303, 304, 305, 308, 316, 317, 321, 347	2.2	M3	
		M3.2		200 - 260 HB	> 750 ≤ 870	201L, 301L, 303Se, 304H, 304L, 304LN, 309Cb, 316Ti, 317LMN, 347H	2.2	M3	
		M3.3		260 - 300 HB	> 870 ≤ 1040	1.4308, 1.4301, 1.4305, 1.4311, 1.4552, 1.4401, 1.4571, 1.4878, 1.4961	2.2	M3	
	M4	M4.1	Austenitic-ferritic (DUPLEX) or super-austenitic stainless steel	< 300 HB	≤ 990	310MoLN, 314, 904L, 330, S32304, 1.4362, 1.4462, 1.4854, 1.4529	2.3	M4	
		M4.2	Precipitation hardening austenitic stainless steel	300 - 380 HB	≤ 1320	630, 632, 635, PH13-8Mo, 15-5PH, PH15-7Mo, S15500, S17400	2.4	M4	
K	K1	K1.1	Gray iron (ASTM A48) or Automotive Gray iron (ASTM A159)	ferritic or ferritic-pearlitic	< 180 HB	≤ 190	GG10, GG15, G1800, ASTM Grades 20 and 25	3.1	K1
		K1.2		ferritic-pearlitic or pearlitic	180 - 240 HB	> 190 ≤ 310	GG20, GG25, G2500, G3000, A48 Class 25 and 30	3.2	K1
		K1.3		pearlitic	240 - 280 HB	> 310 ≤ 390	GG30, GG35, G3500, G4000, A48 Class 50	3.2	K1
	K2	K2.1	Malleable iron (ASTM A602) (iron-carbon castings with a graphite-free microstructure)	ferritic	< 160 HB	≤ 400	GTS-35-10, GTW-35-04, GTW-5-38-12, GTW-40-05, A47 grade 22010	3.3	K2
		K2.2		ferritic or pearlitic	160 - 200 HB	> 400 ≤ 550	GTS-45-06, GTW45-07	3.3	K2
		K2.3		pearlitic	200 - 240 HB	> 550 ≤ 660	GTSS5-04, GTS-65-02, GTS-70-02, 5.4204, KTB 550-04	3.4	K2
	K3	K3.1	Ductile iron (ASTM A536) (iron-carbon castings with a nodular graphite microstructure)	ferritic	< 180 HB	≤ 560	GGG-35,3, GGG-40, GGG-50, A439 types D-2C and D-3A	3.3	K3
		K3.2		ferritic or pearlitic	180 - 220 HB	> 560 ≤ 680	GGG-60, GGG-70, A476, SA-476	3.3	K4
		K3.3		pearlitic	220 - 260 HB	> 680 ≤ 800	GGG-80, A897 grade 1050/700/7, AD 1600, F34800	3.4	K4
	K4	K4.1	Austenitic gray iron (ASTM A436) Austenitic ductile iron (ASTM A439 or ASTM A571) Austempered ductile iron (ASTM A897) (iron-carbon alloy castings with an ausferrite microstructure)	< 180 HB	≤ 610	GGG & GGL-NiMn 13 7, GGG & GGL-NiCr 20 3, 0.6652, 0.7652			
		K4.2		< 240 HB	> 610 ≤ 840	GGL-NiSiCr 30 5 5, GGG-NiSiCr 30 5 5, 0.6680, 0.7680			
		K4.3		< 280 HB	> 840 ≤ 980	A897 GRADE 1, A897 GRADE 2, A897 GRADE 3...			
		K4.4		280 - 320 HB	> 980 ≤ 1130	EN-GJS-800-8, EN-GJS-800-10, EN-GJS-900-8, EN-GJS-1050-6, EN-GJS-1200-3			
		K4.5		320 - 360 HB	> 1130 ≤ 1280				
	K5	K5.1	Compacted graphite iron CGI (ASTM A842) (iron-carbon castings with a vermicular graphite structure)	ferritic	< 180 HB	A842-300, 5.2100, 5.2200, EN-GJV-300, EN-GJV-350			
K5.2		ferritic or pearlitic		180 - 220 HB	A842-300, 5.2100, EN-GJV-300, EN-GJV-350, -400, -450				
K5.3		pearlitic		220 - 260 HB	EN-GJV-400, EN-GJV-450, EN-GJV-500				
N	N1	N1.1	Commercially pure wrought aluminum	< 60 HB	≤ 240	AI99.8, AI99.0Cu, AA1050, AA1100, AA1175, 3.0255, 3.0275, 3.0205	7.1	N1	
		N1.2	Wrought aluminum alloys	half hard tempered	60 - 100 HB	> 240 ≤ 400	AlCu4MgSi, AlMn1Mg1, AA2017, AA3003, AA4043, 3.1325, 3.1355	7.1	N1
		N1.3		full hard tempered	100 - 150 HB	> 400 ≤ 590	AlMg1SiPb, AlZn6CuMgZn, AlZn5.5MgCu, AA6262, AA7050, 3.0517	7.2	N2
	N2	N2.1	Cast aluminum alloys	< 75 HB	≤ 240	G-AlCu4S, GAlSi5Cu1Mg, G-AlSi7Mg, A295.0, A355.0, LM11, LM21, LM25	7.3	N1	
		N2.2		75 - 90 HB	> 240 ≤ 270	G-AlSi5Cu1Mg, G-AlSi7Mg, A242.0, A319.0, LM14, LM4, LM16	7.3	N1	
		N2.3		90 - 140 HB	> 270 ≤ 440	G-AlCu4MgTi, G-AlCu4Ni2Mg2, A204.0, A771.0, LM30, LM24, ELT-204	7.3	N2	
	N3	N3.1	Free-cutting copper-alloys materials with excellent machining properties			CuPb1P, CuSp, CuZn39Pb3, 2.1498, 2.1546, 2.0780, C18700, C79800, C34200	6.3	N3	
		N3.2	Short-chip copper-alloys with good to moderate machining properties			CuNi3Si, CuZn40, CuZn40Al2, 2.0857, 2.0360, 2.0550, C2109, C2135, C28000	6.2	N3	
	N4	N3.3	Electrolytic copper and long-chip copper-alloys with moderate to poor machining properties			Cu-0Fe, SF-Cu, CuNi2Be, 2.0070, 2.0090, 2.0855, C103, C10100, C12200	6.1	N4	
		N4.1	Thermoplastic polymers			Polyolefine, PE, PP, Styrol, PS, SAN, ABS, PMMA, Acryl, PC	8.1		
N4.2		Thermosetting polymers			Aramid, Epoxy, Fluoropolymer, Melamine, Mehackrylate, Phenolic, Polyester	8.2			
N5	N4.3	Reinforced polymers or composites			GFK, CFK, GMT, LFT, SMC, Kevlar, Honeycomb, Organo	8.3			
	N5.1	Graphite			Extruded, Compression Molded and Isostatically Pressed	10.1			
S	S1	S1.1	Titanium or titanium alloys	< 200 HB	≤ 660	R50250, 3.7025, T35, 2TA1, R50400, 3.7035, 2TA2,	4.1	S1	
		S1.2		200 - 280 HB	> 660 ≤ 950	TA6V, Ti-6Al-4V, Ti 10.2.3, Ti5553	4.2	S1	
		S1.3		280 - 360 HB	> 950 ≤ 1200		4.3	S1	
	S2	S2.1	Fe-based high-temperature alloys	< 200 HB	≤ 690	A-286, Discaloy, Haynes 556, Inconel 909, Greek Asccolloy		S2	
		S2.2		200 - 280 HB	> 690 ≤ 970			S2	
	S3	S3.1	Ni-based high-temperature alloys	< 280 HB	≤ 940	Inconel 718, 706 Waspalloy, Udimet 720, Inconel 625	5.2	S3	
		S3.2		280 - 360 HB	> 940 ≤ 1200		5.3	S3	
	S4	S4.1	Co-based high-temperature alloys	< 240 HB	≤ 800	Haynes 25, Stellite 21, 31		S4	
S4.2		240 - 320 HB		> 800 ≤ 1070			S4		
H	H1	H1.1	Chilled cast iron	< 440 HB		GHK-CrNi 350, GHK-470, GHK-475			
	H2	H2.1	Hardened cast iron	< 55 HRC		GHK-500, GHK-530, EN-GJN-HV550, EN-GJN-HV600, EN-GJN-HV600(XCr11), EN-GJN-HV600(XCr14), EN-GJN-NH600(XCr18)		H2	
		H2.2		> 55 HRC				H2	
	H3	H3.1	Hardened steel <55HRC	< 51 HRC		1026, 1526... 1059, 1060... 1090, 1330... A2317, A2515... 3140... 4023... 4118, 4130... E50100... 50B40, 50B44... 5120, 5130... A-2, D-4, F-1, H-13, P-2... 1.1520, 1.2319, 1.2378... 100CrMo5, 38CrCoWV18 17-17, 40CRMoS4, X40CrMoV5-1...	1.7	H3	
		H3.2		51 - 55 HRC			1.7	H3	
H4	H4.1	Hardened steel >55HRC	55 - 59 HRC			1.8	H4		
	H4.2		> 59 HRC			1.8	H4		

# FEED TABLES AND CORRECTION FACTORS (WMG)



## HSS Milling Feed (IPT) with ≥ 50% radial immersion

Ø DC (decimal)	Ø DC (mm)	A	B	C	D	E	F	G	H	I	J
0.0394	1.00	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0004	0.0005	0.0006
0.0787	2.00	0.0001	0.0002	0.0002	0.0002	0.0003	0.0003	0.0004	0.0005	0.0006	0.0007
0.1181	3.00	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008
0.1575	4.00	0.0002	0.0002	0.0003	0.0004	0.0004	0.0005	0.0006	0.0007	0.0009	0.0011
0.1969	5.00	0.0002	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0010	0.0012
0.2362	6.00	0.0002	0.0003	0.0003	0.0004	0.0005	0.0006	0.0007	0.0009	0.0011	0.0013
0.3150	8.00	0.0003	0.0004	0.0004	0.0006	0.0007	0.0008	0.0009	0.0011	0.0014	0.0017
0.3937	10.00	0.0004	0.0005	0.0006	0.0007	0.0009	0.0011	0.0013	0.0016	0.0019	0.0022
0.4724	12.00	0.0004	0.0006	0.0007	0.0009	0.0011	0.0013	0.0015	0.0019	0.0022	0.0026
0.5512	14.00	0.0005	0.0006	0.0008	0.0010	0.0013	0.0015	0.0018	0.0022	0.0026	0.0031
0.6299	16.00	0.0006	0.0007	0.0009	0.0011	0.0014	0.0017	0.0020	0.0024	0.0030	0.0035
0.7087	18.00	0.0007	0.0009	0.0011	0.0013	0.0017	0.0020	0.0024	0.0029	0.0034	0.0041
0.7874	20.00	0.0007	0.0009	0.0011	0.0014	0.0018	0.0021	0.0026	0.0031	0.0037	0.0044
0.8661	22.00	0.0008	0.0010	0.0013	0.0016	0.0020	0.0024	0.0029	0.0035	0.0042	0.0050
0.9843	25.00	0.0009	0.0011	0.0014	0.0018	0.0022	0.0026	0.0032	0.0038	0.0046	0.0055
1.1024	28.00	0.0011	0.0013	0.0017	0.0020	0.0026	0.0031	0.0037	0.0044	0.0053	0.0064
1.2598	32.00	0.0012	0.0015	0.0019	0.0023	0.0029	0.0035	0.0042	0.0050	0.0060	0.0072
1.4173	36.00	0.0013	0.0016	0.0020	0.0025	0.0031	0.0038	0.0045	0.0054	0.0065	0.0078
1.5748	40.00	0.0013	0.0017	0.0021	0.0026	0.0033	0.0040	0.0048	0.0057	0.0069	0.0082
2.4803	63.00	0.0017	0.0021	0.0026	0.0033	0.0041	0.0050	0.0059	0.0071	0.0086	0.0103
3.1496	80.00	0.0018	0.0022	0.0028	0.0035	0.0044	0.0052	0.0063	0.0076	0.0091	0.0109
3.9370	100.00	0.0017	0.0020	0.0026	0.0032	0.0040	0.0048	0.0058	0.0069	0.0083	0.0100

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

1. Find your Alpha Code on the product page (example: 279U, "U" is the Alpha Code).
2. Find the closest diameter for your cutting application on the left side of the chart.
3. Find your Alpha Code in the top row of the chart.
4. The intersection (cell) of the Diameter and Alpha Code is the feed rate in inches per tooth (IPT)

NOTE: ONLY if plunging into solid material with a center cutting end mill the values in the chart should be considered as "IPR"

## HM Milling Feed (IPT) with ≥ 50% radial immersion

Ø DC (decimal)	Ø DC (mm)	A	B	C	D	E	F	G	I	J	K	N	O	P	R	S
0.0394	1.00	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0006	0.0007	0.0009
0.0787	2.00	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0004	0.0005	0.0006	0.0008	0.0011	0.0015	0.0019
0.1181	3.00	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003	0.0004	0.0006	0.0007	0.0010	0.0013	0.0018	0.0024	0.0031
0.1575	4.00	0.0002	0.0002	0.0002	0.0002	0.0003	0.0004	0.0006	0.0007	0.0010	0.0014	0.0019	0.0024	0.0033	0.0043	0.0058
0.1969	5.00	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0007	0.0009	0.0013	0.0017	0.0023	0.0031	0.0041	0.0054	0.0072
0.2362	6.00	0.0003	0.0003	0.0003	0.0003	0.0005	0.0006	0.0009	0.0012	0.0016	0.0021	0.0028	0.0038	0.0050	0.0067	0.0089
0.3150	8.00	0.0004	0.0004	0.0004	0.0004	0.0006	0.0007	0.0010	0.0014	0.0019	0.0025	0.0034	0.0045	0.0060	0.0080	0.0106
0.3937	10.00	0.0004	0.0004	0.0004	0.0005	0.0006	0.0009	0.0012	0.0017	0.0022	0.0030	0.0040	0.0053	0.0071	0.0094	0.0125
0.4724	12.00	0.0006	0.0006	0.0006	0.0006	0.0007	0.0010	0.0014	0.0019	0.0026	0.0035	0.0046	0.0061	0.0081	0.0109	0.0144
0.5512	14.00	0.0006	0.0006	0.0006	0.0006	0.0008	0.0011	0.0016	0.0021	0.0029	0.0039	0.0052	0.0069	0.0091	0.0121	0.0161
0.6299	16.00	0.0007	0.0007	0.0007	0.0007	0.0009	0.0013	0.0017	0.0024	0.0033	0.0043	0.0057	0.0077	0.0102	0.0136	0.0181
0.7087	18.00	0.0007	0.0007	0.0007	0.0007	0.0010	0.0014	0.0019	0.0026	0.0035	0.0047	0.0063	0.0084	0.0111	0.0148	0.0198
0.7874	20.00	0.0008	0.0008	0.0008	0.0008	0.0011	0.0015	0.0021	0.0029	0.0039	0.0052	0.0069	0.0092	0.0122	0.0163	0.0217
0.8661	22.00	0.0010	0.0010	0.0010	0.0010	0.0012	0.0017	0.0022	0.0031	0.0042	0.0056	0.0074	0.0099	0.0132	0.0176	0.0233
0.9843	25.00	0.0011	0.0011	0.0011	0.0011	0.0013	0.0019	0.0025	0.0035	0.0047	0.0063	0.0083	0.0111	0.0148	0.0197	0.0263

NOTE: Only if plunging into solid material with a center cutting end mill the values in the chart should be considered as "IPR"

## Correction Factors for < 50% Radial Immersion

### Shoulder Milling

Correction factors for cutting speed  $V_c$  for square shoulder milling with <50% radial immersion

APMX EFW / DC	5%	10%	15%	20%	25%	30%	40%	≥ 50%
	1.48	1.35	1.27	1.22	1.19	1.16	1.11	1.00

Correction factors for feed per tooth  $f_t$  when milling with <50% radial immersion

APMX FFW / DC	5%	10%	15%	20%	25%	30%	40%	≥ 50%
	2.29	1.67	1.40	1.25	1.15	1.09	1.02	1.00

### Slot Milling

Correction factors for feed per tooth  $f_t$  for slot milling operations at different depths of cut

APMX EFW / DC	25%	50%	100%	150%
	1.25	1.00	0.75	0.50

APMX FFW / DC	25%	50%	100%	150%
	1.25	1.00	0.75	0.50

# Visual Index - End Mills

Tool Material:	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM
Application:																	
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	Z 2	Z 2	Z 2
Cut Length:																	
Helix:	$\lambda 45^\circ$	$\lambda 45^\circ$	$\lambda 37^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$
Shank:																	
Finish/Coating:		ZrN	ZrN			AlTiN				AlTiN		AlTiN		AlTiN			
Direction:																	
Style:	S106	S206	S207	S116	S108	S208	S109	S110	S111	S211	S112	S212	S113	S213	S114	S115	
Range:	1/4 - 1.0"	1/4 - 1.0"	1/8 - 1.0"	1/8 - 1/2	1/16 - 1"	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	3.00 - 12.00	1/8 - 5/8	1/8 - 1/2	
Page #	13	13	14	15	16	16	17	18	19	19	20	20	21	21	22	23	
P	P1			■	■	■	■	■	■	■	■	■	■	■	■	■	■
	P2			■	■	■	■	■	■	■	■	■	■	■	■	■	■
	P3			■	■	■	■	■	■	■	■	■	■	■	■	■	■
	P4			■	■	■	■	■	■	■	■	■	■	■	■	■	■
M	M1			■	■	■	■	■	■	■	■	■	■	■	■	■	■
	M2			■	■	■	■	■	■	■	■	■	■	■	■	■	■
	M3			■	■	■	■	■	■	■	■	■	■	■	■	■	■
	M4			■	■	■	■	■	■	■	■	■	■	■	■	■	■
K	K1			■	■	■	■	■	■	■	■	■	■	■	■	■	■
	K2			■	■	■	■	■	■	■	■	■	■	■	■	■	■
	K3			■	■	■	■	■	■	■	■	■	■	■	■	■	■
	K4			■	■	■	■	■	■	■	■	■	■	■	■	■	■
	K5			■	■	■	■	■	■	■	■	■	■	■	■	■	■
N	N1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	N2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	N3	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	N4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	N5																
S	S1					■				■		■		■		■	
	S2					■				■		■		■		■	
	S3					■				■		■		■		■	
	S4					■				■		■		■		■	
H	H1																
	H2																
	H3																
	H4																

