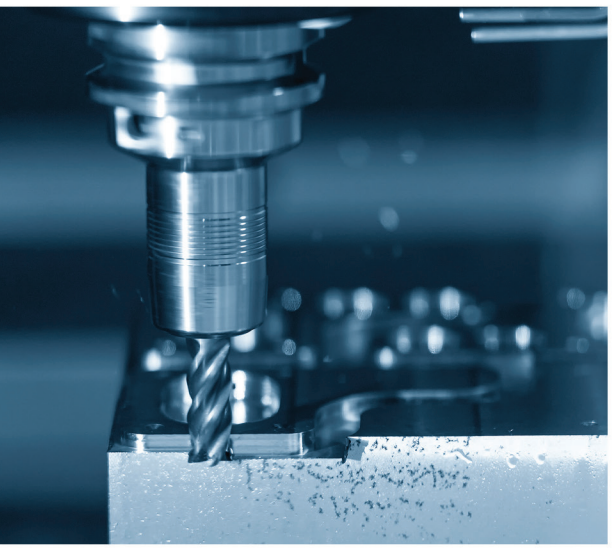
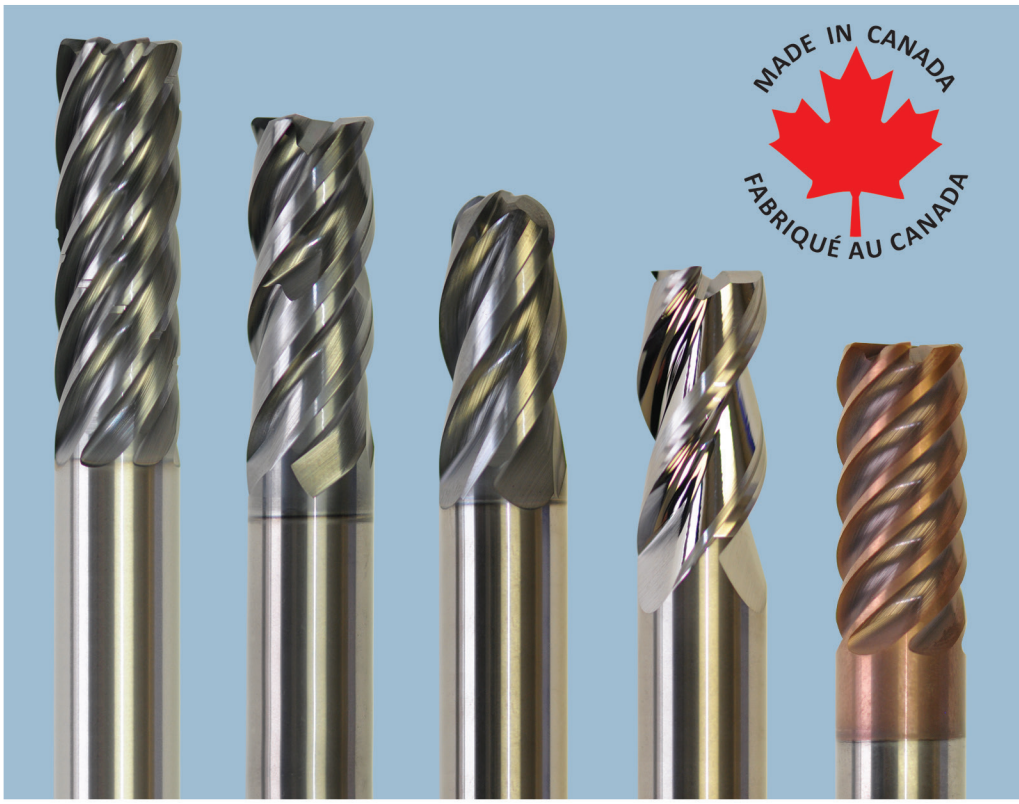
Carbide End Mill Program

TyCarb



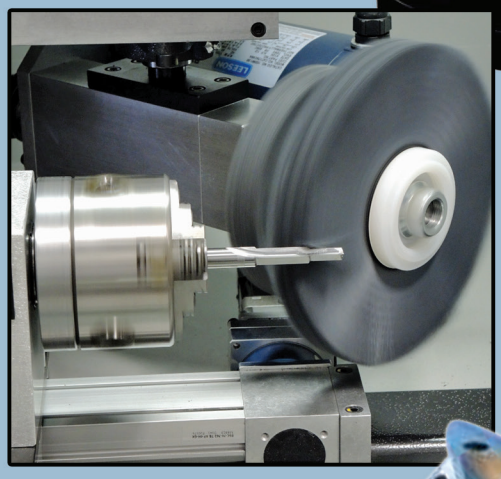


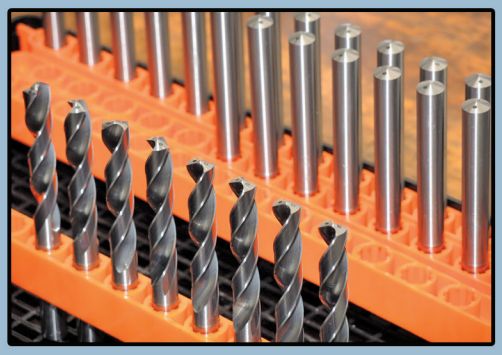
CUSTOM SOLUTIONS

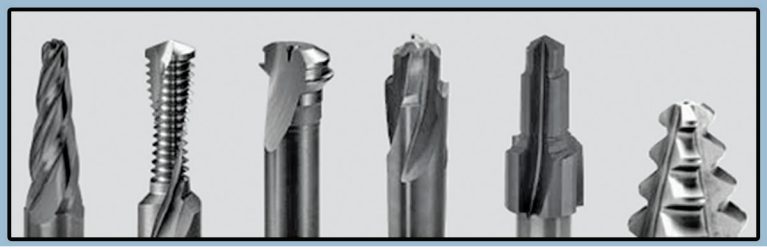
TYcarb

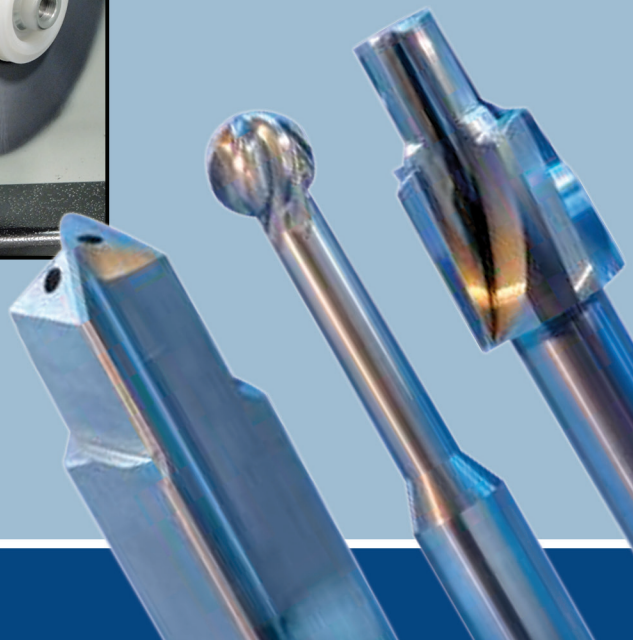
From simple modifications to standard lines of tooling, to completely engineered tooling solutions - we have the skill, knowledge and expertise to deliver quality products to increase productivity

- Solid Carbide Tooling
- Custom Drills & End Mills
- Custom Form Tools
- Coolant Through G-Drills, & Step Drills
- Special Radii Tooling
- Carbide Reamers
- Jig Boring Tools
- Dovetail Cutters
- Porting Tools
- Coolant Through End Mills
- Spherical End Mills









GP End Mills

GP High Performance 4 Flute End Mills

TyCarb GP High Performance 4 flute end mills feature differential flute spacing to achieve virtually chatter free machining in a wide range of materials. Excellent results can be achieved on all steels from carbon to alloy as well as stainless and even exotic materials. With the unique design of these tools as well as the superior TiAlN coating you can expect excellent levels of performance in your machining applications.

- Differential flute spacing
- Superior TiAlN PVD coating
- Available with Cylindrical or Weldon style shanks
- Available with square end as well as wide range of radius choices

MADE IN CANADA
FABRIQUÉ AU CANADA

GP High Performance 4 Flute Ball Nose End Mills

TyCarb GP High Performance 4 flute ball nose end mills feature Differential flute spacing to achieve virtually chatter free machining in a wide range of materials. Excellent results can be achieved on all steels from carbon to alloy as well as stainless and even exotic materials. With the unique design of these tools as well as the superior TiAlN coating you can expect excellent levels of performance in your machining applications.

- Differential flute spacing
- Superior TiAlN PVD coating
- Available with Cylindrical or Weldon style shanks

TL25 Grade has a thick titanium aluminum nitride (TiAlN) PVD coating designed for the most demanding, dry machining applications. Due to it's exceptional balance of wear and toughness this grade maintains sharp cutting edges and consistent controlled wear rates.

GP Recommended Cutting Parameters

Work Material	Type of Cut	ap	ae	Cutting Speed (SFM)		Feed (Inches per Tooth)							
				Min	Max	1/8	3/16	1/4	3/8	1/2	5/8	3/4	1
Low Carbon Steels < 38 Rc 1018, 12L14, 8620	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	385	520	.0007 .0009	.0010 .0012	.0014 .0017	.0021 .0026	.0026 .0033	.0031 .0039	.0034 .0043	.0040 .0050
Medium & High Carbon Carbon Steels <35 Rc 1045, 1050, 1525, 1545	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	360	500	.0007 .0009	.0010 .0012	.0014 .0017	.0021 .0026	.0026 .0033	.0032 .0040	.0036 .0045	.0040 .0050
Alloy Steels & Tool Steels <35 Rc 4000 series, 5000 series P20, H13, A2, D2	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	320	420	.0006 .0007	.0008 .0010	.0011 .0014	.0018 .0022	.0022 .0028	.0026 .0033	.0030 .0038	.0035 .0044
Alloy Steels & Tool Steels <48 Rc 4000 series, 5000 series P20, H13, A2, D2	Slotting Peripheral	0.75 x D 1.5 x D	1 x D 0.5 x D	240	380	.0006 .0007	.0008 .0010	.0010 .0013	.0016 .0020	.0020 .0025	.0024 .0030	.0027 .0034	.0032 .0040
Martensitic & Ferritic Stainless Steels <35 Rc 13-8 PH, 15-5 PH, 17-4 PH, 400 & 500 series	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	160	260	.0005 .0006	.0008 .0010	.0010 .0012	.0014 .0017	.0018 .0022	.0021 .0026	.0024 .0030	.0028 .0035
Martensitic & Ferritic Stainless Steels <48 Rc 13-8 PH, 15-5 PH, 17-4 PH, 400 & 500 series	Slotting Peripheral	0.75 x D 1.5 x D	1 x D 0.5 x D	120	180	.0004 .0005	.0006 .0008	.0008 .0010	.0011 .0014	.0014 .0018	.0016 .0020	.0019 .0024	.0022 .0027
Austenitic Stainless Steels 200 Series, 304, 304L, 309	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	250	300	.0006 .0007	.0008 .0010	.0011 .0014	.0018 .0022	.0022 .0028	.0026 .0033	.0030 .0038	.0035 .0044
High Strength Stainless Steels 310, 316, 316L	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	160	210	.0005 .0006	.0007 .0009	.0010 .0012	.0014 .0018	.0018 .0022	.0021 .0026	.0024 .0030	.0028 .0035
Duplex Stainless Steels F55, 323, 2205	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	160	195	.0004 .0005	.0006 .0008	.0008 .0010	.0011 .0014	.0014 .0018	.0018 .0022	.0019 .0024	.0022 .0027
Gray Cast Iron GG15, GG25, GG30, GG40	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	315	400	.0007 .0009	.0010 .0012	.0014 .0017	.0021 .0026	.0026 .0033	.0030 .0038	.0035 .0044	.0040 .0050
Low to Medium Strength Ductile Cast Iron GGG40, GTS35	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	290	370	.0006 .0007	.0008 .0010	.0011 .0014	.0018 .0022	.0022 .0028	.0026 .0033	.0032 .0040	.0036 .0045
High Strength Ductile Iron GGG60, GTW55, GTS65	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	265	345	.0005 .0006	.0007 .0009	.0010 .0012	.0014 .0017	.0018 .0022	.0021 .0026	.0024 .0030	.0028 .0035
Titanium Alloys	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	120	160	.0004 .0005	.0006 .0008	.0009 .0011	.0013 .0016	.0016 .0020	.0019 .0024	.0022 .0027	.0026 .0032
High Temperature Alloys Inconel, Haynes, Stellite, Hastalloy	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	100	150	.0005 .0006	.0007 .0009	.0008 .0010	.0013 .0016	.0016 .0020	.0019 .0024	.0024 .0030	.0028 .0035

Notes: Use lower value cutting speed for higher hardness or stock removal
Use higher value cutting speed for lower hardness and finishing operations
Adjust values for smaller taper machines

GP2R- 2 Flute End Mills
GP2R- 2 Flute Ball Nose End Mills

GP 2 Flute End Mills

TyCarb 2 flute end mills are designed for plunging, slotting and applications where increased chip clearance at higher feed rates are required in heavy peripheral machining applications.

TyCarb GP Series 2 flute end mills are designed for general milling applications in low to medium carbon steels, cast iron, easy to machine stainless steels as well as aluminum, brass, bronze and copper alloys. Now available with square corners as well as corner rads and full ball nose variations that are available with either cylindrical or weldon shanks.

- Available with Cylindrical or Weldon style shanks
- Premium TiAlN PVD coating

MADE IN CANADA
FABRIQUÉ AU CANADA

2 Flute End Mills
(Center Cutting / Cylindrical)

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Corner Radius	TL25
GP2R-SQ0250	1/4	1/4	3/4	2.1/2	-	●
GP2R-SQ0250-020	1/4	1/4	3/4	2.1/2	.020	●
GP2R-SQ0250-040	1/4	1/4	3/4	2.1/2	.040	●
GP2R-SQ0312	5/16	5/16	13/16	2.1/2	-	●
GP2R-SQ0312-020	5/16	5/16	13/16	2.1/2	.020	●
GP2R-SQ0375	3/8	3/8	7/8	2.1/2	-	●
GP2R-SQ0375-020	3/8	3/8	7/8	2.1/2	.020	●
GP2R-SQ0375-040	3/8	3/8	7/8	2.1/2	.040	●
GP2R-SQ0437	7/16	7/16	1	2.3/4	-	●
GP2R-SQ0500	1/2	1/2	1	3	-	●
GP2R-SQ0500-030	1/2	1/2	1	3	.030	●
GP2R-SQ0500-060	1/2	1/2	1	3	.060	●
GP2R-SQ0562	9/16	9/16	1.1/4	3.1/2	-	●
GP2R-SQ0625	5/8	5/8	1.1/4	3.1/2	-	●
GP2R-SQ0625-030	5/8	5/8	1.1/4	3.1/2	.030	●
GP2R-SQ0625-060	5/8	5/8	1.1/4	3.1/2	.060	●
GP2R-SQ0750	3/4	3/4	1.1/2	4	-	●
GP2R-SQ0750-030	3/4	3/4	1.1/2	4	.030	●
GP2R-SQ0750-060	3/4	3/4	1.1/2	4	.060	●
GP2R-SQ0875	7/8	7/8	1.1/2	4	-	●
GP2R-SQ1000	1	1	1.1/2	4	-	●

2 Flute End Mills
(Center Cutting / Weldon)

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Corner Radius	TL25
GP2RW-SQ0500	1/2	1/2	1	3	-	●
GP2RW-SQ0562	9/16	9/16	1.1/4	3.1/2	-	●
GP2RW-SQ0625	5/8	5/8	1.1/4	3.1/2	-	●
GP2RW-SQ0750	3/4	3/4	1.1/2	4	-	●
GP2RW-SQ0875	7/8	7/8	1.1/2	4	-	●
GP2RW-SQ1000	1	1	1.1/2	4	-	●

2 Flute Ball Nose End Mills
(Center Cutting / Cylindrical)

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Corner Radius	TL25
GP2RC-BN0250	1/4	1/4	3/4	2.1/2	.125	●
GP2RC-BN0312	5/16	5/16	13/16	2.1/2	.156	●
GP2RC-BN0375	3/8	3/8	7/8	2.1/2	.187	●
GP2RC-BN0500	1/2	1/2	1	3	.250	●
GP2RC-BN0625	5/8	5/8	1.1/4	3.1/2	.312	●
GP2RC-BN0750	3/4	3/4	1.1/2	4	.375	●
GP2RC-BN1000	1	1	1.1/2	4	.500	●

GP4- Variable 4 Flute End Mills

The TyCarb GP Series of 4 flute end mills have been specifically designed for today's difficult materials as well as the modern machinery now available. From Micro Grain Carbide Rod to differential fluting and superior PVD coating the GP Series excels in all materials and applications.

