

**HIGH PERFORMANCE
SOLID CARBIDE
CUTTING TOOLS**

GARR TOOL[®]



CATALOG 12

*complete product line
containing several new series
including mini-drills, reamers,
V-series end mills, and drill mills!*



*F*or over sixty-five years, Garr Tool Company has committed to manufacturing the highest quality carbide cutting tools possible, offering competitive prices and providing unequalled customer service.

Our 180,000 square foot facility contains clean, efficient production space and houses state-of-the-art CNC grinding equipment run by conscientious operators. We have dedicated 45,000 square feet of our manufacturing center to the production of solid carbide drills. We have also partnered with Oerlikon Balzers Coating USA to house a coating operations center in our facility. We will continue investing in new technology to meet the future needs of our customers.

We earned our reputation of having fast, reliable deliveries, and we will continue to earn your trust through fast, reliable service. Our standard catalog items are shipped from stock within 24 hours at a 99% fill rate. Garr continues to introduce new series of standard tools to meet the demands of material specific machining. We also take pride in delivering special tools quoted to customer specification within two weeks. Our website, www.garrtool.com, enhances the level of customer service you have come to expect from us.

Our international network of distributors, as well as each of us at Garr Tool, looks forward to servicing your solid carbide round tooling requirements.

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1580HD	2 Flute	3xD	30° Helix	HELICA Coated	18
1580H	2 Flute	3xD	30° Helix	HARDLUBE Coated	21
1580KH	2 Flute	3xD	30° Helix	Coolant Fed - HELICA Coated	24
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1510	2 Flute	3xD	15° Helix		50
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1120	3 Flute	3xD	25° Helix		62
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1205	2 Flute	5xD	25° Helix		66
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142B	2 Flute	Ball	41° Helix	ALUMASTAR Coated	108
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253MA/853MA	3 Flute	Square	50° Helix	X.CEED Coated	114
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253MC	3 Flute	Square	50° Helix	TiCN Coated	118
263M/863M	3 Flute	Square	60° Helix		119
263MC	3 Flute	Square	60° Helix	TiCN Coated	119
263MA/863MA	3 Flute	Square	60° Helix	X.CEED Coated	119
255MA/855MA	5 Flute	Square	45° Helix	X.CEED Coated	120
255M/855M	5 Flute	Square	45° Helix		122
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545RA	4/5 Flute	Radius	45° Helix	X.CEED Coated	143
545BA	4/5 Flute	Ball	45° Helix	X.CEED Coated	144
350MX/950MX	2 Flute	Ball	15° Helix	X.CEED Coated	145
210D	4 Flute	Square	30° Helix	DIAMOND Coated	146
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160MA/860MA	2 Flute	Square	30° Helix	TiALN Coated	153
170MA/870MA	4 Flute	Square	30° Helix	TiALN Coated	153
180M/980M	2 Flute	Ball	30° Helix		154
190M/990M	4 Flute	Ball	30° Helix		154
180MA/980MA	2 Flute	Ball	30° Helix	TiALN Coated	155
190MA/990MA	4 Flute	Ball	30° Helix	TiALN Coated	155
165M/865M	2 Flute	Square	30° Helix	Double End	156
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195M/995M	4 Flute	Ball	30° Helix	Double End	158
185MA/985MA	2 Flute	Ball	30° Helix	Double End - TiALN Coated	159
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223M/823M	3 Flute	Square	30° Helix			160
230M/830M	4 Flute	Square	30° Helix			160
220MT	2 Flute	Square	30° Helix	TiN Coated		162
230MT	4 Flute	Square	30° Helix	TiN Coated		162
220MC	2 Flute	Square	30° Helix	TiCN Coated		163
223MC	3 Flute	Square	30° Helix	TiCN Coated		163
230MC	4 Flute	Square	30° Helix	TiCN Coated		163
220MA/820MA	2 Flute	Square	30° Helix	TiALN Coated		164
223MA/823MA	3 Flute	Square	30° Helix	TiALN Coated		164
230MA/830MA	4 Flute	Square	30° Helix	TiALN Coated		164
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230R	4 Flute	Radius	30° Helix			166
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323M/923M	3 Flute	Ball	30° Helix			171
330M/930M	4 Flute	Ball	30° Helix			171
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330MT	4 Flute	Ball	30° Helix	TiN Coated		173
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535MA	4 Flute	Ball	30° Helix	Double End/3/8" Shank/TiALN		181
420M	2 Flute	Square	30° Helix	Double End		182
430M/450M	4 Flute	Square	30° Helix	Double End		182
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430MA/450MA	4 Flute	Square	30° Helix	Double End/TiALN Coated		183
520M	2 Flute	Ball	30° Helix	Double End		184
530M	4 Flute	Ball	30° Helix	Double End		184
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620MA/640MA	2 Flute	Square	30° Helix	TiALN Coated		189
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723MC	3 Flute	Ball	30° Helix	TiCN Coated		199
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720MA/740MA	2 Flute	Ball	30° Helix	TiALN Coated		200
723MA/743MA	3 Flute	Ball	30° Helix	TiALN Coated		200
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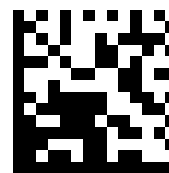
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GARR TOOL®














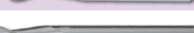
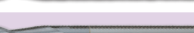
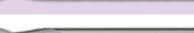



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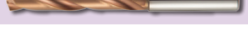
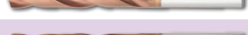
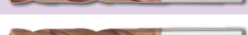




DRILLS

SERIES	PAGE	COATING	DESCRIPTION
1180 	14	ALUMASTAR	Jobber length, 3 flute, High performance
1520 	56	BRIGHT	Stub length, 2 flute, General purpose
1520H 	59	HARDLUBE	Stub length, 2 flute, General purpose
1205 	66	BRIGHT	Jobber length, 2 flute, General purpose
1205H 	69	HARDLUBE	Jobber length, 2 flute, General purpose
1800H 	82	HARDLUBE	Taper length, 2 flute, Parabolic







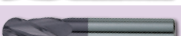





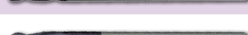



END MILLS

SERIES	PAGE	COATING	DESCRIPTION
143M 	109	ALUMASTAR	High velocity, 3 flute, High metal removal rate
143R 	111	ALUMASTAR	High velocity, 3 flute, High metal removal rate, Corner radius
142M 	106	ALUMASTAR	High velocity, 2 flute, High metal removal rate
142B 	108	ALUMASTAR	High velocity, 2 flute, High metal removal rate
242M / 842M 	113	BRIGHT	High performance, 2 flute, For 4000-8000 RPM
253M / 853M 	116	BRIGHT	High performance, 3 flute, Profiling and finishing
253MC 	118	TiCN	High performance, 3 flute, Profiling and finishing
160M / 860M 	151	BRIGHT	Stub length, 2 flute, General purpose
180M / 980M 	154	BRIGHT	Stub length, 2 flute, General purpose
220M / 820M 	160	BRIGHT	Standard length, 2 flute, General purpose
220MC 	163	TiCN	Standard length, 2 flute, General purpose
320M / 920M 	171	BRIGHT	Standard length, 2 flute, General purpose
320MC 	174	TiCN	Standard length, 2 flute, General purpose
620M / 640M 	186	BRIGHT	Extra length, 2 flute, General purpose
620MC 	188	TiCN	Extra length, 2 flute, General purpose
720M / 740M 	197	BRIGHT	Extra length, 2 flute, General purpose
720MC 	199	TiCN	Extra length, 2 flute, General purpose





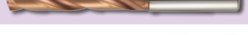
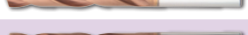
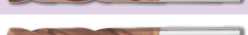
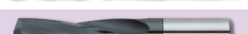



DRILLS

SERIES	PAGE	COATING	DESCRIPTION
1580HD 	18	HELICA	Stub length, 2 flute, High performance, Common shank
1580H 	21	HARDLUBE	Stub length, 2 flute, High performance
1280H 	31	HARDLUBE	Jobber length, 2 flute, High performance
1580KD 	26	HELICA	Stub length, 2 flute, High performance, Coolant fed, Common shank
1280KD 	36	HELICA	Jobber length, 2 flute, High performance, Coolant fed, Common shank
1580KH 	24	HELICA	Stub length, 2 flute, High performance, Coolant fed
1280KH 	34	HELICA	Jobber length, 2 flute, High performance, Coolant fed
1880KH 	39	HELICA	Taper length, 2 flute, High performance, Coolant fed
1520H 	59	HARDLUBE	Stub length, 2 flute, General purpose
1205H 	69	HARDLUBE	Jobber length, 2 flute, General Purpose
1180 	14	ALUMASTAR	Jobber length, 3 flute, High performance




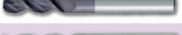
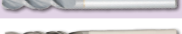

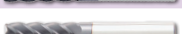





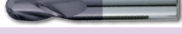

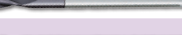
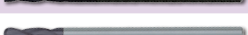
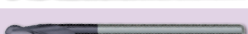



END MILLS

SERIES	PAGE	COATING	DESCRIPTION
V4 	129	AlCrN	High performance, 4 flute, Variable helix
V5 	133	AlCrN	High performance, 5 flute, Variable helix
VRX 	136	X.CEED	High performance, 4 flute, Variable flute rougher/finisher,
253MA / 853MA 	114	X.CEED	High performance, 3 flute, Profiling and finishing
255MA / 855MA 	120	X.CEED	High performance, 5 flute
255RA / 855RA 	125	X.CEED	High performance, 5 flute, Corner radius
242M / 842M 	113	BRIGHT	High performance, 2 flute, For 4000-8000 RPM
170MA / 870MA 	153	FUTURA	Stub length, 4 flute, General purpose
190MA / 990MA 	155	FUTURA	Stub length, 4 flute, General purpose
223MA / 823MA 	164	FUTURA	Standard length, 3 flute, General purpose
230MA / 830MA 	164	FUTURA	Standard length, 4 flute, General purpose
230RA / 830RA 	168	FUTURA	Standard length, 4 flute, General purpose, Corner radius
323MA / 923MA 	175	FUTURA	Standard length, 3 flute, General purpose
330MA / 930MA 	175	FUTURA	Standard length, 4 flute, General purpose
623MA / 643MA 	189	FUTURA	Extra length, 3 flute, General purpose
630MA / 650MA 	189	FUTURA	Extra length, 4 flute, General purpose
630RA 	194	FUTURA	Extra length, 4 flute, General purpose, Corner radius
723MA / 743MA 	200	FUTURA	Extra length, 3 flute, General purpose
730MA / 750MA 	200	FUTURA	Extra length, 4 flute, General purpose

DRILLS

SERIES	PAGE	COATING	DESCRIPTION
1580HD 	18	HELICA	Stub length, 2 flute, High performance, Common shank
1580H 	21	HARDLUBE	Stub length, 2 flute, High performance
1280H 	31	HARDLUBE	Jobber length, 2 flute, High performance
1580KD 	26	HELICA	Stub length, 2 flute, High performance, Coolant fed, Common shank
1280KD 	36	HELICA	Jobber length, 2 flute, High performance, Coolant fed, Common shank
1580KH 	24	HELICA	Stub length, 2 flute, High performance, Coolant fed
1280KH 	34	HELICA	Jobber length, 2 flute, High performance, Coolant fed
1880KH 	39	HELICA	Taper length, 2 flute, High performance, Coolant fed
1510H 	53	HARDLUBE	Stub length, 2 flute, 15° helix, General purpose
1520H 	59	HARDLUBE	Stub length, 2 flute, General purpose
1205H 	69	HARDLUBE	Jobber length, 2 flute, General Purpose

END MILLS




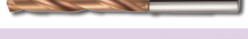
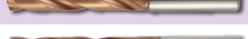
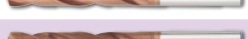
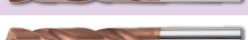






SERIES	PAGE	COATING	DESCRIPTION
V4 	129	AlCrN	High performance, 4 flute, Variable helix
VRX 	136	X.CEED	High performance, 4 flute, Variable flute rougher/finisher
VHM 	128	X.CEED	High performance, 4 flute, Variable flute hog mill rougher
253MA / 853MA 	114	X.CEED	High performance, 3 flute, Profiling and finishing
253MC 	118	TiCN	First choice for 304/304L, High performance, 3 flute, Profiling and finishing
V5 	133	AlCrN	High performance, 5 flute, Variable helix
255MA / 855MA 	120	X.CEED	High performance, 5 flute
255RA / 855RA 	125	X.CEED	High performance, 5 flute, Corner radius
170MA / 870MA 	153	FUTURA	Stub length, 4 flute, General purpose
190MA / 990MA 	155	FUTURA	Stub length, 4 flute, General purpose
223MA / 823MA 	164	FUTURA	Standard length, 3 flute, General purpose
230MA / 830MA 	164	FUTURA	Standard length, 4 flute, General purpose
230RA / 830RA 	168	FUTURA	Standard length, 4 flute, General purpose, Corner radius
323MA / 923MA 	175	FUTURA	Standard length, 3 flute, General purpose
330MA / 930MA 	175	FUTURA	Standard length, 4 flute, General purpose
623MA / 643MA 	189	FUTURA	Extra length, 3 flute, General purpose
630MA / 650MA 	189	FUTURA	Extra length, 4 flute, General purpose
630RA 	194	FUTURA	Extra length, 4 flute, General purpose, Corner radius
723MA / 743MA 	200	FUTURA	Extra length, 3 flute, General purpose
730MA / 750MA 	200	FUTURA	Extra length, 4 flute, General purpose

Recommended tools for:







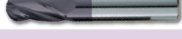
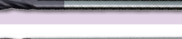


COBALT, NICKEL, IRON-BASED ALLOYS

RECOMMENDED
TOOLS

DRILLS

SERIES	PAGE	COATING	DESCRIPTION
1580HD 	18	HELICA	Stub length, 2 flute, High performance, Common shank
1580H 	21	HARDLUBE	Stub length, 2 flute, High performance
1280H 	31	HARDLUBE	Jobber length, 2 flute, High performance
1580KD 	26	HELICA	Stub length, 2 flute, High performance, Coolant fed, Common shank
1280KD 	36	HELICA	Jobber length, 2 flute, High performance, Coolant fed, Common shank
1580KH 	24	HELICA	Stub length, 2 flute, High performance, Coolant fed
1280KH 	34	HELICA	Jobber length, 2 flute, High performance, Coolant fed
1880KH 	39	HELICA	Taper length, 2 flute, High performance, Coolant fed
1510H 	53	HARDLUBE	Stub length, 2 flute, Slow helix, General purpose
1520H 	59	HARDLUBE	Stub length, 2 flute, General purpose
1205H 	69	HARDLUBE	Jobber length, 2 flute, General Purpose
1120H 	64	HARDLUBE	Stub length, 3 flute, General purpose
1100H 	80	HARDLUBE	Jobber length, 3 flute, General Purpose

END MILLS







SERIES	PAGE	COATING	DESCRIPTION
V4 	129	AlCrN	High performance, 4 flute, Variable helix
VRX 	136	X.CEED	High performance, 4 flute, Variable flute rougher/finisher
VHM 	128	X.CEED	High performance, 4 flute, Variable flute hog mill rougher
V5 	133	AlCrN	High performance, 5 flute, Variable helix
545MA 	142	X.CEED	High performance, High Rc finisher
545RA 	143	X.CEED	High performance, High Rc finisher, Corner radius
545BA 	144	X.CEED	High performance, High Rc finisher
255MA / 855MA 	120	X.CEED	High performance, 5 flute
255RA / 855RA 	125	X.CEED	High performance, 5 flute, Corner radius
170MA / 870MA 	153	FUTURA	Stub length, 4 flute, General purpose
190MA / 990MA 	155	FUTURA	Stub length, 4 flute, General purpose
230MA / 830MA 	164	FUTURA	Standard length, 4 flute, General purpose
230RA / 830RA 	168	FUTURA	Standard length, 4 flute, General purpose, Corner radius
330MA / 930MA 	175	FUTURA	Standard length, 4 flute, General purpose
630MA / 650MA 	189	FUTURA	Extra length, 4 flute, General purpose
630RA 	194	FUTURA	Extra length, 4 flute, General purpose, Corner radius
730MA / 750MA 	200	FUTURA	Extra length, 4 flute, General purpose

Recommended tools for:












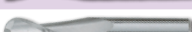


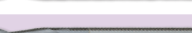

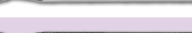
BRASS, BRONZE, COPPER, MAGNESIUM

RECOMMENDED
TOOLS

DRILLS

SERIES	PAGE	COATING	DESCRIPTION
1180 	14	ALUMASTAR	Jobber length, 3 flute, High performance
1520 	56	BRIGHT	Stub length, 2 flute, General purpose
1520H 	59	HARDLUBE	Stub length, 2 flute, General purpose
1205 	66	BRIGHT	Jobber length, 2 flute, General purpose
1205H 	69	HARDLUBE	Jobber length, 2 flute, General purpose
1800H 	82	HARDLUBE	Taper length, 2 flute, Parabolic



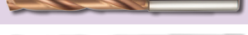
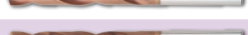
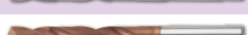





END MILLS

SERIES	PAGE	COATING	DESCRIPTION
143M 	109	ALUMASTAR	High velocity, 3 flute, High metal removal rate
143R 	111	ALUMASTAR	High velocity, 3 flute, High metal removal rate, Corner radius
142M 	106	ALUMASTAR	High velocity, 2 flute, High metal removal rate
142B 	108	ALUMASTAR	High velocity, 2 flute, High metal removal rate
242M / 842M 	113	BRIGHT	High performance, 2 flute, For 4000-8000 RPM
253M / 853M 	116	BRIGHT	High performance, 3 flute, Profiling and finishing
253MC 	118	TiCN	High performance, 3 flute, Profiling and finishing
160M / 860M 	151	BRIGHT	Stub length, 2 flute, General purpose
180M / 980M 	154	BRIGHT	Stub length, 2 flute, General purpose
220M / 820M 	160	BRIGHT	Standard length, 2 flute, General purpose
220MC 	163	TiCN	Standard length, 2 flute, General purpose
320M / 920M 	171	BRIGHT	Standard length, 2 flute, General purpose
320MC 	174	TiCN	Standard length, 2 flute, General purpose
620M / 640M 	186	BRIGHT	Extra length, 2 flute, General purpose
620MC 	188	TiCN	Extra length, 2 flute, General purpose
720M / 740M 	197	BRIGHT	Extra length, 2 flute, General purpose
720MC 	199	TiCN	Extra length, 2 flute, General purpose

HARDENED TOOL STEELS

(generally over 45Rc)