# Visual Index - End Mills

Tool Material:	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM	HM
Application:																
Number of Flutes:	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
Cut Length:																
Helix:	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$
Shank:																
Finish/Coating:	AlTiN		AlTiN			AlTiN		AlTiN		AlTiN		AlTiN		AlTiN		AlTiN
Direction:																
Style:	S215	S121	S221	S129	S134	S234	S135	S235	S136	S236	S137	S237	S138	S238	S139	S239
Range:	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
Page #	23	24	24	25	26	26	27	27	28	28	29	29	30	30	31	31
<b>P</b>	P1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	P2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	P3	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	P4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
<b>M</b>	M1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	M2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	M3	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	M4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
<b>K</b>	K1	■	▣	▣	▣	▣	▣	▣	▣	▣	▣	▣	▣	▣	▣	▣
	K2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	K3	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	K4	■	▣	▣	▣	▣	▣	▣	▣	▣	▣	▣	▣	▣	▣	▣
	K5	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
<b>N</b>	N1		▣		▣	▣		▣		▣		▣		▣		▣
	N2		▣		▣	▣		▣		▣		▣		▣		▣
	N3		■		■	■		■		■		■		■		■
	N4															
	N5															
<b>S</b>	S1	▣		▣			▣		▣		▣		▣		▣	▣
	S2	▣		▣			▣		▣		▣		▣		▣	▣
	S3	▣		▣			▣		▣		▣		▣		▣	▣
	S4	▣		▣			▣		▣		▣		▣		▣	▣
<b>H</b>	H1															
	H2															
	H3															
	H4															



# Visual Index - End Mills

Tool Material:	HM	HM	HM	HM	HM	HM	HM	HM	HSS-E PM	HSS	HSS	HSS	HSS-E	HSS-E PM	HSS	
Application:																
Number of Flutes:	Z 4	Z 4	Z 4	Z 4	Z 4	Z 4	Z 5	Z 5	Z 2	Z 2	Z 2	Z 2	Z 2	Z 2	Z 2	
Cut Length:																
Helix:	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda^*$	$\lambda^*$	$\lambda^*$	$\lambda^*$	$\lambda 30^\circ$ $\gamma 12^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$ $\gamma 12^\circ$	$\lambda 30^\circ$	
Shank:					DIN 6535HA	DIN 6535HB	DIN 6535HA	DIN 6535HB	DIN 1835B						DIN 1835B	
Finish/Coating:		ATIN		ATIN	ATIN	ATIN	ATIN	ATIN	e8	$+0.03$ $-0.000$	$+0.03$ $-0.000$	$+0.001$ $-0.0015$	$+0.03$ $-0.000$	e8	$+0.03$ $-0.000$	
Direction:																
Style:	S146	S246	S147	S247	S223HA	S223HB	S248HA	S248HB	C110	C600	C601	C602	C603	C123	C604	
Range:	1/4 - 5/8	1/4 - 5/8	1/8 - 5/8	1/8 - 5/8	1/8 - 1.0"	1/8 - 1.0"	5/16 - 1.0"	5/16 - 1.0"	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	
Page #	32	32	33	33	34	34	35	35	36	38	39	40	41	42	44	
<b>P</b>	P1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	P2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	P3	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	P4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
<b>M</b>	M1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	M2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	M3	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	M4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
<b>K</b>	K1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	K2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	K3	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	K4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	K5	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
<b>N</b>	N1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	N2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	N3	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	N4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	N5	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
<b>S</b>	S1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	S2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	S3	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	S4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
<b>H</b>	H1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	H2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	H3	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	H4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■



# Visual Index - End Mills

Tool Material:	HSS	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
Application:																
Number of Flutes:	Z 2	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
Cut Length:																
Helix:	$\lambda 38^\circ$	$\lambda 38^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$ $\gamma 12^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$ $\gamma 12^\circ$	$\lambda 30^\circ$ $\gamma 12^\circ$	$\lambda 30^\circ$	$\lambda 30^\circ$
Shank:				DIN 1835B									DIN 1835B	DIN 1835B		
Finish/Coating:						TiCN		TiCN								
Direction:																
Style:	C605	C606	C607	C346	C608	C609	C610	C611	C612	C613	C614	C615	C247	C273	C617	C618
Range:	1/4 - 1"	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"
Page #	45	46	47	48	49	49	50	50	51	52	53	54	55	57	58	59
<b>P</b>	P1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	P2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	P3			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	P4			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>M</b>	M1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	M2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	M3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>												
	M4															
<b>K</b>	K1			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	K2			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	K3			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	K4			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	K5			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>N</b>	N1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	N2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>												
	N3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	N4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	N5															
<b>S</b>	S1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	S2			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	S3			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	S4			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>H</b>	H1															
	H2															
	H3															
	H4															

# Solid Carbide 2-Flute End Mill



## Regular length, Square End, 45° Helix

S106	N1.1	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	N4.2
	■ 2326 P	■ 1749 P	■ 1171 P	■ 1171 O	■ 1050 O	■ 751 O	■ 1224 O	■ 719 O	■ 367 O	■ 1224 R	■ 472 R

HM



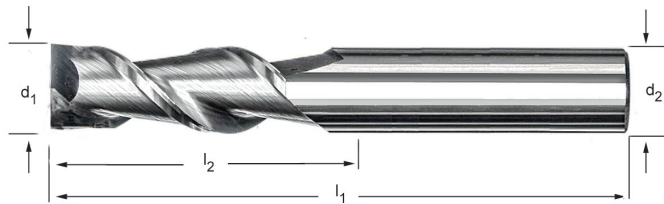
Double gullet flute design allows for fast, efficient evacuation of chips in soft and non-ferrous materials

S206	N1.1	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	N4.2
	■ 2326 P	■ 1749 P	■ 1171 P	■ 1171 O	■ 1050 O	■ 751 O	■ 1224 O	■ 719 O	■ 367 O	■ 1224 R	■ 472 R

HM



Zirconium coating increases surface hardness, improves chip evacuation and tool life allowing for higher removal rates in soft and non-ferrous materials



S106	S206
1/4 - 1	1/4 - 1
S106	S206

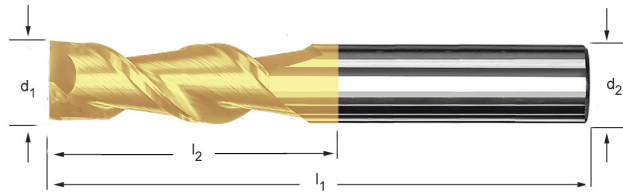
$d_1$ Ø Inch	$d_1$ decimal Inch	$d_2$ Ø Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	S106	S206
1/4	0.2500	1/4	1	2-1/2	2	1	7648490	7648497
5/16	0.3125	5/16	1	3	2	1	7648491	7648498
3/8	0.3750	3/8	1	2-1/2	2	1	7648492	7648499
1/2	0.5000	1/2	1-1/4	3	2	1	7648493	7648500
5/8	0.6250	5/8	1-5/8	3-1/2	2	1	7648494	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

## Regular Length, Square End, 37° Helix

S207	N1.1	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	N4.2	N4.3
	■ 2093 P	■ 1575 P	■ 1056 P	■ 1056 O	■ 945 O	■ 676 O	■ 1102 O	■ 646 O	■ 331 O	■ 1102 R	■ 427 R	■ 456 R



Unique flute design along with the Zirconium coating allow for faster speeds and feeds in soft and non-ferrous materials



1/8 - 1"

$d_1$ ∅ Inch	$d_1$ decimal Inch	$d_2$ ∅ 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

# Solid Carbide 2-Flute End Mill

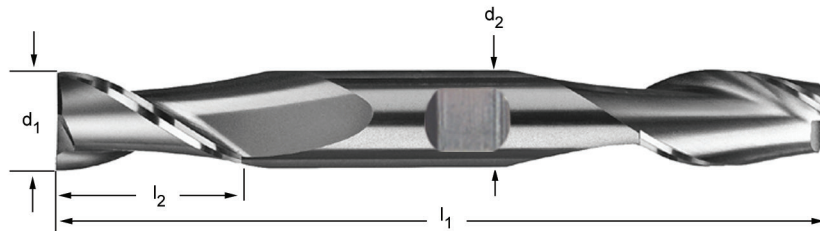


## Regular Length, Square End, Double End, 30° Helix

S116	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3
	■276 K	■308 K	■322 K	■236 K	■207 K	■184 J	■220 K	■177 J	■151 J	■131 J	■112 J	▽92 J	■256 K	■217 K	■230 K	■187 J	▽154 J	■154 J	■131 J	■118 J
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1
	■102 J	▽85 J	■348 K	▽256 K	▽194 K	■364 K	■295 K	▽236 J	■325 K	■246 K	▽197 J	■299 J	■226 J	▽164 J	▽141 J	▽118 J	■338 J	■253 J	▽197 J	▽1394 K
	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3												
	▽1047 K	▽699 K	▽932 K	▽837 K	▽604 K	■784 K	■463 K	■233 K												



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	S116
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

## Regular Length, Square End, 30° Helix

S108	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3	
	■ 295 K	■ 331 K	■ 344 K	■ 253 K	■ 223 K	■ 197 J	■ 236 K	■ 190 J	■ 161 J	■ 141 J	■ 121 J	■ 98 J	■ 276 K	■ 233 K	■ 246 K	■ 200 J	■ 167 J	■ 164 J	■ 141 J	■ 128 J	
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1	
	■ 108 J	■ 92 J	■ 374 K	■ 276 K	■ 207 K	■ 390 K	■ 318 K	■ 253 J	■ 348 K	■ 266 K	■ 213 J	■ 322 J	■ 243 J	■ 177 J	■ 151 J	■ 128 J	■ 364 J	■ 272 J	■ 210 J	■ 1499 K	
	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3													
	■ 1125 K	■ 751 K	■ 1001 K	■ 899 K	■ 650 K	■ 843 K	■ 499 K	■ 249 K													

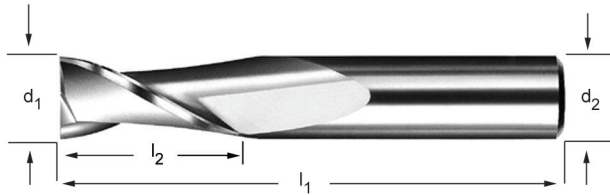


Bright finish improves chip flow in soft and non-ferrous materials.

S208	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3	
	■ 397 K	■ 443 K	■ 459 K	■ 338 K	■ 299 K	■ 262 J	■ 338 K	■ 272 J	■ 230 J	■ 203 J	■ 171 J	■ 141 J	■ 446 K	■ 377 K	■ 397 K	■ 325 J	■ 272 J	■ 259 J	■ 223 J	■ 200 J	
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	S1.1	
	■ 174 J	■ 151 J	■ 551 K	■ 407 K	■ 305 K	■ 646 K	■ 525 K	■ 417 J	■ 571 K	■ 436 K	■ 354 J	■ 528 J	■ 400 J	■ 292 J	■ 249 J	■ 210 J	■ 600 J	■ 449 J	■ 348 J	■ 230 J	
	S1.2	S1.3	S2.1	S2.2	S3.1	S3.2	S4.1	S4.2													
	■ 200 J	■ 190 J	■ 213 J	■ 138 J	■ 161 J	■ 98 J	■ 125 J	■ 79 J													



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	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	—

# Solid Carbide 2-Flute End Mill

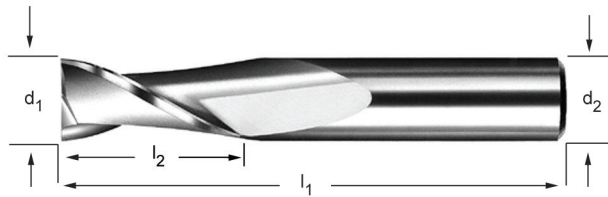


## Regular Length, Square End, 30° Helix, Metric

S109	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3
	■ 295 K	■ 331 K	■ 344 K	■ 253 K	■ 223 K	■ 197 J	■ 236 K	■ 190 J	■ 161 J	■ 141 J	■ 121 J	■ 98 J	■ 276 K	■ 233 K	■ 246 K	■ 200 J	■ 167 J	■ 164 J	■ 141 J	■ 128 J
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1
	■ 108 J	■ 92 J	■ 374 K	■ 276 K	■ 207 K	■ 390 K	■ 318 K	■ 253 J	■ 348 K	■ 266 K	■ 213 J	■ 322 J	■ 243 J	■ 177 J	■ 151 J	■ 128 J	■ 364 J	■ 272 J	■ 210 J	■ 1499 K
	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3												
	■ 1125 K	■ 751 K	■ 1001 K	■ 899 K	■ 650 K	■ 843 K	■ 499 K	■ 249 K												



Bright finish improves chip flow in soft and non-ferrous materials.



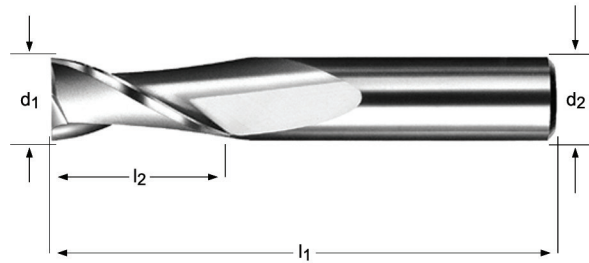
d <sub>1</sub> Ø Inch	d <sub>1</sub> decimal Inch	d <sub>2</sub> Ø Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	# of Flutes	Pack Qty	S109
2.00	0.0787	3.0	6.0	38.0	2	1	7648558
2.50	0.0984	3.0	7.0	38.0	2	1	7648559
3.00	0.1181	3.0	12.0	38.0	2	1	7648560
4.00	0.1575	4.0	14.0	50.0	2	1	7648561
4.50	0.1772	5.0	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

## Long Length, Square End, 30° Helix

S110	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3
	■ 276 K	■ 308 K	■ 322 K	■ 236 K	■ 207 K	■ 184 J	■ 220 K	■ 177 J	■ 151 J	■ 131 J	■ 112 J	▣ 92 J	■ 256 K	■ 217 K	■ 230 K	■ 187 J	▣ 154 J	■ 154 J	■ 131 J	■ 118 J
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1
	■ 102 J	▣ 85 J	■ 348 K	▣ 256 K	▣ 194 K	■ 364 K	■ 295 K	▣ 236 J	■ 325 K	■ 246 K	▣ 197 J	■ 299 J	■ 226 J	▣ 164 J	▣ 141 J	▣ 118 J	■ 338 J	■ 253 J	▣ 197 J	▣ 1394 K
	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3												
	▣ 1047 K	▣ 699 K	▣ 932 K	▣ 837 K	▣ 604 K	■ 784 K	■ 463 K	■ 233 K												



Bright finish improves chip flow in soft and non-ferrous materials.



$d_1$ ∅ Inch	$d_1$ decimal Inch	$d_2$ ∅ 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



# Solid Carbide 2-Flute End Mill



## Extra Long Length, Square End, 30° Helix

S111	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3
	266 K	299 K	308 K	226 K	200 K	177 J	213 K	171 J	144 J	128 J	108 J	89 J	246 K	210 K	220 K	180 J	151 J	125 J	108 J	98 J
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1
	98 J	85 J	299 K	220 K	167 K	305 K	249 K	200 J	272 K	207 K	167 J	253 J	190 J	138 J	118 J	98 J	285 J	213 J	164 J	1348 K
	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3												
	1010 K	676 K	899 K	807 K	584 K	761 K	449 K	226 K												

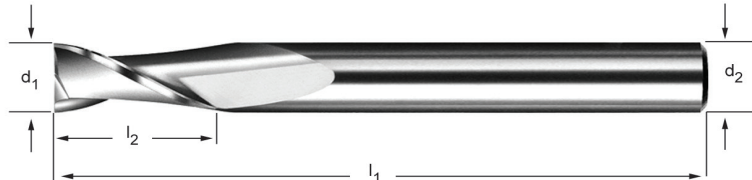


Bright finish improves chip flow in soft and non-ferrous materials.

S211	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3
	358 K	400 K	413 K	305 K	269 K	240 J	295 K	236 J	200 J	177 J	148 J	121 J	410 K	348 K	364 K	299 J	249 J	210 J	180 J	164 J
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	S1.1
	171 J	148 J	499 K	371 K	276 K	492 K	400 K	318 J	436 K	331 K	269 J	404 J	305 J	223 J	190 J	161 J	456 J	344 J	266 J	200 J
	S1.2	S1.3	S2.1	S2.2	S3.1	S3.2	S4.1	S4.2												
	180 J	174 J	187 J	121 J	141 J	85 J	112 J	69 J												



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	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

## Regular Length, Ball Nose, 30° Helix

S112	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3	
	■ 295 F	■ 331 F	■ 344 F	■ 253 F	■ 223 F	■ 197 F	■ 236 F	■ 190 F	■ 161 F	■ 141 F	■ 121 F	▣ 98 F	■ 276 F	■ 233 F	■ 246 F	■ 200 F	■ 167 F	■ 164 F	■ 141 F	■ 128 E	
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1	
	■ 108 E	■ 92 E	■ 374 F	▣ 276 F	▣ 207 F	■ 390 F	■ 318 F	▣ 253 F	■ 348 F	■ 266 F	▣ 213 F	■ 322 F	■ 243 F	▣ 177 F	▣ 151 E	▣ 128 E	■ 364 F	■ 272 F	▣ 210 F	▣ 1499 G	
	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3													
	▣ 1125 G	▣ 751 G	▣ 1001 F	▣ 899 F	▣ 650 F	▣ 843 F	▣ 499 F	▣ 249 F													

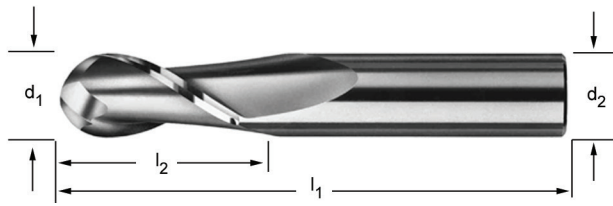


Ball nose for cutting internal part radius. Bright finish improves chip flow in soft or non-ferrous materials.

