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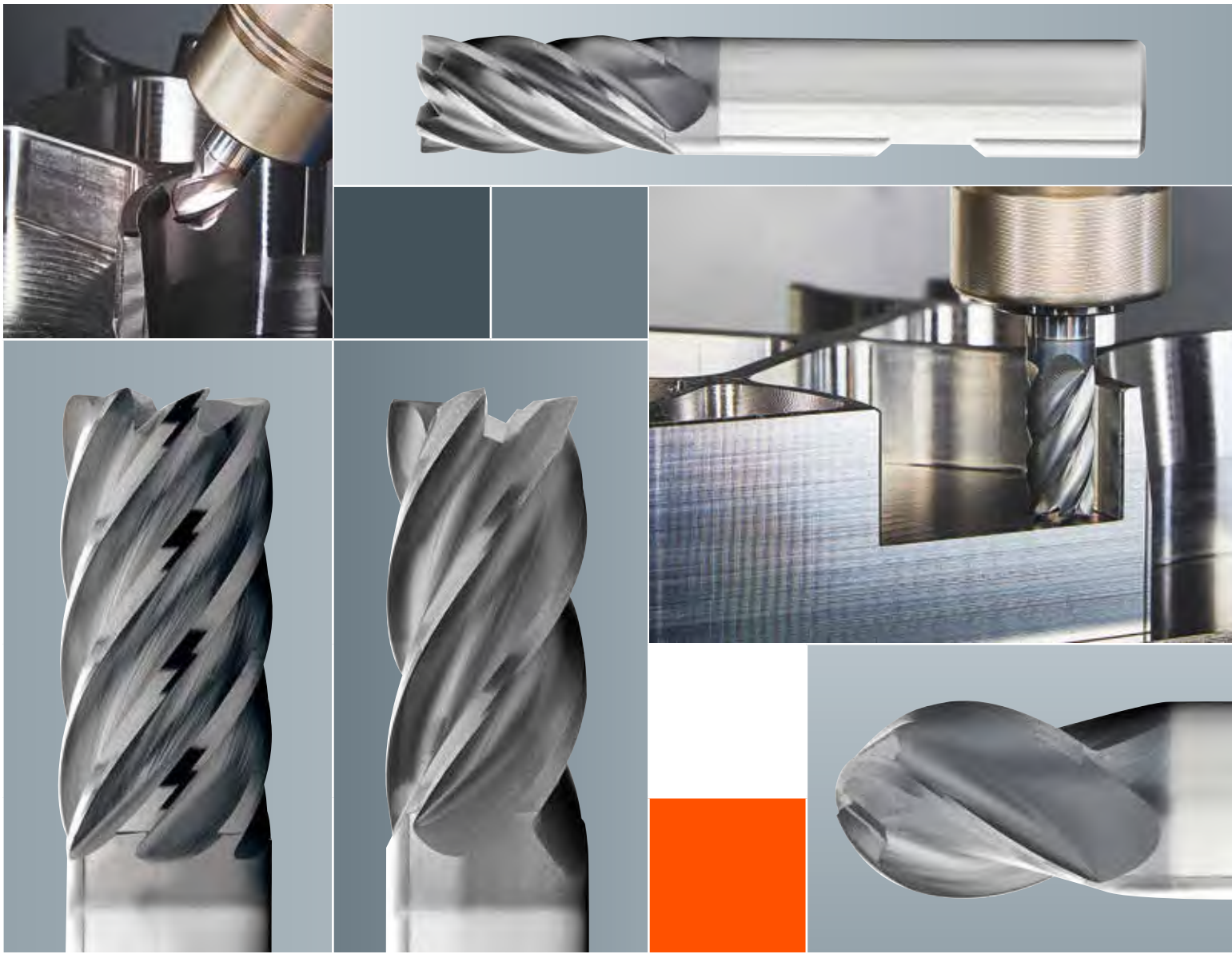
EMUGE FRANKEN

NEW Expanded Program



FRANKEN

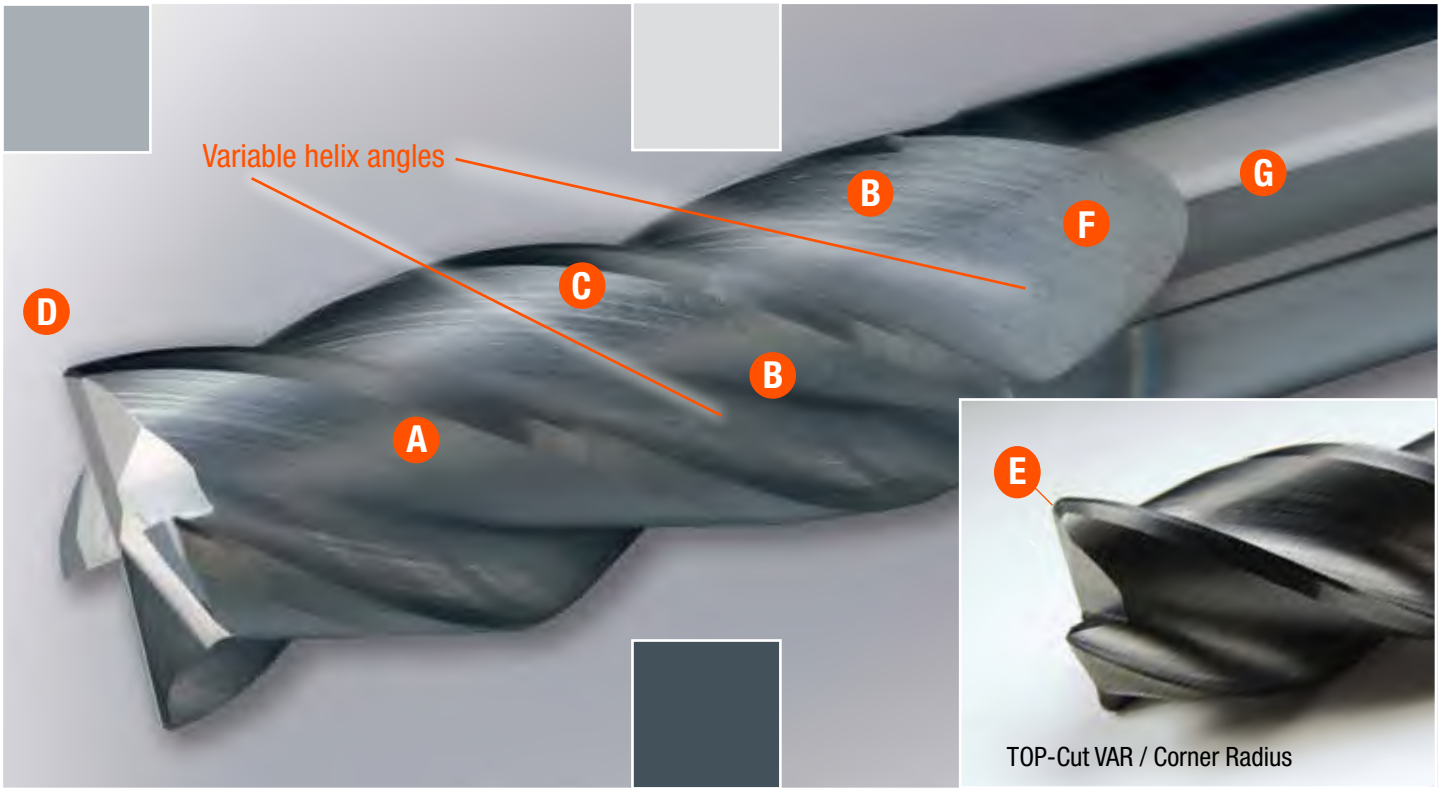
HIGH PERFORMANCE

TOP-CUT VAR END MILLS

PROUDLY MADE IN USA

TOP-Cut VAR High Performance End Mills

For Universal Milling Applications

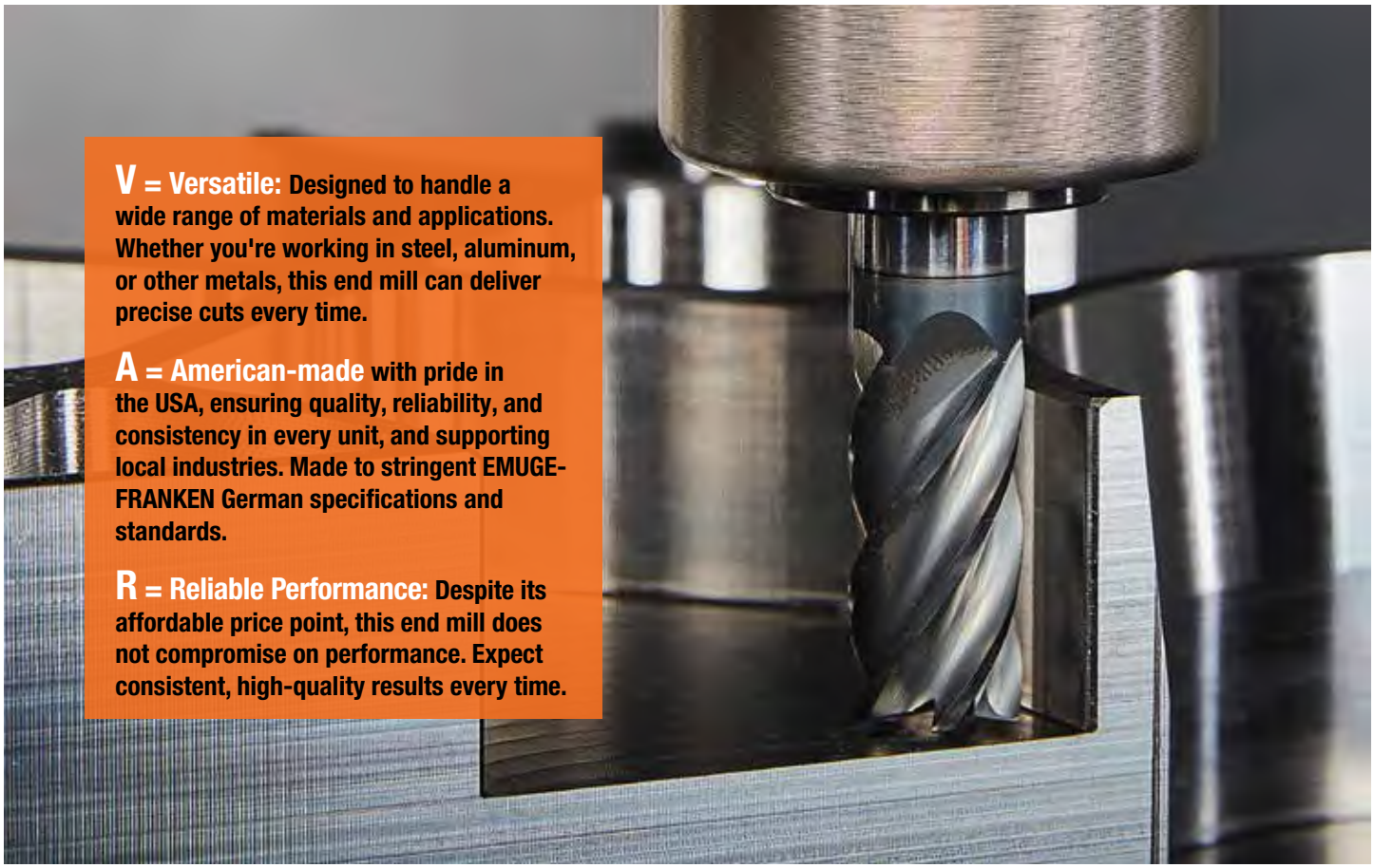


The TOP-Cut VAR end mill is the most versatile variable helix carbide tool in the industry. Featuring unique geometry and coating, it can be used in virtually all materials and applications. TOP-Cut VAR is the best choice for manufacturers who need flexibility and high performance.

- A **Unique flute and profile geometries** optimized for extended tool life, provide superior performance in both roughing and finishing applications
- B **Variable helix angle flutes** provide vibration dampening milling
- C **Precision ground flutes with advanced edge preparation processes** for repeatable performance
- D **Chamfer feature** protects cutting edges to prevent tool chipping
- E **Fully blended corner radius** extends tool life and delivers improved surface finishes
- F **Advanced ALCR PVD coating** enables outstanding performance in higher operating temperatures
- G **Proprietary sub-micro grain carbide grade** for maximum abrasion resistance and durability, providing consistent, high performance levels

German engineered
EMUGE-FRANKEN quality
Manufactured in EMUGE-FRANKEN USA West Boylston, MA facility

Industry's Most Versatile, High Performance End Mills



V = Versatile: Designed to handle a wide range of materials and applications. Whether you're working in steel, aluminum, or other metals, this end mill can deliver precise cuts every time.

A = American-made with pride in the USA, ensuring quality, reliability, and consistency in every unit, and supporting local industries. Made to stringent EMUGE-FRANKEN German specifications and standards.

R = Reliable Performance: Despite its affordable price point, this end mill does not compromise on performance. Expect consistent, high-quality results every time.

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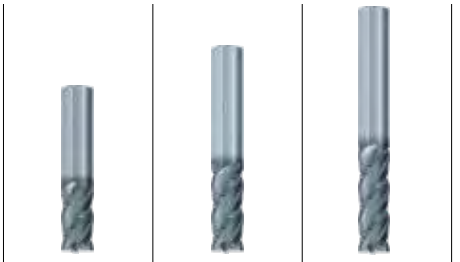
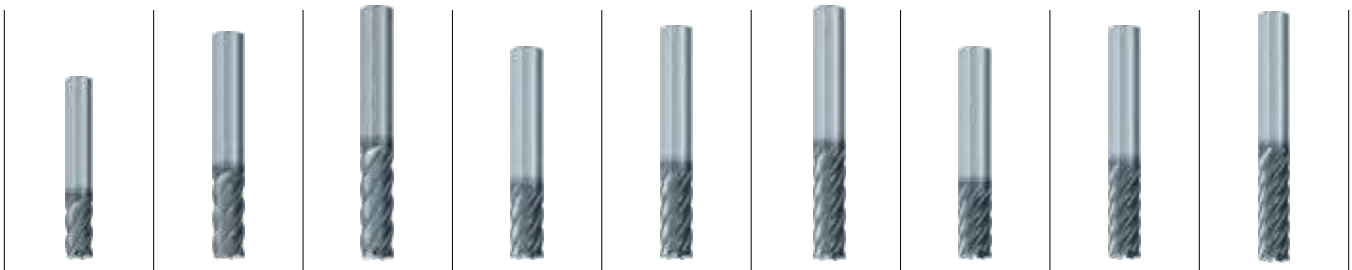
TOP-CUT VAR PRODUCT FINDER

Choose the end mills most suitable for your applications / materials:



						Square End			
						N			
					d_1	1/16 - 3/4"	1/8 - 1"	1/8 - 1"	
					# Flutes	4			
						2992L	2994L	2996L	
						2993L	2995L	2997L	
	Applications / Materials		Hardness Range			Material Examples	Page	8	
			HRC	BHN	N/mm²		v_c/f_z	26	27	28
P		**Steel materials**								
	1.1	Cold-extrusion steels, Construction steels, Free-cutting steels, etc.		≤ 180	≤ 600	1010 / 1018 / 1020 / 12L14 / 12L15 / A36 / T1		■	■	■
	2.1	Construction steels, Cementation steels, Steel castings, etc.	≤ 22	≤ 235	≤ 800	A36 / T1 / 1030-1095 / 4140 / 4340 / 8620		■	■	■
	3.1	Cementation steels, Heat-treatable steels, Cold work steels, etc.	≤ 31	≤ 295	≤ 1000	4140 / 4340 / 8620 / P20 / H13 / D2 / A2 / S7 / H1150		■	■	■
	4.1	Heat-treatable steels, Cold work steels, Nitriding steels, etc.	≤ 38	≤ 355	≤ 1200	4140 / 4340 / 8620 / P20 / H13 / D2 / 300M / 52100 / M1-M42		■	■	■
	5.1	High-alloyed steels, Cold work steels, Hot work steels, etc.	≤ 44	≤ 415	≤ 1400	4140 / 4340 / 8620 / P20 / H13 / D2 / 300M / 52100		■	■	■
M		**Stainless steel materials**								
	1.1	Ferritic, martensitic	≤ 29	≤ 280	≤ 950	410 / 440 / 440C / 17-4 PH		■	■	■
	2.1	Austenitic	≤ 29	≤ 280	≤ 950	303 / 304 / 316 / 316L / 321		■	■	■
	3.1	Austenitic-ferritic (Duplex)	≤ 35	≤ 325	≤ 1100			■	■	■
	4.1	Austenitic-ferritic heat-resistant (Super Duplex)	≤ 39	≤ 370	≤ 1250			■	■	■
K		**Cast materials**								
	1.1	Cast iron with lamellar graphite (GJL)		30 - 75	100 - 250	Grey cast irons G10-GG40		■	■	■
	1.2			75 - 135	250 - 450			■	■	■
	2.1	Cast iron with nodular graphite (GJS)		105 - 150	350 - 500	Nodular GGG40-GGG70		■	■	■
	2.2			150 - 265	500 - 900			■	■	■
	3.1	Cast iron with vermicular graphite (GJV)		90 - 120	300 - 400			■	■	■
	3.2			120 - 150	400 - 500	Compact graphite iron (CGI)		■	■	■
	4.1	Malleable cast iron (GTMW, GTMB)		70 - 145	250 - 500			■	■	■
	4.2			150 - 235	500 - 800	White iron		■	■	■
N		**Non ferrous materials**								
		Aluminum alloys								
	1.1	Aluminum wrought alloys		≤ 60	≤ 200	7075				■
	1.2			≤ 105	≤ 350	6061-T6 / 2024-T4		■	■	■
	1.3			≤ 165	≤ 550			■	■	■
	1.4	Aluminum cast alloys Si ≤ 7%						■	■	■
	1.5	Aluminum cast alloys 7% < Si ≤ 12%								□
	1.6	Aluminum cast alloys 12% < Si ≤ 17%								□
		Copper alloys								
	2.1	Pure copper, low-alloyed copper		≤ 120	≤ 400			■	■	■
	2.2	Copper-zinc alloys (brass, long-chipping)		≤ 165	≤ 550			■	■	■
	2.3	Copper-zinc alloys (brass, short-chipping)		≤ 165	≤ 550			■	■	■
	2.4	Copper-aluminum alloys (alu bronze, long-chipping)		≤ 235	≤ 800			■	■	■
	2.5	Copper-tin alloys (tin bronze, long-chipping)		≤ 205	≤ 700			■	■	■
	2.6	Copper-tin alloys (tin bronze, short-chipping)		≤ 120	≤ 400			■	■	■
	2.7	Special copper alloys		≤ 180	≤ 600			■	■	■
	2.8		≤ 44	≤ 415	≤ 1400			■	■	■
		Magnesium alloys								
	3.1	Magnesium wrought alloys		≤ 150	≤ 500			■	■	
	3.2	Magnesium cast alloys		≤ 150	≤ 500			■	■	
		Synthetics								
	4.1	Duroplastics (short-chipping)						■	■	
	4.2	Thermoplastics (long-chipping)								
	4.3	Fiber-reinforced synthetics (fiber content ≤ 30%)								
	4.4	Fiber-reinforced synthetics (fiber content > 30%)								
		Special materials								
	5.1	Graphite								
	5.2	Tungsten-copper alloys						■	■	■
	5.3	Composite materials								
S		**Special materials**								
		Titanium alloys								
	1.1	Pure titanium		≤ 135	≤ 450	CP1 / CP2		■	■	■
	1.2	Titanium alloys	≤ 27	≤ 265	≤ 900	6AL4V		■	■	■
	1.3		≤ 39	≤ 370	≤ 1250			■	■	■
		Nickel alloys, cobalt alloys and iron alloys								
	2.1	Pure nickel		≤ 180	≤ 600			■	■	□
	2.2	Nickel-based alloys	≤ 31	≤ 295	≤ 1000	Monel 500 / Hastelloy / 625 Inconel		■	■	□
	2.3		≤ 49	≤ 475	≤ 1600	718 Inconel		■	■	□
	2.4	Cobalt-based alloys	≤ 31	≤ 295	≤ 1000			■	■	□
	2.5		≤ 49	≤ 475	≤ 1600	Haynes 25		■	■	□
	2.6	Iron-base alloys	≤ 46	≤ 445	≤ 1500	Incoloy 925		■	■	□
H		**Hard materials**								
	1.1	High strength steels, hardened steels, hard castings	44 - 50			Weldox 1100		■	■	
	1.2		50 - 55			Hardox 550		□	□	
	1.3		55 - 60			Armox 600T		□	□	
	1.4		60 - 63			Ferro-Titanit				
	1.5		63 - 66			HSSE				

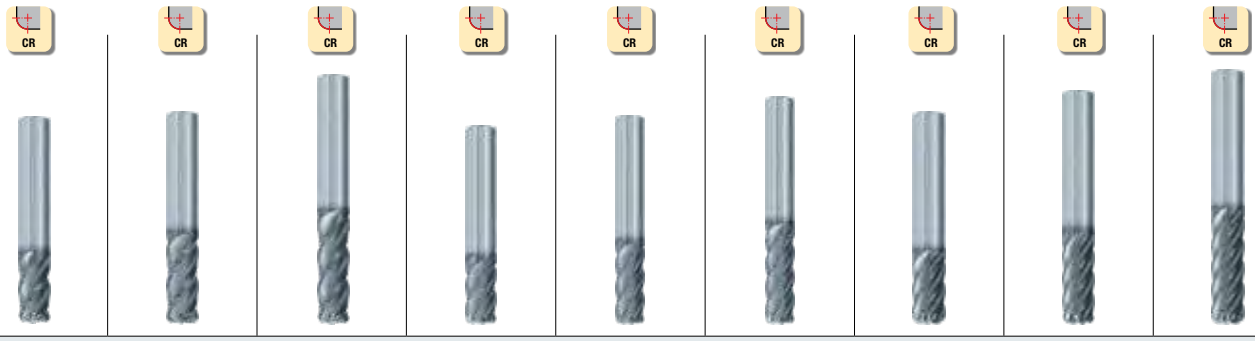
■ = very suitable □ = suitable



	Square End									
	N									
	1/4 - 1"	1/4 - 1"	1/4 - 1"	1/4 - 1"	1/4 - 1"	1/4 - 1"	1/4 - 1"	1/4 - 1"	1/4 - 1"	d_1
		5			6			7		# Flutes
	3920L	2946L	3922L	3924L	2948L	3926L	3916L	3917L	3918L	
	3921L	2920L	3923L	3925L	3908L	3927L	3930L	3931L	3932L	
		9			10			11		Page
		29		33	34	35	36	37	38	v_c / f_z
									Steel materials	
	■	■	■	■	■	■	■	■	■	1.1
	■	■	■	■	■	■	■	■	■	2.1
	■	■	■	■	■	■	■	■	■	3.1
	■	■	■	■	■	■	■	■	■	4.1
	■	■	■	■	■	■	■	■	■	5.1
								Stainless steel materials		
	■	■	■	■	■	■	■	■	■	1.1
	■	■	■	■	■	■	■	■	■	2.1
	■	■	■	■	■	■	■	■	■	3.1
	■	■	■	■	■	■	■	■	■	4.1
									Cast materials	
	■	■	■	■	■	■	■	■	■	1.1
	■	■	■	■	■	■	■	■	■	1.2
	■	■	■	■	■	■	■	■	■	2.1
	■	■	■	■	■	■	■	■	■	2.2
	■	■	■	■	■	■	■	■	■	3.1
	■	■	■	■	■	■	■	■	■	3.2
	■	■	■	■	■	■	■	■	■	4.1
	■	■	■	■	■	■	■	■	■	4.2
									Non ferrous materials	
									Aluminum alloys	
										1.1
	■	■	■	■	■	■	■	■	■	1.2
	■	■	■	■	■	■	■	■	■	1.3
	■	■	■	■	■	■	■	■	■	1.4
										1.5
										1.6
									Copper alloys	
	■	■	■	■	■	■	■	■	■	2.1
	■	■	■	■	■	■	■	■	■	2.2
	■	■	■	■	■	■	■	■	■	2.3
	■	■	■	■	■	■	■	■	■	2.4
	■	■	■	■	■	■	■	■	■	2.5
	■	■	■	■	■	■	■	■	■	2.6
	■	■	■	■	■	■	■	■	■	2.7
	■	■	■	■	■	■	■	■	■	2.8
									Magnesium alloys	
	■	■	■	■	■	■	■	■	■	3.1
	■	■	■	■	■	■	■	■	■	3.2
									Synthetics	
	■	■	■	■	■	■	■	■	■	4.1
										4.2
										4.3
										4.4
									Special materials	
										5.1
	■	■	■	■	■	■	■	■	■	5.2
										5.3
									Special materials	
									Titanium alloys	
	■	■	■	■	■	■	■	■	■	1.1
	■	■	■	■	■	■	■	■	■	1.2
	■	■	■	■	■	■	■	■	■	1.3
								Nickel alloys, cobalt alloys and iron alloys		
	■	■	■	■	■	■	■	■	■	2.1
	■	■	■	■	■	■	■	■	■	2.2
	■	■	■	■	■	■	■	■	■	2.3
	■	■	■	■	■	■	■	■	■	2.4
	■	■	■	■	■	■	■	■	■	2.5
	■	■	■	■	■	■	■	■	■	2.6
									Hard materials	
	■	■	■	■	■	■	■	■	■	1.1
	□	□	□	□	□	□	□	□	□	1.2
	□	□	□	□	□	□	□	□	□	1.3
										1.4
										1.5