The unique design enables true chatter-free machining. Excellent performance is achievable in slotting as well as profiling applications. The GP family is ideal for heavily interrupted cuts and when machining carbon, die, alloy and stainless steels, also titanium as well as other materials that generate high temperatures.

MADE IN CANADA
FABRIQUÉ AU CANADA

4 Flute End Mills

(Variable Flute / Center Cutting)

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Corner Radius	TL25
GP4S-SQ0125	1/8	1/8	1/4	1.1/2	---	●
GP4S-SQ0125-010	1/8	1/8	1/4	1.1/2	.010	●
GP4S-SQ0125-015	1/8	1/8	1/4	1.1/2	.015	●
GP4R-SQ0125	1/8	1/8	1/2	2	---	●
GP4R-SQ0125-010	1/8	1/8	1/2	2	.010	●
GP4S-SQ0187	3/16	3/16	5/16	1.1/2	---	●
GP4S-SQ0187-015	3/16	3/16	5/16	1.1/2	.015	●
GP4R-SQ0187	3/16	3/16	5/8	2	---	●
GP4R-SQ0187-015	3/16	3/16	5/8	2	.015	●
GP4E-SQ0187	3/16	3/16	7/8	2.1/2	---	●
GP4S-SQ0250	1/4	1/4	3/8	2	---	●
GP4S-SQ0250-015	1/4	1/4	3/8	2	.015	●
GP4S-SQ0250-030	1/4	1/4	3/8	2	.030	●
GP4R-SQ0250	1/4	1/4	3/4	2.1/2	---	●
GP4R-SQ0250-020	1/4	1/4	3/4	2.1/2	.020	●
GP4R-SQ0250-030	1/4	1/4	3/4	2.1/2	.030	●
GP4R-SQ0250-060	1/4	1/4	3/4	2.1/2	.060	●
GP4L-SQ0250	1/4	1/4	1.1/4	3	---	●
GP4L-SQ0250-020	1/4	1/4	1.1/4	3	.020	●
GP4S-SQ0312	5/16	5/16	1/2	2	---	●
GP4S-SQ0312-020	5/16	5/16	1/2	2	.020	●
GP4R-SQ0312	5/16	5/16	13/16	2.1/2	---	●
GP4R-SQ0312-020	5/16	5/16	13/16	2.1/2	.020	●
GP4S-SQ0375	3/8	3/8	1/2	2	---	●
GP4S-SQ0375-020	3/8	3/8	1/2	2	.020	●
GP4S-SQ0375-030	3/8	3/8	1/2	2	.030	●
GP4R-SQ0375	3/8	3/8	7/8	2.1/2	---	●
GP4R-SQ0375-020	3/8	3/8	7/8	2.1/2	.020	●
GP4R-SQ0375-030	3/8	3/8	7/8	2.1/2	.030	●
GP4R-SQ0375-060	3/8	3/8	7/8	2.1/2	.060	●
GP4R-SQ0375-120	3/8	3/8	7/8	2.1/2	.120	●
GP4E-SQ0375	3/8	3/8	1.1/8	3	---	●
GP4E-SQ0375-020	3/8	3/8	1.1/8	3	.020	●
GP4L-SQ0375	3/8	3/8	1.1/2	3.1/2	---	●
GP4L-SQ0375-030	3/8	3/8	1.1/2	3.1/2	.030	●
GP4R-SQ0437	7/16	7/16	1	2.3/4	---	●
GP4S-SQ0500	1/2	1/2	5/8	2.1/2	---	●
GP4S-SQ0500-020	1/2	1/2	5/8	2.1/2	.020	●
GP4S-SQ0500-030	1/2	1/2	5/8	2.1/2	.030	●
GP4R-SQ0500	1/2	1/2	1	3	---	●
GP4R-SQ0500-030	1/2	1/2	1	3	.030	●
GP4R-SQ0500-060	1/2	1/2	1	3	.060	●
GP4E-SQ0500	1/2	1/2	1.1/4	3	---	●
GP4E-SQ0500-020	1/2	1/2	1.1/4	3	.020	●
GP4E-SQ0500-030	1/2	1/2	1.1/4	3	.030	●
GP4E-SQ0500-060	1/2	1/2	1.1/4	3	.060	●
GP4E-SQ0500-090	1/2	1/2	1.1/4	3	.090	●
GP4E-SQ0500-120	1/2	1/2	1.1/4	3	.120	●
GP4M-SQ0500	1/2	1/2	1.5/8	3.1/2	---	●
GP4L-SQ0500	1/2	1/2	2	4	---	●
GP4L-SQ0500-030	1/2	1/2	2	4	.030	●
GP4R-SQ0562	9/16	9/16	1.1/4	3.1/2	---	●
GP4R-SQ0625	5/8	5/8	1.1/4	3.1/2	---	●
GP4R-SQ0625-030	5/8	5/8	1.1/4	3.1/2	.030	●
GP4R-SQ0625-060	5/8	5/8	1.1/4	3.1/2	.060	●
GP4E-SQ0625	5/8	5/8	1.5/8	3.1/2	---	●
GP4E-SQ0625-030	5/8	5/8	1.5/8	3.1/2	.030	●
GP4S-SQ0750	3/4	3/4	7/8	3	---	●
GP4S-SQ0750-030	3/4	3/4	7/8	3	.030	●
GP4S-SQ0750-060	3/4	3/4	7/8	3	.060	●
GP4R-SQ0750	3/4	3/4	1.1/2	4	---	●
GP4R-SQ0750-030	3/4	3/4	1.1/2	4	.030	●
GP4R-SQ0750-060	3/4	3/4	1.1/2	4	.060	●
GP4R-SQ0750-090	3/4	3/4	1.1/2	4	.090	●
GP4R-SQ0750-120	3/4	3/4	1.1/2	4	.120	●
GP4E-SQ0750	3/4	3/4	1.3/4	4	---	●
GP4E-SQ0750-030	3/4	3/4	1.3/4	4	.030	●
GP4E-SQ0750-060	3/4	3/4	1.3/4	4	.060	●
GP4E-SQ0750-120	3/4	3/4	1.3/4	4	.120	●
GP4M-SQ0750	3/4	3/4	2.3/8	5	---	●
GP4R-SQ1000	1	1	1.1/2	4	---	●
GP4R-SQ1000-030	1	1	1.1/2	4	.030	●
GP4R-SQ1000-060	1	1	1.1/2	4	.060	●
GP4R-SQ1000-120	1	1	1.1/2	4	.120	●

GP4- 4 Flute End Mills
GP4R- 4 Flute Ball Nose End Mills

The TyCarb GP Series of 4 flute end mills have been specifically designed for today's difficult materials as well as the modern machinery now available. From Micro Grain Carbide Rod to differential fluting and superior PVD coating, the GP Series excels in all materials and applications.

GP Ball Nose Series End Mills are manufactured to the same stringent standards as our regular 4 flute cutters. Differential pitch and superior PVD coatings ensure trouble free performance on even the most difficult materials. These end mills are available with either Cylindrical or Weldon shanks.

4 Flute End Mills
(Variable Flute / Center Cutting / Weldon)

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Corner Radius	TL25
GP4RW-SQ0500	1/2	1/2	1	3	---	●
GP4RW-SQ0500-015	1/2	1/2	1	3	.015	●
GP4RW-SQ0500-030	1/2	1/2	1	3	.030	●
GP4RW-SQ0500-060	1/2	1/2	1	3	.060	●
GP4EW-SQ0500	1/2	1/2	1.1/4	3	---	●
GP4EW-SQ0500-030	1/2	1/2	1.1/4	3	.030	●
GP4EW-SQ0500-060	1/2	1/2	1.1/4	3	.060	●
GP4MW-SQ0500	1/2	1/2	1.5/8	3.1/2	---	●
GP4RW-SQ0562	9/16	9/16	1.1/4	3.1/2	---	●
GP4RW-SQ0625	5/8	5/8	1.1/4	3.1/2	---	●
GP4RW-SQ0625-030	5/8	5/8	1.1/4	3.1/2	.030	●
GP4RW-SQ0625-060	5/8	5/8	1.1/4	3.1/2	.060	●
GP4EW-SQ0625	5/8	5/8	1.5/8	3.1/2	---	●
GP4EW-SQ0625-030	5/8	5/8	1.5/8	3.1/2	.030	●
GP4SW-SQ0750	3/4	3/4	7/8	3	---	●
GP4SW-SQ0750-030	3/4	3/4	7/8	3	.030	●
GP4SW-SQ0750-060	3/4	3/4	7/8	3	.060	●
GP4RW-SQ0750	3/4	3/4	1.1/2	4	---	●
GP4RW-SQ0750-030	3/4	3/4	1.1/2	4	.030	●
GP4RW-SQ0750-060	3/4	3/4	1.1/2	4	.060	●
GP4RW-SQ0750-090	3/4	3/4	1.1/2	4	.090	●
GP4RW-SQ0750-120	3/4	3/4	1.1/2	4	.120	●
GP4EW-SQ0750	3/4	3/4	1.3/4	4	---	●
GP4EW-SQ0750-030	3/4	3/4	1.3/4	4	.030	●
GP4RW-SQ1000	1	1	1.1/2	4	---	●
GP4RW-SQ1000-030	1	1	1.1/2	4	.030	●
GP4RW-SQ1000-060	1	1	1.1/2	4	.060	●
GP4RW-SQ1000-120	1	1	1.1/2	4	.120	●
GP4MW-SQ1000	1	1	2	5	---	●
GP4LW-SQ1000	1	1	4	7	---	●

4 Flute Ball Nose End Mills
(Variable Flute / Cylindrical Shank)

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Corner Radius	TL25
GP4RC-BN0125	1/8	1/8	1/2	2	.062	●
GP4RC-BN0187	3/16	3/16	5/8	2	.094	●
GP4EC-BN0187	3/16	3/16	7/8	2.1/2	.094	●
GP4RC-BN0250	1/4	1/4	3/4	2.1/2	.125	●
GP4RC-BN0312	5/16	5/16	13/16	2.1/2	.156	●
GP4RC-BN0375	3/8	3/8	7/8	2.1/2	.188	●
GP4RC-BN0500	1/2	1/2	1	3	.250	●
GP4RC-BN0625	5/8	5/8	1.1/4	3.1/2	.313	●
GP4RC-BN0750	3/4	3/4	1.1/2	4	.375	●
GP4RC-BN1000	1	1	1.1/2	4	.500	●

4 Flute Ball Nose End Mills
(Variable Flute / Weldon)

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Corner Radius	TL25
GP4RW-BN0375	3/8	3/8	7/8	2.1/2	.188	●
GP4RW-BN0500	1/2	1/2	1	3	.250	●
GP4RW-BN0625	5/8	5/8	1.1/4	3.1/2	.313	●
GP4RW-BN0750	3/4	3/4	1.1/2	4	.375	●
GP4RW-BN1000	1	1	1.1/2	4	.500	●

Designed for HSC (High Speed Cutting) & HPM (High Performance Milling)

STRATUS ST4 4 Flute End Mills

- Differential Flute spacing
- Variable Flute design
- Eccentric Relief for improved edge strength
- Tapered core for added stability
- Next Generation AlCrN PVD coating
- Post Process treatment after coating

STRATUS ST5 5 Flute End Mills

- Differential Flute spacing
- Variable Flute design
- Eccentric Relief for improved edge strength
- Tapered core for added stability
- Next Generation AlCrN PVD coating
- Post Process treatment after coating

STRATUS ST5X4C 5 Flute Extended End Mills

- Extended Cut length of 4 times diameter
- Differential Flute spacing
- Eccentric Relief for improved edge strength
- Next Generation AlCrN PVD Coating
- Post Process treatment after coating
- Designed for HSC (High Speed Cutting)
- Ideal tool for dynamic / trochoidal milling

STRATUS ST7X2C, X3C & X4C 7 Flute End Mills

- Extended Cut length of 2, 3 & 4 times diameter
- Differential Flute spacing
- Eccentric Relief for improved edge strength
- Tapered core for added stability
- Next Generation AlCrN PVD Coating
- Post Process treatment after coating
- Designed for HSC (High Speed Cutting)
- Ideal tool for dynamic / trochoidal milling
- Supplied with Chip Management Grooves

STRATUS 4 Flute End Mills

- Premium Micro-grain carbide substrate
- Next generation AlCrN PVD coating
- Differential flute spacing for smooth cutting performance
- Variable Helix design to combat vibration & chatter
- Designed to Slot at 1 x D
- Eccentric Relief for improved edge strength
- Tapered core for added stability
- All STRATUS end mills are Post Processed after coating to achieve improved tool performance.

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4 Flute End Mills

(Variable Flute / Center Cutting)