DRILLS

SERIES	PAGE	COATING	DESCRIPTION
1580HD 	18	HELICA	Stub length, 2 flute, High performance, Common shank
1580H 	21	HARDLUBE	Stub length, 2 flute, High performance
1280H 	31	HARDLUBE	Jobber length, 2 flute, High performance
1580KD 	26	HELICA	Stub length, 2 flute, High performance, Coolant fed, Common shank
1280KD 	36	HELICA	Jobber length, 2 flute, High performance, Coolant fed, Common shank
1580KH 	24	HELICA	Stub length, 2 flute, High performance, Coolant fed
1280KH 	34	HELICA	Jobber length, 2 flute, High performance, Coolant fed
1880KH 	39	HELICA	Taper length, 2 flute, High performance, Coolant fed
1500H 	48	HARDLUBE	Stub length, 2 flute, straight flute hard metal
1510H 	53	HARDLUBE	Stub length, 2 flute, 15° helix, General purpose
1520H 	59	HARDLUBE	Jobber length, 2 flute, General purpose
1205H 	69	HARDLUBE	Jobber length, 2 flute, High performance

END MILLS









SERIES	PAGE	COATING	DESCRIPTION
545MA 	142	X.CEED	High performance, High Rc finisher
545RA 	143	X.CEED	High performance, High Rc finisher, Corner radius
545BA 	144	X.CEED	High performance, High Rc finisher
VRX 	136	X.CEED	High performance, 4 flute, Variable flute rougher/finisher
350MX / 950MX 	145	X.CEED	High performance, High Rc finisher
170MA / 870MA 	153	FUTURA	Stub length, 4 flute, General purpose
190MA / 990MA 	155	FUTURA	Stub length, 4 flute, General purpose
230MA / 830MA 	164	FUTURA	Standard length, 4 flute, General purpose
230RA / 830RA 	168	FUTURA	Standard length, 4 flute, General purpose, Corner radius
330MA / 930MA 	175	FUTURA	Standard length, 4 flute, General purpose
630MA / 650MA 	189	FUTURA	Extra length, 4 flute, General purpose
630RA 	194	FUTURA	Extra length, 4 flute, General purpose, Corner radius
730MA / 750MA 	200	FUTURA	Extra length, 4 flute, General purpose

Recommended tools for:

COMPOSITE MATERIALS

(Graphite, Plastics, Carbon Fiber)

DRILLS

SERIES	PAGE	COATING	DESCRIPTION
1180 	14	ALUMASTAR	Jobber length, 3 flute, High performance
1520H 	59	HARDLUBE	Stub length, 2 flute, General purpose
1205H 	69	HARDLUBE	Jobber length, 2 flute, General purpose
1120H 	64	HARDLUBE	Stub length, 3 flute, General purpose
1100H 	80	HARDLUBE	Jobber length, 3 flute, General purpose
1800H 	82	HARDLUBE	Taper length, 2 flute, Parabolic
1500H 	48	HARDLUBE	Stub length, 2 straight flutes, Hard Metal
152D / 152DA 	104-105	BRIGHT/TIAlN	Standard length, 2 flute, Drill/Mill, 120° 4-facet drill point

END MILLS

SERIES	PAGE	COATING	DESCRIPTION
210D 	146	DIAMOND	Standard length, 4 flute
310D 	148	DIAMOND	Standard length, 4 flute
210RD 	147	DIAMOND	Standard length, 4 flute, Corner radius
610D 	149	DIAMOND	Extra length, 4 flute
710D 	150	DIAMOND	Extra length, 4 flute
143M 	109	ALUMASTAR	High velocity, 3 flute, High metal removal rate
143R 	111	ALUMASTAR	High velocity, 3 flute, High metal removal rate, Corner radius
142M 	106	ALUMASTAR	High velocity, 2 flute, High metal removal rate
142B 	108	ALUMASTAR	High velocity, 2 flute, High metal removal rate
253M / 853M 	116	BRIGHT	High performance, 3 flute, Profiling and finishing
253MC 	118	TICN	High performance, 3 flute, Profiling and finishing
255MC 	124	TICN	High performance, 5 flute, Profiling and finishing
220MC 	163	TICN	Standard length, 2 flute, General purpose
320MC 	174	TICN	Standard length, 2 flute, General purpose
620MC 	188	TICN	Extra length, 2 flute, General purpose
720MC 	199	TICN	Extra length, 2 flute, General purpose
154M / 154MA 	102-103	BRIGHT/TIAlN	Standard length, 4 flute, Drill/Mill, Center cutting to a point
152M / 152MA 	100-101	BRIGHT/TIAlN	Standard length, 2 flute, Drill/Mill, Center cutting to a point



Check out the inside back cover to see a variety of non-stock specials that we offer specifically designed for use in composite materials.





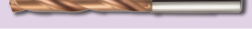
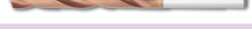
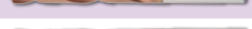
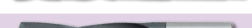




Recommended tools for:

CARBON STEELS, MEDIUM ALLOY STEELS







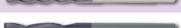
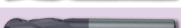









(generally under 45Rc)

RECOMMENDED TOOLS

DRILLS

SERIES	PAGE	COATING	DESCRIPTION
1580HD 	18	HELICA	Stub length, 2 flute, High performance, Common shank
1580H 	21	HARDLUBE	Stub length, 2 flute, High performance
1280H 	31	HARDLUBE	Jobber length, 2 flute, High performance
1580KD 	26	HELICA	Stub length, 2 flute, High performance, Coolant fed, Common shank
1280KD 	36	HELICA	Jobber length, 2 flute, High performance, Coolant fed, Common shank
1580KH 	24	HELICA	Stub length, 2 flute, High performance, Coolant fed
1280KH 	34	HELICA	Jobber length, 2 flute, High performance, Coolant fed
1880KH 	39	HELICA	Taper length, 2 flute, High performance, Coolant fed
1510H 	53	HARDLUBE	Stub length, 2 flute, 15° helix, General purpose
1520H 	59	HARDLUBE	Stub length, 2 flute, General purpose
1205H 	69	HARDLUBE	Jobber length, 2 flute, General Purpose
152D / 152DA 	104-105	BRIGHT/TIAlN	Standard length, 2 flute, Drill/Mill, 120° 4-facet drill point

END MILLS

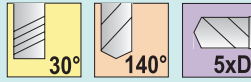
SERIES	PAGE	COATING	DESCRIPTION
V4 	129	AlCrN	High performance, 4 flute, Variable helix
VRX 	136	X.CEED	High performance, 4 flute, Variable flute rougher/finisher
VHM 	128	X.CEED	High performance, 4 flute, Variable flute hog mill rougher
253MA / 853MA 	114	X.CEED	High performance, 3 flute, Profiling and finishing
V5 	133	AlCrN	High performance, 5 flute, Variable helix
255MA / 855MA 	120	X.CEED	High performance, 5 flute
255RA / 855RA 	125	X.CEED	High performance, 5 flute, Corner radius
170MA / 870MA 	153	FUTURA	Stub length, 4 flute, General purpose
190MA / 990MA 	155	FUTURA	Stub length, 4 flute, General purpose
230MA / 830MA 	164	FUTURA	Standard length, 4 flute, General purpose
230RA / 830RA 	168	FUTURA	Standard length, 4 flute, General purpose, Corner radius
330MA / 930MA 	175	FUTURA	Standard length, 4 flute, General purpose
630MA / 650MA 	189	FUTURA	Extra length, 4 flute, General purpose
630RA 	194	FUTURA	Extra length, 4 flute, General purpose, Corner radius
730MA / 750MA 	200	FUTURA	Extra length, 4 flute, General purpose
154M / 154MA 	102-103	BRIGHT/TIAlN	Standard length, 4 flute, Drill/Mill, Center cutting to a point
152M / 152MA 	100-101	BRIGHT/TIAlN	Standard length, 2 flute, Drill/Mill, Center cutting to a point

1180 - 3 Flute

Technical information: page 258

TOLERANCES	
<i>d</i>	+0.000" -0.005" (+0.000 -0.127mm)
<i>l1</i>	+0.125" -0.125" (+3.175 -3.175mm)
<i>l2</i>	+0.125" -0.125" (+3.175 -3.175mm)

.1575" - .3150"
(4.000mm - 8.000mm)



ALUMASTAR Coated

High performance solid submicron grain carbide drill

Designed for drilling aluminum and other soft materials

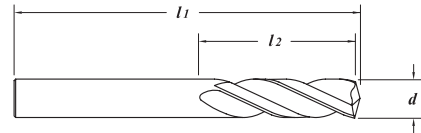
No spot drilling required

Unique point geometry and coating for higher speeds and feeds

Up to 5x longer tool life than Zrn coated drills

High performance drill point

Live tooling recommended on lathe processes



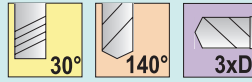
EDP#	<i>d</i> [†] Diameter		<i>l1</i> Overall Length	<i>l2</i> Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
70166	.1575	4.000	65	24	45.14	43.18	41.21	39.25	
70191	.1772	4.500	65	25	47.69	45.62	43.54	41.47	
70211	.1875	3/16"	4.763	2-3/4"	1-1/4"	48.94	46.82	44.69	42.56
70216	.1890	#12	4.801	2-3/4"	1-1/4"	50.76	48.55	46.35	44.14
70221	.1910	#11	4.851	2-3/4"	1-1/4"	51.07	48.85	46.63	44.41
70226	.1935	#10	4.914	2-3/4"	1-1/4"	51.39	49.16	46.92	44.69
70231	.1969		5.000	75	32	52.03	49.76	47.50	45.24
70236	.1990	#8	5.055	3"	1-5/16"	52.28	50.01	47.73	45.46
70241	.2010	#7	5.105	3"	1-5/16"	52.49	50.20	47.92	45.64
70246	.2031	13/64"	5.159	3"	1-5/16"	52.87	50.57	48.27	45.97
70251	.2040	#6	5.182	3"	1-3/8"	53.22	50.91	48.59	46.28
70256	.2055	#5	5.220	3"	1-3/8"	53.57	51.24	48.91	46.58
70261	.2090	#4	5.309	3"	1-3/8"	53.88	51.54	49.19	46.85
70266	.2130	#3	5.410	3"	1-3/8"	54.22	51.87	49.51	47.15
70271	.2165		5.500	75	35	54.54	52.17	49.80	47.43
70276	.2188	7/32"	5.558	3"	1-3/8"	54.87	52.48	50.10	47.71
70281	.2210	#2	5.613	3"	1-3/8"	55.97	53.54	51.10	48.67
70286	.2280	#1	5.791	3"	1-3/8"	56.24	53.79	51.35	48.90
70296	.2344	15/64"	5.954	3-1/4"	1-1/2"	57.37	54.88	52.38	49.89
70301	.2362		6.000	82	38	57.53	55.03	52.53	50.03
70306	.2380	B	6.045	3-1/4"	1-5/8"	57.68	55.18	52.67	50.16
70311	.2420	C	6.147	3-1/4"	1-5/8"	58.06	55.54	53.01	50.49
70316	.2460	D	6.248	3-1/4"	1-5/8"	58.42	55.88	53.34	50.80
70321	.2500	1/4" / E	6.350	3-1/4"	1-5/8"	58.72	56.17	53.61	51.06
70326	.2559		6.500	82	41	62.65	59.93	57.20	54.48
70331	.2570	F	6.528	3-1/4"	1-11/16"	63.60	60.83	58.07	55.30
70336	.2610	G	6.629	3-1/2"	1-11/16"	64.57	61.77	58.96	56.15
70341	.2656	17/64"	6.746	3-1/2"	1-11/16"	65.53	62.68	59.83	56.98
70346	.2660	H	6.756	3-1/2"	1-11/16"	66.53	63.64	60.74	57.85
70351	.2720	I	6.909	3-1/2"	1-11/16"	67.47	64.54	61.60	58.67
70356	.2756		7.000	88	43	68.43	65.45	62.48	59.50
70361	.2770	J	7.036	3-1/2"	1-11/16"	69.40	66.39	63.37	60.35
70371	.2812	9/32"	7.142	3-1/2"	1-3/4"	71.36	68.26	65.15	62.05
70376	.2900	L	7.366	3-1/2"	1-3/4"	72.24	69.10	65.96	62.82
70381	.2953		7.500	95	44	73.20	70.02	66.83	63.65
70386	.2969	19/64"	7.541	3-3/4"	1-7/8"	73.83	70.62	67.41	64.20
70391	.3020	N	7.671	3-3/4"	1-7/8"	76.52	73.19	69.87	66.54
70396	.3125	5/16"	7.938	3-3/4"	1-7/8"	76.72	73.38	70.05	66.71
70401	.3150		8.000	95	48	80.96	77.44	73.92	70.40

EDP#	d^+ Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
70406	.3160	O	8.026	3-3/4"	1-7/8"	80.96	77.44	73.92	70.40
70411	.3230	P	8.204	3-3/4"	2-3/32"	81.22	77.69	74.16	70.63
70416	.3281	21/64"	8.334	4"	2-3/32"	81.91	78.35	74.79	71.23
70421	.3320	Q	8.433	4"	2-3/32"	83.42	79.79	76.17	72.54
70426	.3346		8.500	100	53	83.98	80.33	76.68	73.03
70431	.3390	R	8.611	4"	2-3/32"	86.08	82.34	78.59	74.85
70436	.3438	11/32"	8.733	4"	2-3/16"	88.90	85.03	81.17	77.30
70441	.3480	S	8.839	4"	2-3/16"	94.01	89.93	85.84	81.75
70446	.3543		9.000	100	55	94.53	90.42	86.31	82.20
70451	.3580	T	9.093	4-1/4"	2-9/32"	99.60	95.27	90.94	86.61
70456	.3594	23/64"	9.129	4-1/4"	2-9/32"	100.13	95.78	91.42	87.07
70461	.3680	U	9.347	4-1/4"	2-9/32"	109.42	104.67	99.91	95.15
70466	.3740		9.500	108	58	110.39	105.59	100.79	95.99
70471	.3750	3/8"	9.525	4-1/4"	2-3/8"	111.39	106.55	101.70	96.86
70476	.3770	V	9.576	4-1/4"	2-3/8"	114.34	109.37	104.40	99.43
70481	.3860	W	9.804	4-1/2"	2-3/8"	116.17	111.12	106.07	101.02
70486	.3906	25/64"	9.921	4-1/2"	2-3/8"	117.46	112.35	107.25	102.14
70491	.3937		10.000	114	60	120.65	115.40	110.16	104.91
70496	.3970	X	10.084	4-1/2"	2-1/2"	123.18	117.82	112.47	107.11
70501	.4040	Y	10.262	4-1/2"	2-9/16"	126.58	121.08	115.57	110.07
70506	.4062	13/32"	10.317	4-1/2"	2-9/16"	127.57	122.02	116.48	110.93
70511	.4134		10.500	114	67	128.64	123.05	117.45	111.86
70516	.4219	27/64"	10.716	4-1/2"	2-11/16"	129.71	124.07	118.43	112.79
70521	.4331		11.000	114	68	138.39	132.37	126.36	120.34
70526	.4375	7/16"	11.113	4-3/4"	2-13/16"	138.90	132.86	126.82	120.78
70531	.4528		11.500	120	70	147.71	141.28	134.86	128.44
70536	.4531	29/64"	11.509	4-3/4"	2-7/8"	147.71	141.28	134.86	128.44
70541	.4688	15/32"	11.909	4-3/4"	2-7/8"	154.61	147.88	141.16	134.44
70546	.4724		12.000	120	73	155.01	148.27	141.53	134.79
70551	.4844	31/64"	12.304	5-5/16"	3"	157.76	150.90	144.04	137.18
70556	.4921		12.500	135	75	159.51	152.57	145.64	138.70
70561	.5000	1/2"	12.700	5-3/8"	3-1/16"	159.82	152.87	145.92	138.97
70566	.5118		13.000	136	78	179.86	172.04	164.22	156.40
70571	.5156	33/64"	13.096	5-3/8"	3-1/8"	183.71	175.73	167.74	159.75
70576	.5312	17/32"	13.492	5-11/16"	3-5/16"	187.68	179.52	171.36	163.20
70581	.5469	35/64"	13.891	5-13/16"	3-3/8"	195.32	186.82	178.33	169.84
70586	.5512		14.000	148	86	199.19	190.53	181.87	173.21
70591	.5625	9/16"	14.287	5-15/16"	3-1/2"	214.13	204.82	195.51	186.20
70596	.5781	37/64"	14.683	6"	3-1/2"	221.41	211.78	202.16	192.53
70601	.5906		15.000	152	90	225.26	215.47	205.67	195.88
70606	.5938	19/32"	15.082	6"	3-9/16"	226.34	216.50	206.66	196.82
70611	.6094	39/64"	15.478	6-3/16"	3-11/16"	245.36	234.70	224.03	213.36
70616	.6250	5/8"	15.875	6-5/16"	3-3/4"	247.50	236.74	225.98	215.22
70621	.6299		16.000	160	95	252.68	241.69	230.71	219.72

TOLERANCES

d_1	+0.000" -0.004" (+.000 -0.10mm)
d_2	[h6] +0.000" -0.003" (+.000 -0.08mm)

NEW SERIES



0.792mm - 1.450mm
(.0312" - .0571")

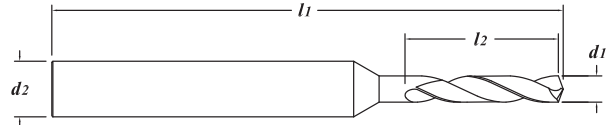
Balinit® HELICA Coated

High performance solid submicron grain carbide drill on 3mm or 1/8" diameter shank
30° helix for better chip evacuation

Recommended to run in high nickel, high temperature alloys, cobalt-based alloys, stainless steels and tool steels

Balinit® HELICA is a multi-layer AlCr-based coating designed exclusively for high performance drilling