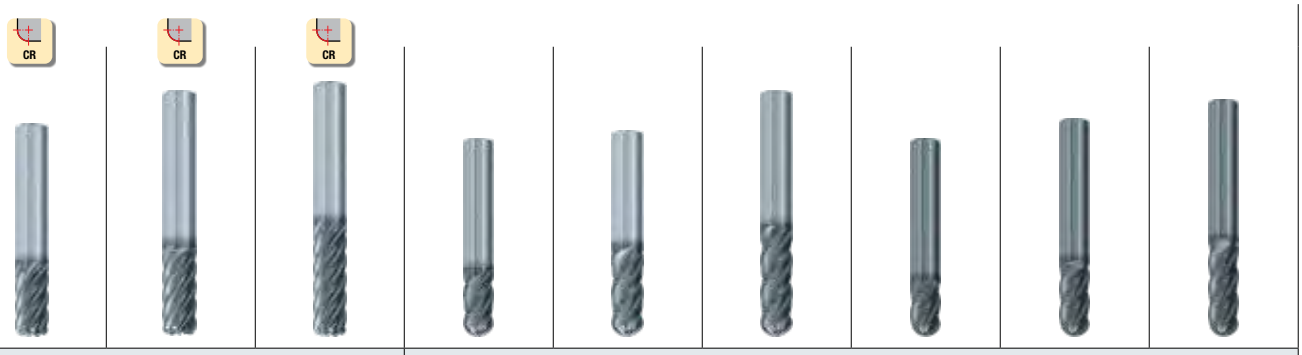
P M K N S H

■ = very suitable □ = suitable



		Corner Radius								
		N								
d_1		1/8 - 1"	1/8 - 1"	1/8 - 1"	1/4 - 1"	1/4 - 5/8"	1/4 - 5/8"	1/4 - 1"	1/4 - 1"	1/4 - 1"
# Flutes			4			5			6	
		3945L	2998L	3947L	3928L	3902L	3933L	3941L	2947L	3943L
		3946L	2999L	3948L	3929L	3903L	3934L	3942L	3909L	3944L
Page			12-14			15-17			18-19	
	v_c / f_z	30	31	32	31	30	32	33	34	35
P	Steel materials									
	1.1	■	■	■	■	■	■	■	■	■
	2.1	■	■	■	■	■	■	■	■	■
	3.1	■	■	■	■	■	■	■	■	■
	4.1	■	■	■	■	■	■	■	■	■
	5.1	■	■	■	■	■	■	■	■	■
M	Stainless steel materials									
	1.1	■	■	■	■	■	■	■	■	■
	2.1	■	■	■	■	■	■	■	■	■
	3.1	■	■	■	■	■	■	■	■	■
	4.1	■	■	■	■	■	■	■	■	■
K	Cast materials									
	1.1	■	■	■	■	■	■	■	■	■
	1.2	■	■	■	■	■	■	■	■	■
	2.1	■	■	■	■	■	■	■	■	■
	2.2	■	■	■	■	■	■	■	■	■
	3.1	■	■	■	■	■	■	■	■	■
	3.2	■	■	■	■	■	■	■	■	■
	4.1	■	■	■	■	■	■	■	■	■
	4.2	■	■	■	■	■	■	■	■	■
N	Non ferrous materials									
	Aluminum alloys									
	1.1									
	1.2	■	■	■	■	■	■	■	■	■
	1.3	■	■	■	■	■	■	■	■	■
	1.4	■	■	■	■	■	■	■	■	■
	1.5									
	1.6									
	Copper alloys									
	2.1	■	■	■	■	■	■	■	■	■
	2.2	■	■	■	■	■	■	■	■	■
	2.3	■	■	■	■	■	■	■	■	■
	2.4	■	■	■	■	■	■	■	■	■
	2.5	■	■	■	■	■	■	■	■	■
	2.6	■	■	■	■	■	■	■	■	■
	2.7	■	■	■	■	■	■	■	■	■
	2.8	■	■	■	■	■	■	■	■	■
	Magnesium alloys									
	3.1	■	■	■	■	■	■	■	■	■
	3.2	■	■	■	■	■	■	■	■	■
	Synthetics									
	4.1	■	■	■	■	■	■	■	■	■
	4.2									
	4.3									
	4.4									
	Special materials									
	5.1									
	5.2	■	■	■	■	■	■	■	■	■
	5.3									
S	Special materials									
	Titanium alloys									
	1.1	■	■	■	■	■	■	■	■	■
	1.2	■	■	■	■	■	■	■	■	■
	1.3	■	■	■	■	■	■	■	■	■
	Nickel alloys, cobalt alloys and iron alloys									
	2.1	■	■	■	■	■	■	■	■	■
	2.2	■	■	■	■	■	■	■	■	■
	2.3	■	■	■	■	■	■	■	■	■
	2.4	■	■	■	■	■	■	■	■	■
	2.5	■	■	■	■	■	■	■	■	■
	2.6	■	■	■	■	■	■	■	■	■
H	Hard materials									
	1.1	■	■	■	■	■	■	■	■	■
	1.2	□	□	□	□	□	□	□	□	□
	1.3	□	□	□	□	□	□	□	□	□
	1.4									
	1.5									

■ = very suitable □ = suitable

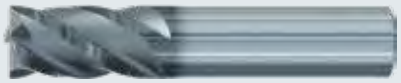


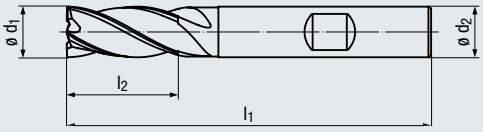
	Corner Radius			Ball Nose						
	N						N			
	1/4 - 1"	1/4 - 1"	1/4 - 1"	1/8 - 1"			1/8 - 1"			d_1
	7			4			5			# Flutes
	3935L	3937L	3939L	2919L	2974L	3900L	3949L	3950L	3951L	
	3936L	3938L	3940L	–	–	–	–	–	–	
	20-22			23			24			Page
	36	37	38	39			39			v_c / f_z
									Steel materials	
	■	■	■	■	■	■	■	■	■	1.1
	■	■	■	■	■	■	■	■	■	2.1
	■	■	■	■	■	■	■	■	■	3.1
	■	■	■	■	■	■	■	■	■	4.1
	■	■	■	■	■	■	■	■	■	5.1
								Stainless steel materials		
	■	■	■	■	■	■	■	■	■	1.1
	■	■	■	■	■	■	■	■	■	2.1
	■	■	■	□	□	□	□	□	□	3.1
	■	■	■	□	□	□	□	□	□	4.1
									Cast materials	
	■	■	■	■	■	■	■	■	■	1.1
	■	■	■	■	■	■	■	■	■	1.2
	■	■	■	■	■	■	■	■	■	2.1
	■	■	■	■	■	■	■	■	■	2.2
	■	■	■	□	□	□	□	□	□	3.1
	■	■	■	□	□	□	□	□	□	3.2
	■	■	■	□	□	□	□	□	□	4.1
	■	■	■	□	□	□	□	□	□	4.2
								Non ferrous materials		
									Aluminum alloys	
										1.1
	■	■	■							1.2
	■	■	■							1.3
	■	■	■							1.4
										1.5
										1.6
									Copper alloys	
	■	■	■	■	■	■	■	■	■	2.1
	■	■	■	■	■	■	■	■	■	2.2
	■	■	■	■	■	■	■	■	■	2.3
	■	■	■	■	■	■	■	■	■	2.4
	■	■	■	■	■	■	■	■	■	2.5
	■	■	■	■	■	■	■	■	■	2.6
	■	■	■	■	■	■	■	■	■	2.7
	■	■	■	■	■	■	■	■	■	2.8
									Magnesium alloys	
	■	■	■							3.1
	■	■	■							3.2
									Synthetics	
	■	■	■	■	■	■	■	■	■	4.1
				■	■	■	■	■	■	4.2
										4.3
										4.4
									Special materials	
										5.1
	■	■	■	■	■	■	■	■	■	5.2
				■	■	■	■	■	■	5.3
									Special materials	
									Titanium alloys	
	■	■	■	□	□	□	□	□	□	1.1
	■	■	■	□	□	□	□	□	□	1.2
	■	■	■	□	□	□	□	□	□	1.3
								Nickel alloys, cobalt alloys and iron alloys		
	■	■	■	□	□	□	□	□	□	2.1
	■	■	■	□	□	□	□	□	□	2.2
	■	■	■	□	□	□	□	□	□	2.3
	■	■	■	□	□	□	□	□	□	2.4
	■	■	■	□	□	□	□	□	□	2.5
	■	■	■	□	□	□	□	□	□	2.6
									Hard materials	
	■	■	■							1.1
	□	□	□							1.2
	□	□	□							1.3
										1.4
										1.5

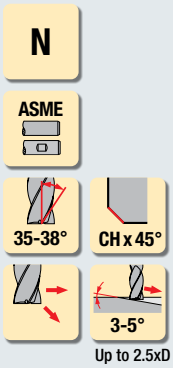
■ = very suitable □ = suitable

4 Flutes

- Variable helix angle flutes
- Vibration dampening
- Chamfer to stabilize the cutting edge
- ALCR PVD coating
- Sub-micro grain carbide
- Center cutting







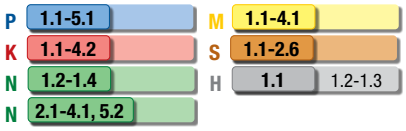
Icon descriptions (see page 25)

Applications

- Ideal for most materials
- Suitable for roughing and finishing operations

Cutting Data (see pages 26-28)

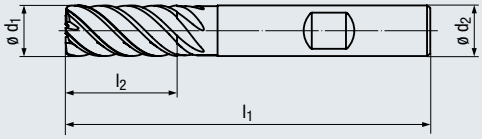
Materials - ISO Material Groups (see page 4)

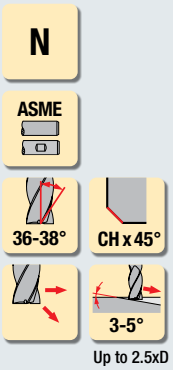


Cutter Dia.	Shank Dia.	Overall Length	Length of Cut		Coating	ALCR	
ø d_1 h10	ø d_2 h6	l_1	l_2	Chamfer	# Flutes	Tool No. Straight Shank	Tool No. Weldon Shank
1/16	1/8	1 1/2	1/8	0.002	4	2992L.00625	–
3/32	1/8	1 1/2	3/16	0.003	4	2992L.009375	–
	1/8	1 1/2	1/4	0.003	4	2992L.0125	–
1/8	1/8	1 1/2	3/8	0.003	4	2994L.0125	–
	1/8	2 1/4	3/4	0.003	4	2996L.0125	–
5/32	3/16	2	5/16	0.003	4	2992L.015625	–
	3/16	2	3/8	0.005	4	2992L.01875	–
3/16	3/16	2	7/16	0.005	4	2994L.01875	–
	3/16	2 1/2	3/4	0.005	4	2996L.01875	–
7/32	1/4	2	7/16	0.005	4	2992L.021875	2993L.021875
	1/4	2	1/2	0.005	4	2992L.0250	2993L.0250
1/4	1/4	2 1/2	1/2	0.005	4	2994L.0250	2995L.0250
	1/4	2 1/2	3/4	0.005	4	2994L.A250	2995L.A250
	1/4	3	1 1/8	0.005	4	2996L.0250	2997L.0250
	5/16	2	1/2	0.005	4	2992L.03125	2993L.03125
5/16	5/16	2 1/4	9/16	0.005	4	2992L.A3125	2993L.A3125
	5/16	2 1/2	13/16	0.005	4	2994L.03125	2995L.03125
	5/16	3	1 1/8	0.005	4	2996L.03125	2997L.03125
	3/8	2	5/8	0.008	4	2992L.0375	2993L.0375
	3/8	2 1/2	5/8	0.008	4	2992L.A375	2993L.A375
3/8	3/8	2 1/2	7/8	0.008	4	2994L.0375	2995L.0375
	3/8	2 3/4	7/8	0.008	4	2994L.A375	2995L.A375
	3/8	3	1 1/8	0.008	4	2996L.0375	2997L.0375
	7/16	2 1/2	5/8	0.008	4	2992L.04375	–
7/16	7/16	2 3/4	1	0.008	4	2994L.04375	–
	7/16	4	2	0.008	4	2994L.A4375	–
	7/16	4 1/2	2	0.008	4	2996L.04375	–
	1/2	2 1/2	5/8	0.008	4	2992L.0500	2993L.0500
	1/2	2 3/4	5/8	0.008	4	2992L.A500	2993L.A500
1/2	1/2	3	1	0.008	4	2994L.0500	2995L.0500
	1/2	3 1/4	1 1/4	0.008	4	2994L.A500	2995L.A500
	1/2	4 1/2	2	0.008	4	2996L.0500	2997L.0500
	5/8	3	3/4	0.008	4	2992L.0625	2993L.0625
	5/8	3 1/2	1 1/4	0.008	4	2994L.0625	2995L.0625
5/8	5/8	4	1 7/8	0.008	4	2994L.A625	2995L.A625
	5/8	4 3/4	2 1/4	0.008	4	2994L.B625	2995L.B625
	5/8	5	2 1/4	0.008	4	2996L.0625	2997L.0625
	3/4	3	1	0.012	4	2992L.0750	2993L.0750
3/4	3/4	3 1/2	1	0.012	4	2992L.A750	2993L.A750
	3/4	4	1 1/2	0.012	4	2994L.0750	2995L.0750
	3/4	5	2 1/4	0.012	4	2996L.0750	2997L.0750
	1	4	1	0.012	4	2992L.1000	2993L.1000
	1	4	1 1/2	0.012	4	2994L.1000	2995L.1000
1	1	5	2	0.012	4	2994L.A000	2995L.A000
	1	5	2 1/4	0.012	4	2996L.1000	2997L.1000
	1	6	3	0.012	4	2996L.A000	2997L.A000

5 Flutes

- Variable pitch helix angle
- Vibration dampening
- Increased feed rates
- Chamfer to stabilize corner
- ALCR PVD coating
- Sub-micro grain carbide
- Center cutting





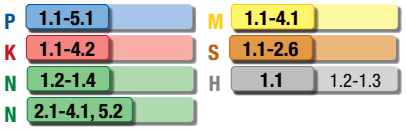
Icon descriptions (see page 25)

Applications

- Well suited for most materials including aerospace alloys
- Suitable for finishing and light roughing
- Suitable for trochoidal style machining strategies

Cutting Data (see page 29)

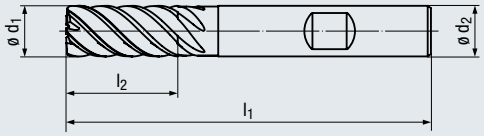
Materials - ISO Material Groups (see pages 4-5)

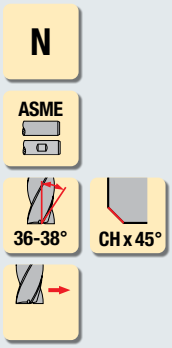


Cutter Dia.	Shank Dia.	Overall Length	Length of Cut		Coating	ALCR	
ø d_1 h10	ø d_2 h6	l_1	l_2	Chamfer	# Flutes	Tool No. Straight Shank	Tool No. Weldon Shank
1/8	1/8	1 1/2	3/8	0.003	5	2946L.0125	–
3/16	3/16	2	9/16	0.003	5	2946L.01875	–
1/4	1/4	2	1/2	0.005	5	3920L.0250	–
	1/4	2 1/2	3/4	0.005	5	2946L.0250	–
	1/4	3	1 1/8	0.005	5	3922L.0250	–
5/16	5/16	2 1/4	9/16	0.005	5	3920L.03125	–
	5/16	2 1/2	13/16	0.005	5	2946L.03125	–
	5/16	3	1 1/8	0.005	5	3922L.03125	–
3/8	3/8	2 1/2	5/8	0.008	5	3920L.0375	–
	3/8	2 3/4	7/8	0.008	5	2946L.0375	–
	3/8	3	1 1/8	0.008	5	3922L.0375	–
7/16	7/16	2 1/2	5/8	0.008	5	3920L.04375	–
	7/16	3	1	0.008	5	2946L.04375	–
	7/16	4	2	0.008	5	3922L.04375	–
1/2	1/2	2 3/4	5/8	0.008	5	3920L.0500	3921L.0500
	1/2	3	1	0.008	5	2946L.0500	2920L.0500
	1/2	3 1/4	1 1/4	0.008	5	2946L.A500	2920L.A500
	1/2	4 1/2	2	0.008	5	3922L.0500	3923L.0500
5/8	5/8	3	3/4	0.008	5	3920L.0625	3921L.0625
	5/8	3 1/2	1 1/4	0.008	5	2946L.0625	2920L.0625
	5/8	4	1 7/8	0.008	5	2946L.A625	2920L.A625
	5/8	4 3/4	2 1/4	0.008	5	3922L.0625	3923L.0625
3/4	3/4	3 1/2	1	0.012	5	3920L.0750	3921L.0750
	3/4	4	1 1/2	0.012	5	2946L.0750	2920L.0750
	3/4	5	2 1/4	0.012	5	3922L.0750	3923L.0750
1	1	4	1	0.012	5	3920L.1000	3921L.1000
	1	5	2	0.012	5	2946L.1000	2920L.1000
	1	6	3	0.012	5	3922L.1000	3923L.1000

6 Flutes

- Variable pitch helix angle
- Vibration dampening
- Increased feed rates
- Chamfer to stabilize corner
- ALCR PVD coating
- Sub-micro grain carbide





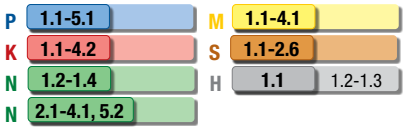
Icon descriptions (see page 25)

Applications

- Well suited for most materials including aerospace alloys
- Suitable for finishing and light roughing
- Suitable for trochoidal style machining strategies

Cutting Data (see pages 33-35)

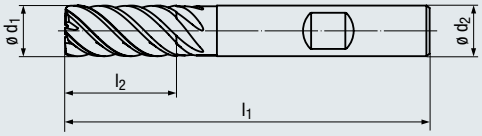
Materials - ISO Material Groups (see pages 4-5)

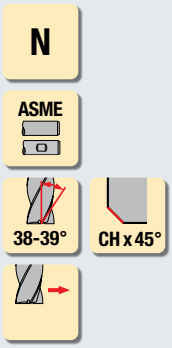


Cutter Dia.	Shank Dia.	Overall Length	Length of Cut		Coating	ALCR	
ø d_1 h10	ø d_2 h6	l_1	l_2	Chamfer	# Flutes	Tool No. Straight Shank	Tool No. Weldon Shank
	1/4	2	1/2	0.005	6	3924L.0250	–
1/4	1/4	2 1/2	3/4	0.005	6	2948L.0250	–
	1/4	3	1 1/8	0.005	6	3926L.0250	–
	5/16	2 1/4	9/16	0.005	6	3924L.03125	–
5/16	5/16	2 1/2	13/16	0.005	6	2948L.03125	–
	5/16	3	1 1/8	0.005	6	3926L.03125	–
	3/8	2 1/2	5/8	0.008	6	3924L.0375	–
3/8	3/8	2 3/4	7/8	0.008	6	2948L.0375	–
	3/8	3	1 1/8	0.008	6	3926L.0375	–
	7/16	2 1/2	5/8	0.008	6	3924L.04375	–
7/16	7/16	3	1	0.008	6	2948L.04375	–
	7/16	4	2	0.008	6	3926L.04375	–
	1/2	2 3/4	5/8	0.008	6	3924L.0500	3925L.0500
1/2	1/2	3	1	0.008	6	2948L.0500	3908L.0500
	1/2	3 1/4	1 1/4	0.008	6	2948L.A500	3908L.A500
	1/2	4 1/2	2	0.008	6	3926L.0500	3927L.0500
	5/8	3	3/4	0.008	6	3924L.0625	3925L.0625
5/8	5/8	3 1/2	1 1/4	0.008	6	2948L.0625	3908L.0625
	5/8	4	1 7/8	0.008	6	2948L.A625	3908L.A625
	5/8	4 3/4	2 1/4	0.008	6	3926L.0625	3927L.0625
	3/4	3 1/2	1	0.012	6	3924L.0750	3925L.0750
3/4	3/4	4	1 1/2	0.012	6	2948L.0750	3908L.0750
	3/4	5	2 1/4	0.012	6	3926L.0750	3927L.0750
	1	4	1	0.012	6	3924L.1000	3925L.1000
1	1	5	2	0.012	6	2948L.1000	3908L.1000
	1	6	3	0.012	6	3926L.1000	3927L.1000

7 Flutes

- Variable pitch helix angle
- Vibration dampening
- Increased feed rates
- Chamfer to stabilize corner
- ALCR PVD coating
- Sub-micro grain carbide





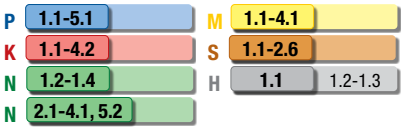
Icon descriptions (see page 25)

Applications

- Well suited for most materials including aerospace alloys
- Suitable for finishing and light roughing
- Suitable for trochoidal style machining strategies

Cutting Data (see pages 36-38)

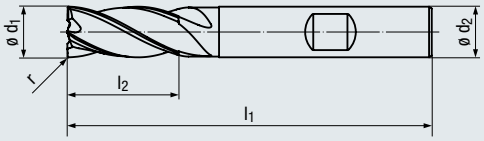
Materials - ISO Material Groups (see pages 4-5)

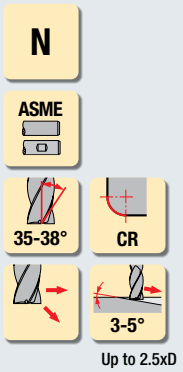


Cutter Dia.	Shank Dia.	Overall Length	Length of Cut		Coating	ALCR	
ø d_1 h10	ø d_2 h6	l_1	l_2	Chamfer	# Flutes	Tool No. Straight Shank	Tool No. Weldon Shank
1/4	1/4	2	1/2	0.005	7	3916L.0250	–
	1/4	2 1/2	3/4	0.005	7	3917L.0250	–
	1/4	3	1 1/8	0.005	7	3918L.0250	–
5/16	5/16	2 1/4	9/16	0.005	7	3916L.03125	–
	5/16	2 1/2	13/16	0.005	7	3917L.03125	–
	5/16	3	1 1/8	0.005	7	3918L.03125	–
3/8	3/8	2 1/2	5/8	0.008	7	3916L.0375	–
	3/8	2 3/4	7/8	0.008	7	3917L.0375	–
	3/8	3	1 1/8	0.008	7	3918L.0375	–
7/16	7/16	2 1/2	5/8	0.008	7	3916L.04375	–
	7/16	3	1	0.008	7	3917L.04375	–
	7/16	4	2	0.008	7	3918L.04375	–
1/2	1/2	2 3/4	5/8	0.008	7	3916L.0500	3930L.0500
	1/2	3	1	0.008	7	3917L.0500	3931L.0500
	1/2	3 1/4	1 1/4	0.008	7	3917L.A500	3931L.A500
	1/2	4 1/2	2	0.008	7	3918L.0500	3932L.0500
5/8	5/8	3	3/4	0.008	7	3916L.0625	3930L.0625
	5/8	3 1/2	1 1/4	0.008	7	3917L.0625	3931L.0625
	5/8	4	1 7/8	0.008	7	3917L.A625	3931L.A625
	5/8	4 3/4	2 1/4	0.008	7	3918L.0625	3932L.0625
3/4	3/4	3 1/2	1	0.012	7	3916L.0750	3930L.0750
	3/4	4	1 1/2	0.012	7	3917L.0750	3931L.0750
	3/4	5	2 1/4	0.012	7	3918L.0750	3932L.0750
1	1	4	1	0.012	7	3916L.1000	3930L.1000
	1	5	2	0.012	7	3917L.1000	3931L.1000
	1	6	3	0.012	7	3918L.1000	3932L.1000

4 Flutes – Corner Radius

- Variable helix angle flutes
- Vibration dampening
- Corner radius options
- ALCR PVD coating
- Sub-micro grain carbide
- Center cutting





Icon descriptions (see page 25)

Applications

- Ideal for most materials including high tensile strength applications
- Suitable for roughing and finishing operations

Cutting Data (see pages 30-32)

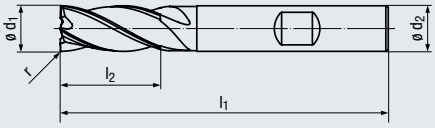
Materials - ISO Material Groups (see pages 4. 6)