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Corner Radius	TL30 Coated
ST4RC-SQ0125	1/8	1/8	1/2	2	---	●
ST4RC-SQ0125-010	1/8	1/8	1/2	2	.010	●
ST4RC-SQ0187	3/16	3/16	5/8	2	---	●
ST4RC-SQ0187-015	3/16	3/16	5/8	2	.015	●
ST4EC-SQ0187	3/16	3/16	7/8	2.1/2	---	●
ST4SC-SQ0250	1/4	1/4	3/8	2	---	●
ST4SC-SQ0250-020	1/4	1/4	3/8	2	.020	●
ST4RC-SQ0250	1/4	1/4	3/4	2.1/2	---	●
ST4RC-SQ0250-020	1/4	1/4	3/4	2.1/2	.020	●
ST4RC-SQ0250-030	1/4	1/4	3/4	2.1/2	.030	●
ST4RC-SQ0250-060	1/4	1/4	3/4	2.1/2	.060	●
ST4LC-SQ0250	1/4	1/4	1.1/4	3	---	●
ST4LC-SQ0250-020	1/4	1/4	1.1/4	3	.020	●
ST4RC-SQ0312	5/16	5/16	13/16	2.1/2	---	●
ST4RC-SQ0312-020	5/16	5/16	13/16	2.1/2	.020	●
ST4SC-SQ0375	3/8	3/8	1/2	2	---	●
ST4SC-SQ0375-020	3/8	3/8	1/2	2	.020	●
ST4RC-SQ0375	3/8	3/8	7/8	2.1/2	---	●
ST4RC-SQ0375-020	3/8	3/8	7/8	2.1/2	.020	●
ST4RC-SQ0375-030	3/8	3/8	7/8	2.1/2	.030	●
ST4RC-SQ0375-060	3/8	3/8	7/8	2.1/2	.060	●
ST4RC-SQ0375-120	3/8	3/8	7/8	2.1/2	.120	●
ST4EC-SQ0375	3/8	3/8	1.1/8	3	---	●
ST4EC-SQ0375-020	3/8	3/8	1.1/8	3	.020	●
ST4LC-SQ0375	3/8	3/8	1.1/2	3.1/2	---	●
ST4LC-SQ0375-030	3/8	3/8	1.1/2	3.1/2	.030	●
ST4RC-SQ0437	7/16	7/16	1	2.3/4	---	●
ST4RC-SQ0437-020	7/16	7/16	1	2.3/4	.020	●
ST4SC-SQ0500	1/2	1/2	5/8	2.1/2	---	●
ST4SC-SQ0500-015	1/2	1/2	5/8	2.1/2	.015	●
ST4SC-SQ0500-030	1/2	1/2	5/8	2.1/2	.030	●
ST4SC-SQ0500-060	1/2	1/2	5/8	2.1/2	.060	●
ST4RC-SQ0500	1/2	1/2	1	3	---	●
ST4RC-SQ0500-030	1/2	1/2	1	3	.030	●
ST4RC-SQ0500-060	1/2	1/2	1	3	.060	●
ST4EC-SQ0500	1/2	1/2	1.1/4	3	---	●
ST4EC-SQ0500-015	1/2	1/2	1.1/4	3	.015	●
ST4EC-SQ0500-020	1/2	1/2	1.1/4	3	.020	●
ST4EC-SQ0500-030	1/2	1/2	1.1/4	3	.030	●
ST4EC-SQ0500-060	1/2	1/2	1.1/4	3	.060	●
ST4EC-SQ0500-090	1/2	1/2	1.1/4	3	.090	●
ST4EC-SQ0500-120	1/2	1/2	1.1/4	3	.120	●
ST4MC-SQ0500	1/2	1/2	1.5/8	3.1/2	---	●
ST4LC-SQ0500	1/2	1/2	2	4	---	●
ST4LC-SQ0500-030	1/2	1/2	2	4	.030	●
ST4SC-SQ0625	5/8	5/8	3/4	3	---	●
ST4SC-SQ0625-030	5/8	5/8	3/4	3	.030	●
ST4SC-SQ0625-060	5/8	5/8	3/4	3	.060	●
ST4RC-SQ0625	5/8	5/8	1.1/4	3.1/2	---	●
ST4RC-SQ0625-030	5/8	5/8	1.1/4	3.1/2	.030	●
ST4RC-SQ0625-060	5/8	5/8	1.1/4	3.1/2	.060	●
ST4EC-SQ0625	5/8	5/8	1.5/8	3.1/2	---	●
ST4EC-SQ0625-030	5/8	5/8	1.5/8	3.1/2	.030	●
ST4SC-SQ0750	3/4	3/4	7/8	3	---	●
ST4SC-SQ0750-030	3/4	3/4	7/8	3	.030	●
ST4SC-SQ0750-060	3/4	3/4	7/8	3	.060	●
ST4RC-SQ0750	3/4	3/4	1.1/2	4	---	●
ST4RC-SQ0750-030	3/4	3/4	1.1/2	4	.030	●
ST4RC-SQ0750-060	3/4	3/4	1.1/2	4	.060	●
ST4RC-SQ0750-090	3/4	3/4	1.1/2	4	.090	●
ST4RC-SQ0750-120	3/4	3/4	1.1/2	4	.120	●
ST4EC-SQ0750	3/4	3/4	1.3/4	4	---	●
ST4EC-SQ0750-030	3/4	3/4	1.3/4	4	.030	●
ST4EC-SQ0750-060	3/4	3/4	1.3/4	4	.060	●
ST4EC-SQ0750-120	3/4	3/4	1.3/4	4	.120	●
ST4MC-SQ0750	3/4	3/4	2.3/8	5	---	●
ST4RC-SQ1000	1	1	1.1/2	4	---	●
ST4RC-SQ1000-030	1	1	1.1/2	4	.030	●
ST4RC-SQ1000-060	1	1	1.1/2	4	.060	●
ST4RC-SQ1000-120	1	1	1.1/2	4	.120	●

STRATUS 4 Flute Ball Nose End Mills

The STRATUS family of Premium end mills bring a new performance level to machining of todays difficult to machine materials. We have incorporated many of the advanced features necessary to achieve superior results.

- Premium Micro-grain carbide substrate
- Next generation AlCrN PVD coating
- 4 flute Differential spacing for smooth cutting performance
- Variable Helix design to combat vibration & chatter
- Eccentic Relief for improved edge strength
- Tapered core for added stability
- All STRATUS end mills are Post Processed after coating to achieve improved tool performance

STRATUS 4 Flute
Cylindrical Shank Ball Nose End Mills

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Corner Radius	TL30 Coated
ST4RC-BN0250	1/4	1/4	3/4	2.1/2	.120	●
ST4RC-BN0312	5/16	5/16	13/16	2.1/2	.156	●
ST4SC-BN0375	3/8	3/8	1/2	2	.188	●
ST4RC-BN0375	3/8	3/8	7/8	2.1/2	.188	●
ST4RC-BN0500	1/2	1/2	1	3	.250	●
ST4EC-BN0500	1/2	1/2	1.1/4	3	.250	●
ST4RC-BN0625	5/8	5/8	1.1/4	3.1/2	.313	●
ST4RC-BN0750	3/4	3/4	1.1/2	4	.375	●
ST4RC-BN1000	1	1	1.1/2	4	.500	●

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STRATUS ST4 & ST5 Recommended Cutting Parameters

Work Material	Type of Cut	ap	ae	Cutting Speed (SFM)		Feed per flute (Inch)						
				Min	Max	3/16	1/4	3/8	1/2	5/8	3/4	1
Low Carbon Steels < 38 Rc 1018, 12L14, 8620	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	480	650	.0010 .0013	.0014 .0017	.0021 .0026	.0026 .0033	.0031 .0039	.0034 .0043	.0040 .0050
Medium & High Carbon Carbon Steels <35 Rc 1045, 1050, 1525, 1545	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	450	625	.0010 .0013	.0014 .0017	.0021 .0026	.0026 .0033	.0032 .0040	.0036 .0045	.0040 .0050
Alloy Steels & Tool Steels <35 Rc 4000 series, 5000 series P20, H13, A2, D2	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	400	525	.0008 .0010	.0011 .0014	.0018 .0022	.0022 .0028	.0026 .0033	.0030 .0038	.0035 .0044
Alloy Steels & Tool Steels <48 Rc 4000 series, 5000 series P20, H13, A2, D2	Slotting Peripheral	0.75 x D 1.5 x D	1 x D 0.5 x D	300	475	.0005 .0008	.0010 .0013	.0016 .0020	.0020 .0025	.0024 .0030	.0027 .0034	.0032 .0040
Martensitic & Ferritic Stainless Steels <35 Rc 13-8 PH, 15-5 PH, 17-4 PH, 400 & 500 series	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	200	325	.0007 .0009	.0010 .0012	.0014 .0017	.0018 .0022	.0021 .0026	.0024 .0030	.0028 .0035
Martensitic & Ferritic Stainless Steels <48 Rc 13-8 PH, 15-5 PH, 17-4 PH, 400 & 500 series	Slotting Peripheral	0.75 x D 1.5 x D	1 x D 0.5 x D	150	225	.0006 .0008	.0008 .0010	.0011 .0014	.0014 .0018	.0016 .0020	.0019 .0024	.0022 .0027
Austenitic Stainless Steels 200 Series, 304, 304L, 309	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	310	375	.0008 .0010	.0011 .0014	.0018 .0022	.0022 .0028	.0026 .0033	.0030 .0038	.0035 .0044
High Strength Stainless Steels 310, 316, 316L	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	200	260	.0007 .0009	.0010 .0012	.0014 .0018	.0018 .0022	.0021 .0026	.0024 .0030	.0028 .0035
Duplex Stainless Steels F55, 323, 2205	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	200	240	.0006 .0008	.0008 .0010	.0011 .0014	.0014 .0018	.0018 .0022	.0019 .0024	.0022 .0027
Gray Cast Iron GG15, GG25, GG30, GG40	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	390	500	.0010 .0013	.0014 .0017	.0021 .0026	.0026 .0033	.0030 .0038	.0035 .0044	.0040 .0050
Low to Medium Strength Ductile Cast Iron GGG40, GTS35	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	360	460	.0008 .0010	.0011 .0014	.0018 .0022	.0022 .0028	.0026 .0033	.0032 .0040	.0036 .0045
High Strength Ductile Iron GGG60, GTW55, GTS65	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	330	430	.0006 .0008	.0010 .0012	.0014 .0017	.0018 .0022	.0021 .0026	.0024 .0030	.0028 .0035
Titanium Alloys	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	150	200	.0006 .0008	.0009 .0011	.0013 .0016	.0016 .0020	.0019 .0024	.0022 .0027	.0026 .0032
High Temperature Alloys Inconel, Haynes, Stellite, Hastalloy	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	120	170	.0006 .0007	.0008 .0010	.0013 .0016	.0016 .0020	.0019 .0024	.0024 .0030	.0028 .0035

Notes: Use lower value cutting speed for higher hardness or stock removal
Use higher value cutting speed for lower hardness and finishing operations
Adjust values for smaller taper machines

STRATUS 5 Flute End Mills

The STRATUS family of Premium end mills bring a new performance level to machining of todays difficult to machine materials. We have incorporated many of the advanced features necessary to achieve superior results

- Premium Micro-grain carbide substrate
- Next generation AlCrN PVD coating
- 5 flute Differential spacing for smooth cutting performance
- Variable Helix design to combat vibration & chatter
- Designed to Slot at 1 x D
- Eccentric Relief for improved edge strength
- Tapered core for added stability
- All STRATUS end mills are Post Processed after coating to achieve improved tool performance

STRATUS 5 Flute High Performance Cylindrical Shank End Mills

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Radius	TL30 Coated
ST5RC-SQ0187	3/16	3/16	5/8	2	---	●
ST5RC-SQ0187-015	3/16	3/16	5/8	2	.015	●
ST5EC-SQ0187	3/16	3/16	7/8	2.1/2	---	●
ST5RC-SQ0250	1/4	1/4	3/4	2.1/2	---	●
ST5RC-SQ0250-020	1/4	1/4	3/4	2.1/2	.020	●
ST5RC-SQ0250-030	1/4	1/4	3/4	2.1/2	.030	●
ST5RC-SQ0250-060	1/4	1/4	3/4	2.1/2	.060	●
ST5RC-SQ0312	5/16	5/16	13/16	2.1/2	---	●
ST5RC-SQ0312-020	5/16	5/16	13/16	2.1/2	.020	●
ST5RC-SQ0375	3/8	3/8	7/8	2.1/2	---	●
ST5RC-SQ0375-020	3/8	3/8	7/8	2.1/2	.020	●
ST5RC-SQ0375-030	3/8	3/8	7/8	2.1/2	.030	●
ST5RC-SQ0375-060	3/8	3/8	7/8	2.1/2	.060	●
ST5RC-SQ0375-120	3/8	3/8	7/8	2.1/2	.120	●
ST5EC-SQ0375	3/8	3/8	1.1/8	3	---	●
ST5EC-SQ0375-020	3/8	3/8	1.1/8	3	.020	●
ST5SC-SQ0500	1/2	1/2	5/8	2.1/2	---	●
ST5RC-SQ0500	1/2	1/2	1	3	---	●
ST5RC-SQ0500-020	1/2	1/2	1	3	.020	●
ST5RC-SQ0500-030	1/2	1/2	1	3	.030	●
ST5RC-SQ0500-060	1/2	1/2	1	3	.060	●
ST5EC-SQ0500	1/2	1/2	1.1/4	3	---	●
ST5EC-SQ0500-015	1/2	1/2	1.1/4	3	.015	●

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Radius	TL30 Coated
ST5EC-SQ0500-020	1/2	1/2	1.1/4	3	.020	●
ST5EC-SQ0500-030	1/2	1/2	1.1/4	3	.030	●
ST5EC-SQ0500-060	1/2	1/2	1.1/4	3	.060	●
ST5EC-SQ0500-090	1/2	1/2	1.1/4	3	.090	●
ST5EC-SQ0500-120	1/2	1/2	1.1/4	3	.120	●
ST5RC-SQ0625	5/8	5/8	1.1/4	3.1/2	---	●
ST5RC-SQ0625-030	5/8	5/8	1.1/4	3.1/2	.030	●
ST5RC-SQ0625-060	5/8	5/8	1.1/4	3.1/2	.060	●
ST5EC-SQ0625	5/8	5/8	1.5/8	3.1/2	---	●
ST5EC-SQ0625-030	5/8	5/8	1.5/8	3.1/2	.030	●
ST5RC-SQ0750	3/4	3/4	1.1/2	4	---	●
ST5RC-SQ0750-030	3/4	3/4	1.1/2	4	.030	●
ST5RC-SQ0750-060	3/4	3/4	1.1/2	4	.060	●
ST5RC-SQ0750-090	3/4	3/4	1.1/2	4	.090	●
ST5RC-SQ0750-120	3/4	3/4	1.1/2	4	.120	●
ST5EC-SQ0750	3/4	3/4	1.3/4	4	---	●
ST5EC-SQ0750-030	3/4	3/4	1.3/4	4	.030	●
ST5EC-SQ0750-060	3/4	3/4	1.3/4	4	.060	●
ST5EC-SQ0750-120	3/4	3/4	1.3/4	4	.120	●
ST5RC-SQ1000	1	1	1.1/2	4	---	●
ST5RC-SQ1000-030	1	1	1.1/2	4	.030	●
ST5RC-SQ1000-060	1	1	1.1/2	4	.060	●
ST5RC-SQ1000-120	1	1	1.1/2	4	.120	●

STRATUS 5 Flute Extended End Mills

STRATUS 5 Flute Extended End Mills

Designation	Dia.	Shank Dia.	LOC	OAL	Radius	TL30 Coated
ST5X4C-SQ0375	3/8	3/8	1.1/2	3.1/2	---	●
ST5X4C-SQ0375-030	3/8	3/8	1.1/2	3.1/2	.030	●
ST5X4C-SQ0375-060	3/8	3/8	1.1/2	3.1/2	.060	●
ST5X4C-SQ0500	1/2	1/2	2	4	---	●
ST5X4C-SQ0500-030	1/2	1/2	2	4	.030	●
ST5X4C-SQ0500-060	1/2	1/2	2	4	.060	●
ST5X4C-SQ0625	5/8	5/8	2.1/2	5	---	●
ST5X4C-SQ0625-030	5/8	5/8	2.1/2	5	.030	●
ST5X4C-SQ0750	3/4	3/4	3	6	---	●
ST5X4C-SQ0750-030	3/4	3/4	3	6	.030	●
ST5X4C-SQ0750-060	3/4	3/4	3	6	.060	●
ST5X4C-SQ0750-120	3/4	3/4	3	6	.120	●
ST5X4C-SQ1000	1	1	4	7	---	●
ST5X4C-SQ1000-030	1	1	4	7	.030	●
ST5X4C-SQ1000-060	1	1	4	7	.060	●
ST5X4C-SQ1000-120	1	1	4	7	.120	●

- Differential Flute spacing
- Eccentric Relief for improved edge strength
- Tapered core for added stability
- Post Process treatment after coating
- Designed for HSC (High Speed Cutting)
- Ideal tool for Dynamic / Trochoidal milling

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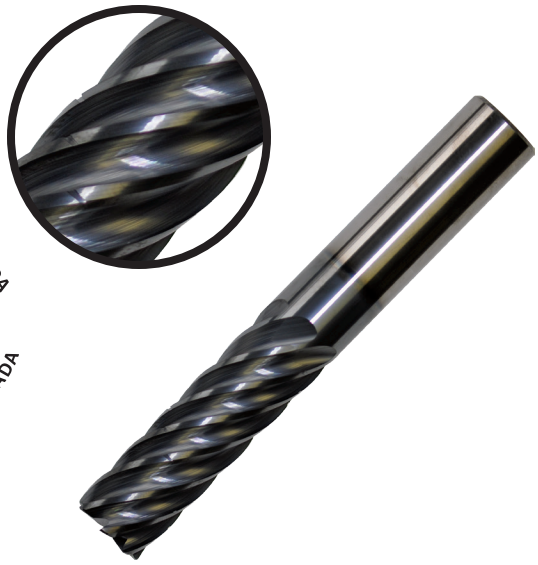
STRATUS ST5X & ST7X Recommended Cutting Parameters for Finishing Applications