Live tooling recommended on lathe processes



EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
00100	.0312"	1/32"	0.792	1/8"	2"	5/32"	38.82	37.14	35.45	33.76
00102	.0315"		0.800	3.0	50	4.0	38.18	36.52	34.86	33.20
00104	.0319"		0.810	3.0	50	4.0	38.18	36.52	34.86	33.20
00106	.0320"	#67	0.812	1/8"	2"	11/64"	38.82	37.14	35.45	33.76
00108	.0323"		0.820	3.0	50	4.5	38.18	36.52	34.86	33.20
00110	.0327"		0.830	3.0	50	4.5	38.18	36.52	34.86	33.20
00112	.0330"	#66	0.838	1/8"	2"	11/64"	38.82	37.14	35.45	33.76
00114	.0331"		0.840	3.0	50	4.5	38.18	36.52	34.86	33.20
00116	.0335"		0.850	3.0	50	4.5	38.18	36.52	34.86	33.20
00118	.0339"		0.860	3.0	50	4.5	38.18	36.52	34.86	33.20
00120	.0343"		0.870	3.0	50	4.5	38.18	36.52	34.86	33.20
00122	.0346"		0.880	3.0	50	4.5	38.18	36.52	34.86	33.20
00124	.0350"	#65	0.890	3.0	50	4.5	38.18	36.52	34.86	33.20
00126	.0354"		0.900	3.0	50	4.5	38.18	36.52	34.86	33.20
00128	.0358"		0.910	3.0	50	5.0	38.18	36.52	34.86	33.20
00130	.0360"	#64	0.914	1/8"	2"	3/16"	38.82	37.14	35.45	33.76
00132	.0362"		0.920	3.0	50	5.0	38.18	36.52	34.86	33.20
00134	.0366"		0.930	3.0	50	5.0	38.18	36.52	34.86	33.20
00136	.0370"	#63	0.940	3.0	50	5.0	38.18	36.52	34.86	33.20
00138	.0374"		0.950	3.0	50	5.0	38.18	36.52	34.86	33.20
00140	.0378"		0.960	3.0	50	5.0	38.18	36.52	34.86	33.20
00142	.0380"	#62	0.965	1/8"	2"	3/16"	38.82	37.14	35.45	33.76
00144	.0382"		0.970	3.0	50	5.0	38.18	36.52	34.86	33.20
00146	.0386"		0.980	3.0	50	5.0	38.18	36.52	34.86	33.20
00148	.0390"	#61	0.990	3.0	50	5.0	38.18	36.52	34.86	33.20
00150	.0394"		1.000	3.0	50	5.0	38.18	36.52	34.86	33.20
00152	.0400"	#60	1.016	1/8"	2"	13/64"	38.46	36.78	35.11	33.44
00154	.0410"	#59	1.041	1/8"	2"	13/64"	38.46	36.78	35.11	33.44
00156	.0413"		1.050	3.0	50	5.5	37.81	36.17	34.52	32.88
00158	.0420"	#58	1.066	1/8"	2"	7/32"	38.46	36.78	35.11	33.44
00160	.0430"	#57	1.092	1/8"	2"	7/32"	38.46	36.78	35.11	33.44
00162	.0433"		1.100	3.0	50	5.5	37.81	36.17	34.52	32.88
00164	.0453"		1.150	3.0	50	6.0	37.81	36.17	34.52	32.88
00166	.0465"	#56	1.181	1/8"	2"	15/64"	38.46	36.78	35.11	33.44
00168	.0469"	3/64"	1.191	1/8"	2"	15/64"	38.46	36.78	35.11	33.44
00170	.0472"		1.200	3.0	50	6.0	37.81	36.17	34.52	32.88
00172	.0492"		1.250	3.0	50	6.5	37.81	36.17	34.52	32.88
00174	.0512"		1.300	3.0	50	6.5	37.44	35.82	34.19	32.56
00176	.0520"	#55	1.320	1/8"	2"	17/64"	38.09	36.43	34.78	33.12
00178	.0531"		1.350	3.0	50	6.5	37.44	35.82	34.19	32.56
00180	.0550"	#54	1.397	1/8"	2"	9/32"	38.09	36.43	34.78	33.12
00182	.0551"		1.400	3.0	50	7.0	37.44	35.82	34.19	32.56
00184	.0571"		1.450	3.0	50	7.0	37.44	35.82	34.19	32.56

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
00186	.0591"		1.500	3.0	50	7.5	37.44	35.82	34.19	32.56
00188	.0595"	#53	1.511	1/8"	2"	19/64"	38.09	36.43	34.78	33.12
00190	.0610"		1.550	3.0	50	7.5	37.06	35.45	33.84	32.23
00192	.0625"	1/16"	1.587	1/8"	2"	5/16"	37.72	36.08	34.44	32.80
00194	.0630"		1.600	3.0	50	7.5	37.06	35.45	33.84	32.23
00196	.0635"	#52	1.613	1/8"	2"	5/16"	37.72	36.08	34.44	32.80
00198	.0650"		1.650	3.0	50	8.5	37.06	35.45	33.84	32.23
00200	.0669"		1.700	3.0	50	8.5	37.06	35.45	33.84	32.23
00202	.0670"	#51	1.702	1/8"	2"	11/32"	37.72	36.08	34.44	32.80
00204	.0689"		1.750	3.0	50	9.0	37.06	35.45	33.84	32.23
00206	.0700"	#50	1.778	1/8"	2"	23/64"	37.35	35.73	34.10	32.48
00208	.0709"		1.800	3.0	50	9.0	36.70	35.10	33.51	31.91
00210	.0728"		1.850	3.0	50	9.5	36.70	35.10	33.51	31.91
00212	.0730"	#49	1.854	1/8"	2"	3/8"	37.35	35.73	34.10	32.48
00214	.0748"		1.900	3.0	50	9.5	36.70	35.10	33.51	31.91
00216	.0760"	#48	1.930	1/8"	2"	3/8"	37.35	35.73	34.10	32.48
00218	.0768"		1.950	3.0	50	10.0	36.70	35.10	33.51	31.91
00220	.0781"	5/64"	1.983	1/8"	2"	13/32"	37.35	35.73	34.10	32.48
00222	.0785"	#47	1.994	1/8"	2"	13/32"	37.35	35.73	34.10	32.48
00224	.0787"		2.000	3.0	50	10.0	36.70	35.10	33.51	31.91
00226	.0807"		2.050	3.0	50	10.5	36.33	34.75	33.17	31.59
00228	.0810"	#46	2.057	1/8"	2"	27/64"	36.97	35.37	33.76	32.15
00230	.0820"	#45	2.083	1/8"	2"	27/64"	36.97	35.37	33.76	32.15
00232	.0827"		2.100	3.0	50	10.5	36.33	34.75	33.17	31.59
00234	.0846"		2.150	3.0	50	11.0	36.33	34.75	33.17	31.59
00236	.0860"	#44	2.184	1/8"	2"	7/16"	36.97	35.37	33.76	32.15
00238	.0866"		2.200	3.0	50	11.0	36.33	34.75	33.17	31.59
00240	.0886"		2.250	3.0	50	11.5	36.33	34.75	33.17	31.59
00242	.0890"	#43	2.260	1/8"	2"	29/64"	36.97	35.37	33.76	32.15
00244	.0906"		2.300	3.0	50	11.5	35.96	34.40	32.83	31.27
00246	.0925"		2.350	3.0	50	12.0	35.96	34.40	32.83	31.27
00248	.0935"	#42	2.375	1/8"	2"	31/64"	36.60	35.01	33.42	31.83
00250	.0938"	3/32"	2.382	1/8"	2"	31/64"	36.60	35.01	33.42	31.83
00252	.0945"		2.400	3.0	50	12.0	35.96	34.40	32.83	31.27
00254	.0960"	#41	2.438	1/8"	2"	31/64"	36.60	35.01	33.42	31.83
00256	.0965"		2.450	3.0	50	12.5	35.96	34.40	32.83	31.27
00258	.0980"	#40	2.489	1/8"	2"	1/2"	36.60	35.01	33.42	31.83
00260	.0984"		2.500	3.0	50	12.5	35.96	34.40	32.83	31.27
00262	.0995"	#39	2.527	1/8"	2"	1/2"	36.60	35.01	33.42	31.83
00264	.1004"		2.550	3.0	50	13.0	35.63	34.08	32.53	30.98
00266	.1015"	#38	2.578	1/8"	2"	17/32"	36.27	34.69	33.12	31.54
00268	.1024"		2.600	3.0	50	13.0	35.63	34.08	32.53	30.98
00270	.1040"	#37	2.641	1/8"	2"	17/32"	36.27	34.69	33.12	31.54
00272	.1043"		2.650	3.0	50	13.5	35.63	34.08	32.53	30.98
00274	.1063"		2.700	3.0	50	13.5	35.63	34.08	32.53	30.98
00276	.1065"	#36	2.705	1/8"	2"	17/32"	36.27	34.69	33.12	31.54
00278	.1083"		2.750	3.0	50	14.0	35.63	34.08	32.53	30.98
00280	.1094"	7/64"	2.778	1/8"	2"	9/16"	36.27	34.69	33.12	31.54
00282	.1100"	#35	2.794	1/8"	2"	9/16"	36.27	34.69	33.12	31.54
00284	.1102"		2.800	3.0	50	14.0	35.63	34.08	32.53	30.98
00286	.1110"	#34	2.819	1/8"	2"	9/16"	36.27	34.69	33.12	31.54
00288	.1122"		2.850	3.0	50	14.5	35.63	34.08	32.53	30.98
00290	.1130"	#33	2.870	1/8"	2"	19/32"	36.27	34.69	33.12	31.54
00292	.1142"		2.900	3.0	50	14.5	35.63	34.08	32.53	30.98
00294	.1160"	#32	2.946	1/8"	2"	19/32"	36.27	34.69	33.12	31.54
00296	.1161"		2.950	3.0	50	15.0	35.63	34.08	32.53	30.98
00298	.1181"		3.000	3.0	50	15.0	33.47	32.01	30.56	29.10
00300	.1200"	#31	3.048	1/8"	2"	5/8"	36.27	34.69	33.12	31.54
00302	.1250"	1/8"	3.175	1/8"	2"	5/8"	34.11	32.63	31.14	29.66

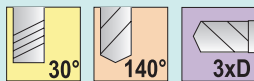
1580HD - 2 Flute

Technical information: page 256-257

TOLERANCES

<i>d1</i> *	3mm - 6mm	+016 +004mm (+.0063" +.0015")
	> 6mm - 10mm	+021 +006mm (+.0082" +.0023")
	> 10mm - 18mm	+025 +007mm (+.0098" +.0027")
	> 18mm - 20mm	+029 +008mm (+.0114" +.0031")
<i>d2</i>	6mm	+000 -008mm (+.0000" - .0030")
	8mm - 10mm	+000 -009mm (+.0000" - .0035")
	12mm - 18mm	+000 -011mm (+.0000" - .0040")
	20mm	+000 -013mm (+.0000" - .0050")

3.000mm - 6.350mm
(.1181" - .2500")



Balinit® HELICA Coated

High performance solid submicron grain carbide drill with reinforced shank

Utilizes DIN standard 6537 *

Up to 50% faster than standard carbide drills

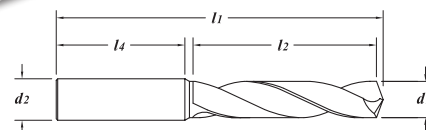
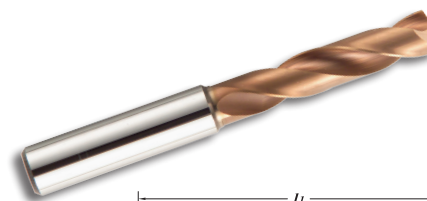
30° helix for better chip evacuation

Honed cutting edge

Recommended to run in high nickel, high temperature alloys, cobalt-based alloys, stainless steels and tool steels

Balinit® HELICA is a multi-layer AlCr-based coating designed exclusively for high performance drilling

Live tooling recommended on lathe processes



** Note - These drills are made to a plus/plus tolerance on the drill diameter. If you are in need of a minus tolerance drill, please refer to our other high performance drills.*

EDP#	<i>d1</i> Diameter		<i>d2</i> Shank Diameter	<i>l1</i> Overall Length	<i>l2</i> Flute Length	<i>l4</i> Shank Length	1-11	12-24	25-49	50-100
	Decimal	Metric								
20085	.1181"	3.000	6.0	62	20	36	58.48	55.94	53.39	50.85
20095	.1220"	3.100	6.0	62	20	36	58.48	55.94	53.39	50.85
20105	.1248"	3.170	6.0	62	20	36	58.48	55.94	53.39	50.85
20115	.1260"	3.200	6.0	62	20	36	58.48	55.94	53.39	50.85
20125	.1280"	3.250	6.0	62	20	36	58.48	55.94	53.39	50.85
20135	.1299"	3.300	6.0	62	20	36	58.48	55.94	53.39	50.85
20145	.1339"	3.400	6.0	62	20	36	58.48	55.94	53.39	50.85
20155	.1378"	3.500	6.0	62	20	36	57.74	55.23	52.72	50.21
20165	.1417"	3.600	6.0	62	20	36	57.74	55.23	52.72	50.21
20175	.1457"	3.700	6.0	62	20	36	57.74	55.23	52.72	50.21
20185	.1476"	3.750	6.0	62	20	36	57.74	55.23	52.72	50.21
20195	.1496"	3.800	6.0	66	24	36	57.74	55.23	52.72	50.21
20205	.1535"	3.900	6.0	66	24	36	57.74	55.23	52.72	50.21
20215	.1575"	4.000	6.0	66	24	36	57.02	54.54	52.06	49.58
20225	.1614"	4.100	6.0	66	24	36	57.02	54.54	52.06	49.58
20235	.1654"	4.200	6.0	66	24	36	57.02	54.54	52.06	49.58
20245	.1673"	4.250	6.0	66	24	36	57.02	54.54	52.06	49.58
20255	.1693"	4.300	6.0	66	24	36	57.02	54.54	52.06	49.58
20265	.1732"	4.400	6.0	66	24	36	57.02	54.54	52.06	49.58
20275	.1772"	4.500	6.0	66	24	36	56.27	53.82	51.38	48.93
20285	.1811"	4.600	6.0	66	24	36	56.27	53.82	51.38	48.93
20295	.1831"	4.650	6.0	66	24	36	56.27	53.82	51.38	48.93
20305	.1850"	4.700	6.0	66	24	36	56.27	53.82	51.38	48.93
20315	.1870"	4.750	6.0	66	24	36	56.27	53.82	51.38	48.93
20325	.1890"	4.800	6.0	66	28	36	56.27	53.82	51.38	48.93
20335	.1929"	4.900	6.0	66	28	36	56.27	53.82	51.38	48.93
20345	.1969"	5.000	6.0	66	28	36	55.55	53.13	50.72	48.30
20355	.2008"	5.100	6.0	66	28	36	55.55	53.13	50.72	48.30
20365	.2027"	5.150	6.0	66	28	36	55.55	53.13	50.72	48.30
20375	.2047"	5.200	6.0	66	28	36	55.55	53.13	50.72	48.30
20385	.2087"	5.300	6.0	66	28	36	55.55	53.13	50.72	48.30
20395	.2165"	5.500	6.0	66	28	36	54.79	52.40	50.02	47.64
20405	.2185"	5.550	6.0	66	28	36	54.79	52.40	50.02	47.64
20408	.2205"	5.600	6.0	66	28	36	54.79	52.40	50.02	47.64
20412	.2244"	5.700	6.0	66	28	36	54.79	52.40	50.02	47.64
20415	.2283"	5.800	6.0	66	28	36	54.79	52.40	50.02	47.64
20425	.2323"	5.900	6.0	66	28	36	54.79	52.40	50.02	47.64
20435	.2342"	5.950	6.0	66	28	36	54.79	52.40	50.02	47.64
20445	.2362"	6.000	6.0	66	28	36	54.06	51.71	49.36	47.01
20448	.2402"	6.100	8.0	79	34	36	77.34	73.98	70.61	67.25
20452	.2441"	6.200	8.0	79	34	36	77.34	73.98	70.61	67.25
20454	.2480"	6.300	8.0	79	34	36	77.34	73.98	70.61	67.25
20455	.2500"	6.350	8.0	79	34	36	77.34	73.98	70.61	67.25

1580HD - 2 Flute (continued)

6.400mm - 12.000mm
(.2520" - .4724")

HIGH PERFORMANCE
DRILLS

EDP#	<i>d1</i> Diameter		<i>d2</i> Shank Diameter	<i>l1</i> Overall Length	<i>l2</i> Flute Length	<i>l4</i> Shank Length	1-11	12-24	25-49	50-100
	Decimal	Metric								
20462	.2520"	6.400	8.0	79	34	36	77.34	73.98	70.61	67.25
20465	.2559"	6.500	8.0	79	34	36	76.60	73.27	69.94	66.61
20468	.2571"	6.530	8.0	79	34	36	76.60	73.27	69.94	66.61
20472	.2598"	6.600	8.0	79	34	36	76.60	73.27	69.94	66.61
20473	.2638"	6.700	8.0	79	34	36	76.60	73.27	69.94	66.61
20475	.2657"	6.750	8.0	79	34	36	76.60	73.27	69.94	66.61
20485	.2677"	6.800	8.0	79	34	36	76.60	73.27	69.94	66.61
20495	.2717"	6.900	8.0	79	34	36	76.60	73.27	69.94	66.61
20505	.2756"	7.000	8.0	79	34	36	75.89	72.59	69.29	65.99
20515	.2795"	7.100	8.0	79	41	36	75.89	72.59	69.29	65.99
20525	.2815"	7.150	8.0	79	41	36	75.89	72.59	69.29	65.99
20535	.2835"	7.200	8.0	79	41	36	75.89	72.59	69.29	65.99
20542	.2874"	7.300	8.0	79	41	36	75.89	72.59	69.29	65.99
20545	.2913"	7.400	8.0	79	41	36	75.89	72.59	69.29	65.99
20555	.2953"	7.500	8.0	79	41	36	75.11	71.84	68.58	65.31
20565	.2972"	7.550	8.0	79	41	36	75.11	71.84	68.58	65.31
20575	.2992"	7.600	8.0	79	41	36	75.11	71.84	68.58	65.31
20585	.3031"	7.700	8.0	79	41	36	75.11	71.84	68.58	65.31
20595	.3071"	7.800	8.0	79	41	36	75.11	71.84	68.58	65.31
20605	.3130"	7.950	8.0	79	41	36	75.11	71.84	68.58	65.31
20615	.3150"	8.000	8.0	79	41	36	74.38	71.15	67.91	64.68
20622	.3189"	8.100	10.0	89	47	40	107.90	103.21	98.52	93.83
20625	.3228"	8.200	10.0	89	47	40	107.90	103.21	98.52	93.83
20635	.3268"	8.300	10.0	89	47	40	107.90	103.21	98.52	93.83
20645	.3287"	8.350	10.0	89	47	40	107.90	103.21	98.52	93.83
20652	.3307"	8.400	10.0	89	47	40	107.90	103.21	98.52	93.83
20655	.3346"	8.500	10.0	89	47	40	106.80	102.16	97.51	92.87
20665	.3386"	8.600	10.0	89	47	40	106.80	102.16	97.51	92.87
20675	.3425"	8.700	10.0	89	47	40	106.80	102.16	97.51	92.87
20685	.3445"	8.750	10.0	89	47	40	106.80	102.16	97.51	92.87
20695	.3465"	8.800	10.0	89	47	40	106.80	102.16	97.51	92.87
20705	.3504"	8.900	10.0	89	47	40	106.80	102.16	97.51	92.87
20715	.3543"	9.000	10.0	89	47	40	105.70	101.10	96.51	91.91
20725	.3583"	9.100	10.0	89	47	40	105.70	101.10	96.51	91.91
20735	.3602"	9.150	10.0	89	47	40	105.70	101.10	96.51	91.91
20745	.3622"	9.200	10.0	89	47	40	105.70	101.10	96.51	91.91
20755	.3661"	9.300	10.0	89	47	40	105.70	101.10	96.51	91.91
20762	.3701"	9.400	10.0	89	47	40	105.70	101.10	96.51	91.91
20765	.3740"	9.500	10.0	89	47	40	104.58	100.03	95.49	90.94
20775	.3760"	9.550	10.0	89	47	40	104.58	100.03	95.49	90.94
20778	.3780"	9.600	10.0	89	47	40	104.58	100.03	95.49	90.94
20782	.3819"	9.700	10.0	89	47	40	104.58	100.03	95.49	90.94
20785	.3858"	9.800	10.0	89	47	40	104.58	100.03	95.49	90.94
20795	.3898"	9.900	10.0	89	47	40	104.58	100.03	95.49	90.94
20805	.3937"	10.000	10.0	89	47	40	103.49	98.99	94.49	89.99
20812	.3976"	10.100	12.0	102	55	45	140.59	134.48	128.36	122.25
20815	.4016"	10.200	12.0	102	55	45	140.59	134.48	128.36	122.25
20825	.4055"	10.300	12.0	102	55	45	140.59	134.48	128.36	122.25
20835	.4134"	10.500	12.0	102	55	45	139.12	133.07	127.02	120.97
20842	.4173"	10.600	12.0	102	55	45	139.12	133.07	127.02	120.97
20845	.4213"	10.700	12.0	102	55	45	139.12	133.07	127.02	120.97
20855	.4252"	10.800	12.0	102	55	45	139.12	133.07	127.02	120.97
20865	.4331"	11.000	12.0	102	55	45	137.61	131.63	125.64	119.66
20875	.4370"	11.100	12.0	102	55	45	137.61	131.63	125.64	119.66
20885	.4409"	11.200	12.0	102	55	45	137.61	131.63	125.64	119.66
20892	.4488"	11.400	12.0	102	55	45	137.61	131.63	125.64	119.66
20895	.4528"	11.500	12.0	102	55	45	136.15	130.23	124.31	118.39
20905	.4606"	11.700	12.0	102	55	45	136.15	130.23	124.31	118.39
20915	.4685"	11.900	12.0	102	55	45	136.15	130.23	124.31	118.39
20925	.4724"	12.000	12.0	102	55	45	134.64	128.79	122.93	117.08

continued →

1580HD - 2 Flute (continued)