P 1.1-5.1 | M 1.1-4.1
K 1.1-4.2 | S 1.1-2.6
N 1.2-1.4 | H 1.1 1.2-1.3
N 2.1-4.1, 5.2

Cutter Dia.	Shank Dia.	Overall Length	Length of Cut		Coating	ALCR	
ø d_1 h10	ø d_2 h6	l_1	l_2	Radius	# Flutes	Tool No. Straight Shank	Tool No. Weldon Shank
1/8	1/8	1 1/2	1/4	0.010	4	3945L.012010	–
	1/8	1 1/2	1/4	0.015	4	3945L.012015	–
	1/8	1 1/2	3/8	0.010	4	2998L.012010	–
	1/8	1 1/2	3/8	0.015	4	2998L.012015	–
	1/8	2 1/4	3/4	0.010	4	3947L.012010	–
	1/8	2 1/4	3/4	0.015	4	3947L.012015	–
3/16	3/16	2	3/8	0.010	4	3945L.018010	–
	3/16	2	3/8	0.015	4	3945L.018015	–
	3/16	2	3/8	0.020	4	3945L.018020	–
	3/16	2	3/8	0.030	4	3945L.018030	–
	3/16	2	7/16	0.010	4	2998L.018010	–
	3/16	2	7/16	0.015	4	2998L.018015	–
	3/16	2	7/16	0.020	4	2998L.018020	–
	3/16	2	7/16	0.030	4	2998L.018030	–
	3/16	2 1/2	3/4	0.010	4	3947L.018010	–
	3/16	2 1/2	3/4	0.015	4	3947L.018015	–
	3/16	2 1/2	3/4	0.020	4	3947L.018020	–
	3/16	2 1/2	3/4	0.030	4	3947L.018030	–
1/4	1/4	2	1/2	0.010	4	3945L.025010	3946L.025010
	1/4	2	1/2	0.015	4	3945L.025015	3946L.025015
	1/4	2	1/2	0.020	4	3945L.025020	3946L.025020
	1/4	2	1/2	0.030	4	3945L.025030	3946L.025030
	1/4	2	1/2	0.060	4	3945L.025060	3946L.025060
	1/4	2 1/2	1/2	0.010	4	2998L.025010	2999L.025010
	1/4	2 1/2	1/2	0.015	4	2998L.025015	2999L.025015
	1/4	2 1/2	1/2	0.020	4	2998L.025020	2999L.025020
	1/4	2 1/2	1/2	0.030	4	2998L.025030	2999L.025030
	1/4	2 1/2	1/2	0.060	4	2998L.025060	2999L.025060
	1/4	2 1/2	3/4	0.010	4	2998L.A25010	2999L.A25010
	1/4	2 1/2	3/4	0.015	4	2998L.A25015	2999L.A25015
	1/4	2 1/2	3/4	0.020	4	2998L.A25020	2999L.A25020
	1/4	2 1/2	3/4	0.030	4	2998L.A25030	2999L.A25030
	1/4	2 1/2	3/4	0.060	4	2998L.A25060	2999L.A25060
	1/4	3	1 1/8	0.010	4	3947L.025010	3948L.025010
	1/4	3	1 1/8	0.015	4	3947L.025015	3948L.025015
	1/4	3	1 1/8	0.020	4	3947L.025020	3948L.025020
	1/4	3	1 1/8	0.030	4	3947L.025030	3948L.025030
	1/4	3	1 1/8	0.060	4	3947L.025060	3948L.025060
5/16	5/16	2 1/4	9/16	0.010	4	3945L.031010	3946L.031010
	5/16	2 1/4	9/16	0.015	4	3945L.031015	3946L.031015
	5/16	2 1/4	9/16	0.020	4	3945L.031020	3946L.031020
	5/16	2 1/4	9/16	0.030	4	3945L.031030	3946L.031030
	5/16	2 1/2	13/16	0.010	4	2998L.031010	2999L.031010
	5/16	2 1/2	13/16	0.015	4	2998L.031015	2999L.031015
	5/16	2 1/2	13/16	0.020	4	2998L.031020	2999L.031020
	5/16	2 1/2	13/16	0.030	4	2998L.031030	2999L.031030
	5/16	3	1 1/8	0.010	4	3947L.031010	3948L.031010
	5/16	3	1 1/8	0.015	4	3947L.031015	3948L.031015
	5/16	3	1 1/8	0.020	4	3947L.031020	3948L.031020
	5/16	3	1 1/8	0.030	4	3947L.031030	3948L.031030

4 Flutes – Corner Radius – tool sizes continue on page 13

4 Flutes – Corner Radius (continued from page 12)



N

ASME

CR

35-38°

3-5°

Up to 2.5xD

Icon descriptions (see page 25)

Applications

- Ideal for most materials including high tensile strength applications
- Suitable for roughing and finishing operations

Cutting Data (see pages 30-32)

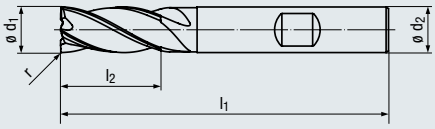
Materials - ISO Material Groups (see pages 4, 6)

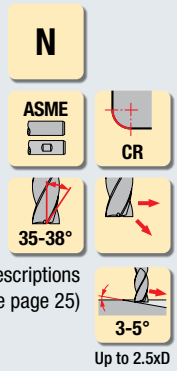
P 1.1-5.1 | M 1.1-4.1
K 1.1-4.2 | S 1.1-2.6
N 1.2-1.4 | H 1.1 | 1.2-1.3
N 2.1-4.1, 5.2

Cutter Dia.	Shank Dia.	Overall Length	Length of Cut		Coating	ALCR	
ø d_1 h10	ø d_2 h6	l_1	l_2	Radius	# Flutes	Tool No. Straight Shank	Tool No. Weldon Shank
3/8	3/8	2 1/2	5/8	0.010	4	3945L.037010	3946L.037010
	3/8	2 1/2	5/8	0.015	4	3945L.037015	3946L.037015
	3/8	2 1/2	5/8	0.020	4	3945L.037020	3946L.037020
	3/8	2 1/2	5/8	0.030	4	3945L.037030	3946L.037030
	3/8	2 1/2	5/8	0.060	4	3945L.037060	3946L.037060
	3/8	2 1/2	5/8	0.090	4	3945L.037090	3946L.037090
	3/8	2 1/2	7/8	0.010	4	2998L.037010	2999L.037010
	3/8	2 1/2	7/8	0.015	4	2998L.037015	2999L.037015
	3/8	2 1/2	7/8	0.020	4	2998L.037020	2999L.037020
	3/8	2 1/2	7/8	0.030	4	2998L.037030	2999L.037030
	3/8	2 1/2	7/8	0.060	4	2998L.037060	2999L.037060
	3/8	2 1/2	7/8	0.090	4	2998L.037090	2999L.037090
	3/8	2 3/4	7/8	0.010	4	2998L.A37010	2999L.A37010
	3/8	2 3/4	7/8	0.015	4	2998L.A37015	2999L.A37015
	3/8	2 3/4	7/8	0.020	4	2998L.A37020	2999L.A37020
	3/8	2 3/4	7/8	0.030	4	2998L.A37030	2999L.A37030
	3/8	2 3/4	7/8	0.060	4	2998L.A37060	2999L.A37060
	3/8	2 3/4	7/8	0.090	4	2998L.A37090	2999L.A37090
	3/8	3	1 1/8	0.010	4	3947L.037010	3948L.037010
	3/8	3	1 1/8	0.015	4	3947L.037015	3948L.037015
	3/8	3	1 1/8	0.020	4	3947L.037020	3948L.037020
	3/8	3	1 1/8	0.030	4	3947L.037030	3948L.037030
	3/8	3	1 1/8	0.060	4	3947L.037060	3948L.037060
	3/8	3	1 1/8	0.090	4	3947L.037090	3948L.037090
7/16	7/16	2 3/4	1	0.010	4	2998L.043010	–
	7/16	2 3/4	1	0.015	4	2998L.043015	–
1/2	1/2	2 3/4	5/8	0.010	4	3945L.050010	3946L.050010
	1/2	2 3/4	5/8	0.015	4	3945L.050015	3946L.050015
	1/2	2 3/4	5/8	0.020	4	3945L.050020	3946L.050020
	1/2	2 3/4	5/8	0.030	4	3945L.050030	3946L.050030
	1/2	2 3/4	5/8	0.060	4	3945L.050060	3946L.050060
	1/2	2 3/4	5/8	0.090	4	3945L.050090	3946L.050090
	1/2	2 3/4	5/8	0.120	4	3945L.050120	3946L.050120
	1/2	3	1	0.010	4	2998L.050010	2999L.050010
	1/2	3	1	0.015	4	2998L.050015	2999L.050015
	1/2	3	1	0.020	4	2998L.050020	2999L.050020
	1/2	3	1	0.030	4	2998L.050030	2999L.050030
	1/2	3	1	0.060	4	2998L.050060	2999L.050060
	1/2	3	1	0.090	4	2998L.050090	2999L.050090
	1/2	3	1	0.120	4	2998L.050120	2999L.050120
	1/2	3 1/4	1 1/4	0.010	4	2998L.A50010	2999L.A50010
	1/2	3 1/4	1 1/4	0.015	4	2998L.A50015	2999L.A50015
	1/2	3 1/4	1 1/4	0.020	4	2998L.A50020	2999L.A50020
	1/2	3 1/4	1 1/4	0.030	4	2998L.A50030	2999L.A50030
	1/2	3 1/4	1 1/4	0.060	4	2998L.A50060	2999L.A50060
	1/2	3 1/4	1 1/4	0.090	4	2998L.A50090	2999L.A50090
	1/2	3 1/4	1 1/4	0.120	4	2998L.A50120	2999L.A50120
	1/2	4 1/2	2	0.010	4	3947L.050010	3948L.050010
	1/2	4 1/2	2	0.015	4	3947L.050015	3948L.050015
	1/2	4 1/2	2	0.020	4	3947L.050020	3948L.050020
	1/2	4 1/2	2	0.030	4	3947L.050030	3948L.050030
	1/2	4 1/2	2	0.060	4	3947L.050060	3948L.050060
	1/2	4 1/2	2	0.090	4	3947L.050090	3948L.050090
	1/2	4 1/2	2	0.120	4	3947L.050120	3948L.050120

4 Flutes – Corner Radius – tool sizes continue on page 14

4 Flutes – Corner Radius (continued from page 13)





Icon descriptions (see page 25)

Applications

- Ideal for most materials including high tensile strength applications
- Suitable for roughing and finishing operations

Cutting Data (see pages 30-32)

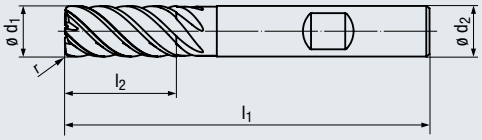
Materials - ISO Material Groups (see pages 4, 6)

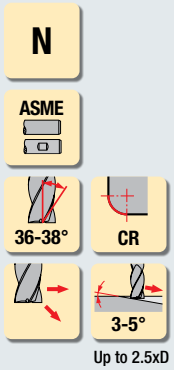
P 1.1-5.1 M 1.1-4.1
K 1.1-4.2 S 1.1-2.6
N 1.2-1.4 H 1.1 1.2-1.3
N 2.1-4.1, 5.2

Cutter Dia.	Shank Dia.	Overall Length	Length of Cut		Coating	ALCR	
ø d_1 h10	ø d_2 h6	l_1	l_2	Radius	# Flutes	Tool No. Straight Shank	Tool No. Weldon Shank
	5/8	3	3/4	0.030	4	3945L.062030	3946L.062030
	5/8	3	3/4	0.060	4	3945L.062060	3946L.062060
	5/8	3	3/4	0.090	4	3945L.062090	3946L.062090
	5/8	3	3/4	0.120	4	3945L.062120	3946L.062120
	5/8	3 1/2	1 1/4	0.030	4	2998L.062030	2999L.062030
	5/8	3 1/2	1 1/4	0.040	4	2998L.062040	2999L.062040
	5/8	3 1/2	1 1/4	0.060	4	2998L.062060	2999L.062060
	5/8	3 1/2	1 1/4	0.090	4	2998L.062090	2999L.062090
5/8	5/8	3 1/2	1 1/4	0.120	4	2998L.062120	2999L.062120
	5/8	4	1 7/8	0.030	4	2998L.A62030	2999L.A62030
	5/8	4	1 7/8	0.060	4	2998L.A62060	2999L.A62060
	5/8	4	1 7/8	0.090	4	2998L.A62090	2999L.A62090
	5/8	4	1 7/8	0.120	4	2998L.A62120	2999L.A62120
	5/8	4 3/4	2 1/4	0.030	4	3947L.062030	3948L.062030
	5/8	4 3/4	2 1/4	0.060	4	3947L.062060	3948L.062060
	5/8	4 3/4	2 1/4	0.090	4	3947L.062090	3948L.062090
	5/8	4 3/4	2 1/4	0.120	4	3947L.062120	3948L.062120
	3/4	3 1/2	1	0.015	4	3945L.075015	3946L.075015
	3/4	3 1/2	1	0.020	4	3945L.075020	3946L.075020
	3/4	3 1/2	1	0.030	4	3945L.075030	3946L.075030
	3/4	3 1/2	1	0.060	4	3945L.075060	3946L.075060
	3/4	3 1/2	1	0.090	4	3945L.075090	3946L.075090
	3/4	3 1/2	1	0.120	4	3945L.075120	3946L.075120
	3/4	3 1/2	1	0.190	4	3945L.075190	3946L.075190
	3/4	3 1/2	1	0.250	4	3945L.075250	3946L.075250
	3/4	4	1 1/2	0.015	4	2998L.075015	2999L.075015
	3/4	4	1 1/2	0.020	4	2998L.075020	2999L.075020
	3/4	4	1 1/2	0.030	4	2998L.075030	2999L.075030
	3/4	4	1 1/2	0.040	4	2998L.075040	2999L.075040
3/4	3/4	4	1 1/2	0.060	4	2998L.075060	2999L.075060
	3/4	4	1 1/2	0.090	4	2998L.075090	2999L.075090
	3/4	4	1 1/2	0.120	4	2998L.075120	2999L.075120
	3/4	4	1 1/2	0.190	4	2998L.075190	2999L.075190
	3/4	4	1 1/2	0.250	4	2998L.075250	2999L.075250
	3/4	5	2 1/4	0.015	4	3947L.075015	3948L.075015
	3/4	5	2 1/4	0.020	4	3947L.075020	3948L.075020
	3/4	5	2 1/4	0.030	4	3947L.075030	3948L.075030
	3/4	5	2 1/4	0.060	4	3947L.075060	3948L.075060
	3/4	5	2 1/4	0.090	4	3947L.075090	3948L.075090
	3/4	5	2 1/4	0.120	4	3947L.075120	3948L.075120
	3/4	5	2 1/4	0.190	4	3947L.075190	3948L.075190
	3/4	5	2 1/4	0.250	4	3947L.075250	3948L.075250
	1	4	1	0.030	4	3945L.100030	3946L.100030
	1	4	1	0.060	4	3945L.100060	3946L.100060
	1	4	1	0.090	4	3945L.100090	3946L.100090
	1	4	1	0.120	4	3945L.100120	3946L.100120
	1	4	1 1/2	0.030	4	2998L.100030	2999L.100030
	1	4	1 1/2	0.040	4	2998L.100040	2999L.100040
	1	4	1 1/2	0.060	4	2998L.100060	2999L.100060
1	1	5	2	0.030	4	2998L.A00030	2999L.A00030
	1	5	2	0.060	4	2998L.A00060	2999L.A00060
	1	5	2	0.090	4	2998L.A00090	2999L.A00090
	1	5	2	0.120	4	2998L.A00120	2999L.A00120
	1	6	3	0.030	4	3947L.100030	3948L.100030
	1	6	3	0.060	4	3947L.100060	3948L.100060
	1	6	3	0.090	4	3947L.100090	3948L.100090
	1	6	3	0.120	4	3947L.100120	3948L.100120

5 Flutes – Corner Radius

- Variable pitch helix angle
- Vibration dampening
- Increased feed rates
- Fully blended corner radius
- ALCR PVD coating
- Sub-micro grain carbide
- Center cutting





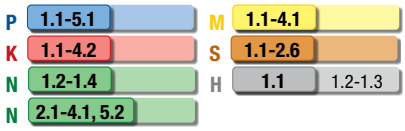
Icon descriptions (see page 25)

Applications

- Well suited for most materials including aerospace alloys
- Suitable for finishing and light roughing
- Suitable for trochoidal style machining strategies

Cutting Data (see pages 30-32)

Materials - ISO Material Groups (see pages 4, 6)

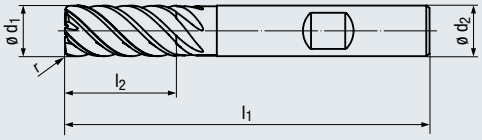


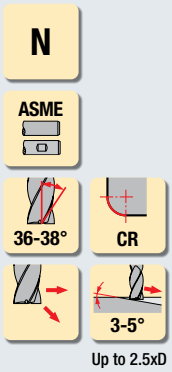
Cutter Dia.	Shank Dia.	Overall Length	Length of Cut		Coating	ALCR	
ø d_1 h10	ø d_2 h6	l_1	l_2	Radius	# Flutes	Tool No. Straight Shank	Tool No. Weldon Shank
1/4	1/4	2	1/2	0.010	5	3928L.025010	–
	1/4	2	1/2	0.015	5	3928L.025015	–
	1/4	2	1/2	0.020	5	3928L.025020	–
	1/4	2	1/2	0.030	5	3928L.025030	–
	1/4	2	1/2	0.060	5	3928L.025060	–
	1/4	2 1/2	3/4	0.010	5	3902L.025010	–
	1/4	2 1/2	3/4	0.015	5	3902L.025015	–
	1/4	2 1/2	3/4	0.020	5	3902L.025020	–
	1/4	2 1/2	3/4	0.030	5	3902L.025030	–
	1/4	2 1/2	3/4	0.060	5	3902L.025060	–
	1/4	3	1 1/8	0.010	5	3933L.025010	–
	1/4	3	1 1/8	0.015	5	3933L.025015	–
	1/4	3	1 1/8	0.020	5	3933L.025020	–
	1/4	3	1 1/8	0.030	5	3933L.025030	–
	1/4	3	1 1/8	0.060	5	3933L.025060	–
3/8	3/8	2 1/2	5/8	0.010	5	3928L.037010	–
	3/8	2 1/2	5/8	0.015	5	3928L.037015	–
	3/8	2 1/2	5/8	0.020	5	3928L.037020	–
	3/8	2 1/2	5/8	0.030	5	3928L.037030	–
	3/8	2 1/2	5/8	0.060	5	3928L.037060	–
	3/8	2 1/2	5/8	0.090	5	3928L.037090	–
	3/8	2 3/4	7/8	0.010	5	3902L.037010	–
	3/8	2 3/4	7/8	0.015	5	3902L.037015	–
	3/8	2 3/4	7/8	0.020	5	3902L.037020	–
	3/8	2 3/4	7/8	0.030	5	3902L.037030	–
	3/8	2 3/4	7/8	0.060	5	3902L.037060	–
	3/8	2 3/4	7/8	0.090	5	3902L.037090	–
	3/8	3	1 1/8	0.010	5	3933L.037010	–
	3/8	3	1 1/8	0.015	5	3933L.037015	–
	3/8	3	1 1/8	0.020	5	3933L.037020	–
	3/8	3	1 1/8	0.030	5	3933L.037030	–
	3/8	3	1 1/8	0.060	5	3933L.037060	–
	3/8	3	1 1/8	0.090	5	3933L.037090	–
1/2	1/2	2 3/4	5/8	0.010	5	3928L.050010	3929L.050010
	1/2	2 3/4	5/8	0.015	5	3928L.050015	3929L.050015
	1/2	2 3/4	5/8	0.020	5	3928L.050020	3929L.050020
	1/2	2 3/4	5/8	0.030	5	3928L.050030	3929L.050030
	1/2	2 3/4	5/8	0.060	5	3928L.050060	3929L.050060
	1/2	2 3/4	5/8	0.090	5	3928L.050090	3929L.050090
	1/2	2 3/4	5/8	0.120	5	3928L.050120	3929L.050120
	1/2	3	1	0.010	5	3902L.050010	3903L.050010
	1/2	3	1	0.015	5	3902L.050015	3903L.050015
	1/2	3	1	0.020	5	3902L.050020	3903L.050020
	1/2	3	1	0.030	5	3902L.050030	3903L.050030
	1/2	3	1	0.060	5	3902L.050060	3903L.050060
	1/2	3	1	0.090	5	3902L.050090	3903L.050090
	1/2	3	1	0.120	5	3902L.050120	3903L.050120

5 Flutes – Corner Radius – tool sizes continue on page 16

5 Flutes – Corner Radius (continued from page 15)

- Variable pitch helix angle
- Vibration dampening
- Increased feed rates
- Fully blended corner radius
- ALCR PVD coating
- Sub-micro grain carbide
- Center cutting





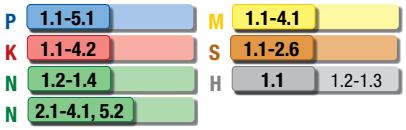
Icon descriptions (see page 25)

Applications

- Well suited for most materials including aerospace alloys
- Suitable for finishing and light roughing
- Suitable for trochoidal style machining strategies

Cutting Data (see pages 30-32)

Materials - ISO Material Groups (see pages 4, 6)

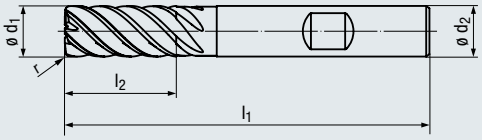


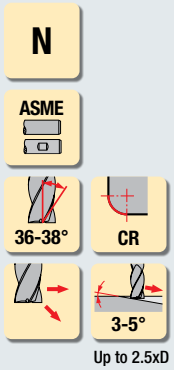
Cutter Dia.	Shank Dia.	Overall Length	Length of Cut		Coating	ALCR	
ø d_1 h10	ø d_2 h6	l_1	l_2	Radius	# Flutes	Tool No. Straight Shank	Tool No. Weldon Shank
1/2	1/2	3 1/4	1 1/4	0.010	5	3902L.A50010	3903L.A50010
	1/2	3 1/4	1 1/4	0.015	5	3902L.A50015	3903L.A50015
	1/2	3 1/4	1 1/4	0.020	5	3902L.A50020	3903L.A50020
	1/2	3 1/4	1 1/4	0.030	5	3902L.A50030	3903L.A50030
	1/2	3 1/4	1 1/4	0.060	5	3902L.A50060	3903L.A50060
	1/2	3 1/4	1 1/4	0.090	5	3902L.A50090	3903L.A50090
	1/2	3 1/4	1 1/4	0.120	5	3902L.A50120	3903L.A50120
	1/2	4 1/2	2	0.010	5	3933L.050010	3934L.050010
	1/2	4 1/2	2	0.015	5	3933L.050015	3934L.050015
	1/2	4 1/2	2	0.020	5	3933L.050020	3934L.050020
	1/2	4 1/2	2	0.030	5	3933L.050030	3934L.050030
	1/2	4 1/2	2	0.060	5	3933L.050060	3934L.050060
	1/2	4 1/2	2	0.090	5	3933L.050090	3934L.050090
	1/2	4 1/2	2	0.120	5	3933L.050120	3934L.050120
5/8	5/8	3	3/4	0.030	5	3928L.062030	3929L.062030
	5/8	3	3/4	0.060	5	3928L.062060	3929L.062060
	5/8	3	3/4	0.090	5	3928L.062090	3929L.062090
	5/8	3	3/4	0.120	5	3928L.062120	3929L.062120
	5/8	3 1/2	1 1/4	0.030	5	3902L.062030	3903L.062030
	5/8	3 1/2	1 1/4	0.060	5	3902L.062060	3903L.062060
	5/8	3 1/2	1 1/4	0.090	5	3902L.062090	3903L.062090
	5/8	3 1/2	1 1/4	0.120	5	3902L.062120	3903L.062120
	5/8	4	1 5/8	0.030	5	3902L.A62030	3903L.A62030
	5/8	4	1 5/8	0.060	5	3902L.A62060	3903L.A62060
	5/8	4	1 5/8	0.090	5	3902L.A62090	3903L.A62090
	5/8	4	1 5/8	0.120	5	3902L.A62120	3903L.A62120
	5/8	4	1 7/8	0.030	5	3902L.B62030	3903L.B62030
	5/8	4	1 7/8	0.060	5	3902L.B62060	3903L.B62060
	5/8	4	1 7/8	0.090	5	3902L.B62090	3903L.B62090
	5/8	4	1 7/8	0.120	5	3902L.B62120	3903L.B62120
	5/8	4 3/4	2 1/4	0.030	5	3933L.062030	3934L.062030
	5/8	4 3/4	2 1/4	0.060	5	3933L.062060	3934L.062060
	5/8	4 3/4	2 1/4	0.090	5	3933L.062090	3934L.062090
	5/8	4 3/4	2 1/4	0.120	5	3933L.062120	3934L.062120

5 Flutes – Corner Radius – tool sizes continue on page 17

5 Flutes – Corner Radius (continued from page 16)

- Variable pitch helix angle
- Vibration dampening
- Increased feed rates
- Fully blended corner radius
- ALCR PVD coating
- Sub-micro grain carbide
- Center cutting





Icon descriptions (see page 25)

Applications

- Well suited for most materials including aerospace alloys
- Suitable for finishing and light roughing
- Suitable for trochoidal style machining strategies

Cutting Data (see pages 30-32)

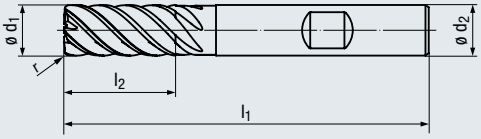
Materials - ISO Material Groups (see pages 4, 6)

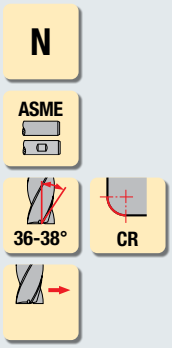
P 1.1-5.1 | M 1.1-4.1
K 1.1-4.2 | S 1.1-2.6
N 1.2-1.4 | H 1.1 1.2-1.3
N 2.1-4.1, 5.2