Work Material	Type of Cut Side Milling		Cutting Speed (SFM)		Feed per flute (inch)				
	ap	ae	Min	Max	3/8	1/2	5/8	3/4	1
Low Carbon Steels < 38 Rc 1018, 12L14, 8620	4 x D	0.05 x D	975	1300	.0026	.0036	.0040	.0045	.0050
Medium & High Carbon Carbon Steels <35 Rc 1045, 1050, 1525, 1545	4 x D	0.05 x D	900	1225	.0026	.0036	.0040	.0045	.0050
Alloy Steels & Tool Steels <35 Rc 4000 series, 5000 series P20, H13, A2, D2	4 x D	0.05 x D	600	975	.0024	.0030	.0035	.0040	.0047
Alloy Steels & Tool Steels <48 Rc 4000 series, 5000 series P20, H13, A2, D2	4 x D	0.05 x D	585	950	.0020	.0025	.0030	.0035	.0040
Martensitic & Ferritic Stainless Steels <35 Rc 13-8 PH, 15-5 PH, 17-4 PH, 400 & 500 series	4 x D	0.05 x D	385	650	.0017	.0022	.0026	.0030	.0035
Martensitic & Ferritic Stainless Steels <48 Rc 13-8 PH, 15-5 PH, 17-4 PH, 400 & 500 series	4 x D	0.05 x D	335	485	.0015	.0018	.0021	.0024	.0027
Austenitic Stainless Steels 200 series, 304, 304L	4 x D	0.05 x D	590	750	.0022	.0028	.0033	.0038	.0045
High Strength Austenitic Stainless Steels 316, 316L	4 x D	0.05 x D	390	525	.0017	.0022	.0026	.0030	.0036
Duplex Stainless Steels F55, 323, 2205	4 x D	0.05 x D	335	485	.0015	.0018	.0021	.0024	.0027
Gray Cast Iron GG15, GG25, GG30, GG40	4 x D	0.05 x D	795	985	.0026	.0036	.0040	.0043	.0050
Low to Medium Strength Ductile Cast Iron GGG40, GTS35	4 x D	0.05 x D	725	850	.0027	.0030	.0034	.0039	.0045
High Strength Ductile Iron GGG60, GTW55, GTS65	4 x D	0.05 x D	650	840	.0017	.0022	.0027	.0030	.0035
Titanium Alloys	4 x D	0.05 x D	325	385	.0016	.0022	.0025	.0028	.0032
High Temperature Alloys Inconel, Haynes, Stellite, Hastalloy	4 x D	0.05 x D	165	385	.0012	.0018	.0024	.0028	.0032
Hardened Steel 44 - 48 Rc H11, H13, 4340, P20	4 x D	0.05 x D	470	525	.0020	.0025	.0030	.0034	.0040

Notes: Do not exceed an overall radial width of cut (ae) greater than 0.035" when using the above data. Use lower value cutting speed for higher hardness or stock removal. Use higher value cutting speed for lower hardness. Adjust values for smaller taper machines.

STRATUS 2xD, 3xD & 4xD 7 Flute End Mills

- Differential Flute spacing
- Eccentric Relief for improved edge strength
- Tapered core for added stability
- Next Generation AlCrN PVD Coating
- Post Process treatment after coating
- Designed for HSC (High Speed Cutting)
- Ideal tool for dynamic / trochoidal milling
- Supplied with Chip Management Grooves
- Extended Cut length of 2, 3 or 4 times diameter



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STRATUS 7 Flute End Mills (2xD)

Designation	Dia.	Shank Dia.	LOC	OAL	Radius	TL30 Coated
ST7X2C-SQ0375	3/8	3/8	3/4	2.1/2	---	●
ST7X2C-SQ0375-030	3/8	3/8	3/4	2.1/2	.030	●
ST7X2C-SQ0375-060	3/8	3/8	3/4	2.1/2	.060	●
ST7X2C-SQ0500	1/2	1/2	1	3	---	●
ST7X2C-SQ0500-030	1/2	1/2	1	3	.030	●
ST7X2C-SQ0500-060	1/2	1/2	1	3	.060	●
ST7X2C-SQ0500-090	1/2	1/2	1	3	.090	●
ST7X2C-SQ0500-120	1/2	1/2	1	3	.120	●
ST7X2C-SQ0625	5/8	5/8	1.1/4	3.1/2	---	●
ST7X2C-SQ0625-030	5/8	5/8	1.1/4	3.1/2	.030	●
ST7X2C-SQ0625-060	5/8	5/8	1.1/4	3.1/2	.060	●
ST7X2C-SQ0750	3/4	3/4	1.1/2	4	---	●
ST7X2C-SQ0750-030	3/4	3/4	1.1/2	4	.030	●
ST7X2C-SQ0750-060	3/4	3/4	1.1/2	4	.060	●
ST7X2C-SQ0750-090	3/4	3/4	1.1/2	4	.090	●
ST7X2C-SQ0750-120	3/4	3/4	1.1/2	4	.120	●

STRATUS 7 Flute End Mills (3xD)

Designation	Dia.	Shank Dia.	LOC	OAL	Radius	TL30 Coated
ST7X3C-SQ0375	3/8	3/8	1.1/8	3	---	●
ST7X3C-SQ0375-015	3/8	3/8	1.1/8	3	.015	●
ST7X3C-SQ0375-030	3/8	3/8	1.1/8	3	.030	●
ST7X3C-SQ0375-060	3/8	3/8	1.1/8	3	.060	●
ST7X3C-SQ0500	1/2	1/2	1.1/2	3.1/2	---	●
ST7X3C-SQ0500-030	1/2	1/2	1.1/2	3.1/2	.030	●
ST7X3C-SQ0500-060	1/2	1/2	1.1/2	3.1/2	.060	●
ST7X3C-SQ0500-090	1/2	1/2	1.1/2	3.1/2	.090	●
ST7X3C-SQ0625	5/8	5/8	1.7/8	4.1/2	---	●
ST7X3C-SQ0625-030	5/8	5/8	1.7/8	4.1/2	.030	●
ST7X3C-SQ0750	3/4	3/4	2.1/4	5	---	●
ST7X3C-SQ0750-030	3/4	3/4	2.1/4	5	.030	●
ST7X3C-SQ0750-060	3/4	3/4	2.1/4	5	.060	●
ST7X3C-SQ0750-090	3/4	3/4	2.1/4	5	.090	●
ST7X3C-SQ0750-120	3/4	3/4	2.1/4	5	.120	●
ST7X3C-SQ1000	1	1	3	6	---	●
ST7X3C-SQ1000-030	1	1	3	6	.030	●
ST7X3C-SQ1000-060	1	1	3	6	.060	●
ST7X3C-SQ1000-090	1	1	3	6	.090	●
ST7X3C-SQ1000-120	1	1	3	6	.120	●

STRATUS 7 Flute End Mills (4xD)

Designation	Dia.	Shank Dia.	LOC	OAL	Radius	TL30 Coated
ST7X4C-SQ0375	3/8	3/8	1.1/2	3.1/2	---	●
ST7X4C-SQ0375-030	3/8	3/8	1.1/2	3.1/2	.030	●
ST7X4C-SQ0375-060	3/8	3/8	1.1/2	3.1/2	.060	●
ST7X4C-SQ0500	1/2	1/2	2	4	---	●
ST7X4C-SQ0500-030	1/2	1/2	2	4	.030	●
ST7X4C-SQ0500-060	1/2	1/2	2	4	.060	●
ST7X4C-SQ0500-090	1/2	1/2	2	4	.090	●
ST7X4C-SQ0500-120	1/2	1/2	2	4	.120	●
ST7X4C-SQ0625	5/8	5/8	2.1/2	5	---	●
ST7X4C-SQ0625-030	5/8	5/8	2.1/2	5	.030	●
ST7X4C-SQ0750	3/4	3/4	3	6	---	●
ST7X4C-SQ0750-030	3/4	3/4	3	6	.030	●
ST7X4C-SQ0750-060	3/4	3/4	3	6	.060	●
ST7X4C-SQ0750-090	3/4	3/4	3	6	.090	●
ST7X4C-SQ0750-120	3/4	3/4	3	6	.120	●
ST7X4C-SQ1000	1	1	4	7	---	●
ST7X4C-SQ1000-030	1	1	4	7	.030	●
ST7X4C-SQ1000-060	1	1	4	7	.060	●
ST7X4C-SQ1000-090	1	1	4	7	.090	●
ST7X4C-SQ1000-120	1	1	4	7	.120	●

Dynamic & Trochoidal Milling Capabilities of ST5XC & ST7XC Multi-Flute End Mills

The Ty-Carb Stratus ST7XC is a high performance line of carbide end mills that are designed with a unique geometry and chip splitters developed specifically for trochoidal / dynamic milling. These new HSC endmills are designed to maximize performance over traditional machining practices. The Stratus 7 is available in 2xD, 3xD and 4xD for proper optimization of your part and taking full advantage of your machine capabilities.

The ST5XC series of end mills are primarily designed for finishing applications and do not include chip splitters. They are however an excellent choice for both Dynamic or Trochoidal milling when machine and application calls for 5 flute high performance end mills.

Both the ST5XC & the ST7XC families of end mills have a honed cutting edge as well as a Post-Process treatment after Coating to improve chip flow while also reversing the stresses created in the Coating process.

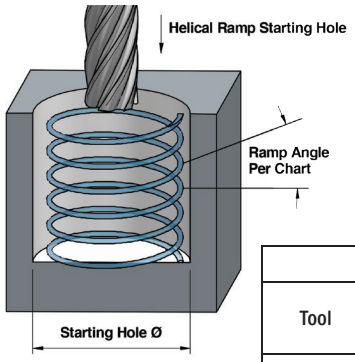
Advantages of Trochoidal / Dynamic Milling

- Axial depth of cut 2xD – 4xD (utilizing the full edge of the endmill)
- Particularly suited for difficult to machine materials
- Reduced thermal stresses due to lower heat generated Increased cutting speeds possible
- Increased feed rates possible
- Machining of unstable or thin walled work pieces
- Optimized metal removal rates for light duty machines
- Reduced power requirements
- Lower risk of spindle damage due to reduced torque fluctuations

Dynamic & Trochoidal Milling Technical

The maximum recommended engagement ratio, based on material group, for trochoidal/dynamic milling can be seen in the chart below.

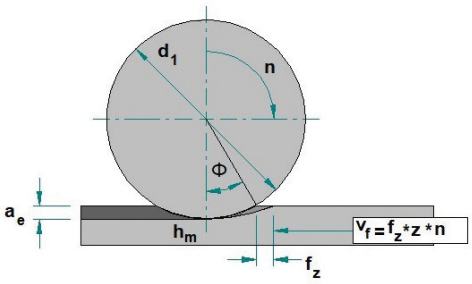
Maximum Recommended Radial Engagement	
ae / D	Material Group
20% (53.15)	Carbon Steel / Alloy Steel
20% (53.15)	Stainless Steel
20% (53.15)	Cast Iron
10% (36.87)	Super Alloys
16% (47.20)	Hard Machining
Based on 3xD length of cut	



A helical ramp entry is the preferred method to enter into the middle of a part. The table shows the factors to the speed and feed charts below. The maximum entry hole diameter is calculated as 2x tool dia. – 2x corner radius.

Helical Ramp Entry				
Tool	Speed (SFM)	Feed Factor with air / low pressure coolant	Feed Factor with high pressure coolant	Ramp Angle
Stratus 5	As Per Chart	IPT x 1.25	IPT x 1.6	0.5 deg
Stratus 7	As Per Chart	IPT x 1.25	IPT x 1.6	0.5 deg
Diameter of the starting hole will be (2 x tool diameter) - (2 x corner radius)				

Trochoidal Milling Adjustment Factors in the chart shown can be applied to the speed and feed chart based on engagement ratio ae /D (engagement angle) being used.



Trochoidal Milling Factors		
ae	Fz Factor	SFM Factor
4% (23.07)	3	3
5% (25.84)	2.5	2
10% (36.87)	2	1.8
20% (53.15)	1.4	1.5
30% (66.42)	1.2	1.2
For 3xD increase values by 10%. For 2xD increase values by 20%		

STRATUS ST5X & ST7X Recommended Cutting Parameters for Dynamic / Trochoidal Miling

Work Material	ap	Cutting Speed (SFM)		Baseline feed per flute (factors need to be applied)				
		Min	Max	3/8	1/2	5/8	3/4	1
Low Carbon Steels < 38 Rc 1018, 12L14, 8620	4 x D	480	650	.0025	.0032	.0037	.0041	.0048
Medium & High Carbon Carbon Steels <35 Rc 1045, 1050, 1525, 1545	4 x D	450	625	.0025	.0032	.0038	.0043	.0048
Alloy Steels & Tool Steels <35 Rc 4000 series, 5000 series P20, H13, A2, D2	4 x D	400	525	.0021	.0027	.0032	.0036	.0042
Alloy Steels & Tool Steels <48 Rc 4000 series, 5000 series P20, H13, A2, D2	4 x D	300	475	.0019	.0024	.0029	.0033	.0038
Martensitic & Ferritic Stainless Steels <35 Rc 13-8 PH, 15-5 PH, 17-4 PH, 400 & 500 series	4 x D	200	325	.0016	.0021	.0025	.0029	.0034
Martensitic & Ferritic Stainless Steels <48 Rc 13-8 PH, 15-5 PH, 17-4 PH, 400 & 500 series	4 x D	150	225	.0013	.0017	.0019	.0023	.0026
Austenitic Stainless Steels 200 Series, 304, 304L, 309	4 x D	310	375	.0021	.0027	.0032	.0036	.0042
High Strength Stainless Steels 310, 316, 316L	4 x D	200	260	.0017	.0021	.0025	.0029	.0034
Duplex Stainless Steels F55, 323, 2205	4 x D	200	240	.0013	.0017	.0021	.0023	.0026
Gray Cast Iron GG15, GG25, GG30, GG40	4 x D	390	500	.0025	.0032	.0036	.0042	.0048
Low to Medium Strength Ductile Cast Iron GGG40, GTS35	4 x D	360	460	.0021	.0027	.0032	.0038	.0043
High Strength Ductile Iron GGG60, GTW55, GTS65	4 x D	330	430	.0016	.0021	.0025	.0029	.0034
Titanium Alloys	4 x D	150	200	.0015	.0019	.0023	.0026	.0031
High Temperature Alloys Inconel, Haynes, Stellite, Hastalloy	4 x D	120	170	.0015	.0019	.0023	.0029	.0034
Hardened Steel 44 - 48 Rc H11, H13, 4340, P20	4 x D	250	450	.0019	.0024	.0029	.0033	.0038
Hardened Steel 49 - 54 Rc H11, H13, 4340, P20	4 x D	225	380	.0013	.0017	.0022	.0025	.0028

Notes: Recommended cutting parameters in chart are a baseline to be used for Trochoidal Milling application. Speeds and feeds need to be adjusted based on percentage of radial engagement using the factors in tables provided to maintain correct chip thickness.
When using ST7 3 x D feeds can be increased 20% before factors are applied.

VEGA 4 Flute End Mills

Designation	Dia.	Shank Dia.	LOC	OAL	Radius	TL30 Coated
VE4RC-SQ0250-020	1/4	1/4	3/4	2.1/2	.020	●
VE4RC-SQ0312-020	5/16	5/16	13/16	2.1/2	.020	●
VE4RC-SQ0375-030	3/8	3/8	1	2.1/2	.030	●
VE4EC-SQ0500-030	1/2	1/2	1.1/4	3	.030	●
VE4RC-SQ0625-030	5/8	5/8	1.1/4	3.1/2	.030	●
VE4RC-SQ0750-030	3/4	3/4	1.5/8	4	.030	●

The new 4 flute in the VEGA series of end mills are specifically engineered to be used in hardened steels, however performs very well in other materials from carbon and alloy steels, stainless steels and cast iron. The specifically designed core gives strength to enable full slotting up to 1 x D in hardened steels up to < 54 Rc with a flute length enabling 2 x D for finishing operations.