12.100mm - 20.000mm
(.4764" - .7874")

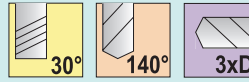
EDP#	<i>d1</i> Diameter		<i>d2</i> Shank Diameter	<i>l1</i> Overall Length	<i>l2</i> Flute Length	<i>l4</i> Shank Length	1-11	12-24	25-49	50-100
	Decimal	Metric								
20935	.4764"	12.100	14.0	107	60	45	174.77	167.17	159.57	151.97
20941	.4803"	12.200	14.0	107	60	45	174.77	167.17	159.57	151.97
20945	.4842"	12.300	14.0	107	60	45	174.77	167.17	159.57	151.97
20951	.4882"	12.400	14.0	107	60	45	174.77	167.17	159.57	151.97
20955	.4921"	12.500	14.0	107	60	45	173.27	165.74	158.20	150.67
20961	.4961"	12.600	14.0	107	60	45	173.27	165.74	158.20	150.67
20965	.5000"	12.700	14.0	107	60	45	173.27	165.74	158.20	150.67
20975	.5039"	12.800	14.0	107	60	45	173.27	165.74	158.20	150.67
20978	.5051"	12.830	14.0	107	60	45	173.27	165.74	158.20	150.67
20981	.5079"	12.900	14.0	107	60	45	173.27	165.74	158.20	150.67
20982	.5098"	12.950	14.0	107	60	45	173.27	165.74	158.20	150.67
20985	.5118"	13.000	14.0	107	60	45	171.81	164.34	156.87	149.40
20995	.5157"	13.100	14.0	107	60	45	171.81	164.34	156.87	149.40
20998	.5236"	13.300	14.0	107	60	45	171.81	164.34	156.87	149.40
21005	.5315"	13.500	14.0	107	60	45	170.32	162.91	155.51	148.10
21015	.5394"	13.700	14.0	107	60	45	170.32	162.91	155.51	148.10
21025	.5433"	13.800	14.0	107	60	45	170.32	162.91	155.51	148.10
21035	.5512"	14.000	14.0	107	60	45	168.84	161.50	154.16	146.82
21045	.5551"	14.100	16.0	115	65	48	206.59	197.60	188.62	179.64
21053	.5591"	14.200	16.0	115	65	48	206.59	197.60	188.62	179.64
21055	.5610"	14.250	16.0	115	65	48	206.59	197.60	188.62	179.64
21065	.5630"	14.300	16.0	115	65	48	206.59	197.60	188.62	179.64
21075	.5709"	14.500	16.0	115	65	48	205.08	196.16	187.25	178.33
21085	.5787"	14.700	16.0	115	65	48	205.08	196.16	187.25	178.33
21095	.5827"	14.800	16.0	115	65	48	205.08	196.16	187.25	178.33
21105	.5906"	15.000	16.0	115	65	48	203.61	194.76	185.90	177.05
21115	.5945"	15.100	16.0	115	65	48	203.61	194.76	185.90	177.05
21125	.6102"	15.500	16.0	115	65	48	202.16	193.37	184.58	175.79
21135	.6181"	15.700	16.0	115	65	48	202.16	193.37	184.58	175.79
21145	.6220"	15.800	16.0	115	65	48	202.16	193.37	184.58	175.79
21155	.6299"	16.000	16.0	115	65	48	200.69	191.96	183.24	174.51
21159	.6331"	16.080	18.0	123	73	48	278.16	266.07	253.97	241.88
21161	.6339"	16.100	18.0	123	73	48	278.16	266.07	253.97	241.88
21163	.6378"	16.200	18.0	123	73	48	278.16	266.07	253.97	241.88
21165	.6398"	16.250	18.0	123	73	48	278.16	266.07	253.97	241.88
21175	.6496"	16.500	18.0	123	73	48	275.23	263.26	251.30	239.33
21185	.6555"	16.650	18.0	123	73	48	275.23	263.26	251.30	239.33
21195	.6693"	17.000	18.0	123	73	48	272.23	260.39	248.56	236.72
21205	.6713"	17.050	18.0	123	73	48	272.23	260.39	248.56	236.72
21215	.6870"	17.450	18.0	123	73	48	272.23	260.39	248.56	236.72
21225	.6890"	17.500	18.0	123	73	48	269.33	257.62	245.91	234.20
21235	.7027"	17.850	18.0	123	73	48	269.33	257.62	245.91	234.20
21245	.7087"	18.000	18.0	123	73	48	266.37	254.79	243.21	231.63
21255	.7185"	18.250	20.0	131	79	50	376.57	360.20	343.82	327.45
21265	.7283"	18.500	20.0	131	79	50	373.65	357.40	341.16	324.91
21275	.7342"	18.650	20.0	131	79	50	373.65	357.40	341.16	324.91
21285	.7480"	19.000	20.0	131	79	50	370.68	354.56	338.45	322.33
21295	.7500"	19.050	20.0	131	79	50	370.68	354.56	338.45	322.33
21297	.7520"	19.100	20.0	131	79	50	370.68	354.56	338.45	322.33
21298	.7539"	19.150	20.0	131	79	50	370.68	354.56	338.45	322.33
21299	.7559"	19.200	20.0	131	79	50	370.68	354.56	338.45	322.33
21300	.7579"	19.250	20.0	131	79	50	370.68	354.56	338.45	322.33
21303	.7590"	19.280	20.0	131	79	50	370.68	354.56	338.45	322.33
21304	.7598"	19.300	20.0	131	79	50	370.68	354.56	338.45	322.33
21305	.7638"	19.400	20.0	131	79	50	370.68	354.56	338.45	322.33
21315	.7677"	19.500	20.0	131	79	50	367.76	351.77	335.78	319.79
21323	.7795"	19.800	20.0	131	79	50	367.76	351.77	335.78	319.79
21325	.7815"	19.850	20.0	131	79	50	367.76	351.77	335.78	319.79
21335	.7874"	20.000	20.0	131	79	50	364.78	348.92	333.06	317.20

TOLERANCES

<i>d</i>	+.0000"-.0005" (+.0000-.0127mm)	
<i>l1</i>	≤ 1/8"	+ .125"-.062" (+3.175-1.588mm)
	> 1/8"	+ .125"-.125" (+3.175-3.175mm)
<i>l2</i>	≤ 1/8"	+ .125"-.062" (+3.175-1.588mm)
	> 1/8"	+ .125"-.125" (+3.175-3.175mm)

Technical information: page 256-257

1580H - 2 Flute

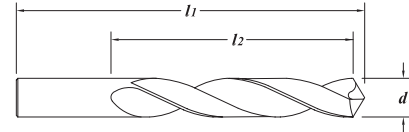


.1181" - .2165"
(3.000mm - 5.500mm)

HIGH PERFORMANCE DRILLS

Balinit® HARDLUBE Coated

- High performance - high penetration solid submicron grain carbide drill
- Extended tool life and greater surface finish through faster SFM rates
- Up to 50% faster than standard carbide drills
- 30° helix for better chip evacuation
- Honed cutting edge
- Recommended to run in high nickel, high temperature alloys, cobalt-based alloys, stainless steels and tool steels
- Live tooling recommended on lathe processes



EDP#	<i>d</i> † Diameter		<i>l1</i> Overall Length	<i>l2</i> Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
20301	.1181	3.000	46	16	33.06	31.63	30.19	28.75	
20306	.1200	#31	3.048	1-13/16"	5/8"	33.40	31.94	30.49	29.04
20311	.1250	1/8"	3.175	1-15/16"	11/16"	33.70	32.23	30.77	29.30
20316	.1285	#30	3.264	1-15/16"	11/16"	33.99	32.52	31.04	29.56
20321	.1360	#29	3.454	2-1/16"	3/4"	34.33	32.84	31.34	29.85
20326	.1378		3.500	52	19	34.66	33.15	31.65	30.14
20331	.1405	#28	3.569	2-1/16"	3/4"	34.98	33.46	31.94	30.42
20336	.1406	9/64"	3.571	2-1/16"	3/4"	35.28	33.75	32.21	30.68
20341	.1440	#27	3.658	2-1/16"	3/4"	35.60	34.06	32.51	30.96
20346	.1470	#26	3.734	2-3/16"	13/16"	35.88	34.32	32.76	31.20
20351	.1495	#25	3.797	2-3/16"	13/16"	36.25	34.67	33.10	31.52
20356	.1520	#24	3.861	2-3/16"	13/16"	36.54	34.95	33.36	31.77
20361	.1540	#23	3.912	2-3/16"	13/16"	36.86	35.26	33.65	32.05
20366	.1562	5/32"	3.967	2-3/16"	13/16"	37.15	35.53	33.92	32.30
20371	.1570	#22	3.988	2-3/16"	13/16"	37.49	35.86	34.23	32.60
20376	.1575		4.000	56	21	37.79	36.15	34.50	32.86
20381	.1590	#21	4.039	2-3/16"	13/16"	38.12	36.47	34.81	33.15
20386	.1610	#20	4.089	2-3/16"	13/16"	38.44	36.77	35.10	33.43
20391	.1660	#19	4.216	2-9/32"	15/16"	38.78	37.09	35.41	33.72
20396	.1695	#18	4.305	2-9/32"	15/16"	39.08	37.38	35.68	33.98
20401	.1719	11/64"	4.366	2-9/32"	15/16"	39.41	37.70	35.98	34.27
20406	.1730	#17	4.394	2-9/32"	15/16"	39.73	38.01	36.28	34.55
20411	.1770	#16	4.496	2-9/32"	15/16"	40.00	38.26	36.52	34.78
20416	.1772		4.500	58	24	40.34	38.59	36.83	35.08
20421	.1800	#15	4.572	2-9/32"	15/16"	40.62	38.85	37.09	35.32
20426	.1820	#14	4.623	2-9/32"	15/16"	41.00	39.22	37.43	35.65
20431	.1850	#13	4.700	2-9/32"	15/16"	41.29	39.49	37.70	35.90
20436	.1875	3/16"	4.763	2-13/32"	1"	41.62	39.81	38.00	36.19
20441	.1890	#12	4.801	2-13/32"	1"	41.93	40.11	38.28	36.46
20446	.1910	#11	4.851	2-13/32"	1"	42.31	40.47	38.63	36.79
20451	.1935	#10	4.915	2-13/32"	1"	42.56	40.71	38.86	37.01
20456	.1960	#9	4.978	2-13/32"	1"	42.87	41.01	39.14	37.28
20461	.1969		5.000	61	25	43.10	41.23	39.35	37.48
20466	.1990	#8	5.055	2-13/32"	1"	43.52	41.62	39.73	37.84
20471	.2010	#7	5.105	2-13/32"	1"	43.63	41.73	39.84	37.94
20476	.2031	13/64"	5.159	2-13/32"	1"	43.93	42.02	40.11	38.20
20481	.2040	#6	5.182	2-13/32"	1"	44.23	42.31	40.38	38.46
20486	.2055	#5	5.220	2-13/32"	1"	44.54	42.60	40.67	38.73
20491	.2090	#4	5.309	2-13/32"	1"	44.82	42.87	40.92	38.97
20496	.2130	#3	5.410	2-5/8"	1-3/32"	45.11	43.15	41.19	39.23
20501	.2165		5.500	67	28	45.40	43.43	41.45	39.48

continued →

1580H - 2 Flute (continued)

.2188" - .4528"
(5.558mm - 11.500mm)

EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
20506	.2188	7/32"	5.558	2-5/8"	1-3/32"	45.78	43.79	41.80	39.81
20511	.2210	#2	5.613	2-5/8"	1-3/32"	46.12	44.11	42.11	40.10
20516	.2280	#1	5.791	2-5/8"	1-3/32"	46.46	44.44	42.42	40.40
20521	.2340	A	5.944	2-5/8"	1-3/32"	46.78	44.75	42.71	40.68
20526	.2344	15/64"	5.954	2-5/8"	1-3/32"	47.14	45.09	43.04	40.99
20531	.2362		6.000	67	28	47.46	45.40	43.33	41.27
20536	.2380	B	6.045	2-3/4"	1-7/32"	47.78	45.71	43.63	41.55
20541	.2420	C	6.147	2-3/4"	1-7/32"	48.16	46.07	43.97	41.88
20546	.2460	D	6.248	2-3/4"	1-7/32"	48.44	46.33	44.23	42.12
20551	.2500	1/4" / E	6.350	2-3/4"	1-7/32"	48.85	46.73	44.60	42.48
20556	.2559		6.500	70	31	49.63	47.48	45.32	43.16
20561	.2570	F	6.528	2-3/4"	1-7/32"	50.42	48.22	46.03	43.84
20566	.2610	G	6.629	2-3/4"	1-7/32"	51.19	48.96	46.74	44.51
20571	.2656	17/64"	6.746	2-15/16"	1-11/32"	51.96	49.70	47.44	45.18
20576	.2660	H	6.756	2-15/16"	1-11/32"	52.73	50.44	48.14	45.85
20581	.2720	I	6.909	2-15/16"	1-11/32"	53.51	51.18	48.86	46.53
20586	.2756		7.000	75	34	54.29	51.93	49.57	47.21
20591	.2770	J	7.036	2-15/16"	1-11/32"	55.04	52.65	50.25	47.86
20596	.2810	K	7.137	2-15/16"	1-11/32"	55.83	53.41	50.98	48.55
20601	.2812	9/32"	7.142	2-15/16"	1-11/32"	56.61	54.15	51.69	49.23
20606	.2900	L	7.366	2-15/16"	1-11/32"	57.39	54.89	52.40	49.90
20611	.2950	M	7.493	2-15/16"	1-11/32"	58.49	55.95	53.40	50.86
20616	.2953		7.500	75	34	58.49	55.95	53.40	50.86
20621	.2969	19/64"	7.541	3-3/32"	1-15/32"	59.01	56.44	53.88	51.31
20626	.3020	N	7.671	3-3/32"	1-15/32"	61.65	58.97	56.29	53.61
20631	.3125	5/16"	7.938	3-3/32"	1-15/32"	61.87	59.18	56.49	53.80
20636	.3150		8.000	79	37	65.67	62.81	59.96	57.10
20641	.3160	O	8.026	3-3/32"	1-15/32"	65.67	62.81	59.96	57.10
20646	.3230	P	8.204	3-3/32"	1-15/32"	66.14	63.26	60.39	57.51
20651	.3281	21/64"	8.334	3-3/32"	1-15/32"	67.37	64.44	61.51	58.58
20656	.3320	Q	8.433	3-3/32"	1-15/32"	68.57	65.59	62.61	59.63
20661	.3346		8.500	79	37	68.86	65.87	62.87	59.88
20666	.3390	R	8.611	3-5/16"	1-9/16"	70.71	67.64	64.56	61.49
20671	.3438	11/32"	8.733	3-5/16"	1-9/16"	72.27	69.12	65.98	62.84
20676	.3480	S	8.839	3-5/16"	1-9/16"	74.66	71.41	68.17	64.92
20681	.3543		9.000	84	40	76.56	73.23	69.90	66.57
20686	.3580	T	9.093	3-5/16"	1-9/16"	79.56	76.10	72.64	69.18
20691	.3594	23/64"	9.129	3-5/16"	1-9/16"	80.05	76.57	73.09	69.61
20696	.3680	U	9.347	3-5/16"	1-9/16"	84.21	80.55	76.89	73.23
20701	.3740		9.500	84	40	84.90	81.21	77.52	73.83
20706	.3750	3/8"	9.525	3-1/2"	1-11/16"	85.42	81.71	77.99	74.28
20711	.3770	V	9.576	3-1/2"	1-11/16"	88.70	84.84	80.99	77.13
20716	.3860	W	9.804	3-1/2"	1-11/16"	90.25	86.33	82.40	78.48
20721	.3906	25/64"	9.921	3-1/2"	1-11/16"	91.39	87.42	83.44	79.47
20726	.3937		10.000	89	43	94.15	90.06	85.96	81.87
20731	.3970	X	10.084	3-1/2"	1-11/16"	96.46	92.27	88.07	83.88
20736	.4040	Y	10.262	3-1/2"	1-11/16"	97.11	92.88	88.66	84.44
20741	.4062	13/32"	10.317	3-1/2"	1-11/16"	100.10	95.74	91.39	87.04
20746	.4130	Z	10.490	3-1/2"	1-11/16"	101.03	96.64	92.24	87.85
20751	.4134		10.500	89	43	101.03	96.64	92.24	87.85
20756	.4219	27/64"	10.716	3-3/4"	1-13/16"	101.98	97.55	93.11	88.68
20761	.4331		11.000	95	46	109.47	104.71	99.95	95.19
20766	.4375	7/16"	11.113	3-3/4"	1-13/16"	109.47	104.71	99.95	95.19
20771	.4528		11.500	95	46	117.51	112.40	107.29	102.18

1580H - 2 Flute (continued)

.4531" - .6299"
(11.509mm - 16.000mm)