Cutter Dia.	Shank Dia.	Overall Length	Length of Cut		Coating	ALCR	
ø d_1 h10	ø d_2 h6	l_1	l_2	Radius	# Flutes	Tool No. Straight Shank	Tool No. Weldon Shank
3/4	3/4	3 1/2	1	0.015	5	3928L.075015	3929L.075015
	3/4	3 1/2	1	0.020	5	3928L.075020	3929L.075020
	3/4	3 1/2	1	0.030	5	3928L.075030	3929L.075030
	3/4	3 1/2	1	0.060	5	3928L.075060	3929L.075060
	3/4	3 1/2	1	0.090	5	3928L.075090	3929L.075090
	3/4	3 1/2	1	0.120	5	3928L.075120	3929L.075120
	3/4	3 1/2	1	0.190	5	3928L.075190	3929L.075190
	3/4	3 1/2	1	0.250	5	3928L.075250	3929L.075250
	3/4	4	1 1/2	0.015	5	3902L.075015	3903L.075015
	3/4	4	1 1/2	0.020	5	3902L.075020	3903L.075020
	3/4	4	1 1/2	0.030	5	3902L.075030	3903L.075030
	3/4	4	1 1/2	0.060	5	3902L.075060	3903L.075060
	3/4	4	1 1/2	0.090	5	3902L.075090	3903L.075090
	3/4	4	1 1/2	0.120	5	3902L.075120	3903L.075120
	3/4	4	1 1/2	0.190	5	3902L.075190	3903L.075190
	3/4	4	1 1/2	0.250	5	3902L.075250	3903L.075250
	3/4	5	1 7/8	0.015	5	3902L.A75015	3903L.A75015
	3/4	5	1 7/8	0.020	5	3902L.A75020	3903L.A75020
	3/4	5	1 7/8	0.030	5	3902L.A75030	3903L.A75030
	3/4	5	1 7/8	0.060	5	3902L.A75060	3903L.A75060
	3/4	5	1 7/8	0.090	5	3902L.A75090	3903L.A75090
	3/4	5	1 7/8	0.120	5	3902L.A75120	3903L.A75120
	3/4	5	1 7/8	0.190	5	3902L.A75190	3903L.A75190
	3/4	5	1 7/8	0.250	5	3902L.A75250	3903L.A75250
	3/4	5	2 1/4	0.015	5	3933L.075015	3934L.075015
	3/4	5	2 1/4	0.020	5	3933L.075020	3934L.075020
	3/4	5	2 1/4	0.030	5	3933L.075030	3934L.075030
	3/4	5	2 1/4	0.060	5	3933L.075060	3934L.075060
	3/4	5	2 1/4	0.090	5	3933L.075090	3934L.075090
	3/4	5	2 1/4	0.120	5	3933L.075120	3934L.075120
	3/4	5	2 1/4	0.190	5	3933L.075190	3934L.075190
	3/4	5	2 1/4	0.250	5	3933L.075250	3934L.075250
1	1	4	1	0.030	5	3928L.100030	3929L.100030
	1	4	1	0.060	5	3928L.100060	3929L.100060
	1	4	1	0.090	5	3928L.100090	3929L.100090
	1	4	1	0.120	5	3928L.100120	3929L.100120
	1	5	2	0.030	5	3902L.100030	3903L.100030
	1	5	2	0.060	5	3902L.100060	3903L.100060
	1	5	2	0.090	5	3902L.100090	3903L.100090
	1	5	2	0.120	5	3902L.100120	3903L.100120
	1	6	3	0.030	5	3933L.100030	3934L.100030
	1	6	3	0.060	5	3933L.100060	3934L.100060
	1	6	3	0.090	5	3933L.100090	3934L.100090
	1	6	3	0.120	5	3933L.100120	3934L.100120

6 Flutes – Corner Radius

- Variable pitch helix angle
- Vibration dampening
- Increased feed rates
- Fully blended corner radius
- ALCR PVD coating
- Sub-micro grain carbide
- Non-center cutting





Icon descriptions (see page 25)

Applications

- Well suited for most materials including aerospace alloys
- Suitable for finishing and light roughing
- Suitable for trochoidal style machining strategies

Cutting Data (see pages 33-35)

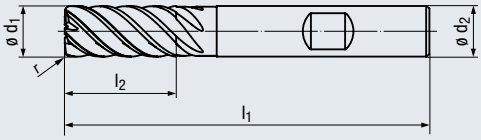
Materials - ISO Material Groups (see pages 4, 6)

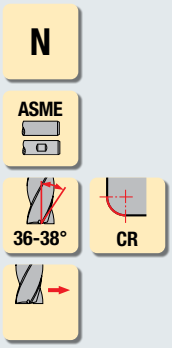
P	1.1-5.1	M	1.1-4.1	
K	1.1-4.2	S	1.1-2.6	
N	1.2-1.4	H	1.1	1.2-1.3
N	2.1-4.1, 5.2			

Cutter Dia.	Shank Dia.	Overall Length	Length of Cut		Coating	ALCR	
ø d_1 h10	ø d_2 h6	l_1	l_2	Radius	# Flutes	Tool No. Straight Shank	Tool No. Weldon Shank
	1/4	2	1/2	0.010	6	3941L.025010	–
	1/4	2	1/2	0.015	6	3941L.025015	–
	1/4	2	1/2	0.020	6	3941L.025020	–
	1/4	2	1/2	0.030	6	3941L.025030	–
	1/4	2	1/2	0.060	6	3941L.025060	–
	1/4	2 1/2	3/4	0.010	6	2947L.025010	–
	1/4	2 1/2	3/4	0.015	6	2947L.025015	–
1/4	1/4	2 1/2	3/4	0.020	6	2947L.025020	–
	1/4	2 1/2	3/4	0.030	6	2947L.025030	–
	1/4	2 1/2	3/4	0.060	6	2947L.025060	–
	1/4	3	1 1/8	0.010	6	3943L.025010	–
	1/4	3	1 1/8	0.015	6	3943L.025015	–
	1/4	3	1 1/8	0.020	6	3943L.025020	–
	1/4	3	1 1/8	0.030	6	3943L.025030	–
	1/4	3	1 1/8	0.060	6	3943L.025060	–
	3/8	2 1/2	5/8	0.010	6	3941L.037010	–
	3/8	2 1/2	5/8	0.015	6	3941L.037015	–
	3/8	2 1/2	5/8	0.020	6	3941L.037020	–
	3/8	2 1/2	5/8	0.030	6	3941L.037030	–
	3/8	2 1/2	5/8	0.060	6	3941L.037060	–
	3/8	2 1/2	5/8	0.090	6	3941L.037090	–
	3/8	2 3/4	7/8	0.010	6	2947L.037010	–
	3/8	2 3/4	7/8	0.015	6	2947L.037015	–
3/8	3/8	2 3/4	7/8	0.020	6	2947L.037020	–
	3/8	2 3/4	7/8	0.030	6	2947L.037030	–
	3/8	2 3/4	7/8	0.060	6	2947L.037060	–
	3/8	2 3/4	7/8	0.090	6	2947L.037090	–
	3/8	3	1 1/8	0.010	6	3943L.037010	–
	3/8	3	1 1/8	0.015	6	3943L.037015	–
	3/8	3	1 1/8	0.020	6	3943L.037020	–
	3/8	3	1 1/8	0.030	6	3943L.037030	–
	3/8	3	1 1/8	0.060	6	3943L.037060	–
	3/8	3	1 1/8	0.090	6	3943L.037090	–
	1/2	2 3/4	5/8	0.010	6	3941L.050010	3942L.050010
	1/2	2 3/4	5/8	0.015	6	3941L.050015	3942L.050015
	1/2	2 3/4	5/8	0.020	6	3941L.050020	3942L.050020
	1/2	2 3/4	5/8	0.030	6	3941L.050030	3942L.050030
	1/2	2 3/4	5/8	0.060	6	3941L.050060	3942L.050060
	1/2	2 3/4	5/8	0.090	6	3941L.050090	3942L.050090
	1/2	2 3/4	5/8	0.120	6	3941L.050120	3942L.050120
	1/2	3	1	0.010	6	2947L.050010	3909L.050010
	1/2	3	1	0.015	6	2947L.050015	3909L.050015
1/2	1/2	3	1	0.020	6	2947L.050020	3909L.050020
	1/2	3	1	0.030	6	2947L.050030	3909L.050030
	1/2	3	1	0.060	6	2947L.050060	3909L.050060
	1/2	3	1	0.090	6	2947L.050090	3909L.050090
	1/2	3	1	0.120	6	2947L.050120	3909L.050120
	1/2	3 1/4	1 1/4	0.010	6	2947L.A50010	3909L.A50010
	1/2	3 1/4	1 1/4	0.015	6	2947L.A50015	3909L.A50015
	1/2	3 1/4	1 1/4	0.020	6	2947L.A50020	3909L.A50020
	1/2	3 1/4	1 1/4	0.030	6	2947L.A50030	3909L.A50030
	1/2	3 1/4	1 1/4	0.060	6	2947L.A50060	3909L.A50060
	1/2	3 1/4	1 1/4	0.090	6	2947L.A50090	3909L.A50090

6 Flutes – Corner Radius – tool sizes continue on page 19

6 Flutes – Corner Radius (continued from page 18)





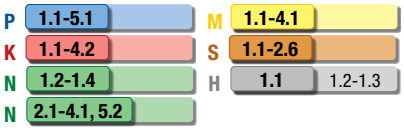
Icon descriptions (see page 25)

Applications

- Well suited for most materials including aerospace alloys
- Suitable for finishing and light roughing
- Suitable for trochoidal style machining strategies

Cutting Data (see pages 33-35)

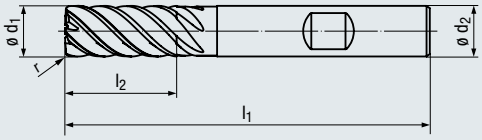
Materials - ISO Material Groups (see pages 4, 6)

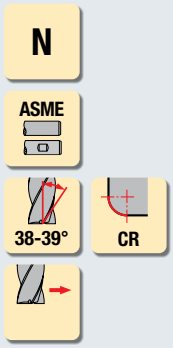


Cutter Dia.	Shank Dia.	Overall Length	Length of Cut		Coating	ALCR	
ø d_1 h10	ø d_2 h6	l_1	l_2	Radius	# Flutes	Tool No. Straight Shank	Tool No. Weldon Shank
1/2	1/2	3 1/4	1 1/4	0.120	6	2947L.A50120	3909L.A50120
	1/2	4 1/2	2	0.010	6	3943L.050010	3944L.050010
	1/2	4 1/2	2	0.015	6	3943L.050015	3944L.050015
	1/2	4 1/2	2	0.020	6	3943L.050020	3944L.050020
	1/2	4 1/2	2	0.030	6	3943L.050030	3944L.050030
	1/2	4 1/2	2	0.060	6	3943L.050060	3944L.050060
	1/2	4 1/2	2	0.090	6	3943L.050090	3944L.050090
	1/2	4 1/2	2	0.120	6	3943L.050120	3944L.050120
5/8	5/8	3	3/4	0.030	6	3941L.062030	3942L.062030
	5/8	3	3/4	0.060	6	3941L.062060	3942L.062060
	5/8	3	3/4	0.090	6	3941L.062090	3942L.062090
	5/8	3	3/4	0.120	6	3941L.062120	3942L.062120
	5/8	3 1/2	1 1/4	0.030	6	2947L.062030	3909L.062030
	5/8	3 1/2	1 1/4	0.060	6	2947L.062060	3909L.062060
	5/8	3 1/2	1 1/4	0.090	6	2947L.062090	3909L.062090
	5/8	3 1/2	1 1/4	0.120	6	2947L.062120	3909L.062120
	5/8	4	1 7/8	0.030	6	2947L.A62030	3909L.A62030
	5/8	4	1 7/8	0.060	6	2947L.A62060	3909L.A62060
	5/8	4	1 7/8	0.090	6	2947L.A62090	3909L.A62090
	5/8	4	1 7/8	0.120	6	2947L.A62120	3909L.A62120
	5/8	4 3/4	2 1/4	0.030	6	3943L.062030	3944L.062030
	5/8	4 3/4	2 1/4	0.060	6	3943L.062060	3944L.062060
	5/8	4 3/4	2 1/4	0.090	6	3943L.062090	3944L.062090
	5/8	4 3/4	2 1/4	0.120	6	3943L.062120	3944L.062120
3/4	3/4	3 1/2	1	0.015	6	3941L.075015	3942L.075015
	3/4	3 1/2	1	0.020	6	3941L.075020	3942L.075020
	3/4	3 1/2	1	0.030	6	3941L.075030	3942L.075030
	3/4	3 1/2	1	0.060	6	3941L.075060	3942L.075060
	3/4	3 1/2	1	0.090	6	3941L.075090	3942L.075090
	3/4	3 1/2	1	0.120	6	3941L.075120	3942L.075120
	3/4	3 1/2	1	0.190	6	3941L.075190	3942L.075190
	3/4	3 1/2	1	0.250	6	3941L.075250	3942L.075250
	3/4	4	1 1/2	0.015	6	2947L.075015	3909L.075015
	3/4	4	1 1/2	0.020	6	2947L.075020	3909L.075020
	3/4	4	1 1/2	0.030	6	2947L.075030	3909L.075030
	3/4	4	1 1/2	0.060	6	2947L.075060	3909L.075060
	3/4	4	1 1/2	0.090	6	2947L.075090	3909L.075090
	3/4	4	1 1/2	0.120	6	2947L.075120	3909L.075120
	3/4	4	1 1/2	0.190	6	2947L.075190	3909L.075190
	3/4	4	1 1/2	0.250	6	2947L.075250	3909L.075250
	3/4	5	2 1/4	0.015	6	3943L.075015	3944L.075015
	3/4	5	2 1/4	0.020	6	3943L.075020	3944L.075020
	3/4	5	2 1/4	0.030	6	3943L.075030	3944L.075030
	3/4	5	2 1/4	0.060	6	3943L.075060	3944L.075060
	3/4	5	2 1/4	0.090	6	3943L.075090	3944L.075090
	3/4	5	2 1/4	0.120	6	3943L.075120	3944L.075120
	3/4	5	2 1/4	0.190	6	3943L.075190	3944L.075190
	3/4	5	2 1/4	0.250	6	3943L.075250	3944L.075250
1	1	4	1	0.030	6	3941L.100030	3942L.100030
	1	4	1	0.060	6	3941L.100060	3942L.100060
	1	4	1	0.090	6	3941L.100090	3942L.100090
	1	4	1	0.120	6	3941L.100120	3942L.100120
	1	5	2	0.030	6	2947L.100030	3909L.100030
	1	5	2	0.060	6	2947L.100060	3909L.100060
	1	5	2	0.090	6	2947L.100090	3909L.100090
	1	5	2	0.120	6	2947L.100120	3909L.100120
	1	6	3	0.030	6	3943L.100030	3944L.100030
	1	6	3	0.060	6	3943L.100060	3944L.100060
	1	6	3	0.090	6	3943L.100090	3944L.100090
	1	6	3	0.120	6	3943L.100120	3944L.100120

7 Flutes – Corner Radius

- Variable pitch helix angle
- Vibration dampening
- Increased feed rates
- Fully blended corner radius
- ALCR PVD coating
- Sub-micro grain carbide





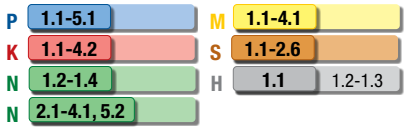
Icon descriptions (see page 25)

Applications

- Well suited for most materials including aerospace alloys
- Suitable for finishing and light roughing
- Suitable for trochoidal style machining strategies

Cutting Data (see pages 36-38)

Materials - ISO Material Groups (see pages 4, 7)

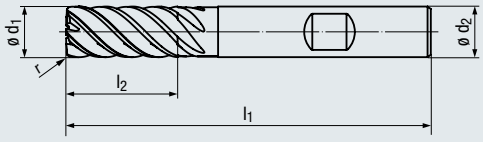


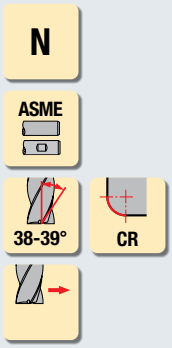
Cutter Dia.	Shank Dia.	Overall Length	Length of Cut		Coating	ALCR	
ø d_1 h10	ø d_2 h6	l_1	l_2	Radius	# Flutes	Tool No. Straight Shank	Tool No. Weldon Shank
	1/4	2	1/2	0.010	7	3935L.025010	–
	1/4	2	1/2	0.015	7	3935L.025015	–
	1/4	2	1/2	0.020	7	3935L.025020	–
	1/4	2	1/2	0.030	7	3935L.025030	–
	1/4	2	1/2	0.060	7	3935L.025060	–
	1/4	2 1/2	3/4	0.010	7	3937L.025010	–
1/4	1/4	2 1/2	3/4	0.015	7	3937L.025015	–
	1/4	2 1/2	3/4	0.020	7	3937L.025020	–
	1/4	2 1/2	3/4	0.030	7	3937L.025030	–
	1/4	2 1/2	3/4	0.060	7	3937L.025060	–
	1/4	3	1 1/8	0.010	7	3939L.025010	–
	1/4	3	1 1/8	0.015	7	3939L.025015	–
	1/4	3	1 1/8	0.020	7	3939L.025020	–
	1/4	3	1 1/8	0.030	7	3939L.025030	–
	1/4	3	1 1/8	0.060	7	3939L.025060	–
	3/8	2 1/2	5/8	0.010	7	3935L.037010	–
	3/8	2 1/2	5/8	0.015	7	3935L.037015	–
	3/8	2 1/2	5/8	0.020	7	3935L.037020	–
	3/8	2 1/2	5/8	0.030	7	3935L.037030	–
	3/8	2 1/2	5/8	0.060	7	3935L.037060	–
	3/8	2 1/2	5/8	0.090	7	3935L.037090	–
	3/8	2 3/4	7/8	0.010	7	3937L.037010	–
	3/8	2 3/4	7/8	0.015	7	3937L.037015	–
3/8	3/8	2 3/4	7/8	0.020	7	3937L.037020	–
	3/8	2 3/4	7/8	0.030	7	3937L.037030	–
	3/8	2 3/4	7/8	0.060	7	3937L.037060	–
	3/8	2 3/4	7/8	0.090	7	3937L.037090	–
	3/8	3	1 1/8	0.010	7	3939L.037010	–
	3/8	3	1 1/8	0.015	7	3939L.037015	–
	3/8	3	1 1/8	0.020	7	3939L.037020	–
	3/8	3	1 1/8	0.030	7	3939L.037030	–
	3/8	3	1 1/8	0.060	7	3939L.037060	–
	3/8	3	1 1/8	0.090	7	3939L.037090	–
	1/2	2 3/4	5/8	0.010	7	3935L.050010	3936L.050010
	1/2	2 3/4	5/8	0.015	7	3935L.050015	3936L.050015
	1/2	2 3/4	5/8	0.020	7	3935L.050020	3936L.050020
	1/2	2 3/4	5/8	0.030	7	3935L.050030	3936L.050030
	1/2	2 3/4	5/8	0.060	7	3935L.050060	3936L.050060
	1/2	2 3/4	5/8	0.090	7	3935L.050090	3936L.050090
1/2	1/2	2 3/4	5/8	0.120	7	3935L.050120	3936L.050120
	1/2	3	1	0.010	7	3937L.050010	3938L.050010
	1/2	3	1	0.015	7	3937L.050015	3938L.050015
	1/2	3	1	0.020	7	3937L.050020	3938L.050020
	1/2	3	1	0.030	7	3937L.050030	3938L.050030
	1/2	3	1	0.060	7	3937L.050060	3938L.050060
	1/2	3	1	0.090	7	3937L.050090	3938L.050090
	1/2	3	1	0.120	7	3937L.050120	3938L.050120

7 Flutes – Corner Radius – tool sizes continue on page 21

7 Flutes – Corner Radius (continued from page 20)

- Variable pitch helix angle
- Vibration dampening
- Increased feed rates
- Fully blended corner radius
- ALCR PVD coating
- Sub-micro grain carbide





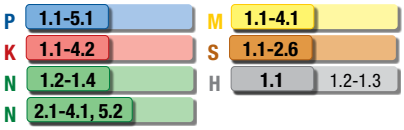
Icon descriptions (see page 25)

Applications

- Well suited for most materials including aerospace alloys
- Suitable for finishing and light roughing
- Suitable for trochoidal style machining strategies

Cutting Data (see pages 36-38)

Materials - ISO Material Groups (see pages 4, 7)

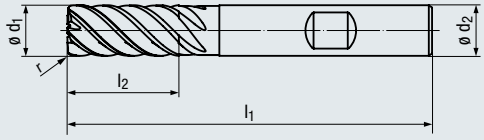


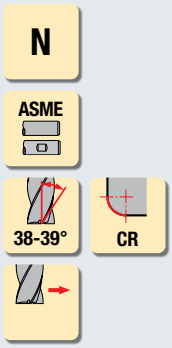
Cutter Dia.	Shank Dia.	Overall Length	Length of Cut		Coating	ALCR	
ø d_1 h10	ø d_2 h6	l_1	l_2	Radius	# Flutes	Tool No. Straight Shank	Tool No. Weldon Shank
1/2	1/2	3 1/4	1 1/4	0.010	7	3937L.A50010	3938L.A50010
	1/2	3 1/4	1 1/4	0.015	7	3937L.A50015	3938L.A50015
	1/2	3 1/4	1 1/4	0.020	7	3937L.A50020	3938L.A50020
	1/2	3 1/4	1 1/4	0.030	7	3937L.A50030	3938L.A50030
	1/2	3 1/4	1 1/4	0.060	7	3937L.A50060	3938L.A50060
	1/2	3 1/4	1 1/4	0.090	7	3937L.A50090	3938L.A50090
	1/2	3 1/4	1 1/4	0.120	7	3937L.A50120	3938L.A50120
	1/2	4 1/2	2	0.010	7	3939L.050010	3940L.050010
	1/2	4 1/2	2	0.015	7	3939L.050015	3940L.050015
	1/2	4 1/2	2	0.020	7	3939L.050020	3940L.050020
	1/2	4 1/2	2	0.030	7	3939L.050030	3940L.050030
	1/2	4 1/2	2	0.060	7	3939L.050060	3940L.050060
	1/2	4 1/2	2	0.090	7	3939L.050090	3940L.050090
	1/2	4 1/2	2	0.120	7	3939L.050120	3940L.050120
5/8	5/8	3	3/4	0.030	7	3935L.062030	3936L.062030
	5/8	3	3/4	0.060	7	3935L.062060	3936L.062060
	5/8	3	3/4	0.090	7	3935L.062090	3936L.062090
	5/8	3	3/4	0.120	7	3935L.062120	3936L.062120
	5/8	3 1/2	1 1/4	0.030	7	3937L.062030	3938L.062030
	5/8	3 1/2	1 1/4	0.060	7	3937L.062060	3938L.062060
	5/8	3 1/2	1 1/4	0.090	7	3937L.062090	3938L.062090
	5/8	3 1/2	1 1/4	0.120	7	3937L.062120	3938L.062120
	5/8	4	1 5/8	0.030	7	3937L.A62030	3938L.A62030
	5/8	4	1 5/8	0.060	7	3937L.A62060	3938L.A62060
	5/8	4	1 5/8	0.090	7	3937L.A62090	3938L.A62090
	5/8	4	1 5/8	0.120	7	3937L.A62120	3938L.A62120
	5/8	4	1 7/8	0.030	7	3937L.B62030	3938L.B62030
	5/8	4	1 7/8	0.060	7	3937L.B62060	3938L.B62060
	5/8	4	1 7/8	0.090	7	3937L.B62090	3938L.B62090
	5/8	4	1 7/8	0.120	7	3937L.B62120	3938L.B62120
	5/8	4 3/4	2 1/4	0.030	7	3939L.062030	3940L.062030
	5/8	4 3/4	2 1/4	0.060	7	3939L.062060	3940L.062060
	5/8	4 3/4	2 1/4	0.090	7	3939L.062090	3940L.062090
	5/8	4 3/4	2 1/4	0.120	7	3939L.062120	3940L.062120
3/4	3/4	3 1/2	1	0.015	7	3935L.075015	3936L.075015
	3/4	3 1/2	1	0.020	7	3935L.075020	3936L.075020
	3/4	3 1/2	1	0.030	7	3935L.075030	3936L.075030
	3/4	3 1/2	1	0.060	7	3935L.075060	3936L.075060
	3/4	3 1/2	1	0.090	7	3935L.075090	3936L.075090
	3/4	3 1/2	1	0.120	7	3935L.075120	3936L.075120
	3/4	3 1/2	1	0.190	7	3935L.075190	3936L.075190
	3/4	3 1/2	1	0.250	7	3935L.075250	3936L.075250

7 Flutes – Corner Radius – tool sizes continue on page 22

7 Flutes – Corner Radius (continued from page 21)

- Variable pitch helix angle
- Vibration dampening
- Increased feed rates
- Fully blended corner radius
- ALCR PVD coating
- Sub-micro grain carbide





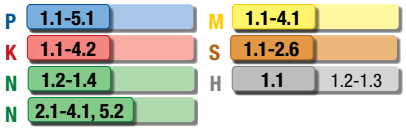
Icon descriptions (see page 25)

Applications

- Well suited for most materials including aerospace alloys
- Suitable for finishing and light roughing
- Suitable for trochoidal style machining strategies

Cutting Data (see pages 36-38)

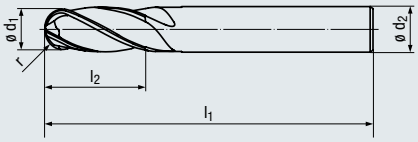
Materials - ISO Material Groups (see pages 4, 7)