- Differential flute spacing & Variable helix design
- Double core flute design for slotting up to 1 x D
- Machining of hardened steels to < 54 Rc
- Next generation AlCrN PVD Coating
- Post Process after Coating for improved performance
- Cutting edge protected with a corner rad

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VEGA 4 Flute End Mill Recommended Cutting Parameters

Work Material	Type of Cut	ap	ae	Cutting Speed (SFM)		Feed per flute (inch)					
				Min	Max	1/4	3/8	1/2	5/8	3/4	1
Low Carbon Steels < 38 Rc 1018, 12L14, 8620	Slotting Peripheral	1 x D 2 x D	1 x D 0.5 x D	480	650	.0014 .0017	.0021 .0026	.0026 .0033	.0031 .0039	.0034 .0043	.0040 .0050
Medium & High Carbon Carbon Steels <35 Rc 1045, 1050, 1525, 1545	Slotting Peripheral	1 x D 2 x D	1 x D 0.5 x D	450	625	.0014 .0017	.0021 .0026	.0026 .0033	.0032 .0040	.0036 .0045	.0040 .0050
Alloy Steels & Tool Steels <35 Rc 4000 series, 5000 series P20, H13, A2, D2	Slotting Peripheral	1 x D 2 x D	1 x D 0.5 x D	400	525	.0011 .0014	.0018 .0022	.0022 .0028	.0026 .0033	.0030 .0038	.0035 .0044
Alloy Steels & Tool Steels <48 Rc 4000 series, 5000 series P20, H13, A2, D2	Slotting Peripheral	0.75 x D 2 x D	1 x D 0.5 x D	300	475	.0010 .0013	.0016 .0020	.0020 .0025	.0024 .0030	.0027 .0034	.0032 .0040
Martensitic & Ferritic Stainless Steels <35 Rc 13-8 PH, 15-5 PH, 17-4 PH, 400 & 500 series	Slotting Peripheral	1 x D 2 x D	1 x D 0.5 x D	200	325	.0010 .0012	.0014 .0017	.0018 .0022	.0021 .0026	.0024 .0030	.0028 .0035
Martensitic & Ferritic Stainless Steels <48 Rc 13-8 PH, 15-5 PH, 17-4 PH, 400 & 500 series	Slotting Peripheral	0.75 x D 2 x D	1 x D 0.5 x D	150	225	.0008 .0010	.0011 .0014	.0014 .0018	.0016 .0020	.0019 .0024	.0022 .0027
Austenitic Stainless Steels 200 Series, 304, 304L, 309	Slotting Peripheral	1 x D 2 x D	1 x D 0.5 x D	310	375	.0011 .0014	.0018 .0022	.0022 .0028	.0026 .0033	.0030 .0038	.0035 .0044
High Strength Stainless Steels 310, 316, 316L	Slotting Peripheral	1 x D 2 x D	1 x D 0.5 x D	200	260	.0010 .0012	.0014 .0018	.0018 .0022	.0021 .0026	.0024 .0030	.0028 .0035
Duplex Stainless Steels F55, 323, 2205	Slotting Peripheral	1 x D 2 x D	1 x D 0.5 x D	200	240	.0008 .0010	.0011 .0014	.0014 .0018	.0018 .0022	.0019 .0024	.0022 .0027
Gray Cast Iron GG15, GG25, GG30, GG40	Slotting Peripheral	1 x D 2 x D	1 x D 0.5 x D	390	500	.0014 .0017	.0021 .0026	.0026 .0033	.0030 .0038	.0035 .0044	.0040 .0050
Low to Medium Strength Ductile Cast Iron GGG40, GTS35	Slotting Peripheral	1 x D 2 x D	1 x D 0.5 x D	360	460	.0011 .0014	.0018 .0022	.0022 .0028	.0026 .0033	.0032 .0040	.0036 .0045
High Strength Ductile Iron GGG60, GTW55, GTS65	Slotting Peripheral	1 x D 2 x D	1 x D 0.5 x D	330	430	.0010 .0012	.0014 .0017	.0018 .0022	.0021 .0026	.0024 .0030	.0028 .0035
Titanium Alloys	Slotting Peripheral	1 x D 2 x D	1 x D 0.5 x D	150	200	.0009 .0011	.0013 .0016	.0016 .0020	.0019 .0024	.0022 .0027	.0026 .0032
High Temperature Alloys Inconel, Haynes, Stellite, Hastalloy	Slotting Peripheral	1 x D 2 x D	1 x D 0.5 x D	120	170	.0008 .0010	.0013 .0016	.0016 .0020	.0019 .0024	.0024 .0030	.0028 .0035
Hardened Steel 44 - 48 Rc H11, H13, 4340, P20	Slotting Peripheral	0.75 x D 2 x D	1 x D 0.5 x D	260	450	.0010 .0013	.0016 .0020	.0020 .0025	.0024 .0030	.0026 .0033	.0030 .0038
Hardened Steel 49 - 54 Rc H11, H13, 4340, P20	Slotting Peripheral	0.5 x D 2 x D	1 x D 0.2 x D	230	380	.0008 .0010	.0011 .0014	.0014 .0018	.0018 .0022	.0020 .0025	.0022 .0028

Notes: Use lower value cutting speed for higher hardness or stock removal
Use higher value cutting speed for lower hardness and finishing operations
Adjust values for smaller taper machines

Vega 6 Flute End Mills

VEGA 6 Flute End Mills

Designation	Dia.	Shank Dia.	LOC	OAL	Radius	TH
VE6RC-SQ0250	1/4	1/4	3/4	2.1/2	---	●
VE6RC-SQ0250-020	1/4	1/4	3/4	2.1/2	.020	●
VE6RC-SQ0312	5/16	5/16	13/16	2.1/2	---	●
VE6RC-SQ0312-020	5/16	5/16	13/16	2.1/2	.020	●
VE6RC-SQ0375	3/8	3/8	1	3	---	●
VE6RC-SQ0375-030	3/8	3/8	1	3	.030	●
VE6RC-SQ0500-030	1/2	1/2	1	3	.030	●
VE6EC-SQ0500	1/2	1/2	1.1/4	3	---	●
VE6EC-SQ0500-030	1/2	1/2	1.1/4	3	.030	●
VE6EC-SQ0625	5/8	5/8	1.5/8	3.1/2	---	●
VE6EC-SQ0625-030	5/8	5/8	1.5/8	3.1/2	.030	●
VE6RC-SQ0750	3/4	3/4	1.5/8	4	---	●
VE6RC-SQ0750-030	3/4	3/4	1.5/8	4	.030	●

The new 6 flute VEGA series end mills bring capabilities of finishing hardened steels up to 65Rc, and can be used in all other ferrous materials. A combination of wear resistant carbide substrate and new generation highly wear resistant PVD coating give the ability for superior finishes with prolonged tool life.

- Machining of hardened steels < 65 Rc
- Designed with a 50° Flute Helix
- Superior End Mill for Finishing Applications
- New Nano-grain Substrate (0.2 Micron Grain Size)
- Next generation TiSiN PVD coating
- Post Process after Coating for improved performance
- Available with Square End or corner radius

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VEGA 6 Flute End Mill Recommended Cutting Parameters

Work Material	Type of Cut Side Milling ap	Type of Cut Side Milling ae	Cutting Speed (SFM) Min	Cutting Speed (SFM) Max	Feed per flute (Inch) 1/4	5/16	3/8	1/2	5/8	3/4	1
Low Carbon Steels < 38 Rc 1018, 12L14, 8620	2 x D	0.07 x D	500	650	.0018	.0022	.0026	.0036	.0040	.0045	.0050
Medium & High Carbon Carbon Steels <35 Rc 1045, 1050, 1525, 1545	2 x D	0.07 x D	450	625	.0018	.0022	.0026	.0036	.0040	.0045	.0050
Alloy Steels & Tool Steels <35 Rc 4000 series, 5000 series P20, H13, A2, D2	2 x D	0.07 x D	400	525	.0015	.0020	.0024	.0030	.0035	.0040	.0047
Alloy Steels & Tool Steels <48 Rc 4000 series, 5000 series P20, H13, A2, D2	2 x D	0.03 x D	300	475	.0013	.0017	.0020	.0025	.0030	.0035	.0040
Martensitic & Ferritic Stainless Steels <35 Rc 13-8 PH, 15-5 PH, 17-4 PH, 400 & 500 series	2 x D	0.05 x D	200	325	.0012	.0015	.0017	.0022	.0026	.0030	.0035
Martensitic & Ferritic Stainless Steels <48 Rc 13-8 PH, 15-5 PH, 17-4 PH, 400 & 500 series	2 x D	0.03 x D	150	225	.0008	.0012	.0015	.0018	.0021	.0024	.0027
Austenitic Stainless Steels 200 Series, 304, 304L, 309	2 x D	0.07 x D	260	330	.0012	.0015	.0017	.0022	.0026	.0030	.0036
High Strength Stainless Steels 310, 316, 316L	2 x D	0.07 x D	200	260	.0010	.0014	.0018	.0023	.0027	.0030	.0036
Duplex Stainless Steels F55, 323, 2205	2 x D	0.05 x D	200	260	.0008	.0012	.0015	.0018	.0021	.0024	.0027
Gray Cast Iron GG15, GG25, GG30, GG40	2 x D	0.07 x D	390	520	.0018	.0022	.0026	.0036	.0040	.0043	.0050
Low to Medium Strength Ductile Cast Iron GGG40, GTS35	2 x D	0.07 x D	360	460	.0018	.0022	.0027	.0030	.0034	.0039	.0045
High Strength Ductile Iron GGG60, GTW55, GTS65	2 x D	0.05 x D	330	430	.0012	.0015	.0017	.0022	.0027	.0030	.0035
Titanium Alloys	2 x D	0.05 x D	150	210	.0004	.0013	.0016	.0022	.0025	.0028	.0032
High Temperature Alloys Inconel, Haynes, Stellite, Hastalloy	2 x D	0.05 x D	100	160	.0008	.0010	.0012	.0018	.0024	.0028	.0032
Hardened Steel 44 - 48 Rc H11, H13, 4340, P20	2 x D	0.02 x D	260	450	.0010	.0014	.0020	.0025	.0030	.0034	.0040
Hardened Steel 49 - 54 Rc H11, H13, 4340, P20	2 x D	0.02 x D	230	380	.0005	.0007	.0010	.0013	.0017	.0020	.0023
Hardened Steel 55 - 62 Rc H11, H13, 4340, P20	2 x D	0.02 x D	200	300	.0003	.0005	.0007	.0010	.0013	.0015	.0020

Notes: Use lower value cutting speed for higher hardness or stock removal
Use higher value cutting speed for lower hardness and finishing operations
Adjust values for smaller taper machines

4 Flute Roughing End Mills

The TyCarb Roughing end mill is recommended for use in most materials from carbon, tool, die, alloy steels as well as cast iron and even stainless steel. The unique chipbreaker and flute configuration achieves higher productivity with less H.P. than other High Performance end mills. The specially designed chipbreaker creates smaller chips, ensuring rapid evacuation and helping reduce potential tool chatter. Added features include differential flute spacing to achieve even higher productivity.

- Cutting edges protected with 45 deg. chamfer
- Next generation AlCrN PVD coating
- Differential flute spacing
- Available with cylindrical or weldon style shanks

4 Flute Roughing End Mills
(Variable Flute / Center Cutting)

Designation	Dia.	Shank Dia.	LOC	OAL	Chamfer	TL30 Coated
RC4RC-SQ0250-C10	1/4	1/4	3/4	2.1/2	.010	●
RC4RC-SQ0375-C10	3/8	3/8	7/8	2.1/2	.010	●
RC4EC-SQ0500-C20	1/2	1/2	1.1/4	3	.020	●
RC4RC-SQ0625-C30	5/8	5/8	1.1/4	3.1/2	.030	●
RC4RC-SQ0750-C30	3/4	3/4	1.1/2	4	.030	●
RC4RC-SQ1000-C30	1	1	1.1/2	4	.030	●

4 Flute Roughing End Mills
(Variable Flute / Center Cutting / Weldon)

Designation	Dia.	Shank Dia.	LOC	OAL	Chamfer	TL30 Coated
RC4EW-SQ0500-C20	1/2	1/2	1.1/4	3	.020	●
RC4RW-SQ0625-C30	5/8	5/8	1.1/4	3.1/2	.030	●
RC4RW-SQ0750-C30	3/4	3/4	1.1/2	4	.030	●
RC4RW-SQ1000-C30	1	1	1.1/2	4	.030	●

4 Flute Roughing End Mills Recommended Cutting Parameters

Work Material	Type of Cut	ap	ae	Cutting Speed (SFM)		Feed (Inches Per Tooth)					
				Min	Max	1/4	3/8	1/2	5/8	3/4	1
Low Carbon Steels < 38 Rc 1018, 12L14, 8620	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	385	520	.0016 .0021	.0025 .0031	.0032 .0040	.0038 .0047	.0042 .0052	.0048 .0061
Medium & High Carbon Carbon Steels <35 Rc 1045, 1050, 1525, 1545	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	360	500	.0016 .0021	.0025 .0031	.0032 .0040	.0039 .0048	.0044 .0054	.0048 .0061
Alloy Steels & Tool Steels <35 Rc 4000 series, 5000 series P20, H13, A2, D2	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	320	420	.0014 .0017	.0021 .0027	.0027 .0034	.0032 .0040	.0037 .0046	.0043 .0053
Alloy Steels & Tool Steels <48 Rc 4000 series, 5000 series P20, H13, A2, D2	Slotting Peripheral	0.75 x D 1.5 x D	1 x D 0.5 x D	240	380	.0013 .0016	.0019 .0024	.0024 .0030	.0029 .0036	.0033 .0041	.0039 .0048
Martensitic & Ferritic Stainless Steels <35 Rc 13-8 PH, 15-5 PH, 17-4 PH, 400 & 500 series	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	160	260	.0012 .0015	.0016 .0021	.0021 .0027	.0025 .0031	.0029 .0036	.0034 .0042
Martensitic & Ferritic Stainless Steels <48 Rc 13-8 PH, 15-5 PH, 17-4 PH, 400 & 500 series	Slotting Peripheral	0.75 x D 1.5 x D	1 x D 0.5 x D	120	180	.0010 .0012	.0014 .0017	.0017 .0022	.0019 .0024	.0023 .0029	.0026 .0033
Austenitic Stainless Steels 200 Series, 304, 304L, 309	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	250	300	.0014 .0017	.0021 .0027	.0027 .0034	.0032 .0040	.0037 .0046	.0043 .0053
High Strength Stainless Steels 310, 316, 316L	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	160	210	.0012 .0015	.0017 .0022	.0021 .0027	.0025 .0031	.0029 .0036	.0034 .0042
Duplex Stainless Steels F55, 323, 2205	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	160	195	.0010 .0012	.0014 .0017	.0017 .0022	.0021 .0027	.0023 .0029	.0026 .0033
Gray Cast Iron GG15, GG25, GG30, GG40	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	315	400	.0016 .0021	.0025 .0031	.0032 .0040	.0037 .0046	.0043 .0053	.0048 .0061
Low to Medium Strength Ductile Cast Iron GGG40, GTS35	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	290	370	.0014 .0017	.0021 .0027	.0027 .0034	.0032 .0040	.0039 .0048	.0044 .0054
High Strength Ductile Iron GGG60, GTW55, GTS65	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	265	345	.0012 .0015	.0016 .0021	.0021 .0027	.0025 .0031	.0029 .0036	.0034 .0042
Titanium Alloys	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	120	160	.0011 .0013	.0015 .0019	.0019 .0024	.0023 .0029	.0026 .0033	.0031 .0039
High Temperature Alloys Inconel, Haynes, Stellite, Hastalloy	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	100	150	.0010 .0012	.0015 .0019	.0019 .0024	.0023 .0029	.0029 .0036	.0034 .0042

Notes: Use lower value cutting speed for higher hardness or stock removal. Use higher value cutting speed for lower hardness and finishing operations
Adjust values for smaller taper machines

2^2 - 4 Flute Rougher / Finisher End Mills

The TyCarb 2^2 High Performance end mills are specifically designed with 2 roughing flutes and 2 Finishing flutes to operate at roughing cutter parameters while achieving excellent surface finish. The eccentric relief and differential flute spacing design make this tool suitable for a wide variety of materials- carbon, die, alloy and stainless steels as well as exotic materials.