S212	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3	
	■ 397 F	■ 443 F	■ 459 F	■ 338 F	■ 299 F	■ 262 F	■ 338 F	■ 272 F	■ 230 F	■ 203 F	■ 171 F	■ 141 F	■ 446 F	■ 377 F	■ 397 F	■ 325 F	■ 272 F	■ 259 F	■ 223 F	■ 200 E	
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	S1.1	
	■ 174 E	■ 151 E	■ 551 F	▣ 407 F	▣ 305 F	■ 646 F	■ 525 F	▣ 417 F	■ 571 F	■ 436 F	▣ 354 F	■ 528 F	■ 400 F	▣ 292 F	▣ 249 E	▣ 210 E	■ 600 F	■ 449 F	▣ 348 F	■ 230 F	
	S1.2	S1.3	S2.1	S2.2	S3.1	S3.2	S4.1	S4.2													
	▣ 200 F	▣ 190 E	▣ 213 L	▣ 138 E	▣ 161 E	▣ 98 E	▣ 125 E	▣ 79 E													



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> ∅ Inch	d <sub>1</sub> decimal Inch	d <sub>2</sub> ∅ Inch	l <sub>2</sub> Inch	l <sub>1</sub> 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

# Solid Carbide 2-Flute End Mill



## Regular Length, Ball Nose, 30° Helix

S113	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3	
	■ 295 F	■ 331 F	■ 344 F	■ 253 F	■ 223 F	■ 197 F	■ 236 F	■ 190 F	■ 161 F	■ 141 F	■ 121 F	■ 98 F	■ 276 F	■ 233 F	■ 246 F	■ 200 F	■ 167 F	■ 164 F	■ 141 F	■ 128 E	
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1	
	■ 108 E	■ 92 E	■ 374 F	■ 276 F	■ 207 F	■ 390 F	■ 318 F	■ 253 F	■ 348 F	■ 266 F	■ 213 F	■ 322 F	■ 243 F	■ 177 F	■ 151 E	■ 128 E	■ 364 F	■ 272 F	■ 210 F	■ 1499 G	
	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3													
	■ 1125 G	■ 751 G	■ 1001 F	■ 899 F	■ 650 F	■ 843 F	■ 499 F	■ 249 F													

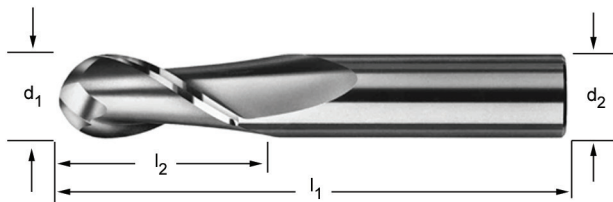


Ball nose for cutting internal part radius. Bright finish improves chip flow in soft or non-ferrous materials.

S213	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3	
	■ 397 F	■ 443 F	■ 459 F	■ 338 F	■ 299 F	■ 262 F	■ 338 F	■ 272 F	■ 230 F	■ 203 F	■ 171 F	■ 141 F	■ 446 F	■ 377 F	■ 397 F	■ 325 F	■ 272 F	■ 259 F	■ 223 F	■ 200 E	
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	S1.1	
	■ 174 E	■ 151 E	■ 551 H	■ 407 F	■ 305 F	■ 646 F	■ 525 F	■ 417 F	■ 571 F	■ 436 F	■ 354 F	■ 528 F	■ 400 F	■ 292 F	■ 249 E	■ 210 E	■ 600 F	■ 449 F	■ 348 F	■ 230 F	
	S1.2	S1.3	S2.1	S2.2	S3.1	S3.2	S4.1	S4.2													
	■ 200 F	■ 190 E	■ 213 E	■ 138 E	■ 161 E	■ 98 E	■ 125 E	■ 79 E													



Ball nose for cutting internal part radius. ALTiN coating increases surface hardness, improves chip flow and tool life, allowing higher metal removal rates.



S113	S213
2.00 - 20.00	3.00 - 12.00

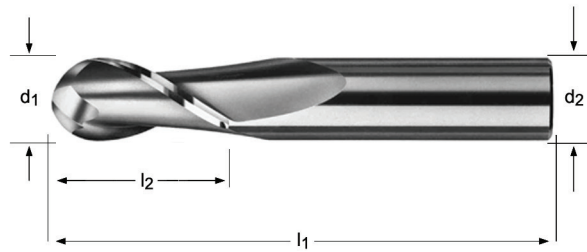
$d_1$ Ø Inch	$d_1$ decimal Inch	$d_2$ Ø Inch	$l_2$ Inch	$l_1$ Inch	# of Flutes	Pack Qty	S113	S213
2.00	0.0787	3.0	6.0	38.0	2	1	7648609	—
2.50	0.0984	3.0	6.0	38.0	2	1	7648610	—
3.00	0.1181	3.0	12.0	38.0	2	1	7648611	7648622
4.00	0.1575	4.0	14.0	50.0	2	1	7648612	7648623
5.00	0.1969	5.0	16.0	50.0	2	1	7648613	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	—

## Long Length, Ball Nose, 30° Helix

S114	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3	
	■ 276 F	■ 308 F	■ 322 F	■ 236 F	■ 207 F	■ 184 F	■ 220 F	■ 177 F	■ 151 F	■ 131 F	■ 112 F	▧ 92 F	■ 256 F	■ 217 F	■ 230 F	■ 187 F	▧ 154 F	■ 154 F	■ 131 F	■ 118 E	
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1	
	■ 102 E	▧ 85 E	■ 348 F	▧ 256 F	▧ 194 F	■ 364 F	■ 295 F	▧ 236 F	■ 325 F	■ 246 F	▧ 197 F	■ 299 F	■ 226 F	▧ 164 F	▧ 141 E	▧ 118 E	■ 338 F	■ 253 F	▧ 197 F	▧ 1394 G	
	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3													
	▧ 1047 G	▧ 699 G	▧ 932 F	▧ 837 F	▧ 604 F	■ 784 F	■ 463 F	■ 233 F													



Ball nose for cutting internal part radius. Bright finish improves chip flow in soft or non-ferrous materials.



$d_1$ ∅ Inch	$d_1$ decimal Inch	$d_2$ ∅ 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

# Solid Carbide 2-Flute End Mill



## Extra Long Length, Ball Nose, 30° Helix

S115	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3
	266 F	299 F	308 F	226 F	200 F	177 F	213 F	171 F	144 F	128 F	108 F	89 F	246 F	210 F	220 F	180 F	151 F	125 F	108 F	98 E
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1
	98 E	85 E	299 F	220 F	167 F	305 F	249 F	200 F	272 F	207 F	167 F	253 F	190 F	138 F	118 E	98 E	285 F	213 F	164 F	1348 G
	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3												
	1010 G	676 G	899 F	807 F	584 F	761 F	449 F	226 F												

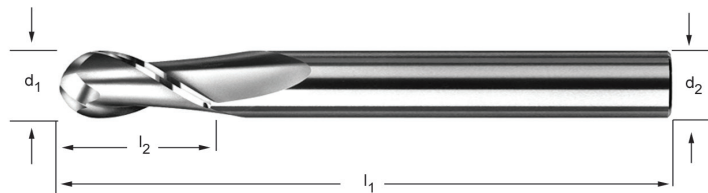


Ball nose for cutting internal part radius. Bright finish improves chip flow in soft or non-ferrous materials.

S215	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3
	358 F	400 F	413 F	305 F	269 F	240 F	295 F	236 F	200 F	177 F	148 F	121 F	410 F	348 F	364 F	299 F	249 F	210 F	180 F	164 E
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	S1.1
	171 E	148 E	499 F	371 F	276 F	492 F	400 F	318 F	436 F	331 F	269 F	404 F	305 F	223 F	190 E	161 E	456 F	344 F	266 F	200 F
	S1.2	S1.3	S2.1	S2.2	S3.1	S3.2	S4.1	S4.2												
	180 F	174 E	187 E	121 E	141 E	85 E	112 E	69 E												



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	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

## Regular Length, Square End, 30° Helix

S121	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M3.1	M3.2	M3.3	M4.1	
	■ 295 J	■ 331 J	■ 344 J	■ 253 J	■ 223 J	■ 197 J	■ 236 J	■ 190 J	■ 161 J	■ 141 J	■ 121 J	▧ 98 J	■ 276 J	■ 233 J	■ 246 J	■ 200 J	■ 164 J	■ 141 J	■ 128 J	■ 108 J	
	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1	N1.2	N1.3	
	■ 374 J	▧ 276 J	▧ 207 J	■ 390 J	■ 318 J	▧ 253 J	■ 348 J	■ 266 J	▧ 213 J	■ 322 J	■ 243 J	▧ 177 J	▧ 151 J	▧ 128 J	■ 364 J	■ 272 J	▧ 210 J	▧ 1499 K	▧ 1125 K	▧ 751 K	
	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3															
	▧ 1001 J	▧ 899 J	▧ 650 J	■ 843 J	■ 499 J																

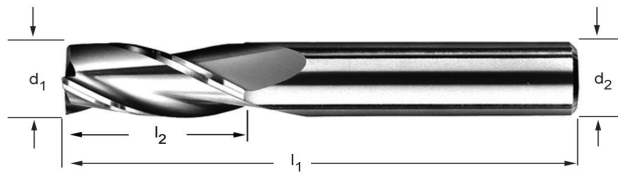


3-flute design for less chatter. Bright finish improves chip flow in soft or non-ferrous materials.

S221	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M3.1	M3.2	M3.3	M4.1	
	■ 397 J	■ 443 J	■ 459 J	■ 338 J	■ 299 J	■ 262 J	■ 338 J	■ 272 J	■ 230 J	■ 203 J	■ 171 J	■ 141 J	■ 446 J	■ 377 J	■ 397 J	■ 325 J	■ 259 J	■ 223 J	■ 200 J	■ 174 J	
	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	S1.1	S1.2	S1.3	
	■ 551 J	▧ 407 J	▧ 305 J	■ 646 J	■ 525 J	▧ 417 J	■ 571 J	■ 436 J	▧ 354 J	■ 528 J	■ 400 J	▧ 292 J	▧ 249 J	▧ 210 J	■ 600 J	■ 449 J	▧ 348 J	■ 230 J	▧ 200 J	▧ 190 J	
	S2.1	S2.2	S3.1	S3.2	S4.1	S4.2															
	▧ 213 J	▧ 138 J	▧ 161 J	▧ 98 J	▧ 125 J	▧ 79 J															



3-flute design for less chatter. AlTiN coating increases surface hardness, improves chip flow and tool life allowing higher metal removal rates.



d <sub>1</sub> ∅ Inch	d <sub>1</sub> decimal Inch	d <sub>2</sub> ∅ Inch	l <sub>2</sub> Inch	l <sub>1</sub> 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

# Solid Carbide 4-Flute End Mill

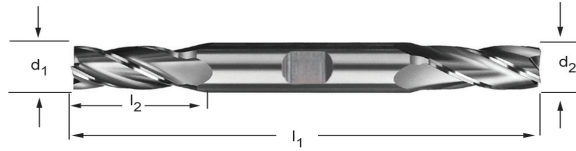


## Square End, Double End, 30° Helix

S129	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3
	■ 276 J	■ 308 J	■ 322 J	■ 236 J	■ 207 J	■ 184 J	■ 220 J	■ 177 J	■ 151 J	■ 131 J	■ 112 J	▣ 92 J	■ 256 J	■ 217 J	■ 230 J	■ 187 J	■ 154 J	■ 154 J	■ 131 J	■ 118 J
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1
	■ 102 J	■ 85 J	■ 348 J	▣ 256 J	▣ 194 J	■ 364 J	■ 295 J	▣ 236 J	■ 325 J	■ 246 J	▣ 197 J	■ 299 J	■ 226 J	▣ 164 J	▣ 141 J	▣ 118 J	■ 338 J	■ 253 J	▣ 197 J	▣ 1394 J
	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3												
	▣ 1047 J	▣ 699 J	▣ 932 J	▣ 837 J	▣ 604 J	■ 784 J	■ 463 J	■ 233 J												



**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



## Regular Length, Square End, 30° Helix

S134	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3
	■ 295 J	■ 331 J	■ 344 J	■ 253 J	■ 223 J	■ 197 J	■ 236 J	■ 190 J	■ 161 J	■ 141 J	■ 121 J	▧ 98 J	■ 276 J	■ 233 J	■ 246 J	■ 200 J	■ 167 J	■ 164 J	■ 141 J	■ 128 J
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1
	■ 108 J	■ 92 J	■ 374 J	▧ 276 J	▧ 207 J	■ 390 J	■ 318 J	▧ 253 J	■ 348 J	■ 266 J	▧ 213 J	■ 322 J	■ 243 J	▧ 177 J	▧ 151 J	▧ 128 J	■ 364 J	■ 272 J	▧ 210 J	▧ 1499 J
	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3												
	▧ 1125 J	▧ 751 J	▧ 1001 J	▧ 899 J	▧ 650 J	■ 843 J	■ 499 J	■ 249 J												

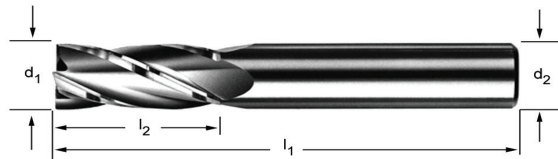


Bright finish improves chip flow in soft or non-ferrous materials.

S234	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3	
	■ 397 J	■ 443 J	■ 459 J	■ 338 J	■ 299 J	■ 262 J	■ 338 J	■ 272 J	■ 230 J	■ 203 J	■ 171 J	■ 141 J	■ 446 J	■ 377 J	■ 397 J	■ 325 J	■ 272 J	■ 259 J	■ 223 J	■ 200 J	
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	S1.1	
	■ 174 J	■ 151 J	■ 551 J	■ 407 J	■ 305 J	■ 646 J	■ 525 J	■ 417 J	■ 571 J	■ 436 J	■ 354 J	■ 528 J	■ 400 J	■ 292 J	■ 249 J	■ 210 J	■ 600 J	■ 449 J	■ 348 J	■ 230 J	
	S1.2	S1.3	S2.1	S2.2	S3.1	S3.2	S4.1	S4.2													
	▧ 200 J	▧ 190 J	▧ 213 J	▧ 138 J	▧ 161 J	▧ 98 J	▧ 125 J	▧ 79 J													



ALTiN coating increases surface hardness, improves chip flow and tool life allowing higher metal removal rates.



d <sub>1</sub> ∅ Inch	d <sub>1</sub> decimal Inch	d <sub>2</sub> ∅ Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	# of Flutes	Pack Qty	S134	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

# Solid Carbide 4-Flute End Mill



## Regular Length, Square End, 30° Helix

S135	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3
	295 J	331 J	344 J	253 J	223 J	197 J	236 J	190 J	161 J	141 J	121 J	98 J	276 J	233 J	246 J	200 J	167 J	164 J	141 J	128 J
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1
	108 J	92 J	374 J	276 J	207 J	390 J	318 J	253 J	348 J	266 J	213 J	322 J	243 J	177 J	151 J	128 J	364 J	272 J	210 J	1499 J
	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3												
	1125 J	751 J	1001 J	899 J	650 J	843 J	499 J	249 J												

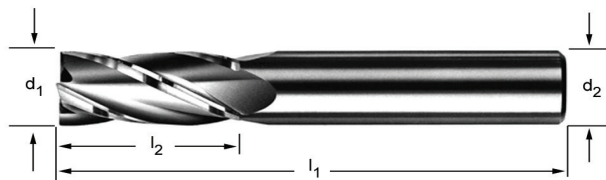


Bright finish improves chip flow in soft or non-ferrous materials.

S235	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3
	397 J	443 J	459 J	338 J	299 J	262 J	338 J	272 J	230 J	203 J	171 J	141 J	446 J	377 J	397 J	325 J	272 J	259 J	223 J	200 J
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	S1.1
	174 J	151 J	551 J	407 J	305 J	646 J	525 J	417 J	571 J	436 J	354 J	528 J	400 J	292 J	249 J	210 J	600 J	449 J	348 J	230 J
	S1.2	S1.3	S2.1	S2.2	S3.1	S3.2	S4.1	S4.2												
	200 J	190 J	213 J	138 J	161 J	98 J	125 J	79 J												



AlTiN coating increases surface hardness, improves chip flow and tool life allowing higher metal removal rates.



S135	S235
	
2.00 - 25.00	2.00 - 20.00

$d_1$ Inch	$d_1$ decimal Inch	$d_2$ Inch	$l_2$ Inch	$l_1$ Inch	# 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	—

## Long Length, Square End, 30° Helix

S136	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3
	■276J	■308J	■322J	■236J	■207J	■184J	■220J	■177J	■151J	■131J	■112J	▣92J	■256J	■217J	■230J	■187J	■154J	■154J	■131J	■118J
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1
	■102J	■85J	■348J	▣256J	▣194J	■364J	■295J	▣236J	■325J	■246J	▣197J	■299J	■226J	▣164J	▣141J	▣118J	■338J	■253J	▣197J	▣1394J
	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3												
	▣1047J	▣699J	▣932J	▣837J	▣604J	■784J	■463J	■233J												

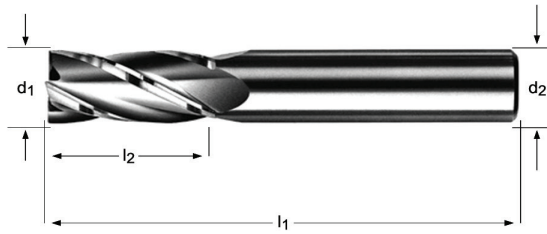


Bright finish improves chip flow in soft or non-ferrous materials.

S236	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3
	■371J	■413J	■427J	■315J	■279J	■243J	■315J	■253J	■213J	■190J	■157J	■131J	■413J	■351J	■371J	■302J	■253J	■240J	■207J	■187J
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	S1.1
	■161J	■141J	■512J	■377J	■282J	■600J	■489J	■387J	■531J	■407J	■328J	■492J	■371J	■272J	■233J	■197J	■558J	■417J	■325J	▣213J
	S1.2	S1.3	S2.1	S2.2	S3.1	S3.2	S4.1	S4.2												
	▣187J	▣177J	▣197J	▣128J	▣151J	▣92J	▣115J	▣72J												



AlTiN coating increases surface hardness, improves chip flow and tool life allowing higher metal removal rates.



d <sub>1</sub> ∅ Inch	d <sub>1</sub> decimal Inch	d <sub>2</sub> ∅ Inch	l <sub>2</sub> Inch	l <sub>1</sub> 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

# Solid Carbide 4-Flute End Mill



## Extra Long Length, Square End, 30° Helix

S137	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3	
	■ 266 J	■ 299 J	■ 308 J	■ 226 J	■ 200 J	■ 177 J	■ 213 J	■ 171 J	■ 144 J	■ 128 J	■ 108 J	■ 89 J	■ 246 J	■ 210 J	■ 220 J	■ 180 J	■ 151 J	■ 125 J	■ 108 J	■ 98 J	
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1	
	■ 98 J	■ 85 J	■ 299 J	■ 220 J	■ 167 J	■ 305 J	■ 249 J	■ 200 J	■ 272 J	■ 207 J	■ 167 J	■ 253 J	■ 190 J	■ 138 J	■ 118 J	■ 98 J	■ 285 J	■ 213 J	■ 164 J	■ 1348 J	
	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3													
■ 1010 J	■ 676 J	■ 899 J	■ 807 J	■ 584 J	■ 761 J	■ 449 J	■ 226 J														

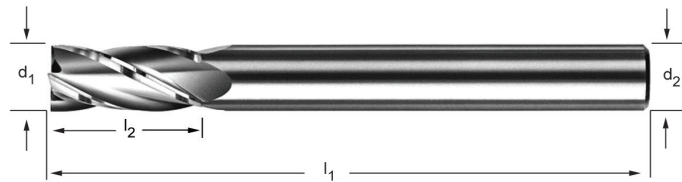


Bright finish improves chip flow in soft or non-ferrous materials.