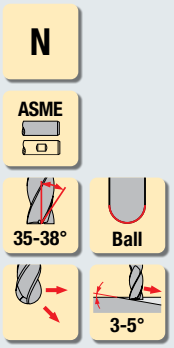


Cutter Dia.	Shank Dia.	Overall Length	Length of Cut		Coating	ALCR	
ø d_1 h10	ø d_2 h6	l_1	l_2	Radius	# Flutes	Tool No. Straight Shank	Tool No. Weldon Shank
3/4	3/4	4	1 1/2	0.015	7	3937L.075015	3938L.075015
	3/4	4	1 1/2	0.020	7	3937L.075020	3938L.075020
	3/4	4	1 1/2	0.030	7	3937L.075030	3938L.075030
	3/4	4	1 1/2	0.060	7	3937L.075060	3938L.075060
	3/4	4	1 1/2	0.090	7	3937L.075090	3938L.075090
	3/4	4	1 1/2	0.120	7	3937L.075120	3938L.075120
	3/4	4	1 1/2	0.190	7	3937L.075190	3938L.075190
	3/4	4	1 1/2	0.250	7	3937L.075250	3938L.075250
	3/4	5	1 7/8	0.015	7	3937L.A75015	3938L.A75015
	3/4	5	1 7/8	0.020	7	3937L.A75020	3938L.A75020
	3/4	5	1 7/8	0.030	7	3937L.A75030	3938L.A75030
	3/4	5	1 7/8	0.060	7	3937L.A75060	3938L.A75060
	3/4	5	1 7/8	0.090	7	3937L.A75090	3938L.A75090
	3/4	5	1 7/8	0.120	7	3937L.A75120	3938L.A75120
	3/4	5	1 7/8	0.190	7	3937L.A75190	3938L.A75190
	3/4	5	1 7/8	0.250	7	3937L.A75250	3938L.A75250
	3/4	5	2 1/4	0.015	7	3939L.075015	3940L.075015
	3/4	5	2 1/4	0.020	7	3939L.075020	3940L.075020
	3/4	5	2 1/4	0.030	7	3939L.075030	3940L.075030
	3/4	5	2 1/4	0.060	7	3939L.075060	3940L.075060
	3/4	5	2 1/4	0.090	7	3939L.075090	3940L.075090
	3/4	5	2 1/4	0.120	7	3939L.075120	3940L.075120
	3/4	5	2 1/4	0.190	7	3939L.075190	3940L.075190
	3/4	5	2 1/4	0.250	7	3939L.075250	3940L.075250
1	1	4	1	0.030	7	3935L.100030	3936L.100030
	1	4	1	0.060	7	3935L.100060	3936L.100060
	1	4	1	0.090	7	3935L.100090	3936L.100090
	1	4	1	0.120	7	3935L.100120	3936L.100120
	1	5	2	0.030	7	3937L.100030	3938L.100030
	1	5	2	0.060	7	3937L.100060	3938L.100060
	1	5	2	0.090	7	3937L.100090	3938L.100090
	1	5	2	0.120	7	3937L.100120	3938L.100120
	1	6	3	0.030	7	3939L.100030	3940L.100030
	1	6	3	0.060	7	3939L.100060	3940L.100060
	1	6	3	0.090	7	3939L.100090	3940L.100090
	1	6	3	0.120	7	3939L.100120	3940L.100120

4 Flutes – Ball Nose

- Variable helix flutes
- Vibration dampening
- ALCR PVD coating
- Sub-micro grain carbide
- 2 center cutting edges





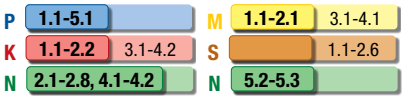
Icon descriptions (see page 25)

Applications

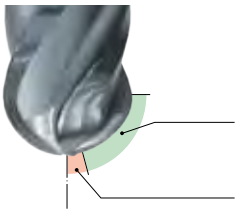
- Ideal for most materials
- Suitable for high speed cutting and finishing

Cutting Data (see page 39)

Materials - ISO Material Groups (see pages 4, 7)

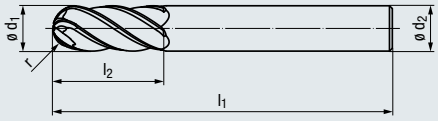


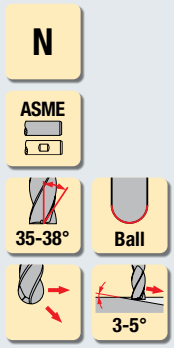
Cutter Dia.	Shank Dia.	Overall Length	Length of Cut	Coating	ALCR	
ø d_1 h10	ø d_2 h6	l_1	l_2	# Flutes	Tool No. Straight Shank	
1/8	1/8	1 1/2	1/4	4	2919L.0125	
	1/8	1 1/2	3/8	4	2974L.0125	
	1/8	2	3/8	4	2974L.A125	
	1/8	2 1/4	3/4	4	3900L.0125	
3/16	3/16	2	3/8	4	2919L.01875	
	3/16	2	7/16	4	2974L.01875	
	3/16	2	9/16	4	2974L.A1875	
	3/16	2 1/2	3/4	4	3900L.01875	
1/4	1/4	2	1/2	4	2919L.0250	
	1/4	2 1/2	1/2	4	2974L.0250	
	1/4	2 1/2	3/4	4	2974L.A250	
	1/4	3	1 1/8	4	3900L.0250	
5/16	5/16	2 1/4	1/2	4	2919L.03125	
	5/16	2 1/2	13/16	4	2974L.03125	
	5/16	3	1 1/8	4	3900L.03125	
3/8	3/8	2 1/2	5/8	4	2919L.0375	
	3/8	2 1/2	7/8	4	2974L.0375	
	3/8	2 3/4	7/8	4	2974L.A375	
	3/8	3	1 1/8	4	3900L.0375	
7/16	7/16	2 1/2	5/8	4	2919L.04375	
	7/16	2 3/4	1	4	2974L.04375	
	7/16	4	2	4	3900L.04375	
1/2	1/2	2 3/4	5/8	4	2919L.0500	
	1/2	3	1	4	2974L.0500	
	1/2	3	1 1/4	4	2974L.A500	
	1/2	3 1/4	1 1/4	4	2974L.B500	
	1/2	4 1/2	2	4	3900L.0500	
5/8	5/8	3	3/4	4	2919L.0625	
	5/8	3 1/2	1 1/4	4	2974L.0625	
	5/8	4	1 7/8	4	2974L.A625	
	5/8	4 3/4	2 1/4	4	3900L.0625	
3/4	3/4	3 1/2	1	4	2919L.0750	
	3/4	4	1 1/2	4	2974L.0750	
	3/4	5	2 1/4	4	3900L.0750	
1	1	4	1	4	2919L.1000	
	1	5	2	4	2974L.1000	
	1	6	3	4	3900L.1000	



5 Flutes – Ball Nose

- Variable helix flutes
- Vibration dampening
- ALCR PVD coating
- Sub-micro grain carbide
- Center cutting





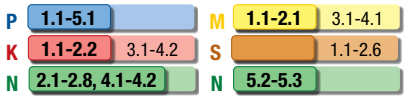
Icon descriptions (see page 25)

Applications

- Ideal for most materials
- Suitable for high speed cutting and finishing

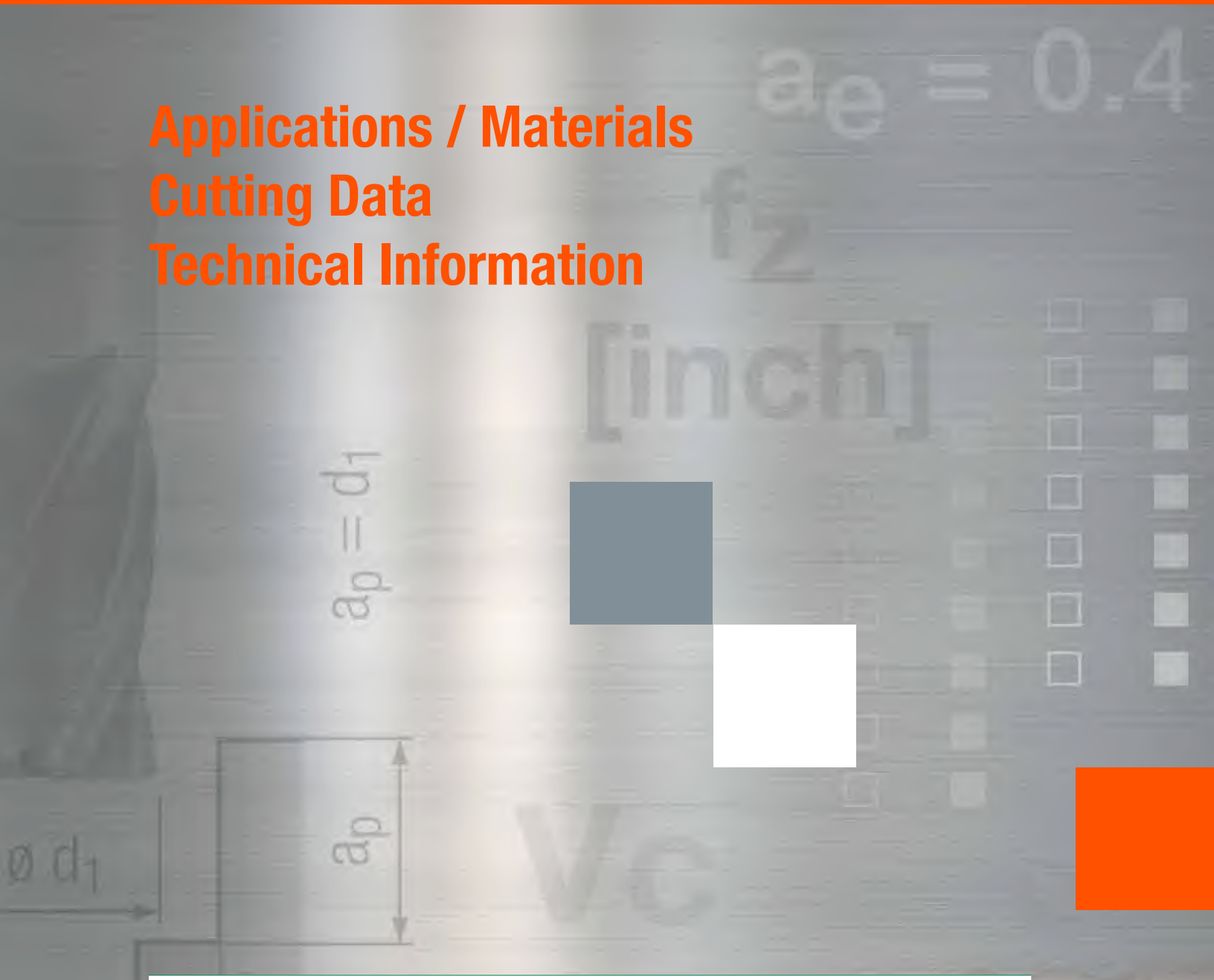
Cutting Data (see page 39)

Materials - ISO Material Groups (see pages 4, 7)



Cutter Dia.	Shank Dia.	Overall Length	Length of Cut	Coating	ALCR	
ø d_1 h10	ø d_2 h6	l_1	l_2	# Flutes	Tool No. Straight Shank	
1/8	1/8	1 1/2	1/4	5	3949L.0125	
	1/8	2	3/8	5	3950L.0125	
	1/8	2 1/4	3/4	5	3951L.0125	
3/16	3/16	2	3/8	5	3949L.01875	
	3/16	2	9/16	5	3950L.01875	
	3/16	2 1/2	3/4	5	3951L.01875	
1/4	1/4	2	1/2	5	3949L.0250	
	1/4	2 1/2	3/4	5	3950L.0250	
	1/4	3	1 1/8	5	3951L.0250	
5/16	5/16	2 1/4	9/16	5	3949L.03125	
	5/16	2 1/2	13/16	5	3950L.03125	
	5/16	3	1 1/8	5	3951L.03125	
3/8	3/8	2 1/2	5/8	5	3949L.0375	
	3/8	2 3/4	7/8	5	3950L.0375	
	3/8	3	1 1/8	5	3951L.0375	
1/2	1/2	2 3/4	5/8	5	3949L.0500	
	1/2	3	1	5	3950L.0500	
	1/2	3 1/4	1 1/4	5	3950L.A500	
	1/2	4 1/2	2	5	3951L.0500	
5/8	5/8	3	3/4	5	3949L.0625	
	5/8	3 1/2	1 1/4	5	3950L.0625	
	5/8	4	1 7/8	5	3950L.A625	
	5/8	4 3/4	2 1/4	5	3951L.0625	
3/4	3/4	3 1/2	1	5	3949L.0750	
	3/4	4	1 1/2	5	3950L.0750	
	3/4	5	2 1/4	5	3951L.0750	
1	1	4	1	5	3949L.1000	
	1	5	2	5	3950L.1000	
	1	6	3	5	3951L.1000	

Applications / Materials
Cutting Data
Technical Information

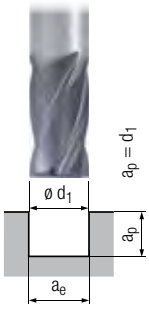


Icon Descriptions

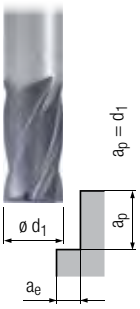
N	Finishing end mill design without chip breaker	35-38°	Helix angles of these tools are shown. If there are variable helix angles, these are all shown.
ASME ASME	The shank designs to be found on the respective page are marked in grey.	3-5°	Specified angle is the recommended angle for ramping applications
CR	Corner radius		The red arrows mark the recommended feed directions of the respective cutters.
Ball	Ball nose		
CH x 45°	Bevelled edge		

Standard length (4 flutes) N

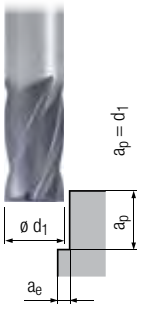
Metal Removal Rate (Cubic Inches per Minute) = IPM x a_e x a_p (a_e = Radial width of cut, a_p = Axial depth of cut)



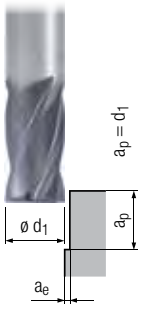
$a_e = d_1$



$a_e = 0.4 \times d_1$



$a_e = 0.2 \times d_1$



$a_e = 0.02 \times d_1$

Valid for Tool Nos.:

2992L
2993L

RPM = (SFM x 3.82) / Dia. (in)
Feed (IPM) = RPM x f_z x Z

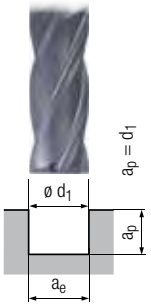
f_z = Feed per tooth Speed
Z = number of teeth (flutes)
v_c = Cutting speed

		v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]			MMS MQL	
P	1.1	615	0.005 x d_1	685	0.006 x d_1	720	0.007 x d_1	865	0.008 x d_1	□	■	□	■
	2.1	540	0.004 x d_1	615	0.005 x d_1	650	0.006 x d_1	760	0.007 x d_1	□	■	□	■
	3.1	470	0.004 x d_1	505	0.005 x d_1	575	0.005 x d_1	650	0.006 x d_1	□	■	□	■
	4.1	435	0.003 x d_1	470	0.004 x d_1	505	0.004 x d_1	615	0.005 x d_1	□	■		
	5.1	360	0.003 x d_1	395	0.003 x d_1	435	0.004 x d_1	505	0.004 x d_1	□	■		
M	1.1	290	0.003 x d_1	325	0.004 x d_1	360	0.004 x d_1	395	0.005 x d_1			□	■
	2.1	255	0.003 x d_1	290	0.004 x d_1	290	0.004 x d_1	360	0.005 x d_1			□	■
	3.1	180	0.002 x d_1	215	0.003 x d_1	215	0.003 x d_1	255	0.004 x d_1			□	■
	4.1	110	0.002 x d_1	110	0.003 x d_1	145	0.003 x d_1	145	0.004 x d_1			□	■
K	1.1	615	0.005 x d_1	685	0.006 x d_1	720	0.007 x d_1	865	0.008 x d_1	□	■		
	1.2	615	0.005 x d_1	685	0.006 x d_1	720	0.007 x d_1	865	0.008 x d_1	□	■		
	2.1	540	0.004 x d_1	615	0.005 x d_1	650	0.006 x d_1	760	0.006 x d_1	□	■		
	2.2	540	0.004 x d_1	615	0.005 x d_1	650	0.006 x d_1	760	0.006 x d_1	□	■		
	3.1	470	0.004 x d_1	505	0.005 x d_1	575	0.006 x d_1	650	0.006 x d_1	□	■		
	3.2	470	0.004 x d_1	505	0.005 x d_1	575	0.006 x d_1	650	0.006 x d_1	□	■		
	4.1	360	0.003 x d_1	395	0.004 x d_1	435	0.004 x d_1	505	0.005 x d_1	□	■		
	4.2	290	0.003 x d_1	325	0.004 x d_1	360	0.004 x d_1	395	0.005 x d_1	□	■		
N	1.1	795	0.009 x d_1	900	0.010 x d_1	1010	0.011 x d_1	1085	0.013 x d_1			□	■
	1.2	795	0.008 x d_1	900	0.009 x d_1	1010	0.010 x d_1	1085	0.011 x d_1			□	■
	1.3	795	0.007 x d_1	900	0.008 x d_1	1010	0.009 x d_1	1085	0.010 x d_1			□	■
	1.4	720	0.008 x d_1	900	0.009 x d_1	1010	0.010 x d_1	1085	0.011 x d_1			□	■
	1.5	720											
	1.6	720											
	2.1	540	0.005 x d_1	615	0.006 x d_1	650	0.007 x d_1	760	0.008 x d_1			□	■
	2.2	540	0.005 x d_1	615	0.006 x d_1	650	0.007 x d_1	760	0.008 x d_1			□	■
	2.3	540	0.005 x d_1	615	0.006 x d_1	650	0.007 x d_1	760	0.008 x d_1		□	□	■
	2.4	470	0.004 x d_1	505	0.005 x d_1	575	0.006 x d_1	650	0.006 x d_1			□	■
	2.5	470	0.004 x d_1	505	0.005 x d_1	575	0.006 x d_1	650	0.006 x d_1			□	■
	2.6	470	0.004 x d_1	505	0.005 x d_1	575	0.006 x d_1	650	0.006 x d_1		□	□	■
	2.7	290	0.003 x d_1	325	0.004 x d_1	360	0.004 x d_1	395	0.005 x d_1			□	■
	2.8	290	0.003 x d_1	325	0.004 x d_1	360	0.004 x d_1	395	0.005 x d_1			□	■
	3.1	1225	0.009 x d_1	1335	0.011 x d_1	1480	0.013 x d_1	1730	0.014 x d_1			□	■
	3.2	1225	0.007 x d_1	1335	0.008 x d_1	1480	0.010 x d_1	1730	0.011 x d_1			□	■
	4.1	1225	0.008 x d_1	1335	0.009 x d_1	1480	0.011 x d_1	1730	0.012 x d_1		□	□	■
	4.2	1805	0.008 x d_1	1985	0.009 x d_1	2165	0.011 x d_1	2525	0.012 x d_1			□	■
	4.3												
	4.4												
	5.1												
	5.2	290	0.003 x d_1	325	0.004 x d_1	360	0.004 x d_1	395	0.005 x d_1				■
	5.3												
S	1.1	290	0.004 x d_1	325	0.004 x d_1	360	0.005 x d_1	395	0.006 x d_1				■
	1.2	255	0.003 x d_1	290	0.004 x d_1	290	0.004 x d_1	360	0.005 x d_1				■
	1.3	145	0.003 x d_1	145	0.003 x d_1	180	0.004 x d_1	215	0.004 x d_1				■
	2.1	255	0.002 x d_1	290	0.002 x d_1	290	0.003 x d_1	360	0.003 x d_1				■
	2.2	110	0.002 x d_1	110	0.002 x d_1	125	0.003 x d_1	145	0.003 x d_1				■
	2.3	70	0.002 x d_1	90	0.002 x d_1	90	0.003 x d_1	110	0.003 x d_1				■
	2.4	70	0.002 x d_1	90	0.002 x d_1	90	0.003 x d_1	110	0.003 x d_1				■
	2.5	70	0.002 x d_1	70	0.002 x d_1	70	0.003 x d_1	110	0.003 x d_1				■
	2.6	70	0.002 x d_1	70	0.002 x d_1	70	0.003 x d_1	110	0.003 x d_1				■
H	1.1	360	0.003 x d_1	395	0.003 x d_1	435	0.004 x d_1	505	0.004 x d_1	□	■		
	1.2	290	0.003 x d_1	325	0.003 x d_1	360	0.004 x d_1	395	0.004 x d_1	□	■		
	1.3			325	0.003 x d_1	360	0.003 x d_1	395	0.004 x d_1	□	■		
	1.4												
	1.5												

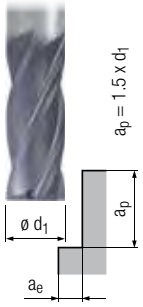
■ = very suitable
□ = suitable

Standard length (4 flutes) N

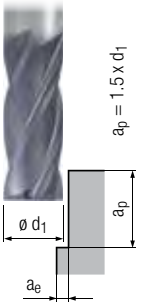
Metal Removal Rate (Cubic Inches per Minute) = IPM x a_e x a_p (a_e = Radial width of cut, a_p = Axial depth of cut)



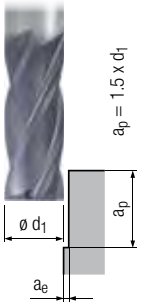
$a_e = d_1$



$a_e = 0.4 \times d_1$



$a_e = 0.2 \times d_1$



$a_e = 0.02 \times d_1$

Valid for Tool Nos.:

2994L
2995L

RPM = (SFM x 3.82) / Dia. (in)
Feed (IPM) = RPM x f_z x Z

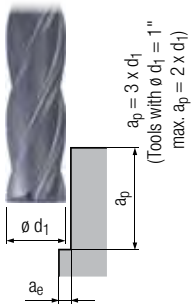
f_z = Feed per tooth Speed
Z = number of teeth (flutes)
v_c = Cutting speed

		v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]			MMS MQL	
P	1.1	505	0.005 x d_1	540	0.005 x d_1	615	0.006 x d_1	720	0.007 x d_1	□	■	□	■
	2.1	470	0.004 x d_1	505	0.005 x d_1	575	0.005 x d_1	650	0.006 x d_1	□	■	□	■
	3.1	395	0.004 x d_1	435	0.004 x d_1	470	0.005 x d_1	540	0.005 x d_1	□	■	□	■
	4.1	360	0.003 x d_1	395	0.003 x d_1	435	0.004 x d_1	505	0.004 x d_1	□	■		
	5.1	325	0.003 x d_1	360	0.003 x d_1	395	0.003 x d_1	470	0.004 x d_1	□	■		
M	1.1	255	0.003 x d_1	290	0.003 x d_1	290	0.004 x d_1	360	0.004 x d_1			□	■
	2.1	215	0.003 x d_1	255	0.003 x d_1	255	0.004 x d_1	290	0.004 x d_1			□	■
	3.1	145	0.002 x d_1	145	0.003 x d_1	180	0.003 x d_1	215	0.003 x d_1			□	■
	4.1	110	0.002 x d_1	110	0.003 x d_1	145	0.003 x d_1	145	0.003 x d_1			□	■
K	1.1	505	0.005 x d_1	540	0.006 x d_1	615	0.006 x d_1	720	0.007 x d_1	□	■		
	1.2	505	0.005 x d_1	540	0.006 x d_1	615	0.006 x d_1	720	0.007 x d_1	□	■		
	2.1	470	0.004 x d_1	505	0.005 x d_1	575	0.005 x d_1	650	0.006 x d_1	□	■		
	2.2	470	0.004 x d_1	505	0.005 x d_1	575	0.005 x d_1	650	0.006 x d_1	□	■		
	3.1	395	0.004 x d_1	435	0.005 x d_1	470	0.005 x d_1	540	0.006 x d_1	□	■		
	3.2	395	0.004 x d_1	435	0.005 x d_1	470	0.005 x d_1	540	0.006 x d_1	□	■		
	4.1	325	0.003 x d_1	360	0.003 x d_1	395	0.004 x d_1	470	0.004 x d_1	□	■		
	4.2	255	0.003 x d_1	290	0.003 x d_1	290	0.004 x d_1	360	0.004 x d_1	□	■		
N	1.1	795	0.009 x d_1	900	0.010 x d_1	1010	0.011 x d_1	1085	0.013 x d_1			□	■
	1.2	795	0.008 x d_1	900	0.009 x d_1	1010	0.010 x d_1	1085	0.011 x d_1			□	■
	1.3	795	0.007 x d_1	900	0.008 x d_1	1010	0.009 x d_1	1085	0.010 x d_1			□	■
	1.4	720	0.008 x d_1	900	0.009 x d_1	1010	0.010 x d_1	1085	0.011 x d_1			□	■
	1.5												
	1.6												
	2.1	470	0.005 x d_1	505	0.006 x d_1	575	0.006 x d_1	650	0.007 x d_1			□	■
	2.2	470	0.005 x d_1	505	0.006 x d_1	575	0.006 x d_1	650	0.007 x d_1			□	■
	2.3	470	0.005 x d_1	505	0.006 x d_1	575	0.006 x d_1	650	0.007 x d_1		□	□	■
	2.4	435	0.004 x d_1	470	0.005 x d_1	505	0.005 x d_1	615	0.006 x d_1			□	■
	2.5	435	0.004 x d_1	470	0.005 x d_1	505	0.005 x d_1	615	0.006 x d_1			□	■
	2.6	435	0.004 x d_1	470	0.005 x d_1	505	0.005 x d_1	615	0.006 x d_1		□	□	■
	2.7	255	0.003 x d_1	290	0.003 x d_1	290	0.004 x d_1	360	0.004 x d_1			□	■
	2.8	255	0.003 x d_1	290	0.003 x d_1	290	0.004 x d_1	360	0.004 x d_1			□	■
	3.1	1045	0.009 x d_1	1155	0.010 x d_1	1265	0.011 x d_1	1480	0.013 x d_1			□	■
	3.2	1045	0.007 x d_1	1155	0.008 x d_1	1265	0.009 x d_1	1480	0.010 x d_1			□	■
	4.1	1045	0.008 x d_1	1155	0.009 x d_1	1265	0.009 x d_1	1480	0.011 x d_1		□	□	■
	4.2	1550	0.008 x d_1	1695	0.009 x d_1	1875	0.009 x d_1	2165	0.011 x d_1			□	■
	4.3												
	4.4												
	5.1												
	5.2	255	0.003 x d_1	290	0.003 x d_1	290	0.004 x d_1	360	0.004 x d_1				■
	5.3												
S	1.1	255	0.004 x d_1	290	0.004 x d_1	290	0.004 x d_1	360	0.005 x d_1				■
	1.2	215	0.003 x d_1	255	0.003 x d_1	255	0.004 x d_1	290	0.004 x d_1				■
	1.3	145	0.003 x d_1	145	0.003 x d_1	180	0.003 x d_1	215	0.004 x d_1				■
	2.1	215	0.002 x d_1	255	0.002 x d_1	255	0.003 x d_1	290	0.003 x d_1				■
	2.2	70	0.002 x d_1	70	0.002 x d_1	55	0.003 x d_1	110	0.003 x d_1				■
	2.3	70	0.002 x d_1	90	0.002 x d_1	90	0.003 x d_1	110	0.003 x d_1				■
	2.4	70	0.002 x d_1	90	0.002 x d_1	90	0.003 x d_1	110	0.003 x d_1				■
	2.5	70	0.002 x d_1	70	0.002 x d_1	70	0.003 x d_1	110	0.003 x d_1				■
	2.6	70	0.002 x d_1	70	0.002 x d_1	70	0.003 x d_1	110	0.003 x d_1				■
H	1.1	325	0.003 x d_1	360	0.003 x d_1	395	0.003 x d_1	470	0.004 x d_1	□	■		
	1.2	255	0.003 x d_1	290	0.003 x d_1	290	0.003 x d_1	360	0.004 x d_1	□	■		
	1.3			255	0.003 x d_1	255	0.003 x d_1	290	0.003 x d_1	□	■		
	1.4												
	1.5												