- Differential flute spacing
- Eccentric relief flute design
- Next generation AlCrN PVD coating
- Available with Cylindrical or Weldon style shanks
- Cutting edges protected with a 45 degree chamfer

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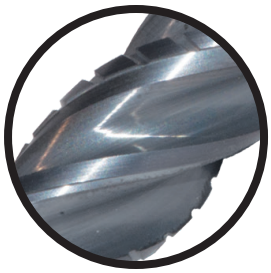

4 Flute Rougher / Finisher End Mills
(Variable Flute / Center Cutting)

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Chamfer	TL30 Coated
SM4RC-SQ0250-C10	1/4	1/4	3/4	2.1/2	.010	●
SM4RC-SQ0375-C10	3/8	3/8	7/8	2.1/2	.010	●
SM4EC-SQ0500-C20	1/2	1/2	1.1/4	3	.020	●
SM4RC-SQ0625-C30	5/8	5/8	1.1/4	3.1/2	.030	●
SM4RC-SQ0750-C30	3/4	3/4	1.1/2	4	.030	●
SM4RC-SQ1000-C30	1	1	1.1/2	4	.030	●

4 Flute Rougher / Finisher End Mills
(Variable Flute / Center Cutting / Weldon)

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Chamfer	TL30 Coated
SM4EW-SQ0500-C20	1/2	1/2	1.1/4	3	.020	●
SM4RW-SQ0625-C30	5/8	5/8	1.1/4	3.1/2	.030	●
SM4RW-SQ0750-C30	3/4	3/4	1.1/2	4	.030	●
SM4RW-SQ1000-C30	1	1	1.1/2	4	.030	●

4 Flute Rougher / Finisher End Mills Recommended Cutting Parameters

Work Material	Type of Cut	Axial DOC	Radial DOC	Speed (SFM)		Feed (Inches Per Tooth)					
				Min.	Max.	1/4	3/8	1/2	5/8	3/4	1
Low Carbon Steels < 38 Rc 1018, 12L14, 8620	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	385	520	.0016 .0021	.0025 .0031	.0032 .0040	.0038 .0047	.0042 .0052	.0048 .0061
Medium & High Carbon Carbon Steels <35 Rc 1045, 1050, 1525, 1545	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	360	500	.0016 .0021	.0025 .0031	.0032 .0040	.0039 .0048	.0044 .0054	.0048 .0061
Alloy Steels & Tool Steels <35 Rc 4000 series, 5000 series P20, H13, A2, D2	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	320	420	.0014 .0017	.0021 .0027	.0027 .0034	.0032 .0040	.0037 .0046	.0043 .0053
Alloy Steels & Tool Steels <48 Rc 4000 series, 5000 series P20, H13, A2, D2	Slotting Peripheral	0.75 x D 1.5 x D	1 x D 0.5 x D	240	380	.0013 .0016	.0019 .0024	.0024 .0030	.0029 .0036	.0033 .0041	.0039 .0048
Martensitic & Ferritic Stainless Steels <35 Rc 13-8 PH, 15-5 PH, 17-4 PH, 400 & 500 series	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	160	260	.0012 .0015	.0016 .0021	.0021 .0027	.0025 .0031	.0029 .0036	.0034 .0042
Martensitic & Ferritic Stainless Steels <48 Rc 13-8 PH, 15-5 PH, 17-4 PH, 400 & 500 series	Slotting Peripheral	0.75 x D 1.5 x D	1 x D 0.5 x D	120	180	.0010 .0012	.0014 .0017	.0017 .0022	.0019 .0024	.0023 .0029	.0026 .0033
Austenitic Stainless Steels 200 Series, 304, 304L, 309	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	250	300	.0014 .0017	.0021 .0027	.0027 .0034	.0032 .0040	.0037 .0046	.0043 .0053
High Strength Stainless Steels 310, 316, 316L	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	160	210	.0012 .0015	.0017 .0022	.0021 .0027	.0025 .0031	.0029 .0036	.0034 .0042
Duplex Stainless Steels F55, 323, 2205	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	160	195	.0010 .0012	.0014 .0017	.0017 .0022	.0021 .0027	.0023 .0029	.0026 .0033
Gray Cast Iron GG15, GG25, GG30, GG40	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	315	400	.0016 .0021	.0025 .0031	.0032 .0040	.0037 .0046	.0043 .0053	.0048 .0061
Low to Medium Strength Ductile Cast Iron GGG40, GTS35	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	290	370	.0014 .0017	.0021 .0027	.0027 .0034	.0032 .0040	.0039 .0048	.0044 .0054
High Strength Ductile Iron GGG60, GTW55, GTS65	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	265	345	.0012 .0015	.0016 .0021	.0021 .0027	.0025 .0031	.0029 .0036	.0034 .0042
Titanium Alloys	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	120	160	.0011 .0013	.0015 .0019	.0019 .0024	.0023 .0029	.0026 .0033	.0031 .0039
High Temperature Alloys Inconel, Haynes, Stellite, Hastalloy	Slotting Peripheral	1 x D 1.5 x D	1 x D 0.5 x D	100	150	.0010 .0012	.0015 .0019	.0019 .0024	.0023 .0029	.0029 .0036	.0034 .0042

Notes: Use lower value cutting speed for higher hardness or stock removal
Use higher value cutting speed for lower hardness and finishing operations
Adjust values for smaller taper machines

ORION End Mills for Aluminum

ORION end mills are ideal for high performance milling in all grades of aluminum, including the high silicon series as well as extruded and die cast parts.

Due to the unique and polished flute configuration, the Orion end mills are designed for aggressive chip evacuation under extremely heavy chip loads. Orion end mills are capable of speeds in excess of 2,000 SFM when run in a balanced assembly. Orion End Mills are available as 2 flute, 3 flute as well as 3 flute Rougher/Finishers.

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UK20 This uncoated carbide grade is made from high quality micro grain material. Due to it's exceptional balance of wear and toughness this grade maintains sharp cutting edges and consistent controlled wear rates. UK20 is used for general purpose to high speed machining of aluminum and non-ferrous materials.

ORION 3 Flute
Roughing End Mills for Aluminum

- Orion 3 flute Roughing End Mills specifically designed for Aluminum
- Differential flute spacing for chatter free performance
- Polished flute design for effective chip evacuation
- Designed for aggressive feed rates while maintaining good surface finishes
- Specially designed chipbreaker creates smaller chips and reduces cutting loads on lighter duty machines
- These end mills are available with a Zirconium or DLC coating on request
- 3 Flute to center end cut design for improved plunging capbilities

ORION 3 Flute Roughing End Mills

(Variable Flute / Center Cutting / Cylindrical Shank)

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Radius	UK20 Uncoated
RCOR3RC-SQ0250-R020	1/4	1/4	3/4	2.1/2	.020	●
RCOR3RC-SQ0375-R030	3/8	3/8	7/8	2.1/2	.030	●
RCOR3EC-SQ0375-R030	3/8	3/8	1.1/8	3	.030	●
RCOR3MC-SQ0375-R030	3/8	3/8	1.1/2	3	.030	●
RCOR3EC-SQ0500-R030	1/2	1/2	1.1/4	3	.030	●
RCOR3LC-SQ0500-R030	1/2	1/2	2	4	.030	●
RCOR3RC-SQ0625-R030	5/8	5/8	1.1/4	3.1/2	.030	●
RCOR3LC-SQ0625-R030	5/8	5/8	2	4	.030	●
RCOR3RC-SQ0750-R060	3/4	3/4	1.1/2	4	.060	●
RCOR3SP-SQ0750-R060	3/4	3/4	1.5/8	4	.060	●
RCOR3EC-SQ0750-R060	3/4	3/4	1.3/4	4	.060	●
RCOR3MC-SQ0750-R060	3/4	3/4	3.1/4	2.1/4	.060	●
RCOR3LC-SQ0750-R060	3/4	3/4	3	6	.060	●
RCOR3EC-SQ1000-R060	1	1	1.1/2	4	.060	●
RCOR3MC-SQ1000-R060	1	1	2	4.1/2	.060	●
RCOR3LC-SQ1000-R060	1	1	3	6	.060	●

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Recommended Cutting Parameters		Application			Uncoated UK20 Cutting Speed Vc	Cutting Speed (Vc) Maximum Feed per Tooth for Side Milling Operations* Cutting Diameter						
		Side Milling		Slotting								
		Axial Depth	Radial Depth	Max. Axial Depth								
Tool Series	Material	ap	ae	ap	SFM	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"
ORION Roughing Cutters	Aluminum Alloys	1.5 x D	.5 x D	1 x D	1000 - 2000	.003 - .0054	.0035 - .0068	.004 - .0075	.0056 - .010	.007 - .0118	.0085 - .0138	.0113 - .0163
	Aluminum with High Silicon	1.5 x D	.5 x D	1 x D	700 - 2000	.0023 - .0054	.003 - .0063	.0034 - .0068	.0045 -.0076	.0056 - .0094	.0068 - .010	.009 - .0138
	other Non-Ferrous materials	1.5 x D	.5 x D	1 x D	750 - 1500	.0023 - .0054	.003 - .0063	.0034 - .0068	.0045 -.0076	.0056 - .0094	.0068 - .010	.009 - .0138

* Feed per tooth in slotting applications should not exceed 80% of feed per tooth for side milling

ORION 2 Flute End Mills for Aluminum

- Orion 2 flute End Mills specifically designed for Aluminum
- New Polished flute design for effective chip evacuation
- One tool for roughing, semi-finishing as well as finishing operations
- Effective for slotting up to 1xD axial depth
- For Side or profile milling capable of 0.5xD radial and 1.5xD axial depth
- Cutting speeds only limited by your machine (Tool Balancing for Higher speeds recommended)
- Multiple length and radius tools available
- These end mills are available with a Zirconium or DLC coating on request

ORION 2 Flute Solid Carbide End Mills (Center Cutting)

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Corner Radius	UK20 Uncoated
OR2RC-SQ0125	1/8	1/8	3/8	1.1/2	---	●
OR2EC-SQ0125	1/8	1/8	1/2	1.1/2	---	●
OR2LC-SQ0125	1/8	1/8	3/4	2.1/2	---	●
OR2RC-SQ0187	3/16	3/16	5/16	2	---	●
OR2EC-SQ0187	3/16	3/16	9/16	2	---	●
OR2RC-SQ0250	1/4	1/4	1/2	2.1/2	---	●
OR2RC-SQ0250-015	1/4	1/4	1/2	2.1/2	.015	●
OR2RC-SQ0250-030	1/4	1/4	1/2	2.1/2	.030	●
OR2RC-SQ0250-060	1/4	1/4	1/2	2.1/2	.060	●
OR2EC-SQ0250	1/4	1/4	3/4	2.1/2	---	●
OR2EC-SQ0250-015	1/4	1/4	3/4	2.1/2	.015	●
OR2EC-SQ0250-030	1/4	1/4	3/4	2.1/2	.030	●
OR2LC-SQ0250	1/4	1/4	1.1/8	2.1/2	---	●
OR2LC-SQ0250-015	1/4	1/4	1.1/8	2.1/2	.015	●
OR2LC-SQ0250-030	1/4	1/4	1.1/8	2.1/2	.030	●
OR2RC-SQ0312	5/16	5/16	5/8	2.1/2	---	●
OR2RC-SQ0312-030	5/16	5/16	5/8	2.1/2	.030	●
OR2LC-SQ0312	5/16	5/16	1.1/8	3	---	●
OR2LC-SQ0312-030	5/16	5/16	1.1/8	3	.030	●
OR2RC-SQ0375	3/8	3/8	3/4	2.1/2	---	●
OR2RC-SQ0375-030	3/8	3/8	3/4	2.1/2	.030	●
OR2RC-SQ0375-060	3/8	3/8	3/4	2.1/2	.060	●
OR2EC-SQ0375	3/8	3/8	1.1/8	3	---	●
OR2EC-SQ0375-030	3/8	3/8	1.1/8	3	.030	●
OR2LC-SQ0375	3/8	3/8	2	4	---	●
OR2LC-SQ0375-030	3/8	3/8	2	4	.030	●
OR2RC-SQ0500	1/2	1/2	1	3	---	●
OR2RC-SQ0500-030	1/2	1/2	1	3	.030	●
OR2RC-SQ0500-060	1/2	1/2	1	3	.060	●
OR2EC-SQ0500	1/2	1/2	1.1/4	3	---	●
OR2EC-SQ0500-030	1/2	1/2	1.1/4	3	.030	●
OR2EC-SQ0500-060	1/2	1/2	1.1/4	3	.060	●
OR2LC-SQ0500	1/2	1/2	2	4	---	●
OR2LC-SQ0500-030	1/2	1/2	2	4	.030	●
OR2LC-SQ0500-060	1/2	1/2	2	4	.060	●
OR2RC-SQ0625	5/8	5/8	1.1/4	3.1/2	---	●
OR2RC-SQ0625-030	5/8	5/8	1.1/4	3.1/2	.030	●
OR2RC-SQ0625-060	5/8	5/8	1.1/4	3.1/2	.060	●
OR2EC-SQ0625	5/8	5/8	1.5/8	3.1/2	---	●
OR2EC-SQ0625-030	5/8	5/8	1.5/8	3.1/2	.030	●
OR2EC-SQ0625-060	5/8	5/8	1.5/8	3.1/2	.060	●
OR2LC-SQ0625	5/8	5/8	2	4	---	●
OR2LC-SQ0625-030	5/8	5/8	2	4	.030	●
OR2LC-SQ0625-060	5/8	5/8	2	4	.060	●
OR2RC-SQ0750	3/4	3/4	1.1/2	4	---	●
OR2RC-SQ0750-030	3/4	3/4	1.1/2	4	.030	●
OR2RC-SQ0750-060	3/4	3/4	1.1/2	4	.060	●
OR2EC-SQ0750	3/4	3/4	1.3/4	4	---	●
OR2EC-SQ0750-030	3/4	3/4	1.3/4	4	.030	●
OR2EC-SQ0750-060	3/4	3/4	1.3/4	4	.060	●
OR2LC-SQ0750	3/4	3/4	3	6	---	●
OR2LC-SQ0750-030	3/4	3/4	3	6	.030	●
OR2LC-SQ0750-060	3/4	3/4	3	6	.060	●
OR2RC-SQ1000	1	1	1.1/2	4	---	●
OR2RC-SQ1000-030	1	1	1.1/2	4	.030	●
OR2RC-SQ1000-060	1	1	1.1/2	4	.060	●
OR2EC-SQ1000	1	1	2	4.1/2	---	●
OR2EC-SQ1000-030	1	1	2	4.1/2	.030	●
OR2EC-SQ1000-060	1	1	2	4.1/2	.060	●
OR2LC-SQ1000	1	1	3	6	---	●
OR2LC-SQ1000-030	1	1	3	6	.030	●
OR2LC-SQ1000-060	1	1	3	6	.060	●

UK20 This uncoated carbide grade is made from high quality micro grain material. Due to it's exceptional balance of wear and toughness this grade maintains sharp cutting edges and consistent controlled wear rates. UK20 is used for general purpose to high speed machining of aluminum and non-ferrous materials.