S237	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3	
	■ 358 J	■ 400 J	■ 413 J	■ 305 J	■ 269 J	■ 240 J	■ 295 J	■ 236 J	■ 200 J	■ 177 J	■ 148 J	■ 121 J	■ 410 J	■ 348 J	■ 364 J	■ 299 J	■ 249 J	■ 125 J	■ 180 J	■ 164 J	
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	S1.1	
	■ 171 J	■ 148 J	■ 499 J	■ 371 J	■ 276 J	■ 492 J	■ 400 J	■ 318 J	■ 436 J	■ 331 J	■ 269 J	■ 404 J	■ 305 J	■ 223 J	■ 190 J	■ 161 J	■ 456 J	■ 344 J	■ 266 J	■ 200 J	
	S1.2	S1.3	S2.1	S2.2	S3.1	S3.2	S4.1	S4.2													
■ 180 J	■ 174 J	■ 187 J	■ 121 J	■ 141 J	■ 85 J	■ 112 J	■ 69 J														



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	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

## Regular Length, Ball Nose, 30° Helix

S138	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3
	■295 E	■331 E	■344 E	■253 E	■223 E	■197 E	■236 E	■190 E	■161 E	■141 E	■121 E	▣98 E	■276 E	■233 E	■246 E	■200 E	■167 E	■164 E	■141 E	■128 D
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1
	■108 D	■92 D	■374 E	▣276 E	▣207 E	■390 E	■318 E	▣253 E	■348 E	■266 E	▣213 E	■322 E	■243 E	▣177 E	▣151 D	▣128 D	■364 E	■272 E	▣210 E	▣1499 F
	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3												
	▣1125 F	▣751 F	▣1001 E	▣899 E	▣650 E	■843 E	■499 E	■249 E												

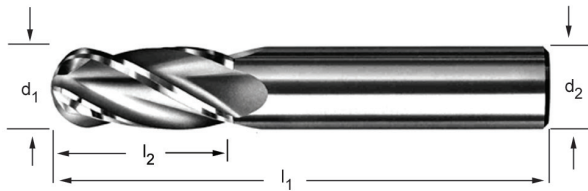


Ball nose for cutting internal part radius. Bright finish improves chip flow in soft or non-ferrous materials.

S238	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3
	■397 E	■443 E	■459 E	■338 E	■299 E	■262 E	■338 E	■272 E	■230 E	■203 E	■171 E	■141 E	■446 E	■377 E	■397 E	■325 E	■272 E	■259 E	■223 E	■200 D
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	S1.1
	■174 D	■151 D	■551 E	■407 E	■305 E	■646 E	■525 E	■417 E	■571 E	■436 E	■354 E	■528 E	■400 E	■292 E	■249 D	■210 D	■600 E	■449 E	■348 E	▣230 E
	S1.2	S1.3	S2.1	S2.2	S3.1	S3.2	S4.1	S4.2												
	▣200 E	▣190 D	▣213 D	▣138 D	▣161 D	▣98 D	▣125 D	▣79 D												



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> ∅ Inch	d <sub>1</sub> decimal Inch	d <sub>2</sub> ∅ Inch	l <sub>2</sub> Inch	l <sub>1</sub> 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

# Solid Carbide 4-Flute End Mill



## Regular Length, Ball Nose, 30° Helix

S139	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3	
	■ 295 E	■ 331 E	■ 344 E	■ 253 E	■ 223 E	■ 197 E	■ 236 E	■ 190 E	■ 161 E	■ 141 E	■ 121 E	▣ 98 E	■ 276 E	■ 233 E	■ 246 E	■ 200 E	■ 167 E	■ 164 E	■ 141 E	■ 128 D	
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1	
	■ 108 D	■ 92 D	■ 374 E	▣ 276 E	▣ 207 E	■ 390 E	■ 318 E	▣ 253 E	■ 348 E	■ 266 E	▣ 213 E	■ 322 E	■ 243 E	▣ 177 E	▣ 151 D	▣ 128 D	■ 364 E	■ 272 E	▣ 210 E	▣ 1499 F	
	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3													
▣ 1125 F	▣ 751 F	▣ 1001 E	▣ 899 E	▣ 650 E	■ 843 E	■ 499 E	■ 249 E														

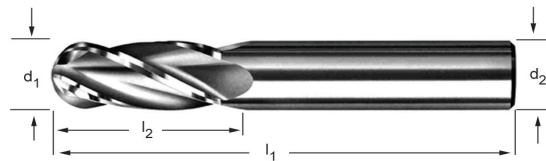


Ball nose for cutting internal part radius. Bright finish improves chip flow in soft or non-ferrous materials.

S239	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3	
	■ 397 E	■ 443 E	■ 459 E	■ 338 E	■ 299 E	■ 262 E	■ 338 E	■ 272 E	■ 230 E	■ 203 E	■ 171 E	■ 141 E	■ 446 E	■ 377 E	■ 397 E	■ 325 E	■ 272 E	■ 259 E	■ 223 E	■ 200 D	
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	S1.1	
	■ 174 D	■ 151 D	■ 551 E	■ 407 E	■ 305 E	■ 646 E	■ 525 E	■ 417 E	■ 571 E	■ 436 E	■ 354 E	■ 528 E	■ 400 E	■ 292 E	■ 249 D	■ 210 D	■ 600 E	■ 449 E	■ 348 E	■ 230 E	
	S1.2	S1.3	S2.1	S2.2	S3.1	S3.2	S4.1	S4.2													
▣ 200 E	▣ 190 D	▣ 213 D	▣ 138 D	▣ 161 D	▣ 98 D	▣ 125 D	▣ 79 D														



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	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

## Long Length, Ball Nose, 30° Helix

S146	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M3.1	M3.2	M3.3	M4.1	
	■ 276 E	■ 308 E	■ 322 E	■ 236 E	■ 207 E	■ 184 E	■ 220 E	■ 177 E	■ 151 E	■ 131 E	■ 112 E	▧ 92 E	■ 256 E	■ 217 E	■ 230 E	■ 187 E	■ 154 E	■ 131 E	■ 118 D	■ 102 D	
	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1	N1.2	N1.3	
	■ 348 E	▧ 256 E	▧ 194 E	■ 364 E	■ 295 E	▧ 236 E	■ 325 E	■ 246 E	▧ 197 E	■ 299 E	■ 226 E	▧ 164 E	▧ 141 D	▧ 118 D	■ 338 E	■ 253 E	▧ 197 E	▧ 1394 F	▧ 1047 F	▧ 699 F	
	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3															
	▧ 932 E	▧ 837 E	▧ 604 E	■ 784 E	■ 463 E	■ 233 E															

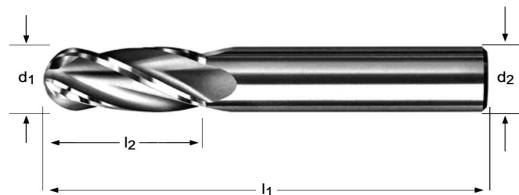


Ball nose for cutting internal part radius. Bright finish improves chip flow in soft or non-ferrous materials.

S246	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3	
	■ 371 E	■ 413 E	■ 427 E	■ 315 E	■ 279 E	■ 243 E	■ 315 E	■ 253 E	■ 213 E	■ 190 E	■ 157 E	■ 131 E	■ 413 E	■ 351 E	■ 371 E	■ 302 E	■ 253 E	■ 240 E	■ 207 E	■ 187 D	
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	S1.1	
	■ 161 D	■ 141 D	■ 512 E	■ 377 E	■ 282 E	■ 600 E	■ 489 E	■ 387 E	■ 531 E	■ 407 E	■ 328 E	■ 492 E	■ 371 E	■ 272 E	■ 233 D	■ 197 D	■ 558 E	■ 417 E	■ 325 E	▧ 213 E	
	S1.2	S1.3	S2.1	S2.2	S3.1	S3.2	S4.1	S4.2													
	▧ 187 E	▧ 177 D	▧ 197 D	▧ 128 D	▧ 151 D	▧ 92 D	▧ 115 D	▧ 72 D													



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> ∅ Inch	d <sub>1</sub> decimal Inch	d <sub>2</sub> ∅ Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	# of Flutes	Pack Qty	S146	S246
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



# Solid Carbide 4-Flute End Mill



## Extra Long Length, Ball Nose, 30° Helix

S147	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M3.1	M3.2	M3.3	M4.1
	276 E	308 E	322 E	236 E	207 E	184 E	220 E	177 E	151 E	131 E	112 E	92 E	256 E	217 E	230 E	187 E	154 E	131 E	118 D	102 D
	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1	N1.2	N1.3
	348 E	256 E	194 E	364 E	295 E	236 E	325 E	246 E	197 E	299 E	226 E	164 E	141 D	118 D	338 E	253 E	197 E	1394 F	1047 F	699 F
	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3														
	932 E	837 E	604 E	784 E	463 E	233 E														

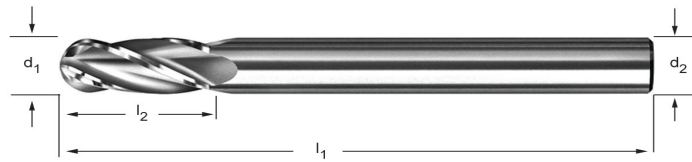


Ball nose for cutting internal part radius. Bright finish improves chip flow in soft or non-ferrous materials.

S247	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3
	358 E	400 E	413 E	305 E	269 E	240 E	295 E	236 E	200 E	177 E	148 E	121 E	410 E	348 E	364 E	299 E	249 E	210 E	180 E	164 D
	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	S1.1
	171 D	148 D	499 E	371 E	276 E	492 E	400 E	318 E	436 E	331 E	269 E	404 E	305 E	223 E	190 D	161 D	456 E	344 E	266 E	200 E
	S1.2	S1.3	S2.1	S2.2	S3.1	S3.2	S4.1	S4.2												
	180 E	174 D	187 D	121 D	141 D	85 D	112 D	69 D												



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> ∅ Inch	d <sub>1</sub> decimal Inch	d <sub>2</sub> ∅ 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

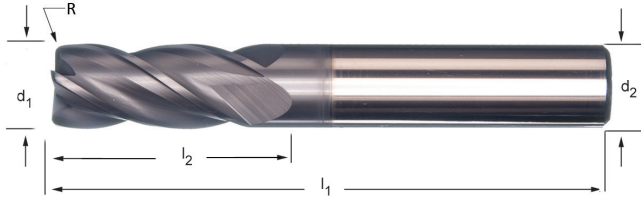
## Regular length, Corner Radius, Unequal Helix

	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3
S223HA	696 J	778 J	801 J	594 J	522 J	463 J	482 J	387 J	328 J	285 J	243 J	197 J	489 J	413 J	433 J	358 J	302 J	400 J	344 J	308 J
S223HB	302 J	256 J	771 J	571 J	430 J	794 J	646 J	515 J	702 J	538 J	433 J	650 J	492 J	361 J	308 J	256 J	735 J	554 J	430 J	522 J
	S1.2	S1.3	S2.1	S2.2	S3.1	S3.2	S4.1	S4.2	H1.1	H2.1	H2.2	H3.1	H3.2	H4.1	H4.2					
	463 J	387 J	358 J	315 J	269 J	223 J	210 J	180 J	348 J	207 G	177 E	230 G	187 G	148 E	125 B					



AlTiN coating increases hardness, and improves tool life 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.

# Solid Carbide 5-Flute End Mill

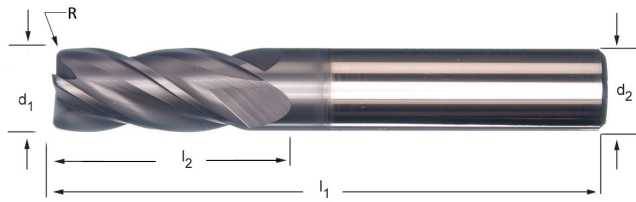


## Regular length, Corner Radius, Unequal Helix

	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3
S248HA	696 J	778 J	801 J	594 J	522 J	463 I	482 J	387 I	328 I	285 I	243 I	197 I	489 J	413 J	433 J	358 I	302 I	400 I	344 I	308 I
S248HB	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	S1.1
	302 I	256 I	456 J	338 J	253 J	469 J	381 J	305 I	417 J	318 J	256 I	384 I	292 I	213 I	184 I	151 I	436 I	328 I	253 I	1017 I
	S1.2	S1.3	S2.1	S2.2	S3.1	S3.2	S4.1	S4.2	H1.1	H2.1	H2.2	H3.1	H3.2	H4.1	H4.2					
	902 I	755 I	699 I	614 I	525 I	436 I	410 I	351 I	673 I	400 G	341 E	443 G	364 G	282 E	240 B					



ALTiN coating increases hardness, and improves tool life 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 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 *

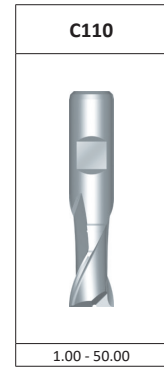
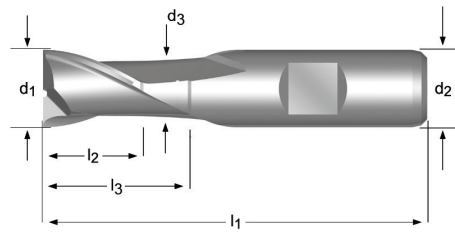
\* Will require a reduction of 30% - 60% in cutting speed.

## Stub Length, Square End, Weldon Shank, 30° Helix

C110	P1.1	P1.2	P1.3	P2.1	P2.2	P3.1	P3.2	P4.1	M1.1	M1.2	M2.1	M2.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2
	174 E	194 E	200 E	148 E	131 E	121 E	98 D	72 D	135 E	115 E	121 E	98 D	115 E	85 E	62 E	203 E	164 E	131 D	177 E	138 E
	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	S1.1
	112 D	164 D	125 D	92 D	79 C	66 C	187 D	141 D	108 D	312 G	233 F	157 F	157 E	141 E	102 E	164 E	95 E	49 E	164 E	115 D
	S1.2	S2.1	S3.1	S4.1																
	82 D	66 C	49 C	39 C																



Powdered Metal. P9 slotting tolerance.



$d_1$ Ø Inch	$d_1$ Ø mm	$d_2$ Ø <sub>h5</sub> mm	$l_2$ mm	$l_1$ mm	# of Flutes	$l_3$ mm	$d_3$ 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

<sup>1)</sup> Diameter tolerance h10

<sup>2)</sup> Slot not in P9 tolerance

<sup>3)</sup> Available in HSCo only

# HSS-PM 2-Flute End Mill



$d_1$ ∅ Inch	$d_1$ ∅ mm	$d_2$ ∅ $h_6$ mm	$l_2$ mm	$l_1$ mm	# of Flutes	$l_3$ mm	$d_3$ ∅ mm	Pack Qty	C110
	9.00	10	11	61	2	-	-	1	0353547
	9.50	10	11	61	2	-	-	1	0353554
3/8	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>
	10.00	10	13	63	2	22.5	9.5	1	0353196
13/32	10.32	12	13	70	2	-	-	1	0639863
	10.50	12	13	70	2	-	-	1	0353202
	11.00	12	13	70	2	-	-	1	0353219
7/16	11.11	12	13	70	2	-	-	1	0639870
	11.50	12	13	70	2	-	-	1	0573433
	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
1/2	12.70	12	16	73	2	27.5	11.5	1	0639887
	13.00	12	16	73	2	27.5	11.5	1	0353233
17/32	13.49	12	16	73	2	27.5	11.5	1	0639894
	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
9/16	14.29	12	16	73	2	27.5	11.5	1	0639900
	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>
5/8	15.88	16	19	79	2	30.5	15.5	1	0639917
	16.00	16	19	79	2	30.5	15.5	1	0353264
	17.00	16	19	79	2	30.5	15.5	1	0353271
11/16	17.46	16	19	79	2	30.5	15.5	1	0639924
	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
3/4	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
	21.70	20	22	88	2	37.5	19.5	1	0628966
	22.00	20	22	88	2	37.5	19.5	1	0353349
7/8	22.22	20	22	88	2	37.5	19.5	1	0639948
	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"	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
1.1/8	28.58	25	26	102	2	45.5	24.5	1	0639962
	30.00	25	26	102	2	45.5	24.5	1	0353400
1.1/4	31.75	32	32	112	2	51.5	31.5	1	0639979
	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>
	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

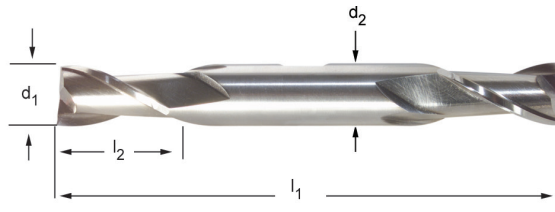
<sup>3)</sup> Available in HSCo only

## Regular Length, Square End, Weldon Shank, 30° Helix

C600	P1.1	P1.2	P1.3	P2.1	P2.2	K1.1	K1.2	K1.3	K2.1	K2.2	K3.1	K3.2	K4.1	K4.2	K5.1	K5.2	N1.1	N1.2	N1.3	N2.1	
	102 C	112 C	115 C	85 C	75 C	82 C	62 C	46 C	102 C	82 C	89 C	69 C	82 B	62 B	95 B	69 B	180 E	135 D	92 D	92 C	
	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	S1.1	S1.2	S2.1	S3.1	S4.1										
	82 C	59 C	95 C	56 C	30 C	95 C	59 B	49 B	26 A	20 A	16 A										



Double end provides two cutting ends in one tool. Bright finish improves chip flow in soft or non-ferrous materials.