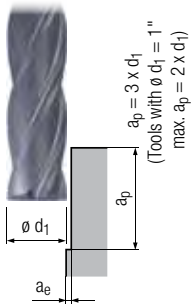
■ = very suitable
□ = suitable

Long length (4 flutes) N

Metal Removal Rate (Cubic Inches per Minute) = IPM x a_e x a_p (a_e = Radial width of cut, a_p = Axial depth of cut)



a_e = 0.1 x d_1



a_e = 0.02 x d_1

Valid for Tool Nos.:

2996L
2997L

RPM = (SFM x 3.82) / Dia. (in)
Feed (IPM) = RPM x f_z x Z

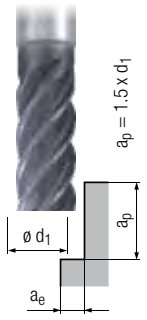
f_z = Feed per tooth Speed
Z = number of teeth (flutes)
v_c = Cutting speed

		v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]			MMS MQL	
P	1.1	435	0.005 x d_1	505	0.006 x d_1	□	■	□	■
	2.1	395	0.004 x d_1	470	0.005 x d_1	□	■	□	■
	3.1	325	0.004 x d_1	395	0.005 x d_1	□	■	□	■
	4.1	255	0.003 x d_1	290	0.004 x d_1	□	■		
	5.1	215	0.003 x d_1	255	0.003 x d_1	□	■		
M	1.1	435	0.003 x d_1	505	0.004 x d_1			□	■
	2.1	360	0.003 x d_1	435	0.004 x d_1			□	■
	3.1	255	0.003 x d_1	290	0.003 x d_1			□	■
	4.1	180	0.003 x d_1	215	0.003 x d_1			□	■
K	1.1	435	0.005 x d_1	505	0.006 x d_1	□	■		
	1.2	435	0.005 x d_1	505	0.006 x d_1	□	■		
	2.1	395	0.004 x d_1	470	0.005 x d_1	□	■		
	2.2	395	0.004 x d_1	470	0.005 x d_1	□	■		
	3.1	325	0.004 x d_1	395	0.005 x d_1	□	■		
	3.2	325	0.004 x d_1	395	0.005 x d_1	□	■		
	4.1	255	0.003 x d_1	290	0.004 x d_1	□	■		
	4.2	215	0.003 x d_1	255	0.004 x d_1	□	■		
N	1.1	1300	0.009 x d_1	1550	0.011 x d_1			□	■
	1.2	1300	0.008 x d_1	1550	0.010 x d_1			□	■
	1.3	1300	0.007 x d_1	1550	0.008 x d_1			□	■
	1.4	865	0.008 x d_1	1045	0.010 x d_1			□	■
	1.5	830	0.007 x d_1	1010	0.008 x d_1			□	■
	1.6	575	0.006 x d_1	685	0.007 x d_1			□	■
	2.1	395	0.005 x d_1	470	0.006 x d_1			□	■
	2.2	395	0.005 x d_1	470	0.006 x d_1			□	■
	2.3	395	0.005 x d_1	470	0.006 x d_1		□	□	■
	2.4	360	0.004 x d_1	435	0.005 x d_1			□	■
	2.5	360	0.004 x d_1	435	0.005 x d_1			□	■
	2.6	360	0.004 x d_1	435	0.005 x d_1		□	□	■
	2.7	215	0.003 x d_1	255	0.004 x d_1			□	■
	2.8	215	0.003 x d_1	255	0.004 x d_1			□	■
	3.1								
	3.2								
	4.1								
	4.2								
	4.3								
	4.4								
	5.1								
	5.2	215	0.003 x d_1	255	0.004 x d_1				■
	5.3								
S	1.1	325	0.004 x d_1	360	0.005 x d_1				■
	1.2	255	0.003 x d_1	290	0.004 x d_1				■
	1.3	255	0.003 x d_1	290	0.003 x d_1				■
	2.1	255	0.004 x d_1	290	0.004 x d_1				■
	2.2	110	0.003 x d_1	145	0.004 x d_1				■
	2.3	70	0.002 x d_1	90	0.002 x d_1				■
	2.4	110	0.003 x d_1	160	0.003 x d_1				■
	2.5	70	0.002 x d_1	70	0.002 x d_1				■
	2.6	70	0.003 x d_1	70	0.003 x d_1				■
H	1.1								
	1.2								
	1.3								
	1.4								
	1.5								

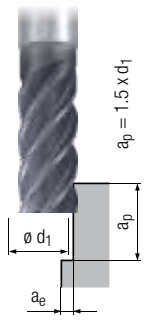
■ = very suitable
□ = suitable

Standard, long and extra long lengths (5 Flutes) N

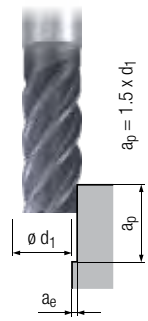
Metal Removal Rate (Cubic Inches per Minute) = IPM x a_e x a_p (a_e = Radial width of cut, a_p = Axial depth of cut)



a_e = 0.4 x d_1



a_e = 0.2 x d_1



a_e = 0.02 x d_1

Valid for Tool Nos.:

2946L	3920L	3922L
2920L	3921L	3923L

RPM = (SFM x 3.82) / Dia. (in)
Feed (IPM) = RPM x f_z x Z

f_z = Feed per tooth Speed
Z = number of teeth (flutes)
v_c = Cutting speed

		v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]			MMS MQL	
P	1.1	540	0.005 x d_1	615	0.006 x d_1	720	0.007 x d_1	□	■	□	■
	2.1	505	0.005 x d_1	575	0.005 x d_1	650	0.006 x d_1	□	■	□	■
	3.1	435	0.004 x d_1	470	0.005 x d_1	540	0.005 x d_1	□	■	□	■
	4.1	395	0.003 x d_1	435	0.004 x d_1	505	0.004 x d_1	□	■		
	5.1	360	0.003 x d_1	395	0.003 x d_1	470	0.004 x d_1	□	■		
M	1.1	290	0.003 x d_1	290	0.004 x d_1	360	0.004 x d_1			□	■
	2.1	255	0.003 x d_1	255	0.004 x d_1	290	0.004 x d_1			□	■
	3.1	145	0.003 x d_1	180	0.003 x d_1	215	0.003 x d_1			□	■
	4.1	110	0.003 x d_1	145	0.003 x d_1	145	0.003 x d_1			□	■
K	1.1	540	0.006 x d_1	615	0.006 x d_1	720	0.007 x d_1	□	■		
	1.2	540	0.006 x d_1	615	0.006 x d_1	720	0.007 x d_1	□	■		
	2.1	505	0.005 x d_1	575	0.005 x d_1	650	0.006 x d_1	□	■		
	2.2	505	0.005 x d_1	575	0.005 x d_1	650	0.006 x d_1	□	■		
	3.1	435	0.005 x d_1	470	0.005 x d_1	540	0.006 x d_1	□	■		
	3.2	435	0.005 x d_1	470	0.005 x d_1	540	0.006 x d_1	□	■		
	4.1	360	0.003 x d_1	395	0.004 x d_1	470	0.004 x d_1	□	■		
	4.2	290	0.003 x d_1	290	0.004 x d_1	360	0.004 x d_1	□	■		
N	1.1	900	0.010 x d_1	1010	0.011 x d_1	1085	0.013 x d_1			□	■
	1.2	900	0.009 x d_1	1010	0.010 x d_1	1085	0.011 x d_1			□	■
	1.3	900	0.008 x d_1	1010	0.009 x d_1	1085	0.010 x d_1			□	■
	1.4	900	0.009 x d_1	1010	0.010 x d_1	1085	0.011 x d_1			□	■
	1.5										
	1.6										
	2.1	505	0.006 x d_1	575	0.006 x d_1	650	0.007 x d_1			□	■
	2.2	505	0.006 x d_1	575	0.006 x d_1	650	0.007 x d_1			□	■
	2.3	505	0.006 x d_1	575	0.006 x d_1	650	0.007 x d_1		□	□	■
	2.4	470	0.005 x d_1	505	0.005 x d_1	615	0.006 x d_1			□	■
	2.5	470	0.005 x d_1	505	0.005 x d_1	615	0.006 x d_1			□	■
	2.6	470	0.005 x d_1	505	0.005 x d_1	615	0.006 x d_1		□	□	■
	2.7	290	0.003 x d_1	290	0.004 x d_1	360	0.004 x d_1			□	■
	2.8	290	0.003 x d_1	290	0.004 x d_1	360	0.004 x d_1			□	■
	3.1	1155	0.010 x d_1	1265	0.011 x d_1	1480	0.013 x d_1			□	■
	3.2	1155	0.008 x d_1	1265	0.009 x d_1	1480	0.010 x d_1			□	■
	4.1	1155	0.009 x d_1	1265	0.009 x d_1	1480	0.011 x d_1		□	□	■
	4.2									□	■
	4.3										
	4.4										
	5.1										
	5.2	290	0.003 x d_1	290	0.004 x d_1	360	0.004 x d_1				■
	5.3										
S	1.1	290	0.004 x d_1	290	0.004 x d_1	1180	0.005 x d_1				■
	1.2	255	0.003 x d_1	255	0.004 x d_1	950	0.004 x d_1				■
	1.3	145	0.003 x d_1	180	0.003 x d_1	705	0.004 x d_1				■
	2.1	255	0.002 x d_1	255	0.003 x d_1	290	0.003 x d_1				■
	2.2	70	0.002 x d_1	55	0.003 x d_1	110	0.003 x d_1				■
	2.3	90	0.002 x d_1	90	0.003 x d_1	110	0.003 x d_1				■
	2.4	90	0.002 x d_1	90	0.003 x d_1	110	0.003 x d_1				■
	2.5	70	0.002 x d_1	70	0.003 x d_1	110	0.003 x d_1				■
	2.6	70	0.002 x d_1	70	0.003 x d_1	110	0.003 x d_1				■
H	1.1	360	0.003 x d_1	395	0.003 x d_1	470	0.004 x d_1	□	■		
	1.2	290	0.003 x d_1	290	0.003 x d_1	360	0.004 x d_1	□	■		
	1.3	255	0.003 x d_1	255	0.003 x d_1	290	0.003 x d_1	□	■		
	1.4										
	1.5										

■ = very suitable
□ = suitable

Standard design (4 - 5 Flutes) with Corner Radius N

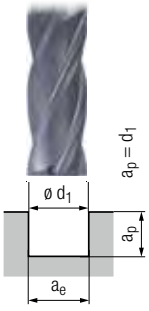
Metal Removal Rate (Cubic Inches per Minute) = IPM x a_e x a_p (a_e = Radial width of cut, a_p = Axial depth of cut)

Valid for Tool Nos.:

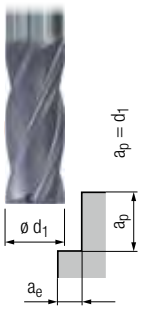
3945L 3902L
3946L 3903L

RPM = (SFM x 3.82) / Dia. (in)
Feed (IPM) = RPM x f_z x Z

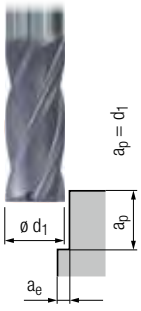
f_z = Feed per tooth Speed
Z = number of teeth (flutes)
v_c = Cutting speed



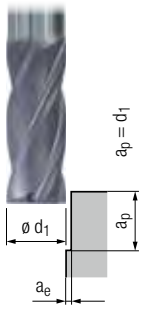
$a_e = d_1$



$a_e = 0.4 \times d_1$



$a_e = 0.2 \times d_1$



$a_e = 0.02 \times d_1$

		v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]			MMS MQL	
P	1.1	560	0.005 x d_1	620	0.006 x d_1	660	0.007 x d_1	785	0.008 x d_1	□	■	□	■
	2.1	490	0.004 x d_1	560	0.005 x d_1	590	0.006 x d_1	690	0.007 x d_1	□	■	□	■
	3.1	425	0.004 x d_1	460	0.005 x d_1	525	0.005 x d_1	590	0.006 x d_1	□	■	□	■
	4.1	395	0.003 x d_1	425	0.004 x d_1	460	0.004 x d_1	560	0.005 x d_1	□	■		
	5.1	330	0.003 x d_1	360	0.003 x d_1	395	0.004 x d_1	460	0.004 x d_1	□	■		
M	1.1	260	0.003 x d_1	295	0.004 x d_1	330	0.004 x d_1	360	0.005 x d_1			□	■
	2.1	230	0.003 x d_1	260	0.004 x d_1	260	0.004 x d_1	330	0.005 x d_1			□	■
	3.1	165	0.002 x d_1	195	0.003 x d_1	195	0.003 x d_1	230	0.004 x d_1			□	■
	4.1	110	0.002 x d_1	110	0.003 x d_1	130	0.003 x d_1	130	0.004 x d_1			□	■
K	1.1	560	0.005 x d_1	620	0.006 x d_1	660	0.007 x d_1	785	0.008 x d_1	□	■		
	1.2	560	0.005 x d_1	620	0.006 x d_1	660	0.007 x d_1	785	0.008 x d_1	□	■		
	2.1	490	0.004 x d_1	560	0.005 x d_1	590	0.006 x d_1	690	0.006 x d_1	□	■		
	2.2	490	0.004 x d_1	560	0.005 x d_1	590	0.006 x d_1	690	0.006 x d_1	□	■		
	3.1	425	0.004 x d_1	460	0.005 x d_1	525	0.006 x d_1	590	0.006 x d_1	□	■		
	3.2	425	0.004 x d_1	460	0.005 x d_1	525	0.006 x d_1	590	0.006 x d_1	□	■		
	4.1	330	0.003 x d_1	360	0.004 x d_1	395	0.004 x d_1	460	0.005 x d_1	□	■		
	4.2	260	0.003 x d_1	295	0.004 x d_1	330	0.004 x d_1	360	0.005 x d_1	□	■		
N	1.1	660	0.009 x d_1	820	0.010 x d_1	920	0.011 x d_1	985	0.013 x d_1			□	■
	1.2	660	0.008 x d_1	820	0.009 x d_1	920	0.010 x d_1	985	0.011 x d_1			□	■
	1.3	660	0.007 x d_1	820	0.008 x d_1	920	0.009 x d_1	985	0.010 x d_1			□	■
	1.4	660	0.008 x d_1	820	0.009 x d_1	920	0.010 x d_1	985	0.011 x d_1			□	■
	1.5												
	1.6												
	2.1	490	0.005 x d_1	560	0.006 x d_1	590	0.007 x d_1	690	0.008 x d_1			□	■
	2.2	490	0.005 x d_1	560	0.006 x d_1	590	0.007 x d_1	690	0.008 x d_1			□	■
	2.3	490	0.005 x d_1	560	0.006 x d_1	590	0.007 x d_1	690	0.008 x d_1		□	□	■
	2.4	425	0.004 x d_1	460	0.005 x d_1	525	0.006 x d_1	590	0.006 x d_1			□	■
	2.5	425	0.004 x d_1	460	0.005 x d_1	525	0.006 x d_1	590	0.006 x d_1			□	■
	2.6	425	0.004 x d_1	460	0.005 x d_1	525	0.006 x d_1	590	0.006 x d_1		□	□	■
	2.7	260	0.003 x d_1	295	0.004 x d_1	330	0.004 x d_1	360	0.005 x d_1			□	■
	2.8	260	0.003 x d_1	295	0.004 x d_1	330	0.004 x d_1	360	0.005 x d_1			□	■
	3.1	1115	0.009 x d_1	1215	0.011 x d_1	1345	0.013 x d_1	1575	0.014 x d_1			□	■
	3.2	1115	0.007 x d_1	1215	0.008 x d_1	1345	0.010 x d_1	1575	0.011 x d_1			□	■
	4.1	1115	0.008 x d_1	1215	0.009 x d_1	1345	0.011 x d_1	1575	0.012 x d_1		□	□	■
	4.2	1640	0.008 x d_1	1805	0.009 x d_1	2280	0.011 x d_1	2660	0.012 x d_1			□	■
	4.3												
	4.4												
	5.1												
	5.2	260	0.003 x d_1	295	0.004 x d_1	330	0.004 x d_1	360	0.005 x d_1				■
	5.3												
S	1.1	260	0.004 x d_1	295	0.004 x d_1	330	0.005 x d_1	360	0.006 x d_1				■
	1.2	230	0.003 x d_1	260	0.004 x d_1	260	0.004 x d_1	330	0.005 x d_1				■
	1.3	130	0.003 x d_1	130	0.003 x d_1	165	0.004 x d_1	195	0.004 x d_1				■
	2.1	230	0.002 x d_1	260	0.002 x d_1	260	0.003 x d_1	330	0.003 x d_1				■
	2.2	110	0.002 x d_1	110	0.002 x d_1	115	0.003 x d_1	130	0.003 x d_1				■
	2.3	65	0.002 x d_1	80	0.002 x d_1	80	0.003 x d_1	110	0.003 x d_1				■
	2.4	65	0.002 x d_1	80	0.002 x d_1	80	0.003 x d_1	110	0.003 x d_1				■
	2.5	65	0.002 x d_1	65	0.002 x d_1	65	0.003 x d_1	110	0.003 x d_1				■
	2.6	65	0.002 x d_1	65	0.002 x d_1	65	0.003 x d_1	110	0.003 x d_1				■
H	1.1	330	0.003 x d_1	360	0.003 x d_1	395	0.004 x d_1	460	0.004 x d_1	□	■		
	1.2	260	0.003 x d_1	295	0.003 x d_1	330	0.004 x d_1	360	0.004 x d_1	□	■		
	1.3			295	0.003 x d_1	330	0.003 x d_1	360	0.004 x d_1	□	■		
	1.4												
	1.5												

■ = very suitable
□ = suitable

Long design (4 - 5 Flutes) with Corner Radius N

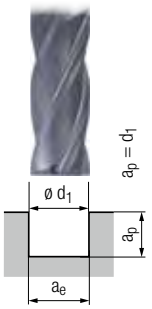
Metal Removal Rate (Cubic Inches per Minute) = IPM x a_e x a_p (a_e = Radial width of cut, a_p = Axial depth of cut)

Valid for Tool Nos.:

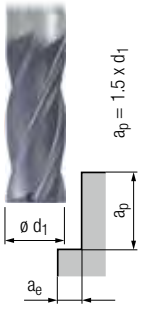
2998L 3928L
2999L 3929L

RPM = (SFM x 3.82) / Dia. (in)
Feed (IPM) = RPM x f_z x Z

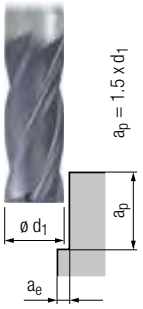
f_z = Feed per tooth Speed
Z = number of teeth (flutes)
v_c = Cutting speed



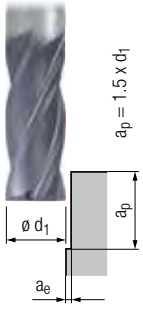
$a_e = d_1$



$a_e = 0.4 \times d_1$



$a_e = 0.2 \times d_1$



$a_e = 0.02 \times d_1$

		v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]			MMS MQL	
P	1.1	460	0.005 x d_1	490	0.005 x d_1	560	0.006 x d_1	655	0.007 x d_1	□	■	□	■
	2.1	430	0.004 x d_1	460	0.005 x d_1	525	0.005 x d_1	590	0.006 x d_1	□	■	□	■
	3.1	360	0.004 x d_1	395	0.004 x d_1	430	0.005 x d_1	490	0.005 x d_1	□	■	□	■
	4.1	330	0.003 x d_1	360	0.003 x d_1	395	0.004 x d_1	460	0.004 x d_1	□	■		
	5.1	295	0.003 x d_1	330	0.003 x d_1	360	0.003 x d_1	430	0.004 x d_1	□	■		
M	1.1	230	0.003 x d_1	260	0.003 x d_1	260	0.004 x d_1	330	0.004 x d_1			□	■
	2.1	195	0.003 x d_1	230	0.003 x d_1	230	0.004 x d_1	260	0.004 x d_1			□	■
	3.1	130	0.002 x d_1	130	0.003 x d_1	165	0.003 x d_1	195	0.003 x d_1			□	■
	4.1	110	0.002 x d_1	110	0.003 x d_1	130	0.003 x d_1	130	0.003 x d_1			□	■
K	1.1	460	0.005 x d_1	490	0.006 x d_1	560	0.006 x d_1	655	0.007 x d_1	□	■		
	1.2	460	0.005 x d_1	490	0.006 x d_1	560	0.006 x d_1	655	0.007 x d_1	□	■		
	2.1	430	0.004 x d_1	460	0.005 x d_1	525	0.005 x d_1	590	0.006 x d_1	□	■		
	2.2	430	0.004 x d_1	460	0.005 x d_1	525	0.005 x d_1	590	0.006 x d_1	□	■		
	3.1	360	0.004 x d_1	395	0.005 x d_1	430	0.005 x d_1	490	0.006 x d_1	□	■		
	3.2	360	0.004 x d_1	395	0.005 x d_1	430	0.005 x d_1	490	0.006 x d_1	□	■		
	4.1	295	0.003 x d_1	330	0.003 x d_1	360	0.004 x d_1	430	0.004 x d_1	□	■		
	4.2	230	0.003 x d_1	260	0.003 x d_1	260	0.004 x d_1	330	0.004 x d_1	□	■		
N	1.1	720	0.009 x d_1	820	0.010 x d_1	920	0.011 x d_1	985	0.013 x d_1			□	■
	1.2	720	0.008 x d_1	820	0.009 x d_1	920	0.010 x d_1	985	0.011 x d_1			□	■
	1.3	720	0.007 x d_1	820	0.008 x d_1	920	0.009 x d_1	985	0.010 x d_1			□	■
	1.4	660	0.008 x d_1	820	0.009 x d_1	920	0.010 x d_1	985	0.011 x d_1			□	■
	1.5												
	1.6												
	2.1	430	0.005 x d_1	460	0.006 x d_1	525	0.006 x d_1	590	0.007 x d_1			□	■
	2.2	430	0.005 x d_1	460	0.006 x d_1	525	0.006 x d_1	590	0.007 x d_1			□	■
	2.3	430	0.005 x d_1	460	0.006 x d_1	525	0.006 x d_1	590	0.007 x d_1		□	□	■
	2.4	395	0.004 x d_1	430	0.005 x d_1	460	0.005 x d_1	560	0.006 x d_1			□	■
	2.5	395	0.004 x d_1	430	0.005 x d_1	460	0.005 x d_1	560	0.006 x d_1			□	■
	2.6	395	0.004 x d_1	430	0.005 x d_1	460	0.005 x d_1	560	0.006 x d_1		□	□	■
	2.7	230	0.003 x d_1	260	0.003 x d_1	260	0.004 x d_1	330	0.004 x d_1			□	■
	2.8	230	0.003 x d_1	260	0.003 x d_1	260	0.004 x d_1	330	0.004 x d_1			□	■
	3.1	950	0.009 x d_1	1050	0.010 x d_1	1150	0.011 x d_1	1345	0.013 x d_1			□	■
	3.2	950	0.007 x d_1	1050	0.008 x d_1	1150	0.009 x d_1	1345	0.010 x d_1			□	■
	4.1	950	0.008 x d_1	1050	0.009 x d_1	1150	0.009 x d_1	1345	0.011 x d_1		□	□	■
	4.2	1410	0.008 x d_1	1540	0.009 x d_1	1705	0.009 x d_1	1970	0.011 x d_1			□	■
	4.3												
	4.4												
	5.1												
	5.2	230	0.003 x d_1	260	0.003 x d_1	260	0.004 x d_1	330	0.004 x d_1				■
	5.3												
S	1.1	230	0.004 x d_1	260	0.004 x d_1	260	0.004 x d_1	330	0.005 x d_1				■
	1.2	195	0.003 x d_1	230	0.003 x d_1	230	0.004 x d_1	260	0.004 x d_1				■
	1.3	130	0.003 x d_1	130	0.003 x d_1	165	0.003 x d_1	195	0.004 x d_1				■
	2.1	195	0.002 x d_1	230	0.002 x d_1	230	0.003 x d_1	260	0.003 x d_1				■
	2.2	65	0.002 x d_1	65	0.002 x d_1	50	0.003 x d_1	110	0.003 x d_1				■
	2.3	65	0.002 x d_1	80	0.002 x d_1	80	0.003 x d_1	110	0.003 x d_1				■
	2.4	65	0.002 x d_1	80	0.002 x d_1	80	0.003 x d_1	110	0.003 x d_1				■
	2.5	65	0.002 x d_1	65	0.002 x d_1	65	0.003 x d_1	110	0.003 x d_1				■
	2.6	65	0.002 x d_1	65	0.002 x d_1	65	0.003 x d_1	110	0.003 x d_1				■
H	1.1	295	0.003 x d_1	330	0.003 x d_1	360	0.003 x d_1	430	0.004 x d_1	□	■		
	1.2	230	0.003 x d_1	260	0.003 x d_1	260	0.003 x d_1	330	0.004 x d_1	□	■		
	1.3			230	0.003 x d_1	230	0.003 x d_1	260	0.003 x d_1	□	■		
	1.4												
	1.5												