ORION 3 Flute End Mills for Aluminum

- Orion 3 flute End Mills specifically designed for Aluminum
- Differential flute spacing for chatter free performance
- New Polished flute design for effective chip evacuation
- One tool for roughing, semi-finishing as well as finishing operations
- Effective for slotting up to 1xD axial depth
- For Side or profile milling capable of 0.5xD radial and 1.5xD axial depth
- Cutting speeds only limited by your machine
  (Tool Balancing for Higher speeds recommended)
- These end mills are available with a Zirconium or DLC coating on request

ORION 3 Flute Solid Carbide End Mills (Center Cutting)

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Corner Radius	UK20 Uncoated
OR3RC-SQ0125	1/8	1/8	3/8	1.1/2	---	●
OR3EC-SQ0125	1/8	1/8	1/2	1.1/2	---	●
OR3LC-SQ0125	1/8	1/8	3/4	2.1/2	---	●
OR3RC-SQ0187	3/16	3/16	5/16	2	---	●
OR3EC-SQ0187	3/16	3/16	9/16	2	---	●
OR3RC-SQ0250	1/4	1/4	1/2	2.1/2	---	●
OR3RC-SQ0250-015	1/4	1/4	1/2	2.1/2	.015	●
OR3RC-SQ0250-030	1/4	1/4	1/2	2.1/2	.030	●
OR3RC-SQ0250-060	1/4	1/4	1/2	2.1/2	.060	●
OR3EC-SQ0250	1/4	1/4	3/4	2.1/2	---	●
OR3EC-SQ0250-015	1/4	1/4	3/4	2.1/2	.015	●
OR3EC-SQ0250-030	1/4	1/4	3/4	2.1/2	.030	●
OR3LC-SQ0250	1/4	1/4	1.1/8	2.1/2	---	●
OR3LC-SQ0250-015	1/4	1/4	1.1/8	2.1/2	.015	●
OR3LC-SQ0250-030	1/4	1/4	1.1/8	2.1/2	.030	●
OR3RC-SQ0312	5/16	5/16	5/8	2.1/2	---	●
OR3RC-SQ0312-030	5/16	5/16	5/8	2.1/2	.030	●
OR3LC-SQ0312	5/16	5/16	1.1/8	3	---	●
OR3LC-SQ0312-030	5/16	5/16	1.1/8	3	.030	●
OR3RC-SQ0375	3/8	3/8	3/4	2.1/2	---	●
OR3RC-SQ0375-030	3/8	3/8	3/4	2.1/2	.030	●
OR3RC-SQ0375-060	3/8	3/8	3/4	2.1/2	.060	●
OR3EC-SQ0375	3/8	3/8	1.1/8	3	---	●
OR3EC-SQ0375-030	3/8	3/8	1.1/8	3	.030	●
OR3EC-SQ0375-060	3/8	3/8	1.1/8	3	.060	●
OR3LC-SQ0375	3/8	3/8	2	4	---	●
OR3LC-SQ0375-030	3/8	3/8	2	4	.030	●
OR3LC-SQ0375-060	3/8	3/8	2	4	.060	●
OR3RC-SQ0500	1/2	1/2	1	3	---	●
OR3RC-SQ0500-030	1/2	1/2	1	3	.030	●
OR3RC-SQ0500-060	1/2	1/2	1	3	.060	●
OR3EC-SQ0500	1/2	1/2	1.1/4	3	---	●
OR3EC-SQ0500-030	1/2	1/2	1.1/4	3	.030	●
OR3EC-SQ0500-060	1/2	1/2	1.1/4	3	.060	●
OR3EC-SQ0500-090	1/2	1/2	1.1/4	3	.090	●

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Corner Radius	UK20 Uncoated
OR3EC-SQ0500-120	1/2	1/2	1.1/4	3	.120	●
OR3LC-SQ0500	1/2	1/2	2	4	---	●
OR3LC-SQ0500-030	1/2	1/2	2	4	.030	●
OR3LC-SQ0500-060	1/2	1/2	2	4	.060	●
OR3RC-SQ0625	5/8	5/8	1.1/4	3.1/2	---	●
OR3RC-SQ0625-030	5/8	5/8	1.1/4	3.1/2	.030	●
OR3RC-SQ0625-060	5/8	5/8	1.1/4	3.1/2	.060	●
OR3EC-SQ0625	5/8	5/8	1.5/8	3.1/2	---	●
OR3EC-SQ0625-030	5/8	5/8	1.5/8	3.1/2	.030	●
OR3EC-SQ0625-060	5/8	5/8	1.5/8	3.1/2	.060	●
OR3LC-SQ0625	5/8	5/8	2	4	---	●
OR3LC-SQ0625-030	5/8	5/8	2	4	.030	●
OR3LC-SQ0625-060	5/8	5/8	2	4	.060	●
OR3RC-SQ0750	3/4	3/4	1.1/2	4	---	●
OR3RC-SQ0750-030	3/4	3/4	1.1/2	4	.030	●
OR3RC-SQ0750-060	3/4	3/4	1.1/2	4	.060	●
OR3RC-SQ0750-090	3/4	3/4	1.1/2	4	.090	●
OR3RC-SQ0750-120	3/4	3/4	1.1/2	4	.120	●
OR3EC-SQ0750	3/4	3/4	1.3/4	4	---	●
OR3EC-SQ0750-030	3/4	3/4	1.3/4	4	.030	●
OR3EC-SQ0750-060	3/4	3/4	1.3/4	4	.060	●
OR3LC-SQ0750	3/4	3/4	3	6	---	●
OR3LC-SQ0750-030	3/4	3/4	3	6	.030	●
OR3LC-SQ0750-060	3/4	3/4	3	6	.060	●
OR3RC-SQ1000	1	1	1.1/2	4	---	●
OR3RC-SQ1000-030	1	1	1.1/2	4	.030	●
OR3RC-SQ1000-060	1	1	1.1/2	4	.060	●
OR3RC-SQ1000-090	1	1	1.1/2	4	.090	●
OR3RC-SQ1000-120	1	1	1.1/2	4	.120	●
OR3EC-SQ1000	1	1	2	4.1/2	---	●
OR3EC-SQ1000-030	1	1	2	4.1/2	.030	●
OR3EC-SQ1000-060	1	1	2	4.1/2	.060	●
OR3LC-SQ1000	1	1	3	6	---	●
OR3LC-SQ1000-030	1	1	3	6	.030	●
OR3LC-SQ1000-060	1	1	3	6	.060	●

ORION 2 & 3 Flute Ball Nose End Mills

The unique design characteristics of the ORION End Mills provide exceptional performance & outstanding tool life. These end mills are available as uncoated UK20 or with a Zirconium or DLC coating on request.

- Highly polished design
- 3 Flute end mill has differential pitch
- Premium Micro-Grain Carbide
- Special Diameters or lengths available on request

MADE IN CANADA
FABRIQUÉ AU CANADA

ORION 2 Flute Ball Nose End Mills

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Corner Radius	UK20 Uncoated
OR2RC-BN0250	1/4	1/4	3/4	2.1/2	.125	●
OR2RC-BN0312	5/16	5/16	13/16	2.1/2	.156	●
OR2RC-BN0375	3/8	3/8	3/4	2.1/2	.188	●
OR2EC-BN0500	1/2	1/2	1.1/4	3	-	●
OR2RC-BN0625	5/8	5/8	1.1/4	3.1/2	.313	●
OR2RC-BN0750	3/4	3/4	1.1/2	4	.375	●

ORION 3 Flute Ball Nose End Mills

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Corner Radius	UK20 Uncoated
OR3RC-BN0250	1/4	1/4	3/4	2.1/2	.125	●
OR3RC-BN0312	5/16	5/16	13/16	2.1/2	.156	●
OR3RC-BN0375	3/8	3/8	3/4	2.1/2	.188	●
OR3EC-BN0500	1/2	1/2	1.1/4	3	.250	●
OR3RC-BN0625	5/8	5/8	1.1/4	3.1/2	.313	●
OR3RC-BN0750	3/4	3/4	1.1/2	4	.375	●

Recommended Cutting Parameters		Application			Uncoated UK20	Cutting Speed (Vc) Maximum Feed per Tooth for Side Milling Operations* Cutting Diameter						
		Side Milling		Slotting								
		Axial Depth	Radial Depth	Max. Axial Depth								
Tool Series	Material	ap	ae	ap	SFM	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"
ORION	Aluminum Alloys	1.5 x D	0.5 x D	1 x D	1000 - 2000 SFM	.0023 - .0043	.0028 - .0055	.0034 - .006	.0045 - .008	.0056 - .0095	.0068 - .011	.0090 - .013
	Aluminum with High Silicon	1.5 x D	0.5 x D	1 x D	700 - 2000 SFM	.0018 - .0043	.0023 - .0050	.0027 - .0052	.0036 - .0061	.0045 - .0075	.0054 - .0081	.0072 - .0110
	other Non-Ferrous materials	1.5 x D	0.5 x D	1 x D	750 - 1500 SFM	.0018 - .0043	.0023 - .0050	.0027 - .0052	.0036 - .0061	.0045 - .0075	.0054 - .0081	.0072 - .0110

* Feed per tooth in slotting applications should not exceed 80% of feed per tooth for side milling

PLOR 3 Flute End Mills for Aluminum

The re-engineered 3 flute TyCarb Orion PLOR series takes a significant leap forward in cutter performance in aluminum and non-ferrous materials. The unique design characteristics incorporates center cutting of all three flutes directly to the center-point of the tools (both end mill and ball nose) which expands application versatility to plunging, ramping, and even drilling. The revised tools improve feed rates, overall cutter balance at high spindle speeds and lower cutting forces versus traditionally designed 3 flute end mills. The square corner end mills also incorporate an improved dish for increased ramping angles. The combined performance gains of the improved design simply translates into better workpiece finishes and enhanced machine spindle life.

- Highly Polished 3 flute design for Aluminum and Non Ferrous materials
- Balanced 3 flute to center design for improved ramping & drilling applications
- Differential pitch for vibration free machining
- Available as Square end or Ball Nose design
- Special diameters or lengths available on request
- Premium Micro-Grain carbide
- These end mills are available with a Zirconium or DLC coating on request

MADE IN CANADA
FABRIQUÉ AU CANADA

ORION 3 Flute Balanced Center Cut Square End

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Corner Radius	UK20 Uncoated
PLOR3RC-SQ0250	1/4	1/4	3/4	2.1/2	-	●
PLOR3RC-SQ0312	5/16	5/16	13/16	2.1/2	-	●
PLOR3RC-SQ0375	3/8	3/8	3/4	2.1/2	-	●
PLOR3EC-SQ0500	1/2	1/2	1.1/4	3	-	●
PLOR3RC-SQ0625	5/8	5/8	1.1/4	3.1/2	-	●
PLOR3RC-SQ0750	3/4	3/4	1.1/2	4	-	●

ORION 3 Flute Balanced Center Cut Ball Nose

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Corner Radius	UK20 Uncoated
PLOR3RC-BN0250	1/4	1/4	3/4	2.1/2	.125	●
PLOR3RC-BN0312	5/16	5/16	13/16	2.1/2	.156	●
PLOR3RC-BN0375	3/8	3/8	3/4	2.1/2	.188	●
PLOR3EC-BN0500	1/2	1/2	1.1/4	3	.250	●
PLOR3RC-BN0625	5/8	5/8	1.1/4	3.1/2	.313	●
PLOR3RC-BN0750	3/4	3/4	1.1/2	4	.375	●

ORION 3 Flute Metric Square End

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Corner Radius	UK20 Uncoated
PLOR3EC-SQ06MM	6	6	20	64	-	●
PLOR3EC-SQ08MM	8	8	20	64	-	●
PLOR3EC-SQ10MM	10	10	28	76	-	●
PLOR3EC-SQ12MM	12	12	32	76	-	●
PLOR3EC-SQ16MM	16	16	38	89	-	●

ORION 3 Flute Metric Ball Nose

Designation	Cutter Dia.	Shank Dia.	Length of Cut	OAL	Corner Radius	UK20 Uncoated
PLOR3EC-BN06MM	6	6	20	64	3.0	●
PLOR3EC-BN08MM	8	8	20	64	4.0	●
PLOR3EC-BN10MM	10	10	28	76	5.0	●
PLOR3EC-BN12MM	12	12	32	76	6.0	●
PLOR3EC-BN16MM	16	16	38	89	8.0	●

High Feed End Mills

- TyCarb High Feed end mills are designed for roughing to semi-finishing applications
- Significantly reduces machining time in hardened materials
- TyCarb High Feed end mills are capable of feed rates up to .029 IPT
- Effective for Z axis machining including pocketing, face milling, helical ramping as well as circular interpolation
- Now available with next generation AlCrN PVD coating
- Excellent in long reach applications
- Machining of hardened steels < 54 Rc

High Feed End Mills

Designation	Cutter Dia.	Shank Dia.	Rtheo	Uncut	Max ap	OAL	Lgth Below Shank	Neck Dia.	Flutes	TL30 Coated
HF4RC-DR0250-034	1/4	1/4	.034	.006	.013	2.50	.750	.210	4	●
HF4RC-DR0312-042	5/16	5/16	.042	.008	.017	3.00	1.00	.270	4	●
HF4RC-DR0375-051	3/8	3/8	.051	.010	.020	3.50	1.25	.340	4	●
HF4RC-DR0500-070	1/2	1/2	.070	.013	.028	4.00	1.50	.460	4	●
HF4RC-DR0625-085	5/8	5/8	.085	.016	.033	4.00	1.50	.590	4	●
HF5RC-DR0625-085	5/8	5/8	.085	.016	.033	4.00	1.50	.590	5	●
HF5RC-DR0750-100	3/4	3/4	.100	.019	.040	5.00	2.00	.710	5	●

High Feed End Mills - Technical Programming Information

Cutter Dia. Inch	Max. ap	Rtheo	Shoulder	RCN	Material Uncut	Circular Interpolation		Length of travel to max ap per deg.		
						Smallest	Largest	deg.	2 deg.	3 deg.
1/4	.013	.034	.020	.064	.006	.378	.500	.762	.381	.254
5/16	.017	.042	.024	.080	.008	.472	.625	.953	.476	.317
3/8	.020	.051	.030	.096	.010	.567	.750	1.143	.572	.381
1/2	.027	.070	.040	.126	.013	.752	1.000	1.525	.762	.508
5/8	.033	.085	.049	.160	.016	.945	1.250	1.906	.953	.635
3/4	.040	.100	.059	.192	.019	1.134	1.500	2.287	1.143	.762
All dimensions are shown in inch						Feed % Reduction:		100%	70%	50%

High Feed End Mill Recommended Cutting Parameters

Work Material	Axial DOC	Radial DOC	Speed		Feed (Inches Per Tooth)					
			Min.	Max.	1/4	5/16	3/8	1/2	5/8	3/4
Medium Carbon Steels <= 38 Rc 4140, 4340	.05 x D	.50 x D	500	650	.010 - .014	.012 - .016	.016 - .020	.020 - .025	.022 - .027	.024 - .029
Tool and Die Steels <= 38 Rc A2, D2, 01, S7, P20, H13	.05 x D	.50 x D	480	600	.010 - .014	.012 - .016	.016 - .020	.020 - .025	.022 - .027	.024 - .029
Tool Steels 39 Rc to 48 Rc	.05 x D	.50 x D	375	525	.006 - .010	.008 - .012	.012 - .014	.016 - .020	.017 - .022	.018 - .024
Easy to machine stainless steel 416, 410, PH Stainless	.05 x D	.50 x D	250	375	.006 - .010	.008 - .012	.012 - .014	.016 - .020	.017 - .022	.018 - .024
Hardened Tool Steels 48 - 53 Rc	.05 x D	.50 x D	350	500	.008 - .012	.010 - .014	.014 - .018	.018 - .022	.020 - .024	.020 - .027

Chamfer Tools

- CH2 – 2 Flute Chamfer Mill –Sharp Point
- Designed for all Materials
- Premium Micro Grain Carbide
- Superior TiAlN PVD Coating
- Available with 60°, 90° or 120° included angles

- CH4 – 4 Flute Chamfer Mill
- Defined Tip Dia. of .040, .060 or .080"
- Premium Micro Grain Carbide
- Superior TiAlN PVD Coating
- Available with 60° or 90° included Angles

CH2RC - 2 Flute Chamfer Tools

Designation	Angle	Dia.	Flute Lgth	OAL	TL25
CH2RC-0250-A60	60	1/4	3/8	2.1/2	●
CH2RC-0375-A60	60	3/8	1/2	2.1/2	●
CH2RC-0500-A60	60	1/2	5/8	3	●
CH2RC-0187-A90	90	3/16	3/8	2	●
CH2RC-0250-A90	90	1/4	3/8	2.1/2	●
CH2RC-0312-A90	90	5/16	3/8	2.1/2	●
CH2RC-0375-A90	90	3/8	1/2	2.1/2	●
CH2RC-0500-A90	90	1/2	5/8	3	●
CH2RC-0250-A120	120	1/4	3/8	2.1/2	●
CH2RC-0375-A120	120	3/8	1/2	2.1/2	●
CH2RC-0500-A120	120	1/2	5/8	3	●