$d_1$ ∅ Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ ∅ 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

# HSS 2-Flute End Mill

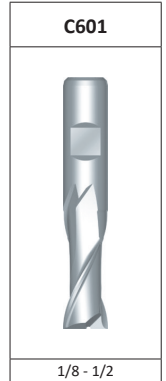
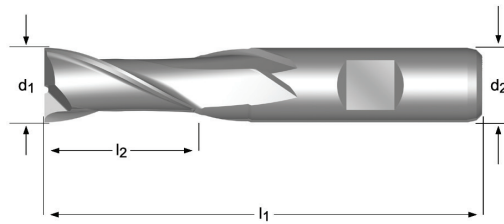


## Regular Length, Square End, Weldon Shank, 30° Helix

C601	P1.1	P1.2	P1.3	P2.1	P2.2	K1.1	K1.2	K1.3	K2.1	K2.2	K3.1	K3.2	K4.1	K4.2	K5.1	K5.2	N1.1	N1.2	N1.3	N2.1	
	102 D	112 D	115 D	85 D	75 D	82 D	62 D	46 D	102 D	82 D	89 D	69 D	82 C	62 C	95 C	69 C	180 F	135 E	92 E	92 D	
	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	S1.1	S1.2	S2.1	S3.1	S4.1										
	82 D	59 D	95 D	56 D	30 D	95 D	59 C	49 C	26 B	20 B	16 B										



Bright finish improves chip flow in soft or non-ferrous materials.



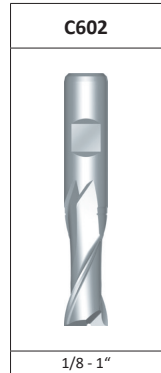
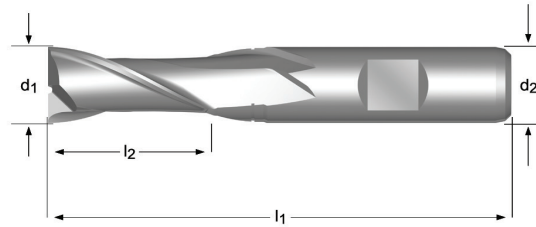
d <sub>1</sub> ∅ Inch	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	d <sub>2</sub> ∅ Inch	# of Flutes	Pack Qty	C601
1/8	0.1250	3/8	2.5/16	3/8	2	1	7647832
3/16	0.1875	7/16	2.3/8	3/8	2	1	7647833
1/4	0.2500	1/2	2.7/16	3/8	2	1	7647834
5/16	0.3125	9/16	2.1/2	3/8	2	1	7647835
3/8	0.3750	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

## Regular Length, Square End, Weldon Shank, 30° Helix

C602	P1.1	P1.2	P1.3	P2.1	P2.2	K1.1	K1.2	K1.3	K2.1	K2.2	K3.1	K3.2	K4.1	K4.2	K5.1	K5.2	N1.1	N1.2	N1.3	N2.1	
	102 D	112 D	115 D	85 D	75 D	82 D	62 D	46 D	102 D	82 D	89 D	69 D	82 C	62 C	95 C	69 C	180 F	135 E	92 E	92 D	
	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	S1.1	S1.2	S2.1	S3.1	S4.1										
	82 D	59 D	95 D	56 D	30 D	95 D	59 C	49 C	26 B	20 B	16 B										



Keyway cutter, close tolerance (+0.0000"/-0.0015"). 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	C602
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



# Cobalt 2-Flute End Mill

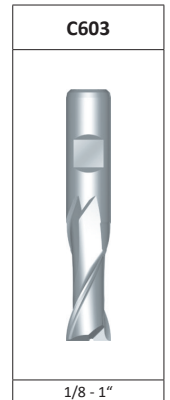
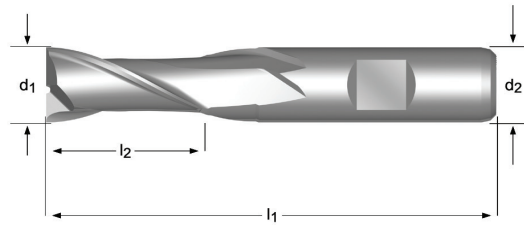


## Regular Length, Square End, Weldon Shank, 30° Helix

C603	P1.1	P1.2	P1.3	P2.1	P2.2	P3.1	P3.2	P4.1	M1.1	M1.2	M2.1	M2.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	
	151 D	171 D	177 D	131 D	115 D	105 D	85 C	62 C	105 D	89 D	92 D	75 C	92 D	69 D	52 D	161 D	131 D	105 C	144 D	108 D	
	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	S1.1	
	89 B	131 C	98 C	72 C	62 B	52 B	151 C	112 C	89 C	266 F	197 E	135 E	135 D	121 D	85 D	141 D	82 D	43 D	141 D	92 C	
	S1.2	S2.1	S3.1	S4.1																	
	75 C	56 B	43 B	33 B																	



Bright finish improves chip flow in soft or non-ferrous materials.



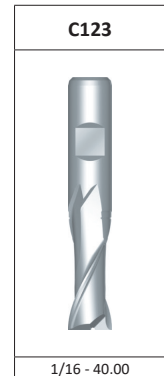
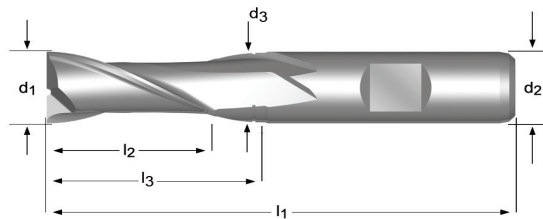
$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ Ø Inch	# of Flutes	Pack Qty	C603
1/8	0.1250	3/8	2.5/16	3/8	2	1	7647874
3/16	0.1875	7/16	2.3/8	3/8	2	1	7647875
1/4	0.2500	1/2	2.7/16	3/8	2	1	7647876
5/16	0.3125	9/16	2.1/2	3/8	2	1	7647877
3/8	0.3750	9/16	2.1/2	3/8	2	1	7647878
1/2	0.5000	1"	3.1/4	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

## Regular Length, Square End, Weldon Shank, 30° Helix

C123	P1.1	P1.2	P1.3	P2.1	P2.2	P3.1	P3.2	P4.1	M1.1	M1.2	M2.1	M2.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2
	174 D	194 D	200 D	148 D	131 D	121 D	98 C	72 C	112 D	95 D	102 D	82 C	98 D	72 D	56 D	180 D	148 D	118 C	161 D	121 D
	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	S1.1
	98 B	148 C	112 C	82 C	72 B	59 B	167 C	128 C	98 C	312 F	233 E	157 E	157 D	141 D	102 D	164 D	95 D	49 D	164 D	98 C
	S1.2	S2.1	S3.1	S4.1																
	82 C	66 B	49 B	39 B																



Powdered Metal. P9 slotting tolerance.



d <sub>1</sub> Ø Inch	d <sub>1</sub> Ø mm	l <sub>2</sub> mm	l <sub>1</sub> mm	l <sub>3</sub> mm	d <sub>3</sub> Ø mm	d <sub>2</sub> Ø <sub>h<sub>6</sub></sub> mm	# of Flutes	Pack Qty	C123
1/16	1.59	7	51	—	—	6	2	1	0640012 <sup>1)</sup>
	2.00	7	51	—	—	6	2	1	0353646
	2.50	8	52	—	—	6	2	1	0353653
	3.00	8	52	—	—	6	2	1	0353714
1/8	3.18	10	54	—	—	6	2	1	0640029 <sup>1)</sup>
	3.50	10	54	—	—	6	2	1	0353721
5/32	3.97	11	55	—	—	6	2	1	0640036 <sup>1)</sup>
	4.00	11	55	—	—	6	2	1	0353769
	4.50	11	55	—	—	6	2	1	0353776
3/16	4.76	13	57	—	—	6	2	1	0640043 <sup>1)</sup>
	5.00	13	57	—	—	6	2	1	0353790
	5.50	13	57	—	—	6	2	1	0353806
	6.00	13	57	—	—	6	2	1	0353813
1/4	6.35	16	66	—	—	10	2	1	0640050 <sup>1)</sup>
	6.50	16	66	—	—	10	2	1	0353820
	7.00	16	66	—	—	10	2	1	0353837
	7.50	16	66	—	—	10	2	1	0353844
5/16	7.94	19	69	—	—	10	2	1	0640067 <sup>1)</sup>
	8.00	19	69	—	—	10	2	1	0353851
	8.50	19	69	—	—	10	2	1	0353868
	9.00	19	69	—	—	10	2	1	0353875
	9.50	19	69	—	—	10	2	1	0353882
3/8	9.52	22	72	31.5	9.5	10	2	1	0640074 <sup>1)</sup>
	10.00	22	72	31.5	9.5	10	2	1	0353561
	11.00	22	79	—	—	12	2	1	0353578
	12.00	26	83	37.5	11.5	12	2	1	0353585
1/2	12.70	26	83	37.5	11.5	12	2	1	0640081 <sup>1)</sup>
	13.00	26	83	37.5	11.5	12	2	1	0353592
	14.00	26	83	37.5	11.5	12	2	1	0353608

<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-PM 2-Flute End Mill



$d_1$ ∅ Inch	$d_1$ ∅ mm	$l_2$ mm	$l_1$ mm	$l_3$ mm	$d_3$ ∅ mm	$d_2$ ∅ $h_6$ mm	# of Flutes	Pack Qty	C123
9/16	14.29	26	83	37.5	11.5	12	2	1	0640098 <sup>1)</sup>
	15.00	26	83	37.5	11.5	12	2	1	0353615
5/8	15.88	32	92	43.5	15.5	16	2	1	0640104 <sup>1)</sup>
	16.00	32	92	43.5	15.5	16	2	1	0353622
	18.00	32	92	43.5	15.5	16	2	1	0353639
3/4	19.05	38	104	53.5	18.5	20	2	1	0640111 <sup>2)</sup>
	20.00	38	104	53.5	19.5	20	2	1	0353660
	22.00	38	104	53.5	19.5	20	2	1	0353677
	25.00	45	121	64.5	24.5	25	2	1	0353691
1"	25.40	45	121	64.5	24.5	25	2	1	0640128
	30.00	45	121	64.5	24.5	25	2	1	0353738
	32.00	53	133	72.5	31.5	32	2	1	0353745
	36.00	53	133	72.5	31.5	32	2	1	0353752 <sup>3)</sup>
	40.00	63	155	84.5	39.0	40	2	1	0353783 <sup>3)</sup>

<sup>1)</sup> Diameter tolerance -.0005 inches / -.0013 inches

<sup>2)</sup> Diameter tolerance -.0005 inches / -.0015 inches

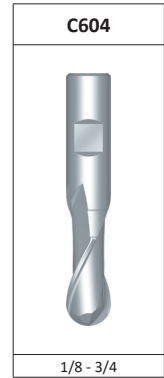
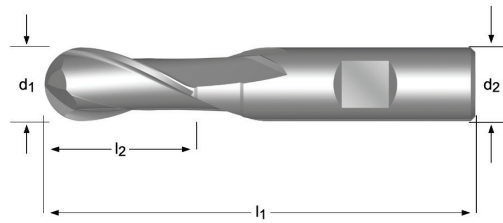
<sup>3)</sup> Available in HSCo only

## Regular Length, Ball Nose, Weldon Shank, 30° Helix

C604	P1.1	P1.2	P1.3	P2.1	P2.2	K1.1	K1.2	K1.3	K2.1	K2.2	K3.1	K3.2	K4.1	K4.2	K5.1	K5.2	N1.1	N1.2	N1.3	N2.1
	105 D	118 D	121 D	89 D	79 D	89 D	66 D	49 D	108 D	89 D	95 D	72 D	89 C	69 C	102 C	75 C	180 F	135 E	92 E	92 D
	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	S1.1	S1.2	S2.1	S3.1	S4.1									
	82 D	59 D	95 D	56 D	30 D	95 D	62 C	49 C	26 B	20 B	16 B									



Ball nose for cutting internal radius. Bright finish improves chip flow in soft or non-ferrous materials.



$d_1$ ∅ Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ ∅ 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

# HSS 2-Flute End Mill



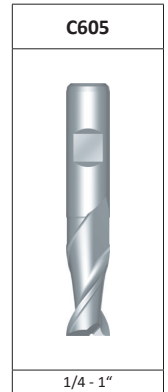
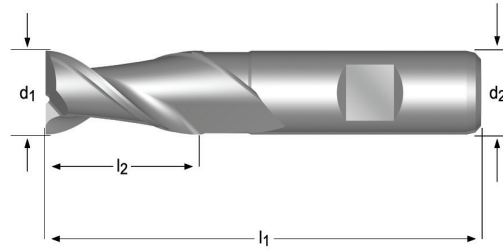
## Regular Length, Square End, Weldon Shank, 37° Helix

C605	P1.1	P1.2	P1.3	P2.1	P2.2	M1.1	M1.2	M2.1	M2.2	M3.1	M3.2	N1.1	N1.2	N1.3	N2.1	N2.2	N2.3	N3.3	N4.1	S1.1
	151 D	171 D	177 D	131 D	115 D	105 D	89 D	92 D	75 C	72 C	62 C	397 F	299 E	200 E	200 D	177 D	128 D	62 D	210 D	92 C

HSS



High Helix design for aluminum and other non-ferrous materials.



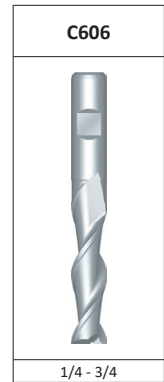
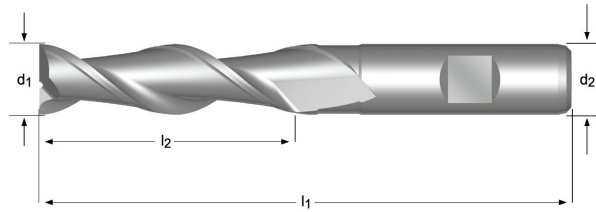
$d_1$ ∅ Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ ∅ Inch	# of Flutes	Pack Qty	C605
1/4	0.2500	5/8	2.7/16	3/8	2	1	7647893
5/16	0.3125	3/4	2.1/2	3/8	2	1	7647894
3/8	0.3750	3/4	2.1/2	3/8	2	1	7647895
1/2	0.5000	1.1/4	3.1/4	1/2	2	1	7647896
3/4	0.7500	1.5/8	3.7/8	3/4	2	1	7647897
1"	1.0000	2"	4.1/2	1"	2	1	7647898

## Long Length, Square End, Weldon Shank, 37° Helix

C606	P1.1	P1.2	P1.3	P2.1	P2.2	M1.1	M1.2	M2.1	M2.2	M3.1	M3.2	N1.1	N1.2	N1.3	N2.1	N2.2	N2.3	N3.3	N4.1	S1.1
	135 C	151 C	157 C	115 C	102 C	89 C	75 C	79 C	66 B	66 B	56 B	374 E	282 D	190 D	190 C	167 C	121 C	59 C	197 C	82 B



High Helix design for aluminum and other non-ferrous materials.



$d_1$ ∅ Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ ∅ 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

# HSS 3-Flute End Mill

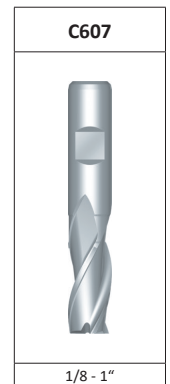
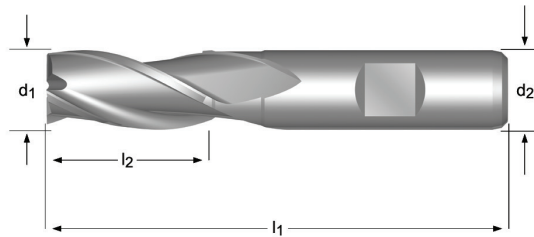


## Regular Length, Square End, Weldon Shank, 30° Helix

C607	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	M3.1	M3.2	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	
	151 D	171 D	177 D	131 D	115 D	102 C	95 D	79 C	66 C	59 C	49 C	72 C	62 C	115 D	85 D	161 D	131 D	105 C	144 D	108 D	
	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N2.1	N2.2	N2.3	N3.1	N3.2	N4.2	S1.1	S1.2	S1.3	S2.1	S2.2	
	89 B	131 C	98 C	72 C	62 B	52 B	151 C	112 C	89 C	135 D	121 D	85 D	141 D	82 D	52 D	92 C	75 C	33 B	56 B	26 B	
	S3.1	S3.2	S4.1	S4.2																	
	43 B	20 B	33 B	16 B																	



3-flute design for less chatter. Bright finish improves chip flow in soft or non-ferrous materials.



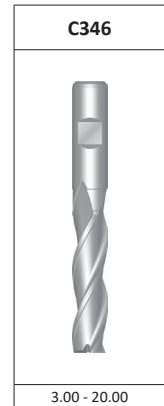
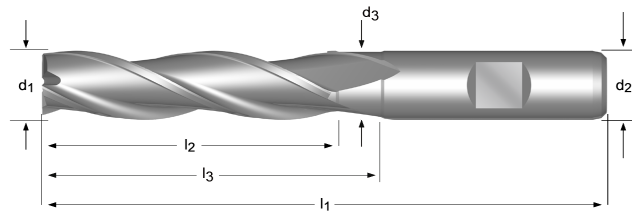
$d_1$ ∅ Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ ∅ Inch	# of Flutes	Pack Qty	C607
1/8	0.1250	3/8	2.5/16	3/8	3	1	7647904
3/16	0.1875	1/2	2.3/8	3/8	3	1	7647905
1/4	0.2500	5/8	2.7/16	3/8	3	1	7647906
5/16	0.3125	3/4	2.1/2	3/8	3	1	7647907
3/8	0.3750	3/4	2.1/2	3/8	3	1	7647908
7/16	0.4375	1"	2.11/16	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

## Long Length, Square End, Weldon Shank, 30° Helix

C346	P1.1	P1.2	P1.3	P2.1	P2.2	P3.1	P3.2	P4.1	M1.1	M1.2	M2.1	M2.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	
	131 C	148 C	151 C	112 C	198 C	92 C	72 B	52 B	89 C	75 C	79 C	66 B	82 C	62 C	46 C	141 C	115 C	92 B	125 C	95 C	
	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1	N1.2	N1.3	N3.1	N3.2	N3.3	N4.1	S1.1	S1.2	S2.1	S3.1	
	79 A	115 B	89 B	66 B	56 A	46 A	131 B	98 B	75 B	249 E	187 D	125 D	131 C	75 C	39 C	131 C	82 B	66 B	43 A	33 A	
	S4.1																				
	26 A																				



P9 slotting tolerance. 3 flute design provides less chatter.