■ = very suitable
□ = suitable

Extra long design (4 - 5 Flutes) with Corner Radius N

Metal Removal Rate (Cubic Inches per Minute) = IPM x a_e x a_p (a_e = Radial width of cut, a_p = Axial depth of cut)

Valid for Tool Nos.:

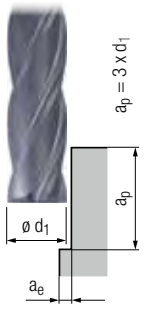
3947L 3933L
3948L 3934L

RPM = (SFM x 3.82) / Dia. (in)
Feed (IPM) = RPM x f_z x Z

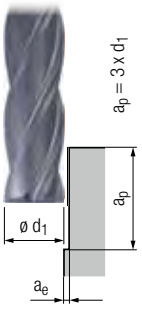
f_z = Feed per tooth Speed
Z = number of teeth (flutes)
v_c = Cutting speed

*Length of Cut = 3 (or 4) x tool diameter

LOC = 3 X d_1*

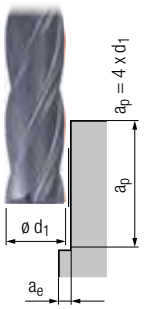


a_e = 0.1 x d_1

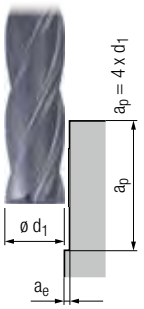


a_e = 0.02 x d_1

LOC = 4 X d_1*



a_e = 0.05 x d_1



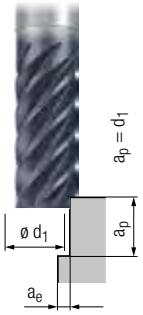
a_e = 0.02 x d_1

		v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]			MMS MQL	
P	1.1	395	0.005 x d_1	460	0.006 x d_1	330	0.005 x d_1	395	0.005 x d_1	□	■	□	■
	2.1	360	0.004 x d_1	430	0.005 x d_1	295	0.004 x d_1	360	0.005 x d_1	□	■	□	■
	3.1	295	0.004 x d_1	360	0.005 x d_1	230	0.004 x d_1	295	0.004 x d_1	□	■	□	■
	4.1	230	0.003 x d_1	260	0.004 x d_1	195	0.003 x d_1	230	0.003 x d_1	□	■		
	5.1	195	0.003 x d_1	230	0.003 x d_1	165	0.003 x d_1	195	0.003 x d_1	□	■		
M	1.1	395	0.003 x d_1	460	0.004 x d_1	330	0.003 x d_1	395	0.003 x d_1			□	■
	2.1	330	0.003 x d_1	395	0.004 x d_1	260	0.003 x d_1	330	0.003 x d_1			□	■
	3.1	230	0.003 x d_1	260	0.003 x d_1	195	0.003 x d_1	230	0.003 x d_1			□	■
	4.1	165	0.003 x d_1	195	0.003 x d_1	130	0.003 x d_1	165	0.003 x d_1			□	■
K	1.1	395	0.005 x d_1	460	0.006 x d_1	330	0.005 x d_1	395	0.006 x d_1	□	■		
	1.2	395	0.005 x d_1	460	0.006 x d_1	330	0.005 x d_1	395	0.006 x d_1	□	■		
	2.1	360	0.004 x d_1	430	0.005 x d_1	295	0.004 x d_1	360	0.004 x d_1	□	■		
	2.2	360	0.004 x d_1	430	0.005 x d_1	295	0.004 x d_1	360	0.004 x d_1	□	■		
	3.1	295	0.004 x d_1	360	0.005 x d_1	230	0.004 x d_1	295	0.004 x d_1	□	■		
	3.2	295	0.004 x d_1	360	0.005 x d_1	230	0.004 x d_1	295	0.004 x d_1	□	■		
	4.1	230	0.003 x d_1	260	0.004 x d_1	195	0.003 x d_1	230	0.003 x d_1	□	■		
	4.2	195	0.003 x d_1	230	0.004 x d_1	165	0.003 x d_1	195	0.003 x d_1	□	■		
N	1.1	1180	0.009 x d_1	1410	0.011 x d_1	985	0.009 x d_1	1410	0.009 x d_1			□	■
	1.2	1180	0.008 x d_1	1410	0.010 x d_1	985	0.008 x d_1	1410	0.009 x d_1			□	■
	1.3	1180	0.007 x d_1	1410	0.008 x d_1	985	0.007 x d_1	1410	0.008 x d_1			□	■
	1.4	785	0.008 x d_1	950	0.010 x d_1	660	0.008 x d_1	950	0.009 x d_1			□	■
	1.5	755	0.007 x d_1	920	0.008 x d_1	590	0.007 x d_1	920	0.008 x d_1			□	■
	1.6	525	0.006 x d_1	620	0.007 x d_1	430	0.006 x d_1	620	0.007 x d_1			□	■
	2.1	360	0.005 x d_1	430	0.006 x d_1	295	0.005 x d_1	360	0.006 x d_1			□	■
	2.2	360	0.005 x d_1	430	0.006 x d_1	295	0.005 x d_1	360	0.006 x d_1			□	■
	2.3	360	0.005 x d_1	430	0.006 x d_1	295	0.005 x d_1	360	0.006 x d_1		□	□	■
	2.4	330	0.004 x d_1	395	0.005 x d_1	260	0.004 x d_1	330	0.004 x d_1			□	■
	2.5	330	0.004 x d_1	395	0.005 x d_1	260	0.004 x d_1	330	0.004 x d_1			□	■
	2.6	330	0.004 x d_1	395	0.005 x d_1	260	0.004 x d_1	330	0.004 x d_1		□	□	■
	2.7	195	0.003 x d_1	230	0.004 x d_1	165	0.003 x d_1	195	0.003 x d_1			□	■
	2.8	195	0.003 x d_1	230	0.004 x d_1	165	0.003 x d_1	195	0.003 x d_1			□	■
	3.1												
	3.2												
	4.1												
	4.2												
	4.3												
	4.4												
	5.1												
	5.2	195	0.003 x d_1	230	0.004 x d_1	165	0.003 x d_1	195	0.003 x d_1				■
	5.3												
S	1.1	295	0.004 x d_1	330	0.005 x d_1	230	0.004 x d_1	260	0.004 x d_1				■
	1.2	230	0.003 x d_1	260	0.004 x d_1	195	0.003 x d_1	230	0.003 x d_1				■
	1.3	230	0.003 x d_1	260	0.003 x d_1	195	0.003 x d_1	230	0.003 x d_1				■
	2.1	230	0.004 x d_1	260	0.004 x d_1	195	0.004 x d_1	230	0.004 x d_1				■
	2.2	110	0.003 x d_1	130	0.004 x d_1	50	0.003 x d_1	110	0.003 x d_1				■
	2.3	65	0.002 x d_1	80	0.002 x d_1	80	0.002 x d_1	65	0.002 x d_1				■
	2.4	110	0.003 x d_1	150	0.003 x d_1	80	0.003 x d_1	110	0.003 x d_1				■
	2.5	65	0.002 x d_1	65	0.002 x d_1	65	0.002 x d_1	65	0.002 x d_1				■
	2.6	65	0.003 x d_1	65	0.003 x d_1	65	0.003 x d_1	65	0.003 x d_1				■
H	1.1												
	1.2												
	1.3												
	1.4												
	1.5												

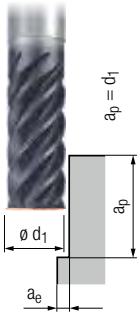
■ = very suitable
□ = suitable

Standard length (6 Flutes) - for Regular and Corner Radius tools N

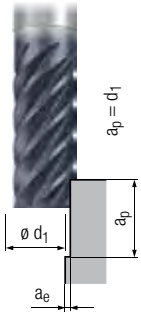
Metal Removal Rate (Cubic Inches per Minute) = IPM x a_e x a_p (a_e = Radial width of cut, a_p = Axial depth of cut)



$a_e = 0.2 \times d_1$



$a_e = 0.1 \times d_1$



$a_e = 0.02 \times d_1$

Valid for Tool Nos.:
3924L 2941L
3925L 2942L

RPM = (SFM x 3.82) / Dia. (in)
Feed (IPM) = RPM x f_z x Z

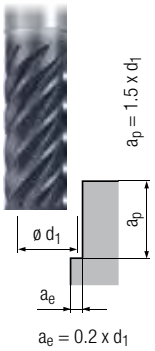
f_z = Feed per tooth Speed
Z = number of teeth (flutes)
v_c = Cutting speed

		v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]			MMS MQL	
P	1.1	720	0.007 x d_1	795	0.008 x d_1	865	0.008 x d_1	□	■	□	■
	2.1	650	0.006 x d_1	705	0.007 x d_1	760	0.007 x d_1	□	■	□	■
	3.1	575	0.005 x d_1	615	0.006 x d_1	650	0.006 x d_1	□	■	□	■
	4.1	505	0.004 x d_1	560	0.005 x d_1	615	0.005 x d_1	□	■		
	5.1	435	0.004 x d_1	470	0.004 x d_1	505	0.004 x d_1	□	■		
M	1.1	360	0.004 x d_1	380	0.005 x d_1	395	0.005 x d_1			□	■
	2.1	290	0.004 x d_1	325	0.005 x d_1	360	0.005 x d_1			□	■
	3.1	215	0.003 x d_1	235	0.004 x d_1	255	0.004 x d_1			□	■
	4.1	145	0.003 x d_1	145	0.004 x d_1	145	0.004 x d_1			□	■
K	1.1	720	0.007 x d_1	795	0.008 x d_1	865		□	■		
	1.2	720	0.007 x d_1	795	0.008 x d_1	865		□	■		
	2.1	650	0.006 x d_1	705	0.006 x d_1	760		□	■		
	2.2	650	0.006 x d_1	705	0.006 x d_1	760		□	■		
	3.1	575	0.006 x d_1	615	0.006 x d_1	650		□	■		
	3.2	575	0.006 x d_1	615	0.006 x d_1	650		□	■		
	4.1	435	0.004 x d_1	470	0.005 x d_1	505		□	■		
	4.2	360	0.004 x d_1	380	0.005 x d_1	395		□	■		
N	1.1	1010	0.011 x d_1	1085	0.013 x d_1	1085	0.013 x d_1			□	■
	1.2	1010	0.010 x d_1	1085	0.011 x d_1	1085	0.011 x d_1			□	■
	1.3	1010	0.009 x d_1	1085	0.010 x d_1	1085	0.010 x d_1			□	■
	1.4	1010	0.010 x d_1	1085	0.011 x d_1	1085	0.011 x d_1			□	■
	1.5										
	1.6										
	2.1	650	0.007 x d_1	760	0.008 x d_1	760	0.008 x d_1			□	■
	2.2	650	0.007 x d_1	760	0.008 x d_1	760	0.008 x d_1			□	■
	2.3	650	0.007 x d_1	760	0.008 x d_1	760	0.008 x d_1		□	□	■
	2.4	575	0.006 x d_1	650	0.006 x d_1	650	0.006 x d_1			□	■
	2.5	575	0.006 x d_1	650	0.006 x d_1	650	0.006 x d_1			□	■
	2.6	575	0.006 x d_1	650	0.006 x d_1	650	0.006 x d_1		□	□	■
	2.7	360	0.004 x d_1	395	0.005 x d_1	395	0.005 x d_1			□	■
	2.8	360	0.004 x d_1	395	0.005 x d_1	395	0.005 x d_1			□	■
	3.1	1480	0.013 x d_1	1730	0.014 x d_1	1730	0.014 x d_1			□	■
	3.2	1480	0.010 x d_1	1730	0.011 x d_1	1730	0.011 x d_1			□	■
	4.1	1480	0.013 x d_1	1730	0.014 x d_1	1730	0.014 x d_1		□	□	■
	4.2	1480	0.010 x d_1	1730	0.011 x d_1	1730	0.011 x d_1			□	■
	4.3										
	4.4										
	5.1										
	5.2	360	0.004 x d_1	395	0.005 x d_1	395	0.005 x d_1				■
	5.3										
S	1.1	360	0.005 x d_1	395	0.005 x d_1	395	0.006 x d_1				■
	1.2	290	0.004 x d_1	360	0.004 x d_1	360	0.005 x d_1				■
	1.3	180	0.004 x d_1	195	0.004 x d_1	215	0.004 x d_1				■
	2.1	290	0.003 x d_1	325	0.003 x d_1	360	0.003 x d_1				■
	2.2	125	0.003 x d_1	145	0.003 x d_1	145	0.003 x d_1				■
	2.3	90	0.003 x d_1	110	0.003 x d_1	110	0.003 x d_1				■
	2.4	90	0.003 x d_1	110	0.003 x d_1	110	0.003 x d_1				■
	2.5	70	0.003 x d_1	85	0.003 x d_1	110	0.003 x d_1				■
	2.6	70	0.003 x d_1	85	0.003 x d_1	110	0.003 x d_1				■
H	1.1	435	0.004 x d_1	470	0.004 x d_1	505	0.004 x d_1	□	■		
	1.2	360	0.004 x d_1	395	0.004 x d_1	395	0.004 x d_1	□	■		
	1.3	360	0.003 x d_1	395	0.004 x d_1	395	0.004 x d_1	□	■		
	1.4										
	1.5										

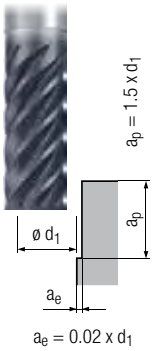
■ = very suitable
□ = suitable

Long length (6 Flutes) - for Regular and Corner Radius tools N

Metal Removal Rate (Cubic Inches per Minute) = IPM x a_e x a_p (a_e = Radial width of cut, a_p = Axial depth of cut)



$a_e = 0.2 \times d_1$



$a_e = 0.02 \times d_1$

Valid for Tool Nos.:

2948L 2947L
3908L 3909L

RPM = (SFM x 3.82) / Dia. (in)
Feed (IPM) = RPM x f_z x Z

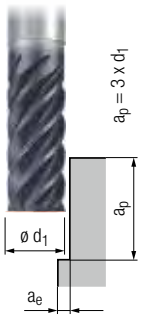
f_z = Feed per tooth Speed
Z = number of teeth (flutes)
v_c = Cutting speed

		v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]			MMS MQL	
P	1.1	615	0.006 x d_1	720	0.007 x d_1	□	■	□	■
	2.1	575	0.005 x d_1	650	0.006 x d_1	□	■	□	■
	3.1	470	0.005 x d_1	540	0.005 x d_1	□	■	□	■
	4.1	435	0.004 x d_1	505	0.004 x d_1	□	■		
	5.1	395	0.003 x d_1	470	0.004 x d_1	□	■		
M	1.1	290	0.004 x d_1	360	0.004 x d_1			□	■
	2.1	255	0.004 x d_1	290	0.004 x d_1			□	■
	3.1	180	0.003 x d_1	215	0.003 x d_1			□	■
	4.1	145	0.003 x d_1	145	0.003 x d_1			□	■
K	1.1	615	0.006 x d_1	720	0.007 x d_1	□	■		
	1.2	615	0.006 x d_1	720	0.007 x d_1	□	■		
	2.1	575	0.005 x d_1	650	0.006 x d_1	□	■		
	2.2	575	0.005 x d_1	650	0.006 x d_1	□	■		
	3.1	470	0.005 x d_1	540	0.006 x d_1	□	■		
	3.2	470	0.005 x d_1	540	0.006 x d_1	□	■		
	4.1	395	0.004 x d_1	470	0.004 x d_1	□	■		
	4.2	290	0.004 x d_1	360	0.004 x d_1	□	■		
N	1.1	1010	0.011 x d_1	1085	0.013 x d_1			□	■
	1.2	1010	0.010 x d_1	1085	0.011 x d_1			□	■
	1.3	1010	0.009 x d_1	1085	0.010 x d_1			□	■
	1.4	1010	0.010 x d_1	1085	0.011 x d_1			□	■
	1.5								
	1.6								
	2.1	575	0.006 x d_1	650	0.007 x d_1			□	■
	2.2	575	0.006 x d_1	650	0.007 x d_1			□	■
	2.3	575	0.006 x d_1	650	0.007 x d_1		□	□	■
	2.4	505	0.005 x d_1	615	0.006 x d_1			□	■
	2.5	505	0.005 x d_1	615	0.006 x d_1			□	■
	2.6	505	0.005 x d_1	615	0.006 x d_1		□	□	■
	2.7	290	0.004 x d_1	360	0.004 x d_1			□	■
	2.8	290	0.004 x d_1	360	0.004 x d_1			□	■
	3.1	1265	0.011 x d_1	1480	0.013 x d_1			□	■
	3.2	1265	0.009 x d_1	1480	0.010 x d_1			□	■
	4.1	1265	0.009 x d_1	1480	0.011 x d_1		□	□	■
	4.2	1875	0.009 x d_1	2165	0.011 x d_1			□	■
	4.3								
	4.4								
	5.1								
	5.2	290	0.004 x d_1	360	0.004 x d_1				■
	5.3								
S	1.1	290	0.004 x d_1	360	0.005 x d_1				■
	1.2	255	0.004 x d_1	290	0.004 x d_1				■
	1.3	180	0.003 x d_1	215	0.004 x d_1				■
	2.1	255	0.003 x d_1	290	0.003 x d_1				■
	2.2	55	0.003 x d_1	110	0.003 x d_1				■
	2.3	90	0.003 x d_1	110	0.003 x d_1				■
	2.4	90	0.003 x d_1	110	0.003 x d_1				■
	2.5	70	0.003 x d_1	110	0.003 x d_1				■
	2.6	70	0.003 x d_1	110	0.003 x d_1				■
H	1.1	395	0.003 x d_1	470	0.004 x d_1	□	■		
	1.2								
	1.3								
	1.4								
	1.5								

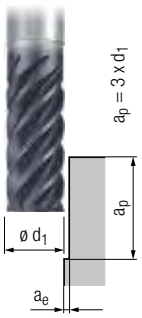
■ = very suitable
□ = suitable

Extra long length (6 Flutes) - for Regular and Corner Radius tools N

Metal Removal Rate (Cubic Inches per Minute) = IPM x a_e x a_p (a_e = Radial width of cut, a_p = Axial depth of cut)



$a_e = 0.1 \times d_1$



$a_e = 0.02 \times d_1$

Valid for Tool Nos.:

3926L 3943L
3927L 3944L

RPM = (SFM x 3.82) / Dia. (in)
Feed (IPM) = RPM x f_z x Z

f_z = Feed per tooth Speed
Z = number of teeth (flutes)
v_c = Cutting speed

		v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]			MMS MQL	
P	1.1	435	0.005 x d_1	505	0.006 x d_1	□	■	□	■
	2.1	395	0.004 x d_1	470	0.005 x d_1	□	■	□	■
	3.1	325	0.004 x d_1	395	0.005 x d_1	□	■	□	■
	4.1	255	0.003 x d_1	290	0.004 x d_1	□	■		
	5.1	215	0.003 x d_1	255	0.003 x d_1	□	■		
M	1.1	435	0.003 x d_1	505	0.004 x d_1			□	■
	2.1	360	0.003 x d_1	435	0.004 x d_1			□	■
	3.1	255	0.003 x d_1	290	0.003 x d_1			□	■
	4.1	180	0.003 x d_1	215	0.003 x d_1			□	■
K	1.1	435	0.005 x d_1	505	0.006 x d_1	□	■		
	1.2	435	0.005 x d_1	505	0.006 x d_1	□	■		
	2.1	395	0.004 x d_1	470	0.005 x d_1	□	■		
	2.2	395	0.004 x d_1	470	0.005 x d_1	□	■		
	3.1	325	0.004 x d_1	395	0.005 x d_1	□	■		
	3.2	325	0.004 x d_1	395	0.005 x d_1	□	■		
	4.1	255	0.003 x d_1	290	0.004 x d_1	□	■		
	4.2	215	0.003 x d_1	255	0.004 x d_1	□	■		
N	1.1	865	0.009 x d_1	1030	0.011 x d_1			□	■
	1.2	865	0.008 x d_1	1030	0.010 x d_1			□	■
	1.3	865	0.007 x d_1	1030	0.008 x d_1			□	■
	1.4	865	0.008 x d_1	1030	0.010 x d_1			□	■
	1.5								
	1.6								
	2.1	490	0.005 x d_1	585	0.006 x d_1			□	■
	2.2	490	0.005 x d_1	585	0.006 x d_1			□	■
	2.3	490	0.005 x d_1	585	0.006 x d_1		□	□	■
	2.4	435	0.004 x d_1	515	0.005 x d_1			□	■
	2.5	435	0.004 x d_1	515	0.005 x d_1			□	■
	2.6	435	0.004 x d_1	515	0.005 x d_1		□	□	■
	2.7	245	0.003 x d_1	290	0.004 x d_1			□	■
	2.8	245	0.003 x d_1	290	0.004 x d_1			□	■
	3.1	1080	0.010 x d_1	1285	0.011 x d_1			□	■
	3.2	1080	0.008 x d_1	1285	0.010 x d_1			□	■
	4.1	1080	0.008 x d_1	1285	0.010 x d_1		□	□	■
	4.2								
	4.3								
	4.4								
	5.1								
	5.2	215	0.003 x d_1	255	0.004 x d_1				■
	5.3								
S	1.1	325	0.004 x d_1	360	0.005 x d_1				■
	1.2	255	0.003 x d_1	290	0.004 x d_1				■
	1.3	255	0.003 x d_1	290	0.003 x d_1				■
	2.1	255	0.004 x d_1	290	0.004 x d_1				■
	2.2	110	0.003 x d_1	145	0.004 x d_1				■
	2.3	70	0.002 x d_1	90	0.002 x d_1				■
	2.4	110	0.003 x d_1	160	0.003 x d_1				■
	2.5	70	0.002 x d_1	70	0.002 x d_1				■
	2.6	70	0.003 x d_1	70	0.003 x d_1				■
H	1.1	340	0.002 x d_1	405	0.003 x d_1	□	■		
	1.2	245	0.002 x d_1	290	0.003 x d_1	□	■		
	1.3	215	0.002 x d_1	255	0.003 x d_1	□	■		
	1.4								
	1.5								

■ = very suitable
□ = suitable

Standard length (7 Flutes) - for Regular and Corner Radius tools N

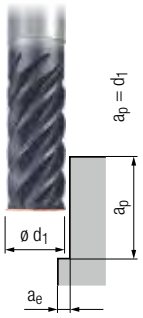
Metal Removal Rate (Cubic Inches per Minute) = IPM x a_e x a_p (a_e = Radial width of cut, a_p = Axial depth of cut)

Valid for Tool Nos.:

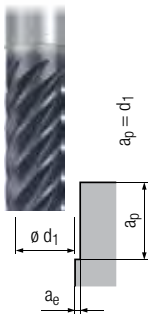
3916L 3935L
3930L 3936L

RPM = (SFM x 3.82) / Dia. (in)
Feed (IPM) = RPM x f_z x Z

f_z = Feed per tooth Speed
Z = number of teeth (flutes)
v_c = Cutting speed



$a_e = 0.1 \times d_1$



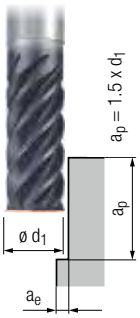
$a_e = 0.02 \times d_1$

		v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]			MMS MQL	
P	1.1	795	0.008 x d_1	865	0.008 x d_1	□	■	□	■
	2.1	705	0.007 x d_1	760	0.007 x d_1	□	■	□	■
	3.1	615	0.006 x d_1	650	0.006 x d_1	□	■	□	■
	4.1	560	0.005 x d_1	615	0.005 x d_1	□	■		
	5.1	470	0.004 x d_1	505	0.004 x d_1	□	■		
M	1.1	380	0.005 x d_1	395	0.005 x d_1			□	■
	2.1	325	0.005 x d_1	360	0.005 x d_1			□	■
	3.1	235	0.004 x d_1	255	0.004 x d_1			□	■
	4.1	145	0.004 x d_1	145	0.004 x d_1			□	■
K	1.1	795	0.008 x d_1	865	0.008 x d_1	□	■		
	1.2	795	0.008 x d_1	865	0.008 x d_1	□	■		
	2.1	705	0.006 x d_1	760	0.006 x d_1	□	■		
	2.2	705	0.006 x d_1	760	0.006 x d_1	□	■		
	3.1	615	0.006 x d_1	650	0.006 x d_1	□	■		
	3.2	615	0.006 x d_1	650	0.006 x d_1	□	■		
	4.1	470	0.005 x d_1	505	0.005 x d_1	□	■		
	4.2	380	0.005 x d_1	395	0.005 x d_1	□	■		
N	1.1	1085	0.013 x d_1	1085	0.013 x d_1			□	■
	1.2	1085	0.011 x d_1	1085	0.011 x d_1			□	■
	1.3	1085	0.010 x d_1	1085	0.010 x d_1			□	■
	1.4	1085	0.011 x d_1	1085	0.011 x d_1			□	■
	1.5								
	1.6								
	2.1	760	0.008 x d_1	760	0.008 x d_1			□	■
	2.2	760	0.008 x d_1	760	0.008 x d_1			□	■
	2.3	760	0.008 x d_1	760	0.008 x d_1		□	□	■
	2.4	650	0.006 x d_1	650	0.006 x d_1			□	■
	2.5	650	0.006 x d_1	650	0.006 x d_1			□	■
	2.6	650	0.006 x d_1	650	0.006 x d_1		□	□	■
	2.7	395	0.005 x d_1	395	0.005 x d_1			□	■
	2.8	395	0.005 x d_1	395	0.005 x d_1			□	■
	3.1	1730	0.014 x d_1	1730	0.014 x d_1			□	■
	3.2	1730	0.011 x d_1	1730	0.011 x d_1			□	■
	4.1	1730	0.012 x d_1	1730	0.012 x d_1		□	□	■
	4.2								
	4.3								
	4.4								
	5.1								
	5.2	395	0.005 x d_1	395	0.005 x d_1				■
	5.3								
S	1.1	395	0.005 x d_1	395	0.006 x d_1				■
	1.2	360	0.004 x d_1	360	0.005 x d_1				■
	1.3	195	0.004 x d_1	215	0.004 x d_1				■
	2.1	325	0.003 x d_1	360	0.003 x d_1				■
	2.2	145	0.003 x d_1	145	0.003 x d_1				■
	2.3	110	0.003 x d_1	110	0.003 x d_1				■
	2.4	110	0.003 x d_1	110	0.003 x d_1				■
	2.5	85	0.003 x d_1	110	0.003 x d_1				■
	2.6	85	0.003 x d_1	110	0.003 x d_1				■
H	1.1	470	0.004 x d_1	505	0.004 x d_1	□	■		
	1.2	395	0.004 x d_1	395	0.004 x d_1	□	■		
	1.3	395	0.004 x d_1	395	0.004 x d_1	□	■		
	1.4								
	1.5								