HIGH PERFORMANCE
DRILLS

EDP#	d^{\dagger}		l_1	l_2	1-11	12-24	25-49	50-100	
	Decimal	Diameter							Metric
20776	.4531	29/64"	11.509	3-3/4"	1-13/16"	117.51	112.40	107.29	102.18
20781	.4688	15/32"	11.908	4"	1-15/16"	123.45	118.09	112.72	107.35
20786	.4724		12.000	102	49	123.82	118.44	113.05	107.67
20791	.4844	31/64"	12.304	4"	1-15/16"	124.67	119.25	113.83	108.41
20796	.4921		12.500	102	49	125.91	120.44	114.96	109.49
20801	.5000	1/2"	12.700	4"	1-15/16"	126.72	121.21	115.70	110.19
20806	.5118		13.000	107	53	140.66	134.54	128.43	122.31
20811	.5156	33/64"	13.096	4-7/32"	2-3/32"	143.97	137.71	131.45	125.19
20816	.5312	17/32"	13.492	4-7/32"	2-3/32"	147.29	140.89	134.48	128.08
20821	.5315		13.500	110	56	150.60	144.06	137.51	130.96
20826	.5469	35/64"	13.891	4-5/16"	2-7/32"	153.92	147.22	140.53	133.84
20831	.5512		14.000	110	56	157.25	150.41	143.58	136.74
20836	.5625	9/16"	14.288	4-9/16"	2-15/32"	169.91	162.53	155.14	147.75
20841	.5709		14.500	116	63	173.10	165.57	158.05	150.52
20846	.5781	37/64"	14.684	4-15/16"	2-9/16"	176.19	168.53	160.87	153.21
20851	.5906		15.000	125	65	179.45	171.64	163.84	156.04
20856	.5938	19/32"	15.083	4-15/16"	2-9/16"	180.42	172.58	164.73	156.89
20861	.6094	39/64"	15.479	5-1/16"	2-13/16"	181.33	173.45	165.56	157.68
20866	.6102		15.500	129	71	182.28	174.35	166.43	158.50
20871	.6250	5/8"	15.875	5-1/4"	3-1/8"	183.18	175.22	167.25	159.29
20876	.6299		16.000	133	79	187.61	179.45	171.30	163.14



Welcome to Garr Tool Company

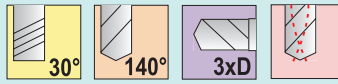
1580KH - 2 Flute

Technical information: page 256-257

TOLERANCES

<i>d</i>	+0.000" -0.005" (+0.000 -0.127mm)	
<i>l1</i>	≤ 1/8"	+0.125" -0.062" (+3.175 -1.588mm)
	> 1/8"	+0.125" -0.125" (+3.175 -3.175mm)
<i>l2</i>	≤ 1/8"	+0.125" -0.062" (+3.175 -1.588mm)
	> 1/8"	+0.125" -0.125" (+3.175 -3.175mm)

.1575" - .2756"
(4.000mm - 7.000mm)

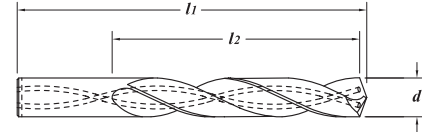
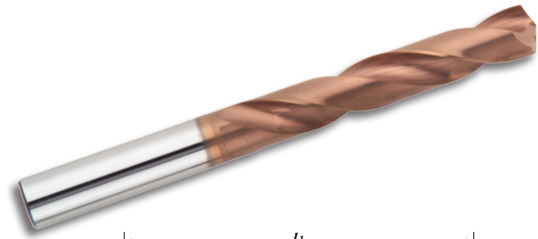


Balinit® HELICA Coated

- High performance - high penetration solid submicron grain carbide drill
- Coolant through capabilities for high pressure coolant systems
- Extended tool life and greater surface finish through faster SFM rates
- Up to 70% faster than standard carbide drills
- 30° helix for better chip evacuation
- Honed cutting edge

Recommended to run in high nickel, high temperature alloys, cobalt-based alloys, stainless steels and tool steels

Live tooling recommended on lathe processes



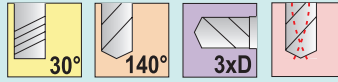
EDP#	<i>d</i> [†] Diameter		<i>l1</i> Overall Length	<i>l2</i> Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
22085	.1575	4.000	56	21	52.47	50.19	47.91	45.63	
22090	.1590	#21	4.039	2-3/16"	13/16"	52.96	50.66	48.35	46.05
22095	.1610	#20	4.089	2-3/16"	13/16"	53.39	51.07	48.75	46.43
22100	.1660	#19	4.216	2-9/32"	15/16"	53.85	51.51	49.17	46.83
22105	.1695	#18	4.305	2-9/32"	15/16"	54.28	51.92	49.56	47.20
22110	.1719	11/64"	4.366	2-9/32"	15/16"	54.73	52.35	49.97	47.59
22115	.1730	#17	4.394	2-9/32"	15/16"	55.17	52.77	50.37	47.97
22120	.1770	#16	4.496	2-9/32"	15/16"	55.56	53.14	50.73	48.31
22125	.1772		4.500	58	24	56.04	53.60	51.17	48.73
22130	.1800	#15	4.572	2-9/32"	15/16"	56.41	53.96	51.50	49.05
22135	.1820	#14	4.623	2-9/32"	15/16"	56.95	54.47	52.00	49.52
22140	.1850	#13	4.699	2-9/32"	15/16"	57.34	54.85	52.35	49.86
22145	.1875	3/16"	4.763	2-13/32"	1"	57.81	55.30	52.78	50.27
22150	.1890	#12	4.801	2-13/32"	1"	58.21	55.68	53.15	50.62
22155	.1910	#11	4.851	2-13/32"	1"	58.75	56.20	53.64	51.09
22160	.1935	#10	4.915	2-13/32"	1"	59.10	56.53	53.96	51.39
22165	.1960	#9	4.978	2-13/32"	1"	59.54	56.95	54.36	51.77
22170	.1969		5.000	61	25	59.87	57.27	54.66	52.06
22175	.1990	#8	5.055	2-13/32"	1"	60.42	57.79	55.17	52.54
22180	.2010	#7	5.105	2-13/32"	1"	60.59	57.96	55.32	52.69
22185	.2031	13/64"	5.159	2-13/32"	1"	61.01	58.36	55.70	53.05
22190	.2040	#6	5.182	2-13/32"	1"	61.42	58.75	56.08	53.41
22195	.2055	#5	5.220	2-13/32"	1"	61.86	59.17	56.48	53.79
22200	.2090	#4	5.309	2-13/32"	1"	62.25	59.54	56.84	54.13
22205	.2130	#3	5.410	2-5/8"	1-3/32"	62.66	59.94	57.21	54.49
22210	.2165		5.500	67	28	63.05	60.31	57.57	54.83
22215	.2188	7/32"	5.558	2-5/8"	1-3/32"	63.60	60.83	58.07	55.30
22220	.2210	#2	5.613	2-5/8"	1-3/32"	64.04	61.26	58.47	55.69
22225	.2280	#1	5.791	2-5/8"	1-3/32"	64.53	61.72	58.92	56.11
22230	.2340	A	5.944	2-5/8"	1-3/32"	64.98	62.15	59.33	56.50
22235	.2344	15/64"	5.954	2-5/8"	1-3/32"	65.47	62.62	59.78	56.93
22240	.2362		6.000	67	28	65.93	63.06	60.20	57.33
22245	.2380	B	6.045	2-3/4"	1-7/32"	66.37	63.48	60.60	57.71
22250	.2420	C	6.147	2-3/4"	1-7/32"	66.91	64.00	61.09	58.18
22255	.2460	D	6.248	2-3/4"	1-7/32"	67.29	64.36	61.44	58.51
22260	.2500	1/4" / E	6.350	2-3/4"	1-7/32"	67.85	64.90	61.95	59.00
22265	.2559		6.500	70	31	68.95	65.96	62.96	59.96
22270	.2570	F	6.528	2-3/4"	1-7/32"	70.01	66.97	63.92	60.88
22275	.2610	G	6.629	2-3/4"	1-7/32"	71.08	67.99	64.90	61.81
22280	.2656	17/64"	6.746	2-15/16"	1-11/32"	72.17	69.04	65.90	62.76
22285	.2660	H	6.756	2-15/16"	1-11/32"	73.24	70.06	66.87	63.69
22290	.2720	I	6.909	2-15/16"	1-11/32"	74.31	71.08	67.85	64.62
22295	.2756		7.000	75	34	75.39	72.12	68.84	65.56

EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
22300	.2770	J	7.036	2-15/16"	1-11/32"	76.44	73.12	69.79	66.47
22305	.2810	K	7.137	2-15/16"	1-11/32"	77.57	74.20	70.82	67.45
22310	.2812	9/32"	7.142	2-15/16"	1-11/32"	78.64	75.22	71.80	68.38
22315	.2900	L	7.366	2-15/16"	1-11/32"	79.70	76.23	72.77	69.30
22320	.2950	M	7.493	2-15/16"	1-11/32"	81.24	77.70	74.17	70.64
22325	.2953		7.500	75	34	81.24	77.70	74.17	70.64
22330	.2969	19/64"	7.541	3-3/32"	1-15/32"	81.94	78.38	74.81	71.25
22335	.3020	N	7.671	3-3/32"	1-15/32"	85.63	81.91	78.18	74.46
22340	.3125	5/16"	7.938	3-3/32"	1-15/32"	85.93	82.19	78.46	74.72
22345	.3150		8.000	79	37	87.55	83.74	79.94	76.13
22350	.3160	O	8.026	3-3/32"	1-15/32"	87.55	83.74	79.94	76.13
22355	.3230	P	8.204	3-3/32"	1-15/32"	88.18	84.35	80.51	76.68
22360	.3281	21/64"	8.334	3-3/32"	1-15/32"	89.83	85.92	82.02	78.11
22365	.3320	Q	8.433	3-3/32"	1-15/32"	91.44	87.46	83.49	79.51
22370	.3346		8.500	79	37	91.82	87.82	83.83	79.84
22375	.3390	R	8.611	3-5/16"	1-9/16"	94.28	90.18	86.08	81.98
22380	.3438	11/32"	8.733	3-5/16"	1-9/16"	96.35	92.16	87.97	83.78
22385	.3480	S	8.839	3-5/16"	1-9/16"	99.53	95.21	90.88	86.55
22390	.3543		9.000	84	40	102.07	97.64	93.20	88.76
22395	.3580	T	9.093	3-5/16"	1-9/16"	106.09	101.48	96.86	92.25
22400	.3594	23/64"	9.129	3-5/16"	1-9/16"	106.73	102.09	97.45	92.81
22405	.3680	U	9.347	3-5/16"	1-9/16"	112.30	107.42	102.53	97.65
22410	.3740		9.500	84	40	113.21	108.28	103.36	98.44
22415	.3750	3/8"	9.525	3-1/2"	1-11/16"	113.90	108.94	103.99	99.04
22420	.3770	V	9.576	3-1/2"	1-11/16"	118.27	113.12	107.98	102.84
22425	.3860	W	9.804	3-1/2"	1-11/16"	120.34	115.10	109.87	104.64
22430	.3906	25/64"	9.921	3-1/2"	1-11/16"	121.84	116.55	111.25	105.95
22435	.3937		10.000	89	43	122.28	116.96	111.65	106.33
22440	.3970	X	10.084	3-1/2"	1-11/16"	125.27	119.82	114.38	108.93
22445	.4040	Y	10.262	3-1/2"	1-11/16"	126.13	120.65	115.16	109.68
22450	.4062	13/32"	10.317	3-1/2"	1-11/16"	130.01	124.36	118.70	113.05
22455	.4130	Z	10.490	3-1/2"	1-11/16"	131.20	125.50	119.79	114.09
22460	.4134		10.500	89	43	131.20	125.50	119.79	114.09
22465	.4219	27/64"	10.716	3-3/4"	1-13/16"	132.43	126.68	120.92	115.16
22470	.4331		11.000	95	46	142.15	135.97	129.79	123.61
22475	.4375	7/16"	11.113	3-3/4"	1-13/16"	142.15	135.97	129.79	123.61
22480	.4528		11.500	95	46	152.61	145.97	139.34	132.70
22485	.4531	29/64"	11.509	3-3/4"	1-13/16"	152.61	145.97	139.34	132.70
22490	.4688	15/32"	11.908	4"	1-15/16"	160.32	153.35	146.38	139.41
22495	.4724		12.000	102	49	160.82	153.82	146.83	139.84
22500	.4844	31/64"	12.304	4"	1-15/16"	173.14	165.62	158.09	150.56
22505	.4921		12.500	102	49	182.49	174.56	166.62	158.69
22510	.5000	1/2"	12.700	4"	1-15/16"	183.64	175.66	167.67	159.69
22515	.5118		13.000	107	53	203.86	195.00	186.13	177.27
22520	.5156	33/64"	13.096	4-7/32"	2-3/32"	208.67	199.60	190.52	181.45
22525	.5312	17/32"	13.492	4-7/32"	2-3/32"	213.46	204.18	194.90	185.62
22530	.5315		13.500	110	56	218.29	208.80	199.31	189.82
22535	.5469	35/64"	13.891	4-5/16"	2-7/32"	223.05	213.36	203.66	193.96
22540	.5512		14.000	110	56	227.90	217.99	208.08	198.17
22545	.5625	9/16"	14.288	4-9/16"	2-15/32"	246.25	235.54	224.84	214.13
22550	.5709		14.500	116	63	250.90	239.99	229.08	218.17
22555	.5781	37/64"	14.684	4-15/16"	2-9/16"	255.38	244.28	233.17	222.07
22560	.5906		15.000	125	65	260.07	248.77	237.46	226.15
22565	.5938	19/32"	15.083	4-15/16"	2-9/16"	261.49	250.12	238.75	227.38
22570	.6094	39/64"	15.479	5-1/16"	2-13/16"	262.80	251.37	239.95	228.52
22575	.6102		15.500	129	71	264.17	252.68	241.20	229.71
22580	.6250	5/8"	15.875	5-1/4"	3-1/8"	265.47	253.92	242.38	230.84
22585	.6299		16.000	133	79	271.89	260.07	248.25	236.43

1580KD - 2 Flute

Technical information: page 256-257

4.000mm - 7.500mm
(.1575" - .2953")



TOLERANCES		
d1 *	3mm - 6mm	+0.16 +.004mm (+.0063" +.0015")
	> 6mm - 10mm	+0.21 +.006mm (+.0082" +.0023")
	> 10mm - 18mm	+0.25 +.007mm (+.0098" +.0027")
	> 18mm - 20mm	+0.29 +.008mm (+.0114" +.0031")
	6mm	+0.00 - .008mm (+.0000" - .0030")
d2	8mm - 10mm	+0.00 - .009mm (+.0000" - .0035")
	12mm - 18mm	+0.00 - .011mm (+.0000" - .0040")
	20mm	+0.00 - .013mm (+.0000" - .0050")

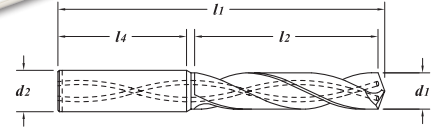
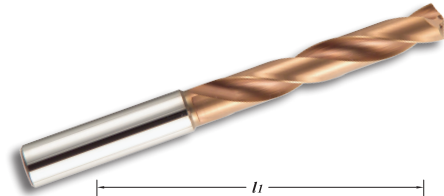
Balinit® HELICA Coated

- High performance solid submicron grain carbide drill with reinforced shank
- Utilizes DIN standard 6537 *
- Coolant through capabilities for high pressure coolant systems
- Up to 70% faster than standard carbide drills
- 30° helix for better chip evacuation
- Honed cutting edge

Recommended to run in high nickel, high temperature alloys, cobalt-based alloys, stainless steels and tool steels

Balinit® HELICA is a multi-layer AlCr-based coating designed exclusively for high performance drilling

Live tooling recommended on lathe processes



* Note - These drills are made to a plus/plus tolerance on the drill diameter. If you are in need of a minus tolerance drill, please refer to our other high performance drills.

EDP#	d1 Diameter		d2 Shank Diameter	l1 Overall Length	l2 Flute Length	l4 Shank Length	1-11	12-24	25-49	50-100
	Decimal	Metric								
28135	.1575"	4.000	6.0	66	24	36	72.28	69.14	65.99	62.85
28145	.1614"	4.100	6.0	66	24	36	72.28	69.14	65.99	62.85
28155	.1654"	4.200	6.0	66	24	36	72.28	69.14	65.99	62.85
28165	.1673"	4.250	6.0	66	24	36	72.28	69.14	65.99	62.85
28175	.1693"	4.300	6.0	66	24	36	72.28	69.14	65.99	62.85
28185	.1732"	4.400	6.0	66	24	36	72.28	69.14	65.99	62.85
28195	.1772"	4.500	6.0	66	24	36	71.53	68.42	65.31	62.20
28205	.1811"	4.600	6.0	66	24	36	71.53	68.42	65.31	62.20
28215	.1831"	4.650	6.0	66	24	36	71.53	68.42	65.31	62.20
28225	.1850"	4.700	6.0	66	24	36	71.53	68.42	65.31	62.20
28235	.1870"	4.750	6.0	66	24	36	71.53	68.42	65.31	62.20
28245	.1890"	4.800	6.0	66	28	36	71.53	68.42	65.31	62.20
28255	.1929"	4.900	6.0	66	28	36	71.53	68.42	65.31	62.20
28265	.1969"	5.000	6.0	66	28	36	70.81	67.73	64.65	61.57
28275	.2008"	5.100	6.0	66	28	36	70.81	67.73	64.65	61.57
28285	.2027"	5.150	6.0	66	28	36	70.81	67.73	64.65	61.57
28295	.2047"	5.200	6.0	66	28	36	70.81	67.73	64.65	61.57
28305	.2087"	5.300	6.0	66	28	36	70.81	67.73	64.65	61.57
28315	.2165"	5.500	6.0	66	28	36	70.07	67.02	63.98	60.93
28325	.2185"	5.550	6.0	66	28	36	70.07	67.02	63.98	60.93
28335	.2205"	5.600	6.0	66	28	36	70.07	67.02	63.98	60.93
28345	.2243"	5.700	6.0	66	28	36	70.07	67.02	63.98	60.93
28355	.2283"	5.800	6.0	66	28	36	70.07	67.02	63.98	60.93
28365	.2323"	5.900	6.0	66	28	36	70.07	67.02	63.98	60.93
28375	.2342"	5.950	6.0	66	28	36	70.07	67.02	63.98	60.93
28385	.2362"	6.000	6.0	66	28	36	69.33	66.32	63.30	60.29
28395	.2402"	6.100	8.0	79	34	36	99.56	95.23	90.90	86.57
28405	.2441"	6.200	8.0	79	34	36	99.56	95.23	90.90	86.57
28415	.2480"	6.300	8.0	79	34	36	99.56	95.23	90.90	86.57
28425	.2500"	6.350	8.0	79	34	36	99.56	95.23	90.90	86.57
28435	.2520"	6.400	8.0	79	34	36	99.56	95.23	90.90	86.57
28445	.2559"	6.500	8.0	79	34	36	98.81	94.51	90.22	85.92
28446	.2571"	6.530	8.0	79	34	36	98.81	94.51	90.22	85.92
28455	.2598"	6.600	8.0	79	34	36	98.81	94.51	90.22	85.92
28461	.2638"	6.700	8.0	79	34	36	98.81	94.51	90.22	85.92
28465	.2657"	6.750	8.0	79	34	36	98.81	94.51	90.22	85.92
28475	.2677"	6.800	8.0	79	34	36	98.81	94.51	90.22	85.92
28485	.2717"	6.900	8.0	79	34	36	98.81	94.51	90.22	85.92
28495	.2756"	7.000	8.0	79	34	36	98.10	93.83	89.57	85.30
28505	.2795"	7.100	8.0	79	41	36	98.10	93.83	89.57	85.30
28515	.2815"	7.150	8.0	79	41	36	98.10	93.83	89.57	85.30
28525	.2835"	7.200	8.0	79	41	36	98.10	93.83	89.57	85.30
28535	.2874"	7.300	8.0	79	41	36	98.10	93.83	89.57	85.30
28545	.2913"	7.400	8.0	79	41	36	98.10	93.83	89.57	85.30
28555	.2953"	7.500	8.0	79	41	36	97.32	93.09	88.86	84.63