$d_1$ Ø mm	$d_2$ Ø <sub>h6</sub> mm	$l_2$ mm	$l_1$ mm	# of Flutes	$l_3$ mm	$d_3$ 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
15.00	12	53	110	3	64.5	11.5	1	0126288
16.00	16	63	123	3	74.5	15.5	1	0126295
20.00	20	75	141	3	90.5	19.5	1	0126318



# Cobalt 4-Flute End Mill



## Regular Length, Square End, Roughing, Weldon Shank, 30° Helix

C608	P1.1	P1.2	P1.3	P2.1	P2.2	P3.1	P3.2	P4.1	M1.1	M1.2	M2.1	M2.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	
	151 F	171 F	177 F	131 F	115 F	105 F	85 E	62 E	105 F	89 F	92 F	75 E	92 F	69 F	52 F	161 F	131 F	105 E	144 F	108 F	
	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	S1.1	S1.2	S2.1	
	89 E	131 E	98 E	72 E	62 D	52 D	151 E	112 E	89 E	135 G	135 F	121 F	85 F	141 F	82 F	43 F	141 F	92 E	75 E	56 D	
	S3.1	S4.1																			
	543 D	33 D																			

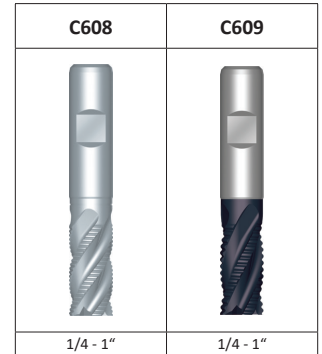
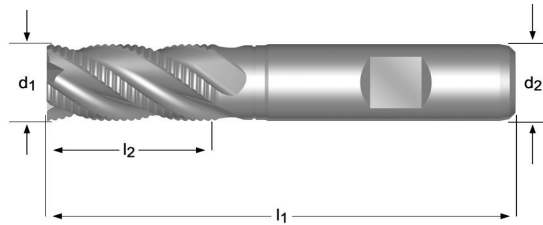


Roughing, Fine Profile, provides a stronger edge and runs longer than conventional coarse profile roughers. Bright finish.

C609	P1.1	P1.2	P1.3	P2.1	P2.2	P3.1	P3.2	P4.1	M1.1	M1.2	M2.1	M2.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	
	213 F	240 F	246 F	184 F	161 F	148 F	118 E	89 E	144 F	121 F	128 F	105 E	128 F	95 F	72 F	226 F	184 F	148 E	200 F	154 F	
	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	S1.1	S1.2	S2.1	
	125 E	184 E	141 E	102 E	89 D	72 D	210 E	157 E	121 E	161 G	161 F	144 F	105 F	167 F	98 F	49 F	167 F	128 E	105 E	79 D	
	S3.1	S4.1																			
	59 D	46 D																			



TiCN coating lowers the coefficient of friction and improves wear resistance on the end mill.



$d_1$ Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ 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

## Regular Length, Square End, Roughing, Weldon Shank, 30° Helix

C610	P1.1	P1.2	P1.3	P2.1	P2.2	P3.1	P3.2	P4.1	M1.1	M1.2	M2.1	M2.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	
	151 G	171 G	177 G	131 G	115 G	105 G	85 F	62 F	105 G	89 G	92 G	75 F	92 G	69 G	52 G	161 G	131 G	105 F	144 G	108 G	
	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	S1.1	S1.2	S2.1	
	89 F	131 F	98 F	72 F	62 E	52 E	151 F	112 F	89 F	135 H	135 G	121 G	85 G	141 G	82 G	43 G	141 G	92 F	75 F	56 E	
	S3.1	S4.1																			
	43 E	33 E																			

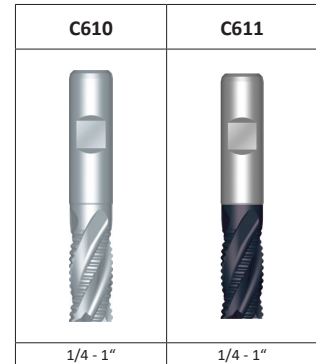
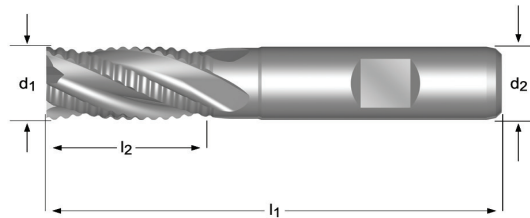


Roughing, Coarse Profile, for maximum metal removal in one pass. Bright finish.

C611	P1.1	P1.2	P1.3	P2.1	P2.2	P3.1	P3.2	P4.1	M1.1	M1.2	M2.1	M2.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	
	213 G	240 F	246 F	184 F	161 F	148 G	118 F	89 F	144 G	121 G	128 G	105 F	128 G	95 G	72 G	226 G	184 G	148 F	200 G	154 G	
	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	S1.1	S1.2	S2.1	
	125 F	184 F	141 F	102 F	89 E	72 E	210 F	157 F	121 F	161 H	161 G	144 G	105 G	167 G	98 G	49 G	167 G	128 F	105 F	79 E	
	S3.1	S4.1																			
	59 E	46 E																			



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

# Cobalt 4-Flute End Mill



## Long Length, Square End, Roughing, Weldon Shank, 30° Helix

C612	P1.1	P1.2	P1.3	P2.1	P2.2	P3.1	P3.2	P4.1	M1.1	M1.2	M2.1	M2.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	
	135 F	151 F	157 F	115 F	102 F	92 F	75 E	56 E	89 F	75 F	79 F	66 E	82 F	62 F	46 F	144 F	118 F	95 E	128 F	98 F	
	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	S1.1	S1.2	S2.1	
	79 E	118 E	89 E	66 E	56 D	46 D	135 E	102 E	79 E	125 G	125 F	112 F	82 F	131 F	75 F	39 F	131 F	82 E	66 E	49 D	
	S3.1	S4.1																			
	36 D	30 D																			

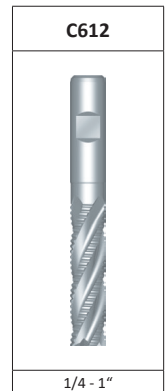
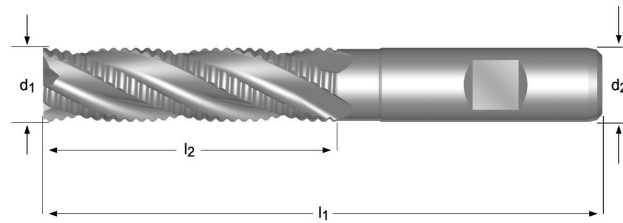
HSS-E



Z  
4-8



Roughing, Coarse Profile, for maximum metal removal in one pass. Bright finish.



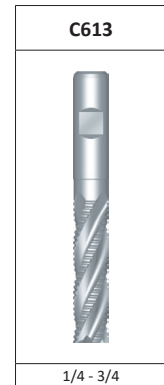
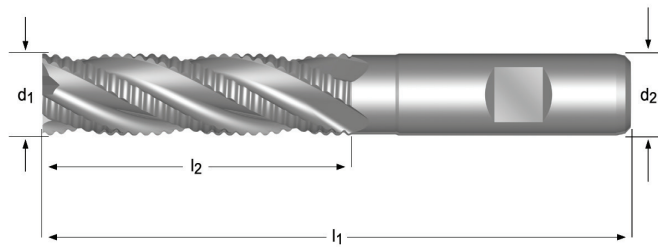
$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ Ø Inch	# of Flutes	Pack Qty	C612
1/4	0.2500	1.1/4	3.1/8	3/8	4	1	7647954
3/8	0.3750	1.1/2	3.1/4	3/8	4	1	7647955
1/2	0.5000	2"	4"	1/2	4	1	7647956
5/8	0.6250	2.1/2	4.5/8	5/8	4	1	7647957
3/4	0.7500	3"	5.1/4	3/4	4	1	7647958
7/8	0.8750	3.1/2	5.3/4	3/4	6	1	7647959
1"	1.0000	4"	6.1/2	1"	5	1	7647960

## Long Length, Square End, Roughing, Weldon Shank, 30° Helix

C613	P1.1	P1.2	P1.3	P2.1	P2.2	P3.1	P3.2	P4.1	M1.1	M1.2	M2.1	M2.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	
	135 E	151 E	157 E	115 E	102 E	92 E	75 D	56 D	89 E	75 E	79 E	66 D	82 E	62 E	46 E	144 E	118 E	95 D	128 E	98 E	
	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	S1.1	S1.2	S2.1	
	79 D	118 D	89 D	66 D	56 C	46 C	135 D	102 D	79 D	125 F	125 E	112 E	82 E	131 E	75 E	39 E	131 E	82 D	66 D	49 C	
	S3.1	S4.1																			
	36 C	30 C																			



Roughing, Fine Profile, provides a stronger edge and runs longer than conventional coarse profile roughers. Bright finish.



$d_1$ ∅ Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ ∅ 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

# HSS 4-Flute End Mill

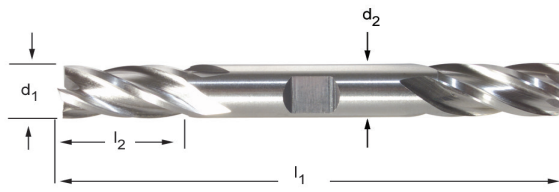


## Regular Length, Square End, Weldon Shank, 30° Helix

C614	P1.1	P1.2	P1.3	P2.1	P2.2	P3.1	P3.2	P4.1	M1.1	M1.2	M2.1	M2.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	
	105 C	118 C	121 C	89 C	79 C	72 C	59 B	43 B	72 C	62 C	66 C	52 B	92 C	69 C	52 C	112 C	92 C	72 B	98 C	75 C	
	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	S1.1	S1.2	S2.1	
	62 A	92 B	69 B	52 B	43 A	36 A	105 B	79 B	62 B	92 D	92 C	82 C	59 C	95 C	56 C	30 C	95 C	62 B	52 B	26 A	
	S3.1	S4.1																			
	20 A	16 A																			



Double end provides two cutting ends in one tool. Bright finish improves chip flow in soft or non-ferrous materials.



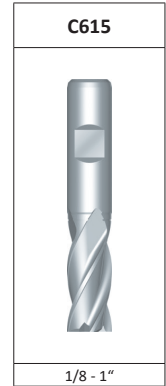
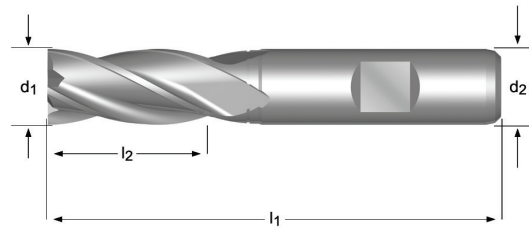
$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ Ø Inch	# of Flutes	Pack Qty	C614
1/8	0.1250	3/8	3.1/16	3/8	4	1	7647965
3/16	0.1875	1/2	3.1/4	3/8	4	1	7647966
1/4	0.2500	5/8	3.3/8	3/8	4	1	7647967
5/16	0.3125	3/4	3.1/2	3/8	4	1	7647968
3/8	0.3750	3/4	3.1/2	3/8	4	1	7647969
1/2	0.5000	1"	4.1/8	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

## Regular Length, Square End, Weldon Shank, 30° Helix

C615	P1.1	P1.2	P1.3	P2.1	P2.2	P3.1	P3.2	P4.1	M1.1	M1.2	M2.1	M2.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2
	151 D	171 D	177 D	131 D	115 D	105 D	85 C	62 C	105 D	89 D	92 D	75 C	92 D	69 D	52 D	161 D	131 D	105 C	144 D	108 D
	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	S1.1
	89 B	131 C	98 C	72 C	62 B	52 B	151 C	112 C	89 C	266 F	197 E	135 E	135 D	121 D	85 D	141 D	82 D	43 D	141 D	92 C
	S1.2	S2.1	S3.1	S4.1																
	75 C	56 B	43 B	33 B																



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	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

# HSS-PM Multi-Flute End Mill



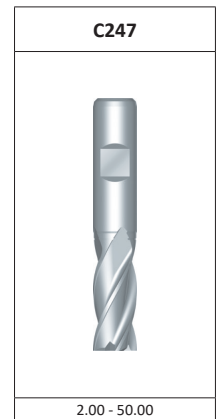
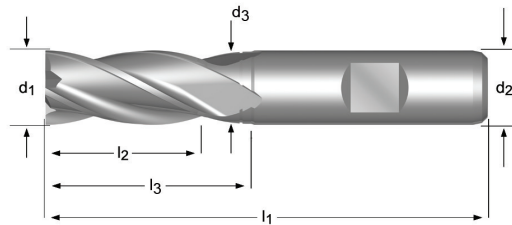
## Regular Length, Square End, Weldon Shank, 30° Helix

C247	P1.1	P1.2	P1.3	P2.1	P2.2	P3.1	P3.2	P4.1	M1.1	M1.2	M2.1	M2.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	
	174 D	194 D	200 D	148 D	131 D	118 D	95 C	72 C	112 D	95 D	102 D	82 C	98 D	72 D	56 D	180 D	148 D	118 C	161 D	121 D	
	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	S1.1	
	98 B	148 C	112 C	82 C	72 B	59 B	167 C	128 C	98 C	312 F	233 E	157 E	157 D	141 D	102 D	164 D	95 D	49 D	164 D	98 C	
	S1.2	S2.1	S3.1	S4.1																	
	82 C	66 B	49 B	39 B																	

HSS-E  
PM



Powdered Metal. Bright finish improves chip flow in soft or non-ferrous materials.



d <sub>1</sub> ∅ Inch	d <sub>1</sub> ∅ mm	d <sub>2</sub> ∅ <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> ∅ mm	Pack Qty	C247
	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

<sup>1)</sup> Diameter tolerance +.0025 inches / -.0005 inches

<sup>2)</sup> Not center Cutting

<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	C247
5/8	15.88	16	32	92	4	43.5	15.5	1	0640210 <sup>1)</sup>
	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



# HSS-PM Multi-Flute End Mill

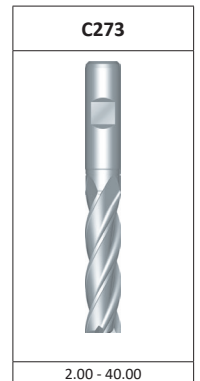
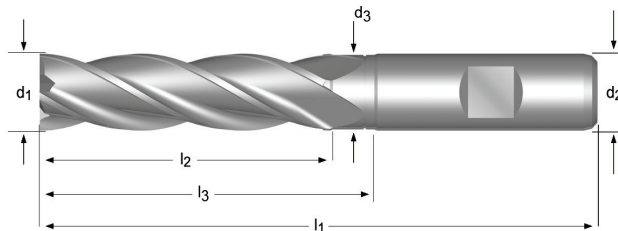


## Long Length, Square End, Weldon Shank

C273	P1.1	P1.2	P1.3	P2.1	P2.2	P3.1	P3.2	P4.1	M1.1	M1.2	M2.1	M2.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2
	151 C	171 C	177 C	131 C	115 C	105 C	85 B	62 B	46 C	39 C	39 C	33 B	82 C	62 C	46 C	161 C	131 C	105 B	144 C	108 C
	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	S1.1
	89 A	131 B	98 B	72 B	62 A	52 A	151 B	112 B	89 B	266 E	197 D	135 D	135 C	121 C	85 C	141 C	82 C	43 C	141 C	82 B
	S1.2	S2.1	S3.1	S4.1																
	66 B	43 A	33 A	26 A																



Powdered Metal. Bright finish improves chip flow in soft or non-ferrous materials.



$d_1$ Ø Inch	$d_1$ Ø mm	$d_2$ Ø <sub>h6</sub> mm	$d_3$ Ø mm	$l_2$ mm	$l_1$ mm	$l_3$ mm	# of Flutes	Pack Qty	C273
	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	9.5	45	95	54.5	4	1	0640296 <sup>1)</sup>
	10.00	10	9.5	45	95	54.5	4	1	0354889
	11.00	12	—	45	102	—	4	1	0354896
	12.00	12	11.5	53	110	64.5	4	1	0354902
1/2	12.70	12	11.5	53	110	64.5	4	1	0640302 <sup>1)</sup>
	13.00	12	11.5	53	110	64.5	4	1	0354919
	14.00	12	11.5	53	110	64.5	4	1	0354926
	15.00	12	11.5	53	110	64.5	4	1	0354933
5/8	15.88	16	15.5	63	123	74.5	4	1	0640319 <sup>1)</sup>
	16.00	16	15.5	63	123	74.5	4	1	0354940
	18.00	16	15.5	63	123	74.5	4	1	0354957
3/4	19.05	20	18.5	75	141	90.5	4	1	0640326 <sup>1)</sup>
	20.00	20	19.5	75	141	90.5	4	1	0354988
	22.00	20	19.5	75	141	90.5	5	1	0354995
	25.00	25	24.5	90	166	109.5	5	1	0355008
1"	25.40	25	24.5	90	166	109.5	5	1	0640340 <sup>1)</sup>
	28.00	25	24.5	90	166	109.5	6	1	0355015
	30.00	25	24.5	90	166	109.5	6	1	0355046
	32.00	32	31.5	106	186	125.5	6	1	0355053
	40.00	40	39.0	125	217	146.5	6	1	0609309 <sup>2)3)</sup>

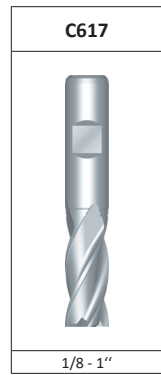
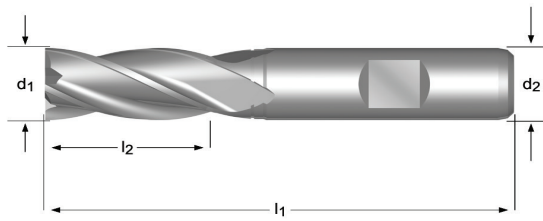
<sup>1)</sup> Diameter tolerance +.0025 inches / -.0005 inches • <sup>2)</sup> Available in HSCo only • <sup>3)</sup> Not Center Cutting

## Regular Length, Square End, Weldon Shank, 30° Helix

C617	P1.1	P1.2	P1.3	P2.1	P2.2	P3.1	P3.2	P4.1	M1.1	M1.2	M2.1	M2.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2
	105 D	118 D	121 D	89 D	79 D	72 D	59 C	43 C	72 D	62 D	66 D	52 C	92 D	69 D	52 D	112 D	92 D	72 C	98 D	75 D
	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	S1.1
	62 B	92 C	69 C	52 C	43 B	36 B	105 C	79 C	62 C	180 F	135 E	92 E	92 D	82 D	59 D	95 D	56 D	30 D	95 D	62 C
	S1.2	S2.1	S3.1	S4.1																
	52 C	26 B	20 B	16 B																



Multi-flute finishing. Bright finish improves chip flow in soft or non-ferrous materials.



d <sub>1</sub> ∅ Inch	d <sub>1</sub> decimal Inch	l <sub>2</sub> Inch	l <sub>1</sub> Inch	d <sub>2</sub> ∅ 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

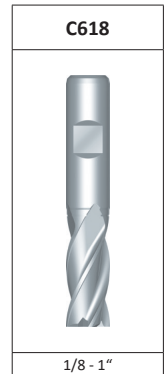
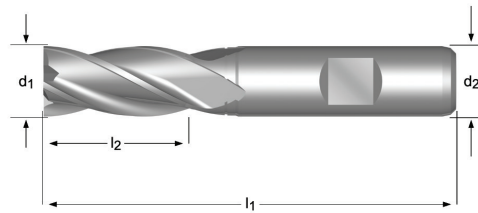


## Long Length, Square End, Weldon Shank

C618	P1.1	P1.2	P1.3	P2.1	P2.2	P3.1	P3.2	P4.1	M1.1	M1.2	M2.1	M2.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2
	151 D	171 D	177 D	131 D	115 D	105 D	85 C	62 C	105 D	89 D	92 D	75 C	92 D	69 D	52 D	161 D	131 D	105 C	144 D	108 D
	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2	K5.3	N1.1	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3	N4.1	S1.1
	89 B	131 C	98 C	72 C	62 B	52 B	151 C	112 C	89 C	266 F	197 E	135 E	135 D	121 D	85 D	141 D	82 D	43 D	141 D	92 C
	S1.2	S2.1	S3.1	S4.1																
	75 C	56 B	43 B	33 B																



Cobalt finishing style for high strength heat resistant materials, stainless and alloy steels, super alloys, and titanium alloys.