CH4RC - 4 Flute Chamfer Tools

Designation	Angle	Dia.	Tip Dia.	Flute Lgth	OAL	TL25
CH4RC-0187-A60-040	60	3/16	.040	3/16	2.1/2	●
CH4RC-0250-A60-060	60	1/4	.060	1/4	2.1/2	●
CH4RC-0312-A60-060	60	5/16	.060	5/16	2.1/2	●
CH4RC-0375-A60-060	60	3/8	.060	3/8	2.1/2	●
CH4RC-0500-A60-080	60	1/2	.080	1/2	3	●
CH4RC-0187-A90-040	90	3/16	.040	3/16	2.1/2	●
CH4RC-0250-A90-060	90	1/4	.060	1/4	2.1/2	●
CH4RC-0312-A90-060	90	5/16	.060	5/16	2.1/2	●
CH4RC-0375-A90-060	90	3/8	.060	3/8	2.1/2	●
CH4RC-0500-A90-080	90	1/2	.080	1/2	3	●

Chamfer Tools Recommended Cutting Parameters

Work Material	Cutting Speed (SFM)		Feed per Flute				
	Min	Max	3/16	1/4	5/16	3/8	1/2
Low Carbon Steels < 38 Rc 1018, 12L14, 8620	385	520	.0008	.0013	.0020	.0023	.0030
Medium & High Carbon Carbon Steels <35 Rc 1045, 1050, 1525, 1545	360	500	.0008	.0013	.0020	.0023	.0030
Alloy Steels & Tool Steels <35 Rc 4000 series, 5000 series P20, H13, A2, D2	320	420	.0008	.0013	.0020	.0023	.0030
Martensitic & Ferritic Stainless Steels <35 Rc 13-8 PH, 15-5 PH, 17-4 PH, 400 & 500 series	160	260	.0008	.0013	.0020	.0023	.0030
Austenitic Stainless Steels 200 Series, 304, 304L, 309	250	300	.0008	.0013	.0020	.0023	.0030
High Strength Stainless Steels 310, 316, 316L	160	210	.0008	.0013	.0020	.0023	.0030
Duplex Stainless Steels F55, 323, 2205	160	195	.0008	.0013	.0020	.0023	.0030
Gray Cast Iron GG15, GG25, GG30, GG40	315	400	.0008	.0013	.0020	.0023	.0030
Low to Medium Strength Ductile Cast Iron GGG40, GTS35	290	370	.0008	.0013	.0020	.0023	.0030
High Strength Ductile Iron GGG60, GTW55, GTS65	265	345	.0008	.0013	.0020	.0023	.0030
Titanium Alloys	120	160	.0008	.0013	.0020	.0023	.0030
High Temperature Alloys Inconel, Haynes, Stellite, Hastalloy	100	150	.0008	.0013	.0020	.0023	.0030

Notes: When machining 2 sides at the same time reduce feed per flute by 20%
When plunging reduce feed per flute 30% - 40%

TP4 Tapered End Mills (For prepping holes for NPT tapping)

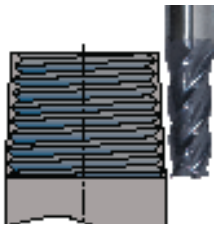
Used for milling the workpiece in preparation of the thread milling or tapping operation of NPT type threads.

Advantages:

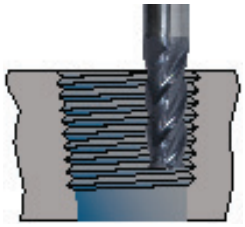
- Increases the tool life of thread milling cutters, indexable inserts or NPT type taps
- Equal and uniform load along the cutting edge of the thread mill cutter
- Shorter machining time during the thread mill operation, due to the preparation of the workpiece

Solid Carbide Tapered End Mills

Designation	Shank Dia.	Tip Dia.	Flute Length	OAL	No. of Flutes	Thread Size	TL25
Standard Length							
TP4RC-SQ0375	3/8	.32	.95	3.0	4	NPT 1/8" - 1" NPTF 1/8" - 1" BSPT 1/8" - 1"	●
TP4RC-SQ0500	1/2	.42	1.26	3.5	4	NPT 1/4" - 3" NPTF 1/4" - 3" BSPT 1/4" - 3"	●
Extended Length							
TP4LC-SQ0500	1/2	.42	1.26	6.0	4	NPT 1/4" - 3" NPTF 1/4" - 3" BSPT 1/4" - 3"	●



External Preparation



Internal Preparation

Solid Carbide End Mills Recommended Cutting Parameters

Work Material	Cutting Speed (SFM)		Feed per Flute	
	Min	Max	3/8	1/2
Low Carbon Steels < 38 Rc 1018, 12L14, 8620	385	520	.0026	.0033
Medium & High Carbon Carbon Steels <35 Rc 1045, 1050, 1525, 1545	360	500	.0026	.0033
Alloy Steels & Tool Steels <35 Rc 4000 series, 5000 series P20, H13, A2, D2	320	420	.0022	.0028
Martensitic & Ferritic Stainless Steels <35 Rc 13-8 PH, 15-5 PH, 17-4 PH, 400 & 500 series	160	260	.0017	.0022
Austenitic Stainless Steels 200 Series, 304, 304L, 309	250	300	.0022	.0028
High Strength Stainless Steels 310, 316, 316L	160	210	.0018	.0022
Duplex Stainless Steels F55, 323, 2205	160	195	.0014	.0018
Gray Cast Iron GG15, GG25, GG30, GG40	315	400	.0026	.0033
Low to Medium Strength Ductile Cast Iron GGG40, GTS35	290	370	.0022	.0028
High Strength Ductile Iron GGG60, GTW55, GTS65	265	345	.0017	.0022
Titanium Alloys	120	160	.0016	.0020
High Temperature Alloys Inconel, Haynes, Stellite, Hastalloy	100	150	.0016	.0020

Notes: When using TP4LC-SQ0500 reduce above feed rates by 20%

Drill Mills

Drill Mills provide versatility in multiple applications. These tools can be applied on carbon & alloy steels as well as Stainless Steels, cast iron and non-ferrous materials. Operations that can be performed with these tools include:

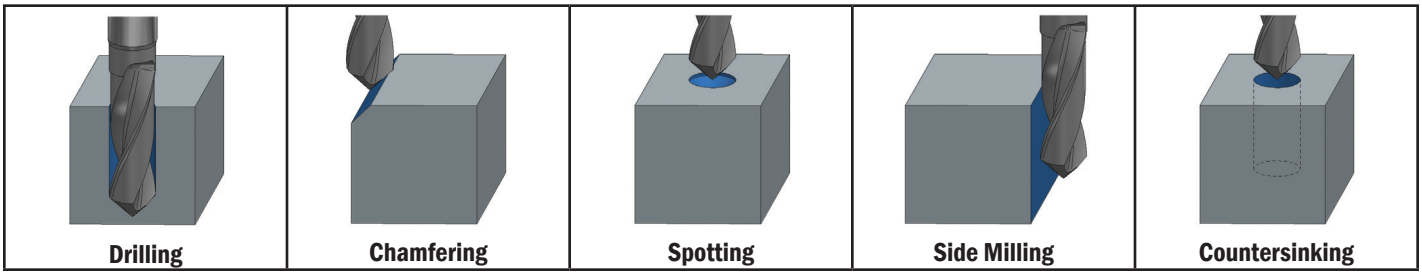
- Drilling
- Chamfering
- Spot Drilling
- Side Milling
- Countersinking

Drill Mill- 2 Flute 90°

Designation	Angle	Dia.	Shank	LOC	OAL	TL25
DRM2RC-DP0125-A90	90°	1/8	1/8	3/16	1.1/2	●
DRM2RC-DP0187-A90	90°	3/16	3/16	5/8	2	●
DRM2RC-DP0250-A90	90°	1/4	1/4	3/4	2.1/2	●
DRM2RC-DP0312-A90	90°	5/16	5/16	13/16	2.1/2	●
DRM2RC-DP0375-A90	90°	3/8	3/8	1	2.1/2	●
DRM2RC-DP0437-A90	90°	7/16	7/16	1	2.3/4	●
DRM2RC-DP0500-A90	90°	1/2	1/2	1	3	●

Drill Mill- 2 Flute 120°

Designation	Angle	Dia.	Shank	LOC	OAL	TL25
DRM2RC-DP0125-A120	120°	1/8	1/8	3/16	1.1/2	●
DRM2RC-DP0187-A120	120°	3/16	3/16	5/8	2	●
DRM2RC-DP0250-A120	120°	1/4	1/4	3/4	2.1/2	●
DRM2RC-DP0312-A120	120°	5/16	5/16	13/16	2.1/2	●
DRM2RC-DP0375-A120	120°	3/8	3/8	1	2.1/2	●
DRM2RC-DP0437-A120	120°	7/16	7/16	1	2.3/4	●
DRM2RC-DP0500-A120	120°	1/2	1/2	1	3	●



Drilling | Chamfering | Spotting | Side Milling | Countersinking

Drill Mills Recommended Cutting Parameters

Work Material	Type of Cut	Cutting Speed (SFM)		Feed per Rev (Drilling) Feed per flute (Milling)					
		Min.	Max.	1/8	3/16	1/4	5/16	3/8	1/2
Low Carbon Steels < 38 Rc 1018, 12L14, 8620	Drilling Milling	175	200	.0020 .0007	.0030 .0010	.0040 .0013	.0060 .0017	.0080 .0021	.0100 .0026
Medium & High Carbon Carbon Steels <35 Rc 1045, 1050, 1525, 1545	Drilling Milling	160	190	.0020 .0007	.0030 .0010	.0040 .0013	.0060 .0017	.0080 .0021	.0100 .0026
Alloy Steels & Tool Steels <35 Rc 4000 series, 5000 series P20, H13, A2, D2	Drilling Milling	150	175	.0015 .0006	.0025 .0008	.0030 .0011	.0045 .0014	.0060 .0017	.0080 .0022
Martensitic & Ferritic Stainless Steels <35 Rc 13-8 PH, 15-5 PH, 17-4 PH, 400 & 500 series	Drilling Milling	130	160	.0015 .0006	.0025 .0008	.0030 .0011	.0045 .0014	.0060 .0017	.0080 .0022
Austenitic Stainless Steels 200 Series, 304, 304L, 309	Drilling Milling	125	140	.0010 .0006	.0020 .0008	.0027 .0011	.0040 .0014	.0044 .0017	.0050 .0022
High Strength Stainless Steels 310, 316, 316L	Drilling Milling	125	140	.0010 .0005	.0020 .0007	.0027 .0010	.0040 .0014	.0044 .0016	.0050 .0018
Gray Cast Iron GG15, GG25, GG30, GG40	Drilling Milling	175	200	.0030 .0007	.0040 .0010	.0055 .0013	.0070 .0017	.0085 .0021	.0110 .0026
Low to Medium Strength Ductile Cast Iron GGG40, GTS35	Drilling Milling	150	175	.0020 .0006	.0035 .0008	.0050 .0011	.0060 .0015	.0075 .0018	.0100 .0022
Aluminum Alloy	Drilling Milling	300	350	.0030 .0010	.0040 .0013	.0060 .0018	.0075 .0023	.0090 .0030	.0110 .0035

Spotting Drills

Used for drilling spotting holes for High Performance drills in most steels, including stainless as well as cast iron and high temp alloys. The 145° point angle prevents damage to the corners of the follow-up drill.

- 2 Flute, Right Hand Spiral, Right-Hand Cut
- 145° Point
- Short Length
- TiAlN coated standard, additional coatings on request

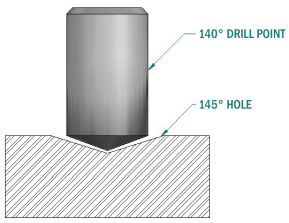
145° Spotting Drills

Designation	Dia.	Shank	LOC	OAL	Radius	TL25
SD2RC-DP0125-A145	1/8	1/8	3/8	2.1/2	-	●
SD2RC-DP0250-A145	1/4	1/4	1/2	2.1/2	-	●
SD2RC-DP0375-A145	3/8	3/8	3/4	2.1/2	-	●
SD2RC-DP0500-A145	1/2	1/2	1	3	-	●
SD2RC-DP0750-A145	3/4	3/4	1.1/2	4	-	●

Features:

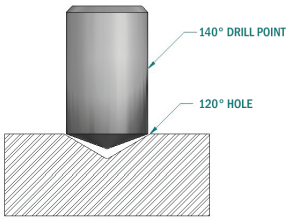
- 145° point angle creates a wider spotting hole
- Full contact & centering of the following drill eliminates chipping of the drill corners & improves accuracy
- Premium TiAlN coating results in improved tool life
- Improves wear pattern on following drill and increases tool life

CORRECT



TyCarb spot drills with a 145° point assures the best possible positioning in the hole allowing increased edge protection as well as improved accuracy for the following drill.

NOT CORRECT



Spot drills using 90° or 120° points can cause problems in carbide drilling. The corners of the follow-up drill hits the workpiece material first creating premature wear & chipping.

Spotting Drill Recommended Cutting Parameters

Work Material	Speed (SFM)	Feed (Inches Per Rev)				
		1/8	1/4	3/8	1/2	3/4
Low Carbon Steels <= 38 Rc 1018, 12L14, 8620	325	.0025	.0040	.0070	.0090	.0110
Medium Carbon Steels <= 48 Rc 4140, 4340	300	.0020	.0035	.0055	.0070	.0090
Tool and Die Steels <= 48 Rc A2, D2, O1, S7, P20, H13	275	.0020	.0035	.0055	.0070	.0090
Martensitic & Ferritic Stainless Steels 416, 410, 302, 303	300	.0023	.0037	.0060	.0080	.0097
Austenitic Stainless Steels 304, 316, Invar, Kovar	300	.0017	.0030	.0048	.0060	.0070
Precipitation Hardening Stainless Steel 17-4 PH, 15-5 PH, 13-8 PH	220	.0015	.0027	.0045	.0057	.0068
Gray Cast Iron GG15, GG25, GG30, GG40	475	.0057	.0095	.0160	.0200	.0240
Low to Medium Strength Ductile Cast Iron GGG40, GTS35	430	.0035	.0038	.0064	.0080	.0097
High Strength Ductile Iron GGG60, GTW55, GTS65	325	.0023	.0038	.0064	.0080	.0097
Titanium Alloys	140	.0017	.0029	.0048	.0060	.0075
High Temperature Alloys Inconel, Haynes, Stellite, Hastalloy	80	.0012	.0019	.0030	.0040	.0050

Custom Quote Request

Company: _____ Contact Name: _____

Address: _____ E-mail Address: _____

City: _____ P/Code: _____ Tel. No.: _____

Proposed Tool Designation: _____ Quantity: _____

End Mill Dia.: _____ Shank Dia.: _____ Overall Length: _____

Length of Cut: _____ Neck Dia.: _____ Neck Length: _____

No. of Flutes: _____ Helix Angle: _____ R/H or L/H: _____

End Type: Center Cutting: _____ Non-Center Cutting: _____

End Feature: Square End: _____ Ball End: _____ Corner Rad.: _____ Corner Chamfer: _____

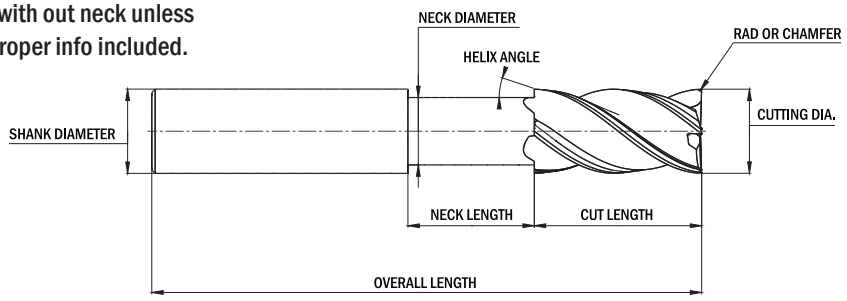
Shank Type: Cylindrical: _____ Weldon: _____ Whistle Notch: _____ Other: _____

Coating: Uncoated: _____ TiAlN: _____ AlCrN: _____ DLC: _____ Other: _____

Material Being Machined: _____ Condition: _____ Hardness: _____

Additional Information: _____

Note! End mills are supplied with out neck unless requested by customer and proper info included.



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