1580KD - 2 Flute (continued)

7.550mm - 12.950mm
(.2972" - .5098")

HIGH PERFORMANCE
DRILLS

EDP#	<i>d1</i> Diameter		<i>d2</i> Shank Diameter	<i>l1</i> Overall Length	<i>l2</i> Flute Length	<i>l4</i> Shank Length	1-11	12-24	25-49	50-100
	Decimal	Metric								
28565	.2972"	7.550	8.0	79	41	36	97.32	93.09	88.86	84.63
28575	.2992"	7.600	8.0	79	41	36	97.32	93.09	88.86	84.63
28585	.3031"	7.700	8.0	79	41	36	97.32	93.09	88.86	84.63
28595	.3071"	7.800	8.0	79	41	36	97.32	93.09	88.86	84.63
28605	.3130"	7.950	8.0	79	41	36	97.32	93.09	88.86	84.63
28615	.3150"	8.000	8.0	79	41	36	96.60	92.40	88.20	84.00
28625	.3189"	8.100	10.0	89	47	40	134.57	128.72	122.87	117.02
28635	.3228"	8.200	10.0	89	47	40	134.57	128.72	122.87	117.02
28645	.3268"	8.300	10.0	89	47	40	134.57	128.72	122.87	117.02
28655	.3287"	8.350	10.0	89	47	40	134.57	128.72	122.87	117.02
28665	.3307"	8.400	10.0	89	47	40	134.57	128.72	122.87	117.02
28675	.3346"	8.500	10.0	89	47	40	133.48	127.68	121.87	116.07
28685	.3386"	8.600	10.0	89	47	40	133.48	127.68	121.87	116.07
28695	.3425"	8.700	10.0	89	47	40	133.48	127.68	121.87	116.07
28725	.3445"	8.750	10.0	89	47	40	133.48	127.68	121.87	116.07
28735	.3465"	8.800	10.0	89	47	40	133.48	127.68	121.87	116.07
28745	.3504"	8.900	10.0	89	47	40	133.48	127.68	121.87	116.07
28755	.3543"	9.000	10.0	89	47	40	132.39	126.63	120.88	115.12
28765	.3583"	9.100	10.0	89	47	40	132.39	126.63	120.88	115.12
28775	.3602"	9.150	10.0	89	47	40	132.39	126.63	120.88	115.12
28815	.3622"	9.200	10.0	89	47	40	132.39	126.63	120.88	115.12
28825	.3661"	9.300	10.0	89	47	40	132.39	126.63	120.88	115.12
28845	.3701"	9.400	10.0	89	47	40	132.39	126.63	120.88	115.12
28855	.3740"	9.500	10.0	89	47	40	131.27	125.57	119.86	114.15
28875	.3760"	9.550	10.0	89	47	40	131.27	125.57	119.86	114.15
28878	.3780"	9.600	10.0	89	47	40	131.27	125.57	119.86	114.15
28882	.3819"	9.700	10.0	89	47	40	131.27	125.57	119.86	114.15
28885	.3858"	9.800	10.0	89	47	40	131.27	125.57	119.86	114.15
28895	.3898"	9.900	10.0	89	47	40	131.27	125.57	119.86	114.15
28905	.3937"	10.000	10.0	89	47	40	130.17	124.51	118.85	113.19
28925	.3976"	10.100	12.0	102	55	45	174.48	166.89	159.31	151.72
28935	.4016"	10.200	12.0	102	55	45	174.48	166.89	159.31	151.72
28945	.4055"	10.300	12.0	102	55	45	174.48	166.89	159.31	151.72
28955	.4134"	10.500	12.0	102	55	45	173.01	165.48	157.96	150.44
28965	.4173"	10.600	12.0	102	55	45	173.01	165.48	157.96	150.44
28975	.4213"	10.700	12.0	102	55	45	173.01	165.48	157.96	150.44
28985	.4252"	10.800	12.0	102	55	45	173.01	165.48	157.96	150.44
28995	.4331"	11.000	12.0	102	55	45	171.53	164.08	156.62	149.16
29005	.4370"	11.100	12.0	102	55	45	171.53	164.08	156.62	149.16
29015	.4409"	11.200	12.0	102	55	45	171.53	164.08	156.62	149.16
29025	.4488"	11.400	12.0	102	55	45	171.53	164.08	156.62	149.16
29035	.4528"	11.500	12.0	102	55	45	170.06	162.67	155.27	147.88
29045	.4606"	11.700	12.0	102	55	45	170.06	162.67	155.27	147.88
29055	.4685"	11.900	12.0	102	55	45	170.06	162.67	155.27	147.88
29065	.4724"	12.000	12.0	102	55	45	168.54	161.22	153.89	146.56
29075	.4764"	12.100	14.0	107	60	45	241.34	230.85	220.35	209.86
29085	.4803"	12.200	14.0	107	60	45	241.34	230.85	220.35	209.86
29095	.4842"	12.300	14.0	107	60	45	241.34	230.85	220.35	209.86
29105	.4882"	12.400	14.0	107	60	45	241.34	230.85	220.35	209.86
29115	.4921"	12.500	14.0	107	60	45	239.84	229.42	218.99	208.56
29125	.4961"	12.600	14.0	107	60	45	239.84	229.42	218.99	208.56
29135	.5000"	12.700	14.0	107	60	45	239.84	229.42	218.99	208.56
29145	.5039"	12.800	14.0	107	60	45	239.84	229.42	218.99	208.56
29148	.5051"	12.830	14.0	107	60	45	239.84	229.42	218.99	208.56
29155	.5079"	12.900	14.0	107	60	45	239.84	229.42	218.99	208.56
29161	.5098"	12.950	14.0	107	60	45	239.84	229.42	218.99	208.56

continued →

1580KD - 2 Flute (continued)

13.000mm - 20.000mm
(.5118" - .7874")

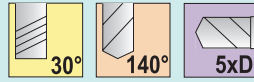
EDP#	<i>d1</i> Diameter		<i>d2</i> Shank Diameter	<i>l1</i> Overall Length	<i>l2</i> Flute Length	<i>l4</i> Shank Length	1-11	12-24	25-49	50-100
	Decimal	Metric								
29165	.5118"	13.000	14.0	107	60	45	238.37	228.01	217.64	207.28
29175	.5157"	13.100	14.0	107	60	45	238.37	228.01	217.64	207.28
29181	.5236"	13.300	14.0	107	60	45	238.37	228.01	217.64	207.28
29185	.5315"	13.500	14.0	107	60	45	236.89	226.59	216.29	205.99
29195	.5394"	13.700	14.0	107	60	45	236.89	226.59	216.29	205.99
29205	.5433"	13.800	14.0	107	60	45	236.89	226.59	216.29	205.99
29215	.5512"	14.000	14.0	107	60	45	235.42	225.18	214.95	204.71
29225	.5551"	14.100	16.0	115	65	48	293.66	280.90	268.13	255.36
29235	.5591"	14.200	16.0	115	65	48	293.66	280.90	268.13	255.36
29245	.5610"	14.250	16.0	115	65	48	293.66	280.90	268.13	255.36
29255	.5630"	14.300	16.0	115	65	48	293.66	280.90	268.13	255.36
29265	.5709"	14.500	16.0	115	65	48	292.16	279.46	266.75	254.05
29275	.5787"	14.700	16.0	115	65	48	292.16	279.46	266.75	254.05
29285	.5827"	14.800	16.0	115	65	48	292.16	279.46	266.75	254.05
29305	.5906"	15.000	16.0	115	65	48	290.67	278.04	265.40	252.76
29315	.5945"	15.100	16.0	115	65	48	290.67	278.04	265.40	252.76
29325	.6102"	15.500	16.0	115	65	48	289.21	276.64	264.06	251.49
29335	.6181"	15.700	16.0	115	65	48	289.21	276.64	264.06	251.49
29345	.6220"	15.800	16.0	115	65	48	289.21	276.64	264.06	251.49
29355	.6299"	16.000	16.0	115	65	48	287.75	275.24	262.73	250.22
29363	.6331"	16.080	18.0	123	73	48	375.60	359.27	342.94	326.61
29365	.6339"	16.100	18.0	123	73	48	375.60	359.27	342.94	326.61
29371	.6378"	16.200	18.0	123	73	48	375.60	359.27	342.94	326.61
29375	.6398"	16.250	18.0	123	73	48	375.60	359.27	342.94	326.61
29385	.6496"	16.500	18.0	123	73	48	372.68	356.48	340.27	324.07
29395	.6555"	16.650	18.0	123	73	48	372.68	356.48	340.27	324.07
29405	.6693"	17.000	18.0	123	73	48	369.68	353.61	337.53	321.46
29415	.6713"	17.050	18.0	123	73	48	369.68	353.61	337.53	321.46
29425	.6870"	17.450	18.0	123	73	48	369.68	353.61	337.53	321.46
29435	.6890"	17.500	18.0	123	73	48	366.78	350.83	334.89	318.94
29445	.7027"	17.850	18.0	123	73	48	366.78	350.83	334.89	318.94
29455	.7087"	18.000	18.0	123	73	48	363.83	348.01	332.19	316.37
29465	.7185"	18.250	20.0	131	79	50	492.46	471.05	449.64	428.23
29475	.7283"	18.500	20.0	131	79	50	489.53	468.25	446.96	425.68
29485	.7342"	18.650	20.0	131	79	50	489.53	468.25	446.96	425.68
29495	.7480"	19.000	20.0	131	79	50	486.57	465.41	444.26	423.10
29505	.7500"	19.050	20.0	131	79	50	486.57	465.41	444.26	423.10
29515	.7520"	19.100	20.0	131	79	50	486.57	465.41	444.26	423.10
29525	.7539"	19.150	20.0	131	79	50	486.57	465.41	444.26	423.10
29535	.7559"	19.200	20.0	131	79	50	486.57	465.41	444.26	423.10
29545	.7579"	19.250	20.0	131	79	50	486.57	465.41	444.26	423.10
29546	.7590"	19.280	20.0	131	79	50	486.57	465.41	444.26	423.10
29551	.7598"	19.300	20.0	131	79	50	486.57	465.41	444.26	423.10
29555	.7638"	19.400	20.0	131	79	50	486.57	465.41	444.26	423.10
29565	.7677"	19.500	20.0	131	79	50	483.64	462.62	441.59	420.56
29585	.7795"	19.800	20.0	131	79	50	483.64	462.62	441.59	420.56
29595	.7815"	19.850	20.0	131	79	50	483.64	462.62	441.59	420.56
29605	.7874"	20.000	20.0	131	79	50	480.67	459.77	438.87	417.97

TOLERANCES

$d1$	+0.000" -0.004" (+.000 -.010mm)
$d2$	[h6] +0.000" -0.003" (+.000 -.008mm)

Technical information: page 254-255

1250H - 2 Flute



NEW SERIES

0.792mm - 1.450mm
(.0312" - .0571")

HIGH PERFORMANCE DRILLS

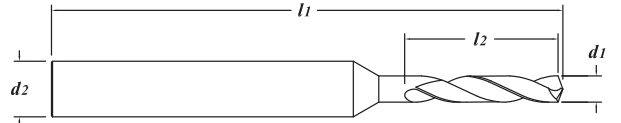
Balinit® HELICA Coated

High performance solid submicron grain carbide drill on 3mm or 1/8" diameter shank
30° helix for better chip evacuation

Recommended to run in high nickel, high temperature alloys, cobalt-based alloys, stainless steels and tool steels

Balinit® HELICA is a multi-layer AlCr-based coating designed exclusively for high performance drilling

Live tooling recommended on lathe processes



EDP#	$d1^{\dagger}$ Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
00304	.0312"	1/32"	0.792	1/8"	2"	15/64"	40.22	38.47	36.72	34.97
00306	.0315"		0.800	3.0	50	6.0	39.66	37.94	36.21	34.49
00308	.0319"		0.810	3.0	50	6.0	39.66	37.94	36.21	34.49
00310	.0320"	#67	0.812	1/8"	2"	15/64"	40.22	38.47	36.72	34.97
00312	.0323"		0.820	3.0	50	6.0	39.66	37.94	36.21	34.49
00314	.0327"		0.830	3.0	50	6.0	39.66	37.94	36.21	34.49
00316	.0330"	#66	0.838	1/8"	2"	15/64"	40.22	38.47	36.72	34.97
00318	.0331"		0.840	3.0	50	6.0	39.66	37.94	36.21	34.49
00320	.0335"		0.850	3.0	50	6.0	39.66	37.94	36.21	34.49
00322	.0339"		0.860	3.0	50	6.5	39.66	37.94	36.21	34.49
00324	.0343"		0.870	3.0	50	6.5	39.66	37.94	36.21	34.49
00326	.0346"		0.880	3.0	50	6.5	39.66	37.94	36.21	34.49
00328	.0350"	#65	0.890	3.0	50	6.5	39.66	37.94	36.21	34.49
00330	.0354"		0.900	3.0	50	6.5	39.66	37.94	36.21	34.49
00332	.0358"		0.910	3.0	50	6.5	39.66	37.94	36.21	34.49
00334	.0360"	#64	0.914	1/8"	2"	1/4"	40.22	38.47	36.72	34.97
00336	.0362"		0.920	3.0	50	6.5	39.66	37.94	36.21	34.49
00338	.0366"		0.930	3.0	50	6.5	39.66	37.94	36.21	34.49
00340	.0370"	#63	0.940	3.0	50	7.0	39.66	37.94	36.21	34.49
00342	.0374"		0.950	3.0	50	7.0	39.66	37.94	36.21	34.49
00344	.0378"		0.960	3.0	50	7.0	39.66	37.94	36.21	34.49
00346	.0380"	#62	0.965	1/8"	2"	17/64"	40.22	38.47	36.72	34.97
00348	.0382"		0.970	3.0	50	7.0	39.66	37.94	36.21	34.49
00350	.0386"		0.980	3.0	50	7.0	39.66	37.94	36.21	34.49
00352	.0390"	#61	0.990	3.0	50	7.0	39.66	37.94	36.21	34.49
00354	.0394"		1.000	3.0	50	7.0	39.66	37.94	36.21	34.49
00356	.0400"	#60	1.016	1/8"	2"	9/32"	39.85	38.12	36.38	34.65
00358	.0410"	#59	1.041	1/8"	2"	9/32"	39.85	38.12	36.38	34.65
00360	.0413"		1.050	3.0	50	7.5	39.33	37.62	35.91	34.20
00362	.0420"	#58	1.066	1/8"	2"	5/16"	39.85	38.12	36.38	34.65
00364	.0430"	#57	1.092	1/8"	2"	5/16"	39.85	38.12	36.38	34.65
00366	.0433"		1.100	3.0	50	8.0	39.33	37.62	35.91	34.20
00368	.0453"		1.150	3.0	50	8.0	39.33	37.62	35.91	34.20
00370	.0465"	#56	1.181	1/8"	2"	11/32"	39.85	38.12	36.38	34.65
00372	.0469"	3/64"	1.191	1/8"	2"	11/32"	39.85	38.12	36.38	34.65
00374	.0472"		1.200	3.0	50	9.0	39.33	37.62	35.91	34.20
00376	.0492"		1.250	3.0	50	9.0	39.33	37.62	35.91	34.20
00378	.0512"		1.300	3.0	50	9.0	38.92	37.22	35.53	33.84
00380	.0520"	#55	1.320	1/8"	2"	3/8"	39.48	37.76	36.05	34.33
00382	.0531"		1.350	3.0	50	9.5	38.92	37.22	35.53	33.84
00384	.0550"	#54	1.397	1/8"	2"	3/8"	39.48	37.76	36.05	34.33
00386	.0551"		1.400	3.0	50	10.0	38.92	37.22	35.53	33.84
00388	.0571"		1.450	3.0	50	10.5	38.92	37.22	35.53	33.84

continued →

1250H - 2 Flute (continued)

1.500mm - 3.175mm
(.0591" - .1250")