$d_1$ Ø Inch	$d_1$ decimal Inch	$l_2$ Inch	$l_1$ Inch	$d_2$ 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

# EDP Conversion Table

Previous Style	Previous Ecode	Previous EDP#	New Style	New Ecode	New EDP#
905	9051/8X3/8	5110390	C604	C6041/8	7647883
905	9053/16X3/8	5110391	C604	C6043/16	7647884
905	9051/4X3/8	5110392	C604	C6041/4	7647885
905	9055/16X3/8	5110393	C604	C6045/16	7647886
905	9053/8X3/8	5110394	C604	C6043/8	7647887
905	9057/16X1/2	5110395	C604	C6047/16	7647888
905	9051/2X1/2	5110396	C604	C6041/2	7647889
905	9059/16X1/2	5110700	C604	C6049/16	7647890
905	9055/8X1/1	5110701	C604	C6045/8	7647891
905	9053/4X1/2	5110702	C604	C6043/4	7647892
920	9201/8X3/8	5110302	C601	C6011/8X3/8	7647832
920	9203/16X3/8	5110303	C601	C6013/16X3/8	7647833
920	9201/4X3/8	5110304	C601	C6011/4X3/8	7647834
920	9205/16X3/8	5110305	C601	C6015/16X3/8	7647835
920	9203/8X3/8	5110306	C601	C6013/8X3/8	7647836
920	9207/16X3/8	5110307	C601	C6017/16X3/8	7647837
920	9201/2X3/8	5110308	C601	C6011/2X3/8	7647838
920	9201/2X1/2	5110309	C601	C6011/2X1/2	7647839
920	9209/16X1/2	5110310	C601	C6019/16X1/2	7647840
920	9205/8X1/2	5110311	C601	C6015/8X1/2	7647841
920	92011/16X1/2	5110312	C601	C60111/16X1/2	7647842
920	9203/4X1/2	5110313	C601	C6013/4X1/2	7647843
920	9205/8X5/8	5110314	C601	C6015/8X5/8	7647844
920	92011/16X5/8	5110315	C601	C60111/16X5/8	7647845
920	9203/4X5/8	5110316	C601	C6013/4X5/8	7647846
920	92013/16X5/8	5110317	C601	C60113/16X5/8	7647847
920	9207/8X5/8	5110318	C601	C6017/8X5/8	7647848
920	92015/16X5/8	5110319	C601	C60115/16X5/8	7647849
920	9201X5/8	5110320	C601	C6011X5/8	7647850
920	9207/8X7/8	5110321	C601	C6017/8X7/8	7647851
920	9201X7/8	5110322	C601	C6011X7/8	7647852
920	9201X1	5110326	C601	C6011X1	7647853
920	9201.1/8X1	5110327	C601	C6011.1/8X1	7647854
920	9201.1/4X1	5110328	C601	C6011.1/4X1	7647855
920	9201.1/2X1	5110330	C601	C6011.1/2X1	7647856
920	9201.1/4X1.1/4	5110331	C601	C6011.1/4X1.1/4	7647857
920	9201.1/2X1.1/4	5110332	C601	C6011.1/2X1.1/4	7647858
920	9203/4X3/4	5110708	C601	C6013/4X3/4	7647859
920	9207/8X3/4	5110709	C601	C6017/8X3/4	7647860
920	9201X3/4	5110710	C601	C6011X3/4	7647861
920	9201.1/8X3/4	5111714	C601	C6011.1/8X3/4	7647862
920	9201.1/2X3/4	5111717	C601	C6011.1/2X3/4	7647863
923	9231/8	5110364	C600	C6001/8	7647759
923	9235/32	5110365	C600	C6005/32	7647820
923	9233/16	5110366	C600	C6003/16	7647821
923	9231/4	5110368	C600	C6001/4	7647822
923	9239/32	5110369	C600	C6009/32	7647823
923	9235/16	5110370	C600	C6005/16	7647824
923	92311/32	5110371	C600	C60011/32	7647825
923	9233/8	5110372	C600	C6003/8	7647826
923	92313/32	5110373	C600	C60013/32	7647827
923	9237/16	5110374	C600	C6007/16	7647828
923	9231/2	5110376	C600	C6001/2	7647829
923	9235/8	5110378	C600	C6005/8	7647830
923	9233/4	5110380	C600	C6003/4	7647831
930	9301/8X3/8	5110221	C607	C6071/8X3/8	7647904
930	9303/16X3/8	5110222	C607	C6073/16X3/8	7647905
930	9301/4X3/8	5110223	C607	C6071/4X3/8	7647906
930	9305/16X3/8	5110224	C607	C6075/16X3/8	7647907
930	9303/8X3/8	5110225	C607	C6073/8X3/8	7647908
930	9307/16X3/8	5110226	C607	C6077/16X3/8	7647909
930	9301/2X1/2	5110228	C607	C6071/2X1/2	7647910
930	9309/16X1/2	5110229	C607	C6079/16X1/2	7658817
930	9305/8X5/8	5110232	C607	C6075/8X5/8	7647912
930	9303/4X5/8	5110233	C607	C6073/4X5/8	7647913
930	9301X5/8	5110235	C607	C6071X5/8	7647914
930	9301X1	5110237	C607	C6071X1	7647915
930	9303/4X3/4	5110696	C607	C6073/4X3/4	7647916
940	9401/8X3/8	5110001	C617	C6171/8X3/8	7647984
940	9403/16X3/8	5110002	C617	C6173/16X3/8	7647985
940	9401/4X3/8	5110003	C617	C6171/4X3/8	7647986
940	9405/16X3/8	5110004	C617	C6175/16X3/8	7647987
940	9403/8X3/8	5110005	C617	C6173/8X3/8	7647988
940	9407/16X3/8	5110006	C617	C6177/16X3/8	7647989
940	9401/2X3/8	5110007	C617	C6171/2X3/8	7647990
940	9401/2X1/2	5110008	C617	C6171/2X1/2	7647991
940	9409/16X1/2	5110009	C617	C6179/16X1/2	7647992
940	9405/8X1/2	5110010	C617	C6175/8X1/2	7647993
940	94011/16X1/2	5110011	C617	C61711/16X1/2	7647994
940	9403/4X1/2	5110012	C617	C6173/4X1/2	7647995
940	9405/8X5/8	5110013	C617	C6175/8X5/8	7647996
940	94011/16X5/8	5110014	C617	C61711/16X5/8	7647997
940	9403/4X5/8	5110015	C617	C6173/4X5/8	7647998
940	94013/16X5/8	5110016	C617	C61713/16X5/8	7647999
940	9407/8X5/8	5110017	C617	C6177/8X5/8	7648000
940	9401X5/8	5110019	C617	C6171X5/8	7648001
940	9407/8X7/8	5110020	C617	C6177/8X7/8	7648002
940	9401X7/8	5110022	C617	C6171X7/8	7648003
940	9401X1	5110025	C617	C6171X1	7648004
940	9403/4X3/4	5110711	C617	C6173/4X3/4	7648005
940	9407/8X3/4	5110712	C617	C6177/8X3/4	7648006
940	9401X3/4	5110713	C617	C6171X3/4	7648007
945	9451/8	5110071	C615	C6151/8	7647973

Previous Style	Previous Ecode	Previous EDP#	New Style	New Ecode	New EDP#
945	9453/16	5110072	C615	C6153/16	7647974
945	9451/4	5110073	C615	C6151/4	7647975
945	9455/16	5110074	C615	C6155/16	7647976
945	9453/8	5110075	C615	C6153/8	7647977
945	9451/2	5110076	C615	C6151/2	7647978
945	9455/8	5110077	C615	C6155/8	7647979
945	94511/16	5110078	C615	C61511/16	7647980
945	9453/4	5110079	C615	C6153/4	7647981
945	9457/8	5110080	C615	C6157/8	7647982
945	9451	5110081	C615	C6151	7647983
948	9481/8	5110162	C614	C6141/8	7647965
948	9483/16	5110163	C614	C6143/16	7647966
948	9481/4	5110164	C614	C6141/4	7647967
948	9485/16	5110165	C614	C6145/16	7647968
948	9483/8	5110166	C614	C6143/8	7647969
948	9481/2	5110167	C614	C6141/2	7647970
948	9485/8	5110168	C614	C6145/8	7647971
948	9483/4	5110169	C614	C6143/4	7647972
960	9601/8X4	5110660	C618	C6181/8	7648008
960	9603/16X4	5110661	C618	C6183/16	7648009
960	9601/4X4	5110662	C618	C6181/4	7648010
960	9605/16X4	5110663	C618	C6185/16	7648011
960	9603/8X4	5110664	C618	C6183/8	7648012
960	9601/2X4	5110665	C618	C6181/2	7648013
960	9605/8X4	5110666	C618	C6185/8	7648014
960	9603/4X4	5110667	C618	C6183/4	7648015
960	9601X4	5110669	C618	C6181	7648016
963	9631/8	5110633	C603	C6031/8	7647874
963	9633/16	5110634	C603	C6033/16	7647875
963	9631/4	5110635	C603	C6031/4	7647876
963	9635/16	5110636	C603	C6035/16	7647877
963	9633/8	5110637	C603	C6033/8	7647878
963	9631/2	5110638	C603	C6031/2	7647879
963	9635/8	5110639	C603	C6035/8	7647880
963	9633/4	5110640	C603	C6033/4	7647881
963	9631	5110641	C603	C6031	7647882
980	9801/4	5110602	C605	C6051/4	7647893
980	9805/16	5110603	C605	C6055/16	7647894
980	9803/8	5110604	C605	C6053/8	7647895
980	9801/2	5110606	C605	C6051/2	7647896
980	9803/4	5110608	C605	C6053/4	7647897
980	9801	5110609	C605	C6051	7647898
981	9811/4	5110613	C606	C6061/4	7647899
981	9815/16	5110614	C606	C6065/16	7647900
981	9813/8	5110615	C606	C6063/8	7647901
981	9811/2	5110617	C606	C6061/2	7647902
981	9813/4	5110619	C606	C6063/4	7647903
9002	90021/4	5210014	C608	C6081/4	7647917
9002	90025/16	5210015	C608	C6085/16	7647918
9002	90023/8	5210016	C608	C6083/8	7647919
9002	90027/16	5210017	C608	C6087/16	7647920
9002	90021/2	5210018	C608	C6081/2	7647921
9002	90029/16	5210019	C608	C6089/16	7647922
9002	90025/8	5210020	C608	C6085/8	7647923
9002	90023/4	5210021	C608	C6083/4	7647924
9002	90027/8	5210022	C608	C6087/8	7647925
9002	90021	5210023	C608	C6081	7647926
9003	90031/4	5210028	C610	C6101/4	7647935
9003	90035/16	5210029	C610	C6105/16	7647936
9003	90033/8	5210030	C610	C6103/8	7647937
9003	90037/16	5210031	C610	C6107/16	7647938
9003	90031/2	5210032	C610	C6101/2	7647939
9003	90039/16	5210033	C610	C6109/16	7647940
9003	90035/8	5210034	C610	C6105/8	7647941
9003	90033/4	5210035	C610	C6103/4	7647942
9003	90037/8	5210036	C610	C6107/8	7647943
9003	90031	5210037	C610	C6101	7647944
9008	90081/4	5210078	C613	C6131/4	7647961
9008	90083/8	5210079	C613	C6133/8	7647962
9008	90081/2	5210080	C613	C6131/2	7647963
9008	90083/4	5210082	C613	C6133/4	7647964
9009	90091/4	5210089	C612	C6121/4	7647954
9009	90093/8	5210090	C612	C6123/8	7647955
9009	90091/2	5210091	C612	C6121/2	7647956
9009	90095/8	5210092	C612	C6125/8	7647957
9009	90093/4	5210093	C612	C6123/4	7647958
9009	90097/8	5210094	C612	C6127/8	7647959
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# EDP Conversion Table

Previous Style	Previous Ecode	Previous EDP#	New Style	New Ecode	New EDP#
E3302	E33025/32	001006	S108	S1085/32	7648531
E3302	E330211/64	001007	S108	S10811/64	7648532
E3302	E33023/32	001008	S108	S1083/32	7648533
E3302	E33027/32	001010	S108	S1087/32	7648534
E3302	E33021/4	001012	S108	S1081/4	7648535
E3302	E33025/16	001016	S108	S1085/16	7648536
E3302	E33023/8	001017	S108	S1083/8	7648537
E3302	E33027/16	001018	S108	S1087/16	7648538
E3302	E33021/2	001019	S108	S1081/2	7648539
E3302	E33029/16	001020	S108	S1089/16	7648540
E3302	E33025/8	001021	S108	S1085/8	7648541
E3302	E33023/4	001023	S108	S1083/4	7648542
E3302	E33021	001025	S108	S1081	7648543
E3302M	E3302M2.0	001028	S109	S1092.0	7648558
E3302M	E3302M2.5	001029	S109	S1092.5	7648559
E3302M	E3302M3.0	001030	S109	S1093.0	7648560
E3302M	E3302M4.0	001032	S109	S1094.0	7648561
E3302M	E3302M4.5	001033	S109	S1094.5	7648562
E3302M	E3302M5.0	001034	S109	S1095.0	7648563
E3302M	E3302M6.0	001035	S109	S1096.0	7648564
E3302M	E3302M7.0	001036	S109	S1097.0	7648565
E3302M	E3302M8.0	001037	S109	S1098.0	7648566
E3302M	E3302M9.0	001038	S109	S1099.0	7648567
E3302M	E3302M10.0	001039	S109	S10910.0	7648568
E3302M	E3302M11.0	001040	S109	S10911.0	7648569
E3302M	E3302M12.0	001041	S109	S10912.0	7648570
E3302M	E3302M14.0	001043	S109	S10914.0	7648571
E3302M	E3302M16.0	001044	S109	S10916.0	7648572
E3302M	E3302M20.0	001046	S109	S10920.0	7648573
E3302M	E3302M25.0	001047	S109	S10925.0	7648574
E3302V	E3302V1/16	002850	S208	S2081/16	7648544
E3302V	E3302V5/64	002851	S208	S2085/64	7648545
E3302V	E3302V3/32	002852	S208	S2083/32	7648546
E3302V	E3302V1/8	002854	S208	S2081/8	7648547
E3302V	E3302V5/32	002856	S208	S2085/32	7648548
E3302V	E3302V3/16	002858	S208	S2083/16	7648549
E3302V	E3302V7/32	002860	S208	S2087/32	7648550
E3302V	E3302V1/4	002862	S208	S2081/4	7648551
E3302V	E3302V5/16	002863	S208	S2085/16	7648552
E3302V	E3302V3/8	002864	S208	S2083/8	7648553
E3302V	E3302V7/16	002865	S208	S2087/16	7648554
E3302V	E3302V1/2	002866	S208	S2081/2	7648555
E3302V	E3302V9/16	002867	S208	S2089/16	7648556
E3302V	E3302V5/8	002868	S208	S2085/8	7648557
E3303	E33031/16	001050	S121	S1211/16	7648657
E3303	E33033/32	001052	S121	S1213/32	7648658
E3303	E33031/8	001054	S121	S1211/8	7648659
E3303	E33035/32	001056	S121	S1215/32	7648660
E3303	E33033/16	001058	S121	S1213/16	7648661
E3303	E33031/4	001062	S121	S1211/4	7648662
E3303	E33035/16	001066	S121	S1215/16	7648663
E3303	E33033/8	001067	S121	S1213/8	7648664
E3303	E33031/2	001069	S121	S1211/2	7648665
E3303V	E3303V1/16	002920	S221	S2211/16	7648666
E3303V	E3303V3/32	002921	S221	S2213/32	7648667
E3303V	E3303V1/8	002922	S221	S2211/8	7648668
E3303V	E3303V5/32	002923	S221	S2215/32	7648669
E3303V	E3303V3/16	002924	S221	S2213/16	7648670
E3303V	E3303V1/4	002926	S221	S2211/4	7648671
E3303V	E3303V5/16	002927	S221	S2215/16	7648672
E3303V	E3303V3/8	002928	S221	S2213/8	7648673
E3303V	E3303V1/2	002930	S221	S2211/2	7648674
E3304	E33041/16	001100	S134	S1341/16	7648726
E3304	E33045/64	001101	S134	S1345/64	7648727
E3304	E33043/32	001102	S134	S1343/32	7648728
E3304	E33047/64	001103	S134	S1347/64	7648729
E3304	E33041/8	001104	S134	S1341/8	7648730
E3304	E33049/64	001105	S134	S1349/64	7648731
E3304	E33045/32	001106	S134	S1345/32	7648732
E3304	E330411/64	001107	S134	S13411/64	7648733
E3304	E33043/16	001108	S134	S1343/16	7648734
E3304	E330413/64	001109	S134	S13413/64	7648735
E3304	E33047/32	001110	S134	S1347/32	7648736
E3304	E33041/4	001112	S134	S1341/4	7648737
E3304	E33045/16	001116	S134	S1345/16	7648738
E3304	E33043/8	001117	S134	S1343/8	7648739
E3304	E33047/16	001118	S134	S1347/16	7648740
E3304	E33041/2	001119	S134	S1341/2	7648741
E3304	E33049/16	001120	S134	S1349/16	7648742
E3304	E33045/8	001121	S134	S1345/8	7648743
E3304	E330411/16	001122	S134	S13411/16	7648744
E3304	E33043/4	001123	S134	S1343/4	7648745
E3304	E33047/8	001124	S134	S1347/8	7648746
E3304	E33041	001125	S134	S1341	7648747
E3304M	E3304M2.0	001128	S135	S1352.0	7648770
E3304M	E3304M2.5	001129	S135	S1352.5	7648771
E3304M	E3304M3.0	001130	S135	S1353.0	7648772
E3304M	E3304M3.5	001131	S135	S1353.5	7648773
E3304M	E3304M4.0	001132	S135	S1354.0	7648774
E3304M	E3304M4.5	001133	S135	S1354.5	7648775
E3304M	E3304M5.0	001134	S135	S1355.0	7648776
E3304M	E3304M6.0	001135	S135	S1356.0	7648777
E3304M	E3304M7.0	001136	S135	S1357.0	7648778
E3304M	E3304M8.0	001137	S135	S1358.0	7648779