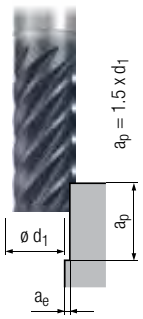
■ = very suitable
□ = suitable

Long length (7 Flutes) - for Regular and Corner Radius tools N

Metal Removal Rate (Cubic Inches per Minute) = IPM x a_e x a_p (a_e = Radial width of cut, a_p = Axial depth of cut)



a_e = 0.1 x d_1



a_e = 0.02 x d_1

Valid for Tool Nos.:

3917L 3937L
3931L 3938L

RPM = (SFM x 3.82) / Dia. (in)
Feed (IPM) = RPM x f_z x Z

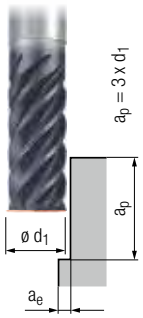
f_z = Feed per tooth Speed
Z = number of teeth (flutes)
v_c = Cutting speed

		v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]			MMS MQL	
P	1.1	670	0.007 x d_1	720	0.007 x d_1	□	■	□	■
	2.1	615	0.006 x d_1	650	0.006 x d_1	□	■	□	■
	3.1	505	0.005 x d_1	540	0.005 x d_1	□	■	□	■
	4.1	470	0.004 x d_1	505	0.004 x d_1	□	■		
	5.1	435	0.004 x d_1	470	0.004 x d_1	□	■		
M	1.1	325	0.004 x d_1	360	0.004 x d_1			□	■
	2.1	290	0.004 x d_1	290	0.004 x d_1			□	■
	3.1	215	0.003 x d_1	215	0.003 x d_1			□	■
	4.1	145	0.003 x d_1	145	0.003 x d_1			□	■
K	1.1	670	0.007 x d_1	720	0.007 x d_1	□	■		
	1.2	670	0.007 x d_1	720	0.007 x d_1	□	■		
	2.1	615	0.006 x d_1	650	0.006 x d_1	□	■		
	2.2	615	0.006 x d_1	650	0.006 x d_1	□	■		
	3.1	505	0.006 x d_1	540	0.006 x d_1	□	■		
	3.2	505	0.006 x d_1	540	0.006 x d_1	□	■		
	4.1	435	0.004 x d_1	470	0.004 x d_1	□	■		
	4.2	325	0.004 x d_1	360	0.004 x d_1	□	■		
N	1.1	1085	0.013 x d_1	1085	0.013 x d_1			□	■
	1.2	1085	0.011 x d_1	1085	0.011 x d_1			□	■
	1.3	1085	0.010 x d_1	1085	0.010 x d_1			□	■
	1.4	1085	0.011 x d_1	1085	0.011 x d_1			□	■
	1.5								
	1.6								
	2.1	650	0.007 x d_1	650	0.007 x d_1			□	■
	2.2	650	0.007 x d_1	650	0.007 x d_1			□	■
	2.3	650	0.007 x d_1	650	0.007 x d_1		□	□	■
	2.4	615	0.006 x d_1	615	0.006 x d_1			□	■
	2.5	615	0.006 x d_1	615	0.006 x d_1			□	■
	2.6	615	0.006 x d_1	615	0.006 x d_1		□	□	■
	2.7	360	0.004 x d_1	360	0.004 x d_1			□	■
	2.8	360	0.004 x d_1	360	0.004 x d_1			□	■
	3.1	1480	0.013 x d_1	1480	0.013 x d_1			□	■
	3.2	1480	0.010 x d_1	1480	0.010 x d_1			□	■
	4.1	1480	0.011 x d_1	1480	0.011 x d_1		□	□	■
	4.2								
	4.3								
	4.4								
	5.1								
	5.2	360	0.004 x d_1	360	0.004 x d_1				■
	5.3								
S	1.1	360	0.004 x d_1	360	0.005 x d_1				■
	1.2	290	0.004 x d_1	290	0.004 x d_1				■
	1.3	215	0.003 x d_1	215	0.004 x d_1				■
	2.1	290	0.003 x d_1	290	0.003 x d_1				■
	2.2	85	0.003 x d_1	110	0.003 x d_1				■
	2.3	110	0.003 x d_1	110	0.003 x d_1				■
	2.4	110	0.003 x d_1	110	0.003 x d_1				■
	2.5	90	0.003 x d_1	110	0.003 x d_1				■
	2.6	90	0.003 x d_1	110	0.003 x d_1				■
H	1.1	435	0.004 x d_1	470	0.004 x d_1	□	■		
	1.2	325	0.004 x d_1	360	0.004 x d_1	□	■		
	1.3	290	0.003 x d_1	290	0.003 x d_1	□	■		
	1.4								
	1.5								

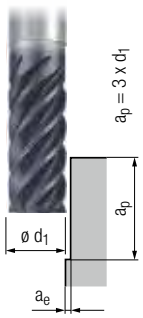
■ = very suitable
□ = suitable

Extra long length (7 Flutes) - for Regular and Corner Radius tools N

Metal Removal Rate (Cubic Inches per Minute) = IPM x a_e x a_p (a_e = Radial width of cut, a_p = Axial depth of cut)



a_e = 0.1 x d_1



a_e = 0.02 x d_1

Valid for Tool Nos.:

3918L 3939L
3932L 3940L

RPM = (SFM x 3.82) / Dia. (in)
Feed (IPM) = RPM x f_z x Z

f_z = Feed per tooth Speed
Z = number of teeth (flutes)
v_c = Cutting speed

		v_c [sfm]	f_z [inch]	v_c [sfm]	f_z [inch]			MMS MQL	
P	1.1	435	0.005 x d_1	505	0.006 x d_1	□	■	□	■
	2.1	395	0.004 x d_1	470	0.005 x d_1	□	■	□	■
	3.1	325	0.004 x d_1	395	0.005 x d_1	□	■	□	■
	4.1	255	0.003 x d_1	290	0.004 x d_1	□	■		
	5.1	215	0.003 x d_1	255	0.003 x d_1	□	■		
M	1.1	435	0.003 x d_1	505	0.004 x d_1			□	■
	2.1	360	0.003 x d_1	435	0.004 x d_1			□	■
	3.1	255	0.003 x d_1	290	0.003 x d_1			□	■
	4.1	180	0.003 x d_1	215	0.003 x d_1			□	■
K	1.1	435	0.005 x d_1	505	0.006 x d_1	□	■		
	1.2	435	0.005 x d_1	505	0.006 x d_1	□	■		
	2.1	395	0.004 x d_1	470	0.005 x d_1	□	■		
	2.2	395	0.004 x d_1	470	0.005 x d_1	□	■		
	3.1	325	0.004 x d_1	395	0.005 x d_1	□	■		
	3.2	325	0.004 x d_1	395	0.005 x d_1	□	■		
	4.1	255	0.003 x d_1	290	0.004 x d_1	□	■		
	4.2	215	0.003 x d_1	255	0.004 x d_1	□	■		
N	1.1	865	0.009 x d_1	1030	0.011 x d_1			□	■
	1.2	865	0.008 x d_1	1030	0.010 x d_1			□	■
	1.3	865	0.007 x d_1	1030	0.008 x d_1			□	■
	1.4	865	0.008 x d_1	1030	0.010 x d_1			□	■
	1.5								
	1.6								
	2.1	490	0.005 x d_1	585	0.006 x d_1			□	■
	2.2	490	0.005 x d_1	585	0.006 x d_1			□	■
	2.3	490	0.005 x d_1	585	0.006 x d_1		□	□	■
	2.4	435	0.004 x d_1	515	0.005 x d_1			□	■
	2.5	435	0.004 x d_1	515	0.005 x d_1			□	■
	2.6	435	0.004 x d_1	515	0.005 x d_1		□	□	■
	2.7	245	0.003 x d_1	290	0.004 x d_1			□	■
	2.8	245	0.003 x d_1	290	0.004 x d_1			□	■
	3.1	1080	0.010 x d_1	1285	0.011 x d_1			□	■
	3.2	1080	0.008 x d_1	1285	0.010 x d_1			□	■
	4.1	1080	0.008 x d_1	1285	0.010 x d_1		□	□	■
	4.2								
	4.3								
	4.4								
	5.1								
	5.2	215	0.003 x d_1	255	0.004 x d_1				■
	5.3								
S	1.1	325	0.004 x d_1	360	0.005 x d_1				■
	1.2	255	0.003 x d_1	290	0.004 x d_1				■
	1.3	255	0.003 x d_1	290	0.003 x d_1				■
	2.1	255	0.004 x d_1	290	0.004 x d_1				■
	2.2	110	0.003 x d_1	145	0.004 x d_1				■
	2.3	70	0.002 x d_1	90	0.002 x d_1				■
	2.4	110	0.003 x d_1	160	0.003 x d_1				■
	2.5	70	0.002 x d_1	70	0.002 x d_1				■
	2.6	70	0.003 x d_1	70	0.003 x d_1				■
H	1.1	340	0.002 x d_1	405	0.003 x d_1	□	■		
	1.2	245	0.002 x d_1	290	0.003 x d_1	□	■		
	1.3	215	0.002 x d_1	255	0.003 x d_1	□	■		
	1.4								
	1.5								

■ = very suitable
□ = suitable

Standard, long and extra long lengths (4 - 5 Flutes) with ball nose N

Metal Removal Rate (Cubic Inches per Minute) = IPM x a_e x a_p (a_e = Radial width of cut, a_p = Axial depth of cut)

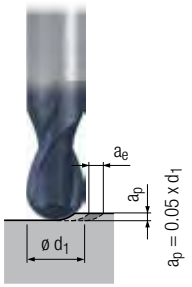
Valid for Tool Nos.:

2919L 3949L
2974L 3950L
3900L 3951L

RPM = (SFM x 3.82) / Dia. (in)
Feed (IPM) = RPM x f_z x Z

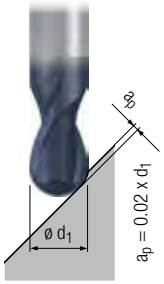
f_z = Feed per tooth Speed
Z = number of teeth (flutes)
v_c = Cutting speed

Roughing



a_e = 0.2 x d_1

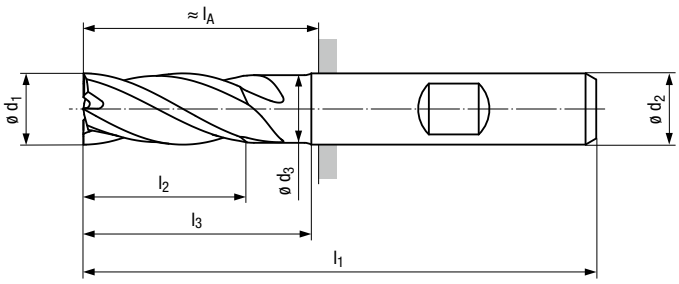
Finishing



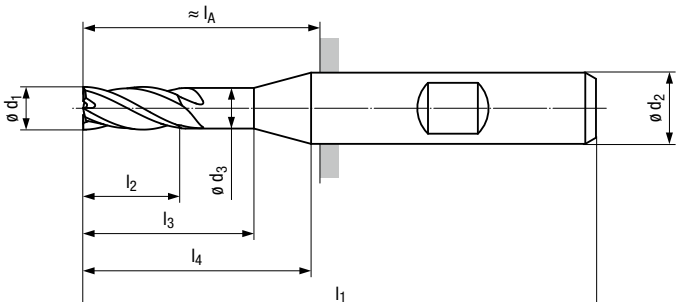
		Roughing v_c [sfm]	Roughing f_z [inch]	Finishing v_c [sfm]	Finishing f_z [inch]			MMS MQL	
P	1.1	655	0.014 x d_1	885	0.010 x d_1	□	■	□	■
	2.1	555	0.013 x d_1	755	0.009 x d_1	□	■	□	■
	3.1	460	0.011 x d_1	655	0.008 x d_1	□	■	□	
	4.1	360	0.010 x d_1	525	0.007 x d_1	□	■	□	
	5.1	325	0.008 x d_1	425	0.006 x d_1	□	■	□	
M	1.1	325	0.008 x d_1	425	0.006 x d_1			□	■
	2.1	260	0.008 x d_1	360	0.006 x d_1			□	■
	3.1	195	0.006 x d_1	260	0.005 x d_1			□	■
	4.1	130	0.006 x d_1	195	0.005 x d_1			□	■
K	1.1	655	0.014 x d_1	855	0.010 x d_1	□	■		□
	1.2	655	0.014 x d_1	855	0.010 x d_1	□	■		□
	2.1	590	0.011 x d_1	755	0.008 x d_1	□	■		□
	2.2	590	0.011 x d_1	755	0.008 x d_1	□	■		□
	3.1	460	0.011 x d_1	655	0.008 x d_1	□	■		
	3.2	460	0.011 x d_1	655	0.008 x d_1	□	■		
	4.1	360	0.008 x d_1	525	0.006 x d_1	□	■		
	4.2	325	0.008 x d_1	425	0.006 x d_1	□	■		
N	1.1								
	1.2								
	1.3								
	1.4								
	1.5								
	1.6								
	2.1	590	0.014 x d_1	755	0.010 x d_1			□	■
	2.2	590	0.014 x d_1	755	0.010 x d_1			□	■
	2.3	590	0.014 x d_1	755	0.010 x d_1	□	□	□	■
	2.4	460	0.011 x d_1	655	0.008 x d_1			□	■
	2.5	460	0.011 x d_1	655	0.008 x d_1			□	■
	2.6	460	0.011 x d_1	655	0.008 x d_1	□	□	□	■
	2.7	295	0.008 x d_1	395	0.006 x d_1			□	■
	2.8	295	0.008 x d_1	395	0.006 x d_1			□	■
	3.1	1310	0.025 x d_1	1640	0.018 x d_1	□	□	□	■
	3.2	1310	0.020 x d_1	1640	0.014 x d_1	□	□	□	■
	4.1	950	0.020 x d_1	1310	0.015 x d_1		□	□	■
	4.2	1410	0.020 x d_1	1900	0.015 x d_1		□	□	■
	4.3								
	4.4								
	5.1								
	5.2	325	0.008 x d_1	425	0.006 x d_1			□	■
	5.3	590	0.017 x d_1	885	0.012 x d_1	□	■		■
S	1.1	325	0.010 x d_1	425	0.007 x d_1			□	■
	1.2	260	0.008 x d_1	360	0.006 x d_1			□	■
	1.3	130	0.007 x d_1	195	0.005 x d_1			□	■
	2.1	230	0.008 x d_1	325	0.006 x d_1			□	■
	2.2	80	0.006 x d_1	130	0.004 x d_1			□	■
	2.3	80	0.006 x d_1	100	0.004 x d_1			□	■
	2.4	80	0.006 x d_1	100	0.004 x d_1			□	■
	2.5	50	0.006 x d_1	80	0.004 x d_1			□	■
	2.6	80	0.006 x d_1	100	0.004 x d_1			□	■
H	1.1								
	1.2								
	1.3								
	1.4								
	1.5								

■ = very suitable
□ = suitable

Descriptions and definitions of the end mill

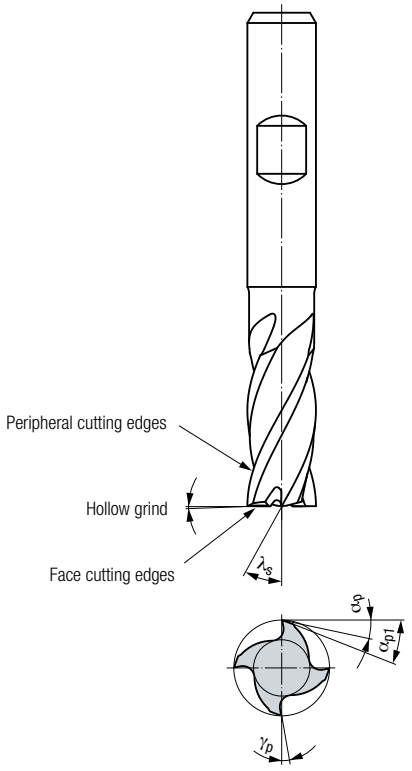


Design l_4:



l_1	Overall length
l_2	Cutting length
l_3	Neck length
l_4	Length of shank connection
l_A	Projecting length
d_1	Cutting diameter
d_2	Shank diameter
d_3	Neck diameter

Important angles of the end mill



α_p	1. Relief angle of the peripheral cutting edge
α_{p1}	2. Relief angle of the peripheral cutting edge
γ_p	Rake angle of the peripheral cutting edge
λ_s	Helix angle

Straight shank

DIN 6535 HA

For solid carbide end mills with a shank diameter from 2 mm to 32 mm

Straight shank with Weldon flat

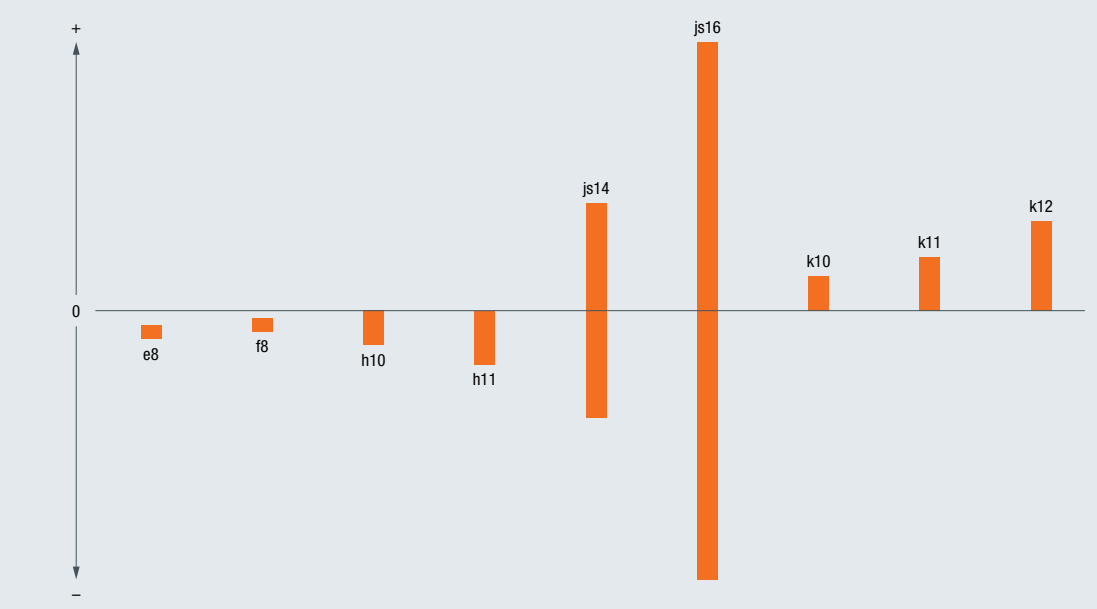
DIN 6535 HB – For solid carbide end mills with a shank diameter from 2 mm to 32 mm
ASME B94.19 HB – For solid carbide end mills with a shank diameter from 3/8”- 1”
Emuge internal standard HB – For solid carbide end mills with a shank diameter from 1/8”-5/16”

Tolerance fields

Nominal value range in millimeters

	e8	f8	h10	h11	js14	js16	k10	k11	k12
	Dimensions in µm								
≤ 3	– 14 – 28	– 6 – 20	0 – 40	0 – 60	+ 125 – 125	+ 300 – 300	+ 40 0	+ 60 0	+ 100 0
> 3 ≤ 6	– 20 – 38	– 10 – 28	0 – 48	0 – 75	+ 150 – 150	+ 375 – 375	+ 48 0	+ 75 0	+ 120 0
> 6 ≤ 10	– 25 – 47	– 13 – 35	0 – 58	0 – 90	+ 180 – 180	+ 450 – 450	+ 58 0	+ 90 0	+ 150 0
> 10 ≤ 18	– 32 – 59	– 16 – 43	0 – 70	0 – 110	+ 215 – 215	+ 550 – 550	+ 70 0	+ 110 0	+ 180 0
> 18 ≤ 30	– 40 – 73	– 20 – 53	0 – 84	0 – 130	+ 260 – 260	+ 650 – 650	+ 84 0	+ 130 0	+ 210 0
> 30 ≤ 50	– 50 – 89	– 25 – 64	0 – 100	0 – 160	+ 310 – 310	+ 800 – 800	+ 100 0	+ 160 0	+ 250 0
> 50 ≤ 80	– 60 – 106	– 30 – 76	0 – 120	0 – 190	+ 370 – 370	+ 950 – 950	+ 120 0	+ 190 0	+ 300 0
> 80 ≤ 120	– 72 – 126	– 36 – 90	0 – 140	0 – 220	+ 435 – 435	+ 1100 – 1100	+ 140 0	+ 220 0	+ 350 0
> 120 ≤ 180	– 85 – 148	– 43 – 106	0 – 160	0 – 250	+ 500 – 500	+ 1250 – 1250	+ 160 0	+ 250 0	+ 400 0
> 180 ≤ 250	– 100 – 172	– 50 – 122	0 – 185	0 – 290	+ 575 – 575	+ 1450 – 1450	+ 185 0	+ 290 0	+ 460 0

Position of the tolerance fields relative to the zero line



Test Cuts Program

Exploring new technology and tooling designs is the best way for progressive manufacturers to stay ahead of the competition. New tooling solutions can sometimes be the best way to reduce cycle times and improve product quality. But breaking into production or tying up critical machines for testing new tool styles is not always an option.

CNC Programming Assistance

On-staff CNC programmers develop machining cycles in conjunction with the most popular CAD/CAM providers such as Mastercam, Open Mind and others. Manufacturers from a broad range of industries look to Emuge CNC programming assistance to enable cost-effective and efficient manufacturing solutions. Not just from a CAM programming perspective, but also incorporating tool designs that allow for optimum performance.

EMUGE-FRANKEN's Technology Center offers a test cut service that allows manufacturers to run test cuts on actual piece parts or sample materials and also 3-Axis and 5-Axis programming assistance along with programming simulations when required.

The Process

- Customers provide EMUGE-FRANKEN with sample piece parts and drawings that are then evaluated by trained EMUGE-FRANKEN tooling engineers.
- Tool process and application improvements are recommended and submitted to the customer.
- Once approved, a series of test cuts are performed and documented.
- Once an optimum solution is identified and approved, EMUGE-FRANKEN develops the solution.

The Outcome

- Full documentation of the operating parameters and CNC machining programs.
- Tool type recommendations for milling, drilling and threading.
- Full documentation of results.
- Video documentation of tooling solutions.
- EMUGE-FRANKEN field engineers will then work with the manufacturer to implement the solutions when requested.

EMUGE-FRANKEN ***offers tool grinding/reconditioning for all end mill products at our West Boylston, MA USA facility.***

Reconditioning your EMUGE-FRANKEN tools through EMUGE-FRANKEN makes sense. EMUGE-FRANKEN has the knowledge and manufacturing expertise to refurbish an EMUGE-FRANKEN tool to its original condition and specification, providing maximum performance levels, predictable operation and longer life than any other method, all at a modest investment for the utmost value.

EMUGE-FRANKEN reconditioning offers:

- Complete inspection and quotation.
- Complete regrinding to the original geometry of the tool.
- Coating via state-of-the-art coating system.
- Corner radius, Weldon flats and other modifications to standard end mills.
- Prompt delivery of reground tools.

Rugged protective containers for shipping tools and individual or bulk packaging provided as needed.

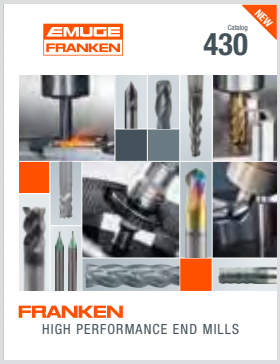
Reconditioning examples – End Mills




EMUGE FRANKEN

Ask about how to increase your machining speed and tool life with EMUGE-FRANKEN FPC Chucks.

EMUGE-FRANKEN high precision / performance FPC Mill / Drill Chucks provide unprecedented rigidity, vibration dampening, concentricity, machining speed, and tool life vs. conventional chuck technologies for milling and drilling applications. Available in a wide range of styles, internal and peripheral coolant options, and MQL-adaptable.



Scan to view our NEW Full Line End Mills Catalog

1. World's only chuck with 1:16 worm gear, a patented design delivering 3 tons of traction force.

2. Optimal Pull-Out Protection via optional Pin-Lock Collet System.

3. High rigidity. Patented design and body provides 100% holding power.

4. Mechanical drive actuated with a hex wrench. Simple design, highly accurate.

5. Maximum dampening. Collet-cone assembly absorbs virtually all vibration.

For FPC Scan to learn more:

EMUGE-FRANKEN U.S.A
1800 Century Drive, West Boylston, MA 01583
800-991-4225

EMUGE-FRANKEN has been the product technology and performance leader in their field for over 100 years. EMUGE-FRANKEN manufactures an extensive line of taps, drills, thread mills, end mills, toolholders, clamping devices and other rotary cutting tools, over 40,000 items sold through distributors worldwide.