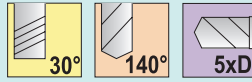
HIGH PERFORMANCE
DRILLS

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
	Decimal	Metric							
00390	.0591"	1.500	3.0	50	10.5	38.92	37.22	35.53	33.84
00392	.0595"	#53 1.511	1/8"	2"	7/16"	39.48	37.76	36.05	34.33
00394	.0610"	1.550	3.0	50	11.0	38.55	36.87	35.20	33.52
00396	.0625"	1/16" 1.587	1/8"	2"	7/16"	39.11	37.41	35.71	34.01
00398	.0630"	1.600	3.0	50	11.0	38.55	36.87	35.20	33.52
00400	.0635"	#52 1.613	1/8"	2"	15/32"	39.11	37.41	35.71	34.01
00402	.0650"	1.650	3.0	50	11.5	38.55	36.87	35.20	33.52
00404	.0669"	1.700	3.0	50	11.5	38.55	36.87	35.20	33.52
00406	.0670"	#51 1.702	1/8"	2"	15/32"	39.11	37.41	35.71	34.01
00408	.0689"	1.750	3.0	50	12.0	38.55	36.87	35.20	33.52
00410	.0700"	#50 1.778	1/8"	2"	1/2"	38.73	37.05	35.36	33.68
00412	.0709"	1.800	3.0	50	13.0	38.18	36.52	34.86	33.20
00414	.0728"	1.850	3.0	50	13.0	38.18	36.52	34.86	33.20
00416	.0730"	#49 1.854	1/8"	2"	1/2"	38.73	37.05	35.36	33.68
00418	.0748"	1.900	3.0	50	13.5	38.18	36.52	34.86	33.20
00420	.0760"	#48 1.930	1/8"	2"	17/32"	38.73	37.05	35.36	33.68
00422	.0768"	1.950	3.0	50	14.0	38.18	36.52	34.86	33.20
00424	.0781"	5/64" 1.983	1/8"	2"	9/16"	38.73	37.05	35.36	33.68
00426	.0785"	#47 1.994	1/8"	2"	9/16"	38.73	37.05	35.36	33.68
00428	.0787"	2.000	3.0	50	14.0	38.18	36.52	34.86	33.20
00430	.0807"	2.050	3.0	50	14.0	37.81	36.17	34.52	32.88
00432	.0810"	#46 2.057	1/8"	2"	9/16"	38.39	36.72	35.05	33.38
00434	.0820"	#45 2.083	1/8"	2"	9/16"	38.39	36.72	35.05	33.38
00436	.0827"	2.100	3.0	50	14.5	37.81	36.17	34.52	32.88
00438	.0846"	2.150	3.0	50	14.5	37.81	36.17	34.52	32.88
00440	.0860"	#44 2.184	1/8"	2"	19/32"	38.39	36.72	35.05	33.38
00442	.0866"	2.200	3.0	50	15.5	37.81	36.17	34.52	32.88
00444	.0886"	2.250	3.0	50	15.5	37.81	36.17	34.52	32.88
00446	.0890"	#43 2.260	1/8"	2"	5/8"	38.39	36.72	35.05	33.38
00448	.0906"	2.300	3.0	50	16.0	37.44	35.82	34.19	32.56
00450	.0925"	2.350	3.0	50	16.0	37.44	35.82	34.19	32.56
00452	.0935"	#42 2.375	1/8"	2"	21/32"	38.00	36.34	34.69	33.04
00454	.0938"	3/32" 2.382	1/8"	2"	21/32"	38.00	36.34	34.69	33.04
00456	.0945"	2.400	3.0	50	17.0	37.44	35.82	34.19	32.56
00458	.0960"	#41 2.438	1/8"	2"	43/64"	38.00	36.34	34.69	33.04
00460	.0965"	2.450	3.0	50	17.0	37.44	35.82	34.19	32.56
00462	.0980"	#40 2.489	1/8"	2"	11/16"	38.00	36.34	34.69	33.04
00464	.0984"	2.500	3.0	50	17.5	37.44	35.82	34.19	32.56
00466	.0995"	#39 2.527	1/8"	2"	11/16"	38.00	36.34	34.69	33.04
00468	.1004"	2.550	3.0	50	17.5	37.11	35.50	33.88	32.27
00470	.1015"	#38 2.578	1/8"	2"	45/64"	37.66	36.03	34.39	32.75
00472	.1024"	2.600	3.0	50	18.0	37.11	35.50	33.88	32.27
00474	.1040"	#37 2.641	1/8"	2"	23/32"	37.66	36.03	34.39	32.75
00476	.1043"	2.650	3.0	50	18.5	37.11	35.50	33.88	32.27
00478	.1063"	2.700	3.0	50	19.0	37.11	35.50	33.88	32.27
00480	.1065"	#36 2.705	1/8"	2"	3/4"	37.66	36.03	34.39	32.75
00482	.1083"	2.750	3.0	50	19.5	37.11	35.50	33.88	32.27
00484	.1094"	7/64" 2.778	1/8"	2"	49/64"	37.66	36.03	34.39	32.75
00486	.1100"	#35 2.794	1/8"	2"	49/64"	37.66	36.03	34.39	32.75
00488	.1102"	2.800	3.0	50	19.5	37.11	35.50	33.88	32.27
00490	.1110"	#34 2.819	1/8"	2"	25/32"	37.66	36.03	34.39	32.75
00492	.1122"	2.850	3.0	50	20.0	37.11	35.50	33.88	32.27
00494	.1130"	#33 2.870	1/8"	2"	51/64"	37.66	36.03	34.39	32.75
00496	.1142"	2.900	3.0	50	20.0	37.11	35.50	33.88	32.27
00498	.1160"	#32 2.946	1/8"	2"	13/16"	37.66	36.03	34.39	32.75
00500	.1161"	2.950	3.0	50	21.0	37.11	35.50	33.88	32.27
00502	.1181"	3.000	3.0	50	21.0	34.94	33.42	31.90	30.38
00504	.1200"	#31 3.048	1/8"	2"	7/8"	37.66	36.03	34.39	32.75
00506	.1250"	1/8" 3.175	1/8"	2"	7/8"	35.50	33.96	32.41	30.87

TOLERANCES

<i>d</i>	+.0000" -.0005" (+.0000 -.0127mm)	
<i>l₁</i>	≤ 1/8"	+ .125" -.062" (+3.175 -1.588mm)
	> 1/8"	+ .125" -.125" (+3.175 -3.175mm)
<i>l₂</i>	≤ 1/8"	+ .125" -.062" (+3.175 -1.588mm)
	> 1/8"	+ .125" -.125" (+3.175 -3.175mm)

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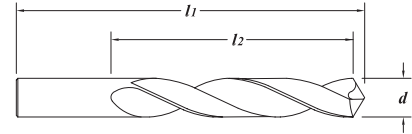
1280H - 2 Flute

.1181" - .2165"
(3.000mm - 5.500mm)

HIGH PERFORMANCE DRILLS

Balinit® HARDLUBE Coated

- High performance - high penetration solid submicron grain carbide drill
- Extended tool life and greater surface finish through faster SFM rates
- Up to 50% faster than standard carbide drills
- 30° helix for better chip evacuation
- Honed cutting edge
- Recommended to run in high nickel, high temperature alloys, cobalt-based alloys, stainless steels and tool steels
- Live tooling recommended on lathe processes



EDP#	<i>d</i> [†] Diameter		<i>l₁</i> Overall Length	<i>l₂</i> Flute Length	1-11	12-24	25-49	50-100
	Decimal	Metric						
21301	.1181	3.000	50	19	34.55	33.04	31.54	30.04
21306	.1200	#31	2"	3/4"	34.82	33.31	31.79	30.28
21311	.1250	1/8"	2"	3/4"	35.10	33.57	32.05	30.52
21316	.1285	#30	2-1/4"	3/4"	35.42	33.88	32.34	30.80
21321	.1360	#29	2-1/4"	7/8"	35.68	34.13	32.58	31.03
21326	.1378	3.500	57	22	35.96	34.40	32.83	31.27
21331	.1405	#28	2-1/4"	7/8"	36.25	34.67	33.10	31.52
21336	.1406	9/64"	2-1/4"	7/8"	36.56	34.97	33.38	31.79
21341	.1440	#27	2-1/4"	7/8"	36.80	35.20	33.60	32.00
21346	.1470	#26	2-1/4"	7/8"	37.11	35.50	33.88	32.27
21351	.1495	#25	2-1/4"	15/16"	37.40	35.77	34.15	32.52
21356	.1520	#24	2-1/4"	15/16"	37.66	36.03	34.39	32.75
21361	.1540	#23	2-1/4"	15/16"	37.97	36.32	34.67	33.02
21366	.1562	5/32"	2-1/2"	15/16"	38.25	36.59	34.92	33.26
21371	.1570	#22	2-1/2"	15/16"	38.53	36.85	35.18	33.50
21376	.1575	4.000	65	24	38.81	37.13	35.44	33.75
21381	.1590	#21	2-1/2"	15/16"	39.09	37.39	35.69	33.99
21386	.1610	#20	2-1/2"	15/16"	39.40	37.69	35.97	34.26
21391	.1660	#19	2-1/2"	1"	39.68	37.95	36.23	34.50
21396	.1695	#18	2-1/2"	1"	39.95	38.21	36.48	34.74
21401	.1719	11/64"	2-1/2"	1"	40.24	38.49	36.74	34.99
21406	.1730	#17	2-1/2"	1"	40.50	38.74	36.98	35.22
21411	.1770	#16	2-1/2"	1"	40.81	39.04	37.26	35.49
21416	.1772	4.500	65	25	41.11	39.33	37.54	35.75
21421	.1800	#15	2-3/4"	1"	41.37	39.57	37.77	35.97
21426	.1820	#14	2-3/4"	1"	41.64	39.83	38.02	36.21
21431	.1850	#13	2-3/4"	1-1/4"	41.95	40.13	38.30	36.48
21436	.1875	3/16"	2-3/4"	1-1/4"	42.25	40.41	38.58	36.74
21441	.1890	#12	2-3/4"	1-1/4"	42.52	40.67	38.82	36.97
21446	.1910	#11	2-3/4"	1-1/4"	42.78	40.92	39.06	37.20
21451	.1935	#10	2-3/4"	1-1/4"	43.09	41.22	39.34	37.47
21456	.1960	#9	4.978	3"	43.36	41.47	39.59	37.70
21461	.1969	5.000	75	33	43.65	41.76	39.86	37.96
21466	.1990	#8	5.055	3"	43.88	41.98	40.07	38.16
21471	.2010	#7	5.105	3"	44.07	42.15	40.24	38.32
21476	.2031	13/64"	5.159	3"	44.40	42.47	40.54	38.61
21481	.2040	#6	5.182	3"	44.72	42.78	40.83	38.89
21486	.2055	#5	5.220	3"	45.03	43.08	41.12	39.16
21491	.2090	#4	5.309	3"	45.32	43.35	41.38	39.41
21496	.2130	#3	5.410	3"	45.63	43.65	41.66	39.68
21501	.2165	5.500	75	35	45.92	43.92	41.93	39.93

continued →

1280H - 2 Flute (continued)

.2188" - .4528"
(5.558mm - 11.500mm)

EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
21506	.2188	7/32"	5.558	3"	1-3/8"	46.21	44.20	42.19	40.18
21511	.2210	#2	5.613	3"	1-3/8"	47.20	45.14	43.09	41.04
21516	.2280	#1	5.791	3"	1-3/8"	47.44	45.38	43.31	41.25
21521	.2340	A	5.944	3-1/4"	1-1/2"	48.15	46.06	43.96	41.87
21526	.2344	15/64"	5.954	3-1/4"	1-1/2"	48.28	46.18	44.08	41.98
21531	.2362		6.000	80	38	48.43	46.32	44.22	42.11
21536	.2380	B	6.045	3-1/4"	1-5/8"	48.56	46.45	44.34	42.23
21541	.2420	C	6.147	3-1/4"	1-5/8"	48.90	46.77	44.65	42.52
21546	.2460	D	6.248	3-1/4"	1-5/8"	49.21	47.07	44.93	42.79
21551	.2500	1/4" / E	6.350	3-1/4"	1-5/8"	49.48	47.33	45.18	43.03
21556	.2559		6.500	80	41	50.36	48.17	45.98	43.79
21561	.2570	F	6.528	3-1/4"	1-11/16"	51.22	48.99	46.77	44.54
21566	.2610	G	6.629	3-1/2"	1-11/16"	52.11	49.84	47.58	45.31
21571	.2656	17/64"	6.746	3-1/2"	1-11/16"	52.96	50.66	48.35	46.05
21576	.2660	H	6.756	3-1/2"	1-11/16"	53.87	51.52	49.18	46.84
21581	.2720	I	6.909	3-1/2"	1-11/16"	54.72	52.34	49.96	47.58
21586	.2756		7.000	88	43	55.57	53.15	50.74	48.32
21591	.2770	J	7.036	3-1/2"	1-11/16"	56.44	53.99	51.53	49.08
21596	.2810	K	7.137	3-1/2"	1-3/4"	57.34	54.85	52.35	49.86
21601	.2812	9/32"	7.142	3-1/2"	1-3/4"	58.20	55.67	53.14	50.61
21606	.2900	L	7.366	3-1/2"	1-3/4"	59.01	56.44	53.88	51.31
21611	.2950	M	7.493	3-3/4"	1-3/4"	59.86	57.26	54.65	52.05
21616	.2953		7.500	95	44	59.86	57.26	54.65	52.05
21621	.2969	19/64"	7.541	3-3/4"	1-7/8"	60.44	57.82	55.19	52.56
21626	.3020	N	7.671	3-3/4"	1-7/8"	62.85	60.12	57.38	54.65
21631	.3125	5/16"	7.938	3-3/4"	1-7/8"	63.03	60.29	57.55	54.81
21636	.3150		8.000	95	48	66.85	63.94	61.04	58.13
21641	.3160	O	8.026	3-3/4"	1-7/8"	66.85	63.94	61.04	58.13
21646	.3230	P	8.204	3-3/4"	2-3/32"	67.09	64.17	61.26	58.34
21651	.3281	21/64"	8.334	4"	2-3/32"	67.71	64.77	61.82	58.88
21656	.3320	Q	8.433	4"	2-3/32"	69.06	66.06	63.05	60.05
21661	.3346		8.500	100	53	69.56	66.54	63.51	60.49
21666	.3390	R	8.611	4"	2-3/32"	71.47	68.37	65.26	62.15
21671	.3438	11/32"	8.733	4"	2-3/16"	73.98	70.76	67.55	64.33
21676	.3480	S	8.839	4"	2-3/16"	76.88	73.54	70.19	66.85
21681	.3543		9.000	100	56	77.33	73.96	70.60	67.24
21686	.3580	T	9.093	4-1/4"	2-9/32"	80.39	76.89	73.40	69.90
21691	.3594	23/64"	9.129	4-1/4"	2-9/32"	80.86	77.34	73.83	70.31
21696	.3680	U	9.347	4-1/4"	2-9/32"	89.22	85.34	81.46	77.58
21701	.3740		9.500	105	58	90.09	86.17	82.26	78.34
21706	.3750	3/8"	9.525	4-1/4"	2-3/8"	91.00	87.04	83.09	79.13
21711	.3770	V	9.576	4-1/4"	2-3/8"	93.22	89.17	85.11	81.06
21716	.3860	W	9.804	4-1/2"	2-3/8"	94.88	90.75	86.63	82.50
21721	.3906	25/64"	9.921	4-1/2"	2-3/8"	96.03	91.85	87.68	83.50
21726	.3937		10.000	115	60	98.91	94.61	90.31	86.01
21731	.3970	X	10.084	4-1/2"	2-1/2"	101.19	96.79	92.39	87.99
21736	.4040	Y	10.262	4-1/2"	2-9/16"	104.24	99.70	95.17	90.64
21741	.4062	13/32"	10.317	4-1/2"	2-9/16"	105.14	100.57	96.00	91.43
21746	.4130	Z	10.490	4-1/2"	2-5/8"	106.10	101.49	96.87	92.26
21751	.4134		10.500	115	67	106.10	101.49	96.87	92.26
21756	.4219	27/64"	10.716	4-1/2"	2-11/16"	107.05	102.40	97.74	93.09
21761	.4331		11.000	115	68	114.87	109.88	104.88	99.89
21766	.4375	7/16"	11.113	4-3/4"	2-13/16"	115.32	110.31	105.29	100.28
21771	.4528		11.500	120	71	123.25	117.89	112.53	107.17

EDP#	d^+ Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
21776	.4531	29/64"	11.509	4-3/4"	2-7/8"	123.25	117.89	112.53	107.17
21781	.4688	15/32"	11.908	4-3/4"	2-7/8"	129.44	123.82	118.19	112.56
21786	.4724		12.000	120	73	129.84	124.19	118.55	112.90
21791	.4844	31/64"	12.304	5-5/16"	3"	131.27	125.57	119.86	114.15
21796	.4921		12.500	135	76	132.84	127.06	121.29	115.51
21801	.5000	1/2"	12.700	5-3/8"	3-1/16"	133.11	127.33	121.54	115.75
21806	.5118		13.000	135	78	148.06	141.63	135.19	128.75
21811	.5156	33/64"	13.096	5-3/8"	3-1/8"	151.54	144.95	138.36	131.77
21816	.5312	17/32"	13.492	5-11/16"	3-5/16"	155.09	148.35	141.60	134.86
21821	.5315		13.500	145	84	158.52	151.62	144.73	137.84
21826	.5469	35/64"	13.891	5-13/16"	3-3/8"	161.97	154.92	147.88	140.84
21831	.5512		14.000	145	86	165.47	158.28	151.08	143.89
21836	.5625	9/16"	14.288	5-15/16"	3-1/2"	178.89	171.12	163.34	155.56
21841	.5709		14.500	150	89	182.18	174.26	166.34	158.42
21846	.5781	37/64"	14.684	6"	3-1/2"	185.45	177.39	169.32	161.26
21851	.5906		15.000	150	90	188.92	180.71	172.49	164.28
21856	.5938	19/32"	15.083	6"	3-9/16"	189.90	181.64	173.39	165.13
21861	.6094	39/64"	15.479	6-3/16"	3-11/16"	205.80	196.86	187.91	178.96
21866	.6102		15.500	160	94	206.75	197.76	188.77	179.78
21871	.6250	5/8"	15.875	6-5/16"	3-3/4"	207.71	198.68	189.65	180.62
21876	.6299		16.000	160	95	212.37	203.14	193.90	184.67



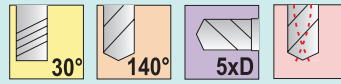
Drill Manufacturing

1280KH - 2 Flute

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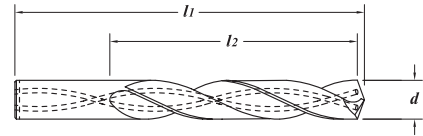
TOLERANCES		
<i>d</i>	+0.000" -0.005" (+0.000 -0.127mm)	
<i>l1</i>	≤ 1/8"	+0.125" -0.062" (+3.175 -1.588mm)
	> 1/8"	+0.125" -0.125" (+3.175 -3.175mm)
<i>l2</i>	≤ 1/8"	+0.125" -0.062" (+3.175 -1.588mm)
	> 1/8"	+0.125" -0.125" (+3.175 -3.175mm)

.1575" - .2756"
(4.000mm - 7.000mm)



Balinit® HELICA Coated

- High performance - high penetration solid submicron grain carbide drill
- Coolant through capabilities for high pressure coolant systems
- Up to 70% faster than standard carbide drills
- 30° helix for better chip evacuation
- Honed cutting edge
- Recommended to run in high nickel, high temperature alloys, cobalt-based alloys, stainless steels and tool steels
- Live tooling recommended on lathe processes