Previous Style	Previous Ecode	Previous EDP#	New Style	New Ecode	New EDP#
E3304M	E3304M9.0	001138	S135	S1359.0	7648780
E3304M	E3304M10.0	001139	S135	S13510.0	7648781
E3304M	E3304M11.0	001140	S135	S13511.0	7648782
E3304M	E3304M12.0	001141	S135	S13512.0	7648783
E3304M	E3304M14.0	001143	S135	S13514.0	7648784
E3304M	E3304M16.0	001144	S135	S13516.0	7648785
E3304M	E3304M18.0	001145	S135	S13518.0	7648786
E3304M	E3304M20.0	001146	S135	S13520.0	7648787
E3304M	E3304M25.0	001147	S135	S13525.0	7648788
E3304MV	E3304MV2.0	004325	S235	S2352.0	7648789
E3304MV	E3304MV2.5	004326	S235	S2352.5	7648790
E3304MV	E3304MV3.0	004327	S235	S2353.0	7648791
E3304MV	E3304MV3.5	004328	S235	S2353.5	7648792
E3304MV	E3304MV4.0	004329	S235	S2354.0	7648793
E3304MV	E3304MV4.5	004330	S235	S2354.5	7648794
E3304MV	E3304MV5.0	004331	S235	S2355.0	7648795
E3304MV	E3304MV6.0	004332	S235	S2356.0	7648796
E3304MV	E3304MV7.0	004333	S235	S2357.0	7648797
E3304MV	E3304MV8.0	004334	S235	S2358.0	7648798
E3304MV	E3304MV9.0	004335	S235	S2359.0	7648799
E3304MV	E3304MV10.0	004336	S235	S23510.0	7648800
E3304MV	E3304MV11.0	004337	S235	S23511.0	7648801
E3304MV	E3304MV12.0	004338	S235	S23512.0	7648802
E3304MV	E3304MV14.0	004339	S235	S23514.0	7648803
E3304MV	E3304MV16.0	004340	S235	S23516.0	7648804
E3304MV	E3304MV18.0	004341	S235	S23518.0	7648805
E3304MV	E3304MV20.0	004342	S235	S23520.0	7648806
E3304V	E3304V1/16	002690	S234	S2341/16	7648748
E3304V	E3304V5/64	002691	S234	S2345/64	7648749
E3304V	E3304V3/32	002692	S234	S2343/32	7648750
E3304V	E3304V7/64	002693	S234	S2347/64	7648751
E3304V	E3304V1/8	002694	S234	S2341/8	7648752
E3304V	E3304V9/64	002695	S234	S2349/64	7648753
E3304V	E3304V5/32	002696	S234	S2345/32	7648754
E3304V	E3304V11/64	002697	S234	S23411/64	7648755
E3304V	E3304V3/16	002698	S234	S2343/16	7648756
E3304V	E3304V13/64	002699	S234	S23413/64	7648757
E3304V	E3304V7/32	002700	S234	S2347/32	7648758
E3304V	E3304V1/4	002702	S234	S2341/4	7648759
E3304V	E3304V5/16	002703	S234	S2345/16	7648760
E3304V	E3304V3/8	002704	S234	S2343/8	7648761
E3304V	E3304V7/16	002705	S234	S2347/16	7648762
E3304V	E3304V1/2	002706	S234	S2341/2	7648763
E3304V	E3304V9/16	002707	S234	S2349/16	7648764
E3304V	E3304V5/8	002708	S234	S2345/8	7648765
E3304V	E3304V11/16	002709	S234	S23411/16	7648766
E3304V	E3304V3/4	002710	S234	S2343/4	7648767
E3304V	E3304V7/8	002711	S234	S2347/8	7648768
E3304V	E3304V1	002712	S234	S2341	7648769
E4302	E43021/8	002200	S116	S1161/8	7648650
E4302	E43025/32	002201	S116	S1165/32	7648651
E4302	E43023/16	002202	S116	S1163/16	7648652
E4302	E43021/4	002204	S116	S1161/4	7648653
E4302	E43025/16	002206	S116	S1165/16	7648654
E4302	E43023/8	002208	S116	S1163/8	7648655
E4302	E43021/2	002210	S116	S1161/2	7648656
E4304	E43041/8	002250	S129	S1291/8	7648719
E4304	E43045/32	002251	S129	S1295/32	7648720
E4304	E43043/16	002252	S129	S1293/16	7648721
E4304	E43041/4	002254	S129	S1291/4	7648722
E4304	E43045/16	002256	S129	S1295/16	7648723
E4304	E43043/8	002258	S129	S1293/8	7648724
E4304	E43041/2	002260	S129	S1291/2	7648725
E5302	E53021/8	000000	S110	S1101/8	7648575
E5302	E53023/16	000001	S110	S1103/16	7648576
E5302	E53021/4	000002	S110	S1101/4	7648577
E5302	E53023/8	000004	S110	S1103/8	7648578
E5302	E53021/2	000006	S110	S1101/2	7648579
E5304	E53041/8	000020	S136	S1361/8	7648807
E5304	E53043/16	000021	S136	S1363/16	7648808
E5304	E53041/4	000022	S136	S1361/4	7648809
E5304	E53045/16	000023	S136	S1365/16	7648810
E5304	E53043/8	000024	S136	S1363/8	7648811
E5304	E53047/16	000025	S136	S1367/16	7648812
E5304	E53041/2	000026	S136	S1361/2	7648813
E5304	E53045/8	000027	S136	S1365/8	7648814
E5304	E53043/4	000028	S136	S1363/4	7648815
E5304V	E5304V1/8	000030	S236	S2361/8	7648816
E5304V	E5304V3/16	000031	S236	S2363/16	



# EDP Conversion Table

Previous Style	Previous Ecode	Previous EDP#	New Style	New Ecode	New EDP#
E6302V	E6302V1/4	003132	S211	S2111/4	7648588
E6302V	E6302V3/8	003134	S211	S2113/8	7648589
E6302V	E6302V1/2	003136	S211	S2111/2	7648590
E6304	E63041/8	004900	S137	S1371/8	7648825
E6304	E63043/16	004901	S137	S1373/16	7648826
E6304	E63041/4	004902	S137	S1371/4	7648827
E6304	E63045/16	004903	S137	S1375/16	7648828
E6304	E63043/8	004904	S137	S1373/8	7648829
E6304	E63047/16	004905	S137	S1377/16	7648830
E6304	E63041/2	004906	S137	S1371/2	7648831
E6304	E63045/8	004907	S137	S1375/8	7648832
E6304	E63043/4	004908	S137	S1373/4	7648833
E6304	E63041	004909	S137	S1371	7648834
E6304V	E6304V1/8	003165	S237	S2371/8	7648835
E6304V	E6304V3/16	003166	S237	S2373/16	7648836
E6304V	E6304V1/4	003167	S237	S2371/4	7648837
E6304V	E6304V5/16	003168	S237	S2375/16	7648838
E6304V	E6304V3/8	003169	S237	S2373/8	7648839
E6304V	E6304V7/16	003170	S237	S2377/16	7648840
E6304V	E6304V1/2	003171	S237	S2371/2	7648841
E6304V	E6304V5/8	003172	S237	S2375/8	7648842
E6304V	E6304V3/4	003173	S237	S2373/4	7648843
E6304V	E6304V1	003174	S237	S2371	7648844
EB3302	EB33021/16	001200	S112	S1121/16	7648591
EB3302	EB33023/32	001202	S112	S1123/32	7648592
EB3302	EB33021/8	001204	S112	S1121/8	7648593
EB3302	EB33025/32	001206	S112	S1125/32	7648594
EB3302	EB33023/16	001208	S112	S1123/16	7648595
EB3302	EB33027/32	001210	S112	S1127/32	7648596
EB3302	EB33021/4	001212	S112	S1121/4	7648597
EB3302	EB33025/16	001216	S112	S1125/16	7648598
EB3302	EB33023/8	001217	S112	S1123/8	7648599
EB3302	EB33021/2	001219	S112	S1121/2	7648600
EB3302M	EB3302M2.0	001228	S113	S1132.0	7648609
EB3302M	EB3302M2.5	001229	S113	S1132.5	7648610
EB3302M	EB3302M3.0	001230	S113	S1133.0	7648611
EB3302M	EB3302M4.0	001232	S113	S1134.0	7648612
EB3302M	EB3302M5.0	001234	S113	S1135.0	7648613
EB3302M	EB3302M6.0	001235	S113	S1136.0	7648614
EB3302M	EB3302M7.0	001236	S113	S1137.0	7648615
EB3302M	EB3302M8.0	001237	S113	S1138.0	7648616
EB3302M	EB3302M9.0	001238	S113	S1139.0	7648617
EB3302M	EB3302M10.0	001239	S113	S11310.0	7648618
EB3302M	EB3302M12.0	001241	S113	S11312.0	7648619
EB3302M	EB3302M16.0	001243	S113	S11316.0	7648620
EB3302M	EB3302M20.0	001245	S113	S11320.0	7648621
EB3302MV	EB3302MV3.0	004402	S213	S2133.0	7648622
EB3302MV	EB3302MV4.0	004404	S213	S2134.0	7648623
EB3302MV	EB3302MV5.0	004406	S213	S2135.0	7648624
EB3302MV	EB3302MV6.0	004407	S213	S2136.0	7648625
EB3302MV	EB3302MV7.0	004408	S213	S2137.0	7648626
EB3302MV	EB3302MV8.0	004409	S213	S2138.0	7648627
EB3302MV	EB3302MV9.0	004410	S213	S2139.0	7648628
EB3302MV	EB3302MV10.0	004411	S213	S21310.0	7648629
EB3302MV	EB3302MV12.0	004413	S213	S21312.0	7648630
EB3302V	EB3302V1/16	002630	S212	S2121/16	7648601
EB3302V	EB3302V1/8	002634	S212	S2121/8	7648602
EB3302V	EB3302V3/16	002638	S212	S2123/16	7648603
EB3302V	EB3302V7/32	002640	S212	S2127/32	7648604
EB3302V	EB3302V1/4	002642	S212	S2121/4	7648605
EB3302V	EB3302V5/16	002643	S212	S2125/16	7648606
EB3302V	EB3302V3/8	002644	S212	S2123/8	7648607
EB3302V	EB3302V1/2	002646	S212	S2121/2	7648608
EB3304	EB33041/16	001300	S138	S1381/16	7648845
EB3304	EB33043/32	001302	S138	S1383/32	7648846
EB3304	EB33041/8	001304	S138	S1381/8	7648847
EB3304	EB33045/32	001306	S138	S1385/32	7648848
EB3304	EB33043/16	001308	S138	S1383/16	7648849
EB3304	EB33041/4	001312	S138	S1381/4	7648850
EB3304	EB33045/16	001316	S138	S1385/16	7648851
EB3304	EB33043/8	001317	S138	S1383/8	7648852
EB3304	EB33047/16	001318	S138	S1387/16	7648853
EB3304	EB33041/2	001319	S138	S1381/2	7648854
EB3304	EB33045/8	001321	S138	S1385/8	7648855
EB3304	EB33043/4	001323	S138	S1383/4	7648856
EB3304M	EB3304M12.0	001331	S139	S13912.0	7648869
EB3304M	EB3304M10.0	001333	S139	S13910.0	7648870
EB3304M	EB3304M8.0	001335	S139	S1398.0	7648871
EB3304M	EB3304M6.0	001337	S139	S1396.0	7648872
EB3304M	EB3304M5.0	001338	S139	S1395.0	7648873
EB3304M	EB3304M4.5	001339	S139	S1394.5	7648874
EB3304M	EB3304M4.0	001340	S139	S1394.0	7648875
EB3304M	EB3304M3.0	001342	S139	S1393.0	7648876
EB3304M	EB3304M2.0	001344	S139	S1392.0	7648877
EB3304MV	EB3304MV2.0	004750	S239	S2392.0	7648878
EB3304MV	EB3304MV3.0	004752	S239	S2393.0	7648879
EB3304MV	EB3304MV4.0	004754	S239	S2394.0	7648880
EB3304MV	EB3304MV5.0	004756	S239	S2395.0	7648881
EB3304MV	EB3304MV6.0	004757	S239	S2396.0	7648882
EB3304MV	EB3304MV8.0	004759	S239	S2398.0	7648883
EB3304MV	EB3304MV10.0	004761	S239	S23910.0	7648884
EB3304MV	EB3304MV12.0	004763	S239	S23912.0	7648885
EB3304V	EB3304V1/16	003070	S238	S2381/16	7648857
EB3304V	EB3304V3/32	003072	S238	S2383/32	7648858

Previous Style	Previous Ecode	Previous EDP#	New Style	New Ecode	New EDP#
EB3304V	EB3304V1/8	003074	S238	S2381/8	7648859
EB3304V	EB3304V5/32	003076	S238	S2385/32	7648860
EB3304V	EB3304V3/16	003078	S238	S2383/16	7648861
EB3304V	EB3304V1/4	003082	S238	S2381/4	7648862
EB3304V	EB3304V5/16	003083	S238	S2385/16	7648863
EB3304V	EB3304V3/8	003084	S238	S2383/8	7648864
EB3304V	EB3304V7/16	003085	S238	S2387/16	7648865
EB3304V	EB3304V1/2	003086	S238	S2381/2	7648866
EB3304V	EB3304V5/8	003088	S238	S2385/8	7648867
EB3304V	EB3304V3/4	003090	S238	S2383/4	7648868
EB5302	EB53021/8	000040	S114	S1141/8	7648631
EB5302	EB53023/16	000041	S114	S1143/16	7648632
EB5302	EB53021/4	000042	S114	S1141/4	7648633
EB5302	EB53025/16	000043	S114	S1145/16	7648634
EB5302	EB53023/8	000044	S114	S1143/8	7648635
EB5302	EB53021/2	000046	S114	S1141/2	7648636
EB5302	EB53025/8	000047	S114	S1145/8	7648637
EB5304	EB53041/4	000062	S146	S1461/4	7648886
EB5304	EB53043/8	000064	S146	S1463/8	7648887
EB5304	EB53041/2	000066	S146	S1461/2	7648888
EB5304	EB53045/8	000067	S146	S1465/8	7648889
EB5304V	EB5304V1/4	000072	S246	S2461/4	7648890
EB5304V	EB5304V3/8	000074	S246	S2463/8	7648891
EB5304V	EB5304V1/2	000076	S246	S2461/2	7648892
EB5304V	EB5304V5/8	000077	S246	S2465/8	7648893
EB6302	EB63021/8	005400	S115	S1151/8	7648638
EB6302	EB63023/16	005401	S115	S1153/16	7648639
EB6302	EB63021/4	005402	S115	S1151/4	7648640
EB6302	EB63025/16	005403	S115	S1155/16	7648641
EB6302	EB63023/8	005404	S115	S1153/8	7648642
EB6302	EB63021/2	005406	S115	S1151/2	7648643
EB6302V	EB6302V1/8	003700	S215	S2151/8	7648644
EB6302V	EB6302V3/16	003701	S215	S2153/16	7648645
EB6302V	EB6302V1/4	003702	S215	S2151/4	7648646
EB6302V	EB6302V5/16	003703	S215	S2155/16	7648647
EB6302V	EB6302V3/8	003704	S215	S2153/8	7648648
EB6302V	EB6302V1/2	003706	S215	S2151/2	7648649
EB6304	EB63041/8	005700	S147	S1471/8	7648894
EB6304	EB63043/16	005701	S147	S1473/16	7648895
EB6304	EB63041/4	005702	S147	S1471/4	7648896
EB6304	EB63045/16	005703	S147	S1475/16	7648897
EB6304	EB63043/8	005704	S147	S1473/8	7648898
EB6304	EB63041/2	005706	S147	S1471/2	7648899
EB6304	EB63045/8	005707	S147	S1475/8	7648900
EB6304V	EB6304V1/8	003745	S247	S2471/8	7648901
EB6304V	EB6304V3/16	003746	S247	S2473/16	7648902
EB6304V	EB6304V1/4	003747	S247	S2471/4	7648903
EB6304V	EB6304V5/16	003748	S247	S2475/16	7648904
EB6304V	EB6304V3/8	003749	S247	S2473/8	7648905
EB6304V	EB6304V1/2	003751	S247	S2471/2	7648906
EB6304V	EB6304V5/8	003752	S247	S2475/8	7648907
TC9002	TC90021/4	5270014	C609	C6091/4	7647927
TC9002	TC90025/16	5270015	C609	C6095/16	7647928
TC9002	TC90023/8	5270016	C609	C6093/8	7647929
TC9002	TC90027/16	5270017	C609	C6097/16	7647930
TC9002	TC90021/2	5270018	C609	C6091/2	7647931
TC9002	TC90025/8	5270020	C609	C6095/8	7647932
TC9002	TC90023/4	5270021	C609	C6093/4	7647933
TC9002	TC90021	5270023	C609	C6091	7647934
TC9003	TC90031/4	5270028	C611	C6111/4	7647945
TC9003	TC90035/16	5270029	C611	C6115/16	7647946
TC9003	TC90033/8	5270030	C611	C6113/8	7647947
TC9003	TC90037/16	5270031	C611	C6117/16	7647948
TC9003	TC90031/2	5270032	C611	C6111/2	7647949
TC9003	TC90035/8	5270034	C611	C6115/8	7647950
TC9003	TC90033/4	5270035	C611	C6113/4	7647951
TC9003	TC90037/8	5270036	C611	C6117/8	7647952
TC9003	TC90031	5270037	C611	C6111	7647953



# SIMPLY RELIABLE

As a professional you can judge the quality of work by just looking at the chip. Our chip is a clean and uncomplicated shape that in itself tells a story. It is a clear and consistent signal and that's why we use it as a symbol for being **Simply Reliable**.

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