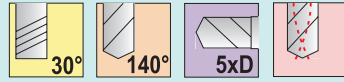
EDP#	<i>d</i> † Diameter		<i>l1</i> Overall Length	<i>l2</i> Flute Length	1-11	12-24	25-49	50-100
	Decimal	Metric						
25441	.1575	4.000	65	24	54.67	52.29	49.92	47.54
25446	.1590	#21 4.039	2-1/2"	15/16"	55.04	52.65	50.25	47.86
25451	.1610	#20 4.089	2-1/2"	15/16"	55.46	53.05	50.64	48.23
25456	.1660	#19 4.216	2-1/2"	1"	55.89	53.46	51.03	48.60
25461	.1695	#18 4.305	2-1/2"	1"	56.28	53.83	51.39	48.94
25466	.1719	11/64" 4.366	2-1/2"	1"	56.68	54.22	51.75	49.29
25471	.1730	#17 4.394	2-1/2"	1"	57.05	54.57	52.09	49.61
25476	.1770	#16 4.496	2-1/2"	1"	57.48	54.98	52.48	49.98
25481	.1772	4.500	65	25	57.90	55.39	52.87	50.35
25486	.1800	#15 4.572	2-3/4"	1"	58.27	55.74	53.20	50.67
25491	.1820	#14 4.623	2-3/4"	1"	58.66	56.11	53.56	51.01
25496	.1850	#13 4.699	2-3/4"	1-1/4"	59.08	56.51	53.94	51.37
25501	.1875	3/16" 4.763	2-3/4"	1-1/4"	59.51	56.93	54.34	51.75
25506	.1890	#12 4.801	2-3/4"	1-1/4"	59.88	57.28	54.67	52.07
25511	.1910	#11 4.851	2-3/4"	1-1/4"	60.27	57.65	55.03	52.41
25516	.1935	#10 4.915	2-3/4"	1-1/4"	60.71	58.07	55.43	52.79
25521	.1960	#9 4.978	3"	1-5/16"	61.07	58.41	55.76	53.10
25526	.1969	5.000	75	33	61.48	58.81	56.13	53.46
25531	.1990	#8 5.055	3"	1-5/16"	61.80	59.11	56.43	53.74
25536	.2010	#7 5.105	3"	1-5/16"	62.08	59.38	56.68	53.98
25541	.2031	13/64" 5.159	3"	1-5/16"	62.53	59.81	57.09	54.37
25546	.2040	#6 5.182	3"	1-3/8"	62.99	60.25	57.51	54.77
25551	.2055	#5 5.220	3"	1-3/8"	63.41	60.65	57.90	55.14
25556	.2090	#4 5.309	3"	1-3/8"	63.84	61.06	58.29	55.51
25561	.2130	#3 5.410	3"	1-3/8"	64.26	61.47	58.67	55.88
25566	.2165	5.500	75	35	64.65	61.84	59.03	56.22
25571	.2188	7/32" 5.558	3"	1-3/8"	64.80	61.99	59.17	56.35
25576	.2210	#2 5.613	3"	1-3/8"	65.90	63.03	60.17	57.30
25581	.2280	#1 5.791	3"	1-3/8"	66.14	63.26	60.39	57.51
25586	.2340	A 5.944	3-1/4"	1-1/2"	74.23	71.01	67.78	64.55
25591	.2344	15/64" 5.954	3-1/4"	1-1/2"	74.36	71.13	67.89	64.66
25596	.2362	6.000	80	38	74.55	71.31	68.07	64.83
25601	.2380	B 6.045	3-1/4"	1-5/8"	76.98	73.63	70.29	66.94
25606	.2420	C 6.147	3-1/4"	1-5/8"	77.35	73.99	70.62	67.26
25611	.2460	D 6.248	3-1/4"	1-5/8"	77.69	74.32	70.94	67.56
25616	.2500	1/4" / E 6.350	3-1/4"	1-5/8"	78.02	74.62	71.23	67.84
25621	.2559	6.500	80	41	78.98	75.55	72.11	68.68
25626	.2570	F 6.528	3-1/4"	1-11/16"	80.81	77.30	73.78	70.27
25631	.2610	G 6.629	3-1/2"	1-11/16"	81.80	78.24	74.69	71.13
25636	.2656	17/64" 6.746	3-1/2"	1-11/16"	82.75	79.16	75.56	71.96
25641	.2660	H 6.756	3-1/2"	1-11/16"	83.74	80.10	76.46	72.82
25646	.2720	I 6.909	3-1/2"	1-11/16"	83.84	80.19	76.55	72.90
25651	.2756	7.000	88	43	84.79	81.10	77.42	73.73

EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
25656	.2770	J	7.036	3-1/2"	1-11/16"	89.08	85.21	81.33	77.46
25661	.2810	K	7.137	3-1/2"	1-3/4"	90.07	86.15	82.24	78.32
25666	.2812	9/32"	7.142	3-1/2"	1-3/4"	91.05	87.09	83.13	79.17
25671	.2900	L	7.366	3-1/2"	1-3/4"	91.45	87.47	83.50	79.52
25676	.2950	M	7.493	3-3/4"	1-3/4"	91.99	87.99	83.99	79.99
25681	.2953		7.500	95	44	91.99	87.99	83.99	79.99
25686	.2969	19/64"	7.541	3-3/4"	1-7/8"	98.27	94.00	89.72	85.45
25691	.3020	N	7.671	3-3/4"	1-7/8"	100.49	96.12	91.75	87.38
25696	.3125	5/16"	7.938	3-3/4"	1-7/8"	100.71	96.33	91.95	87.57
25701	.3150		8.000	95	48	104.95	100.39	95.82	91.26
25706	.3160	O	8.026	3-3/4"	1-7/8"	105.90	101.30	96.69	92.09
25711	.3230	P	8.204	3-3/4"	2-3/32"	106.18	101.56	96.95	92.33
25716	.3281	21/64"	8.334	4"	2-3/32"	106.88	102.23	97.59	92.94
25721	.3320	Q	8.433	4"	2-3/32"	107.49	102.82	98.14	93.47
25726	.3346		8.500	100	53	108.05	103.36	98.66	93.96
25731	.3390	R	8.611	4"	2-3/32"	112.79	107.89	102.98	98.08
25736	.3438	11/32"	8.733	4"	2-3/16"	115.59	110.56	105.54	100.51
25741	.3480	S	8.839	4"	2-3/16"	118.20	113.06	107.92	102.78
25746	.3543		9.000	100	56	118.69	113.53	108.37	103.21
25751	.3580	T	9.093	4-1/4"	2-9/32"	120.95	115.69	110.43	105.17
25756	.3594	23/64"	9.129	4-1/4"	2-9/32"	121.39	116.12	110.84	105.56
25761	.3680	U	9.347	4-1/4"	2-9/32"	128.66	123.07	117.47	111.88
25766	.3740		9.500	105	58	129.31	123.68	118.06	112.44
25771	.3750	3/8"	9.525	4-1/4"	2-3/8"	132.50	126.74	120.98	115.22
25776	.3770	V	9.576	4-1/4"	2-3/8"	132.94	127.16	121.38	115.60
25781	.3860	W	9.804	4-1/2"	2-3/8"	134.40	128.56	122.71	116.87
25786	.3906	25/64"	9.921	4-1/2"	2-3/8"	135.41	129.53	123.64	117.75
25791	.3937		10.000	115	60	136.64	130.70	124.76	118.82
25796	.3970	X	10.084	4-1/2"	2-1/2"	142.80	136.59	130.38	124.17
25801	.4040	Y	10.262	4-1/2"	2-9/16"	143.43	137.19	130.96	124.72
25806	.4062	13/32"	10.317	4-1/2"	2-9/16"	146.18	139.82	133.47	127.11
25811	.4130	Z	10.490	4-1/2"	2-5/8"	148.49	142.03	135.58	129.12
25816	.4134		10.500	115	67	148.49	142.03	135.58	129.12
25821	.4219	27/64"	10.716	4-1/2"	2-11/16"	150.59	144.05	137.50	130.95
25826	.4331		11.000	115	68	156.00	149.22	142.43	135.65
25831	.4375	7/16"	11.113	4-3/4"	2-13/16"	159.16	152.24	145.32	138.40
25836	.4528		11.500	120	71	164.84	157.67	150.51	143.34
25841	.4531	29/64"	11.509	4-3/4"	2-7/8"	170.48	163.06	155.65	148.24
25846	.4688	15/32"	11.908	4-3/4"	2-7/8"	174.37	166.79	159.21	151.63
25851	.4724		12.000	120	73	178.12	170.38	162.63	154.89
25856	.4844	31/64"	12.304	5-5/16"	3"	190.08	181.82	173.55	165.29
25861	.4921		12.500	135	76	204.02	195.15	186.28	177.41
25866	.5000	1/2"	12.700	5-3/8"	3-1/16"	205.95	197.00	188.04	179.09
25871	.5118		13.000	135	78	233.58	223.42	213.27	203.11
25876	.5156	33/64"	13.096	5-3/8"	3-1/8"	243.44	232.86	222.27	211.69
25881	.5312	17/32"	13.492	5-11/16"	3-5/16"	247.38	236.62	225.87	215.11
25886	.5315		13.500	145	84	251.19	240.27	229.35	218.43
25891	.5469	35/64"	13.891	5-13/16"	3-3/8"	264.96	253.44	241.92	230.40
25896	.5512		14.000	145	86	268.85	257.16	245.47	233.78
25901	.5625	9/16"	14.288	5-15/16"	3-1/2"	291.39	278.72	266.05	253.38
25906	.5709		14.500	150	89	293.69	280.92	268.15	255.38
25911	.5781	37/64"	14.684	6"	3-1/2"	294.48	281.68	268.87	256.07
25916	.5906		15.000	150	90	298.32	285.35	272.38	259.41
25921	.5938	19/32"	15.083	6"	3-9/16"	306.08	292.78	279.47	266.16
25926	.6094	39/64"	15.479	6-3/16"	3-11/16"	344.47	329.49	314.52	299.54
25931	.6102		15.500	160	94	345.43	330.41	315.39	300.37
25936	.6250	5/8"	15.875	6-5/16"	3-3/4"	354.95	339.52	324.08	308.65
25941	.6299		16.000	160	95	359.61	343.97	328.34	312.70

1280KD - 2 Flute

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4.000mm - 7.500mm
(.1575" - .2953")



TOLERANCES		
d_1 *	3mm - 6mm	+0.016 +0.004mm (+0.00063" +0.00015")
	> 6mm - 10mm	+0.021 +0.006mm (+0.00082" +0.00023")
	> 10mm - 18mm	+0.025 +0.007mm (+0.00098" +0.00027")
	> 18mm - 20mm	+0.029 +0.008mm (+0.00114" +0.00031")
	6mm	+0.000 -0.008mm (+0.00000" -0.00030")
d_2	8mm - 10mm	+0.000 -0.009mm (+0.00000" -0.00035")
	12mm - 18mm	+0.000 -0.011mm (+0.00000" -0.00040")
	20mm	+0.000 -0.013mm (+0.00000" -0.00050")

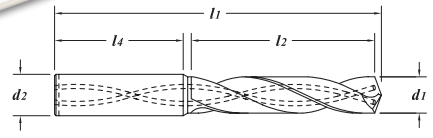
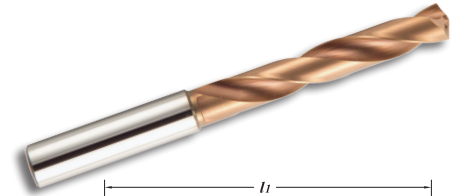
Balinit® HELICA Coated

- High performance solid submicron grain carbide drill with reinforced shank
- Utilizes DIN standard 6537 *
- Coolant through capabilities for high pressure coolant systems
- Up to 70% faster than standard carbide drills
- 30° helix for better chip evacuation
- Honed cutting edge

Recommended to run in high nickel, high temperature alloys, cobalt-based alloys, stainless steels and tool steels

Balinit® HELICA is a multi-layer AlCr-based coating designed exclusively for high performance drilling

Live tooling recommended on lathe processes



* Note - These drills are made to a plus/plus tolerance on the drill diameter. If you are in need of a minus tolerance drill, please refer to our other high performance drills.

EDP#	d_1 Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_4 Shank Length	1-11	12-24	25-49	50-100
	Decimal	Metric								
25205	.1575"	4.000	6.0	74	36	36	90.70	86.76	82.81	78.87
25215	.1614"	4.100	6.0	74	36	36	90.70	86.76	82.81	78.87
25225	.1654"	4.200	6.0	74	36	36	90.70	86.76	82.81	78.87
25235	.1673"	4.250	6.0	74	36	36	90.70	86.76	82.81	78.87
25245	.1693"	4.300	6.0	74	36	36	90.70	86.76	82.81	78.87
25255	.1732"	4.400	6.0	74	36	36	90.70	86.76	82.81	78.87
25265	.1772"	4.500	6.0	74	36	36	89.93	86.02	82.11	78.20
25275	.1811"	4.600	6.0	74	36	36	89.93	86.02	82.11	78.20
25285	.1831"	4.650	6.0	74	36	36	89.93	86.02	82.11	78.20
25295	.1850"	4.700	6.0	74	36	36	89.93	86.02	82.11	78.20
25305	.1870"	4.750	6.0	74	36	36	89.93	86.02	82.11	78.20
25315	.1890"	4.800	6.0	82	44	36	89.93	86.02	82.11	78.20
25325	.1929"	4.900	6.0	82	44	36	89.93	86.02	82.11	78.20
25335	.1969"	5.000	6.0	82	44	36	89.19	85.32	81.44	77.56
25345	.2008"	5.100	6.0	82	44	36	89.19	85.32	81.44	77.56
25355	.2027"	5.150	6.0	82	44	36	89.19	85.32	81.44	77.56
25365	.2047"	5.200	6.0	82	44	36	89.19	85.32	81.44	77.56
25375	.2087"	5.300	6.0	82	44	36	89.19	85.32	81.44	77.56
25385	.2165"	5.500	6.0	82	44	36	85.51	81.80	78.08	74.36
25395	.2185"	5.550	6.0	82	44	36	85.51	81.80	78.08	74.36
25397	.2205"	5.600	6.0	82	44	36	85.51	81.80	78.08	74.36
25400	.2243"	5.700	6.0	82	44	36	85.51	81.80	78.08	74.36
25405	.2283"	5.800	6.0	82	44	36	85.51	81.80	78.08	74.36
25415	.2323"	5.900	6.0	82	44	36	85.51	81.80	78.08	74.36
25425	.2342"	5.950	6.0	82	44	36	85.51	81.80	78.08	74.36
25435	.2362"	6.000	6.0	82	44	36	81.83	78.28	74.72	71.16
25437	.2402"	6.100	8.0	91	53	36	125.41	119.96	114.50	109.05
25440	.2441"	6.200	8.0	91	53	36	125.41	119.96	114.50	109.05
25443	.2480"	6.300	8.0	91	53	36	125.41	119.96	114.50	109.05
25445	.2500"	6.350	8.0	91	53	36	125.41	119.96	114.50	109.05
25450	.2520"	6.400	8.0	91	53	36	122.82	117.48	112.14	106.80
25455	.2559"	6.500	8.0	91	53	36	122.82	117.48	112.14	106.80
25457	.2571"	6.530	8.0	91	53	36	122.82	117.48	112.14	106.80
25460	.2598"	6.600	8.0	91	53	36	122.82	117.48	112.14	106.80
25463	.2638"	6.700	8.0	91	53	36	122.82	117.48	112.14	106.80
25465	.2657"	6.750	8.0	91	53	36	122.82	117.48	112.14	106.80
25475	.2677"	6.800	8.0	91	53	36	122.82	117.48	112.14	106.80
25485	.2717"	6.900	8.0	91	53	36	122.82	117.48	112.14	106.80
25495	.2756"	7.000	8.0	91	53	36	120.23	115.01	109.78	104.55
25505	.2795"	7.100	8.0	91	53	36	120.23	115.01	109.78	104.55
25515	.2815"	7.150	8.0	91	53	36	120.23	115.01	109.78	104.55
25525	.2835"	7.200	8.0	91	53	36	120.23	115.01	109.78	104.55
25530	.2874"	7.300	8.0	91	53	36	120.23	115.01	109.78	104.55
25535	.2913"	7.400	8.0	91	53	36	120.23	115.01	109.78	104.55
25545	.2953"	7.500	8.0	91	53	36	117.65	112.53	107.42	102.30

1280KD - 2 Flute (continued)

7.550mm - 12.950mm
(.2972" - .5098")

HIGH PERFORMANCE
DRILLS

EDP#	<i>d1</i> Diameter		<i>d2</i> Shank Diameter	<i>l1</i> Overall Length	<i>l2</i> Flute Length	<i>l4</i> Shank Length	1-11	12-24	25-49	50-100
	Decimal	Metric								
25555	.2972"	7.550	8.0	91	53	36	117.65	112.53	107.42	102.30
25565	.2992"	7.600	8.0	91	53	36	117.65	112.53	107.42	102.30
25575	.3031"	7.700	8.0	91	53	36	117.65	112.53	107.42	102.30
25585	.3071"	7.800	8.0	91	53	36	117.65	112.53	107.42	102.30
25595	.3130"	7.950	8.0	91	53	36	117.65	112.53	107.42	102.30
25605	.3150"	8.000	8.0	91	53	36	115.09	110.09	105.08	100.08
25610	.3189"	8.100	10.0	103	61	40	160.02	153.07	146.11	139.15
25615	.3228"	8.200	10.0	103	61	40	160.02	153.07	146.11	139.15
25625	.3268"	8.300	10.0	103	61	40	160.02	153.07	146.11	139.15
25635	.3287"	8.350	10.0	103	61	40	160.02	153.07	146.11	139.15
25640	.3307"	8.400	10.0	103	61	40	157.09	150.26	143.43	136.60
25645	.3346"	8.500	10.0	103	61	40	157.09	150.26	143.43	136.60
25655	.3386"	8.600	10.0	103	61	40	157.09	150.26	143.43	136.60
25665	.3425"	8.700	10.0	103	61	40	157.09	150.26	143.43	136.60
25675	.3445"	8.750	10.0	103	61	40	157.09	150.26	143.43	136.60
25685	.3465"	8.800	10.0	103	61	40	157.09	150.26	143.43	136.60
25695	.3504"	8.900	10.0	103	61	40	157.09	150.26	143.43	136.60
25705	.3543"	9.000	10.0	103	61	40	154.15	147.44	140.74	134.04
25715	.3583"	9.100	10.0	103	61	40	154.15	147.44	140.74	134.04
25725	.3602"	9.150	10.0	103	61	40	154.15	147.44	140.74	134.04
25735	.3622"	9.200	10.0	103	61	40	154.15	147.44	140.74	134.04
25745	.3661"	9.300	10.0	103	61	40	154.15	147.44	140.74	134.04
25750	.3701"	9.400	10.0	103	61	40	151.19	144.62	138.04	131.47
25755	.3740"	9.500	10.0	103	61	40	151.19	144.62	138.04	131.47
25765	.3760"	9.550	10.0	103	61	40	151.19	144.62	138.04	131.47
25767	.3780"	9.600	10.0	103	61	40	151.19	144.62	138.04	131.47
25770	.3819"	9.700	10.0	103	61	40	151.19	144.62	138.04	131.47
25775	.3858"	9.800	10.0	103	61	40	151.19	144.62	138.04	131.47
25785	.3898"	9.900	10.0	103	61	40	151.19	144.62	138.04	131.47
25795	.3937"	10.000	10.0	103	61	40	148.26	141.81	135.37	128.92
25800	.3976"	10.100	12.0	118	71	45	205.95	197.00	188.04	179.09
25805	.4016"	10.200	12.0	118	71	45	205.95	197.00	188.04	179.09
25815	.4055"	10.300	12.0	118	71	45	205.95	197.00	188.04	179.09
25825	.4134"	10.500	12.0	118	71	45	202.26	193.47	184.67	175.88
25830	.4173"	10.600	12.0	118	71	45	202.26	193.47	184.67	175.88
25835	.4213"	10.700	12.0	118	71	45	202.26	193.47	184.67	175.88
25845	.4252"	10.800	12.0	118	71	45	202.26	193.47	184.67	175.88
25855	.4331"	11.000	12.0	118	71	45	198.56	189.93	181.29	172.66
25865	.4370"	11.100	12.0	118	71	45	198.56	189.93	181.29	172.66
25875	.4409"	11.200	12.0	118	71	45	198.56	189.93	181.29	172.66
25880	.4488"	11.400	12.0	118	71	45	194.91	186.44	177.96	169.49
25885	.4528"	11.500	12.0	118	71	45	194.91	186.44	177.96	169.49
25895	.4606"	11.700	12.0	118	71	45	194.91	186.44	177.96	169.49
25905	.4685"	11.900	12.0	118	71	45	194.91	186.44	177.96	169.49
25915	.4724"	12.000	12.0	118	71	45	191.21	182.90	174.58	166.27
25925	.4764"	12.100	14.0	124	77	45	296.87	283.97	271.06	258.15
25930	.4803"	12.200	14.0	124	77	45	296.87	283.97	271.06	258.15
25935	.4842"	12.300	14.0	124	77	45	296.87	283.97	271.06	258.15
25940	.4882"	12.400	14.0	124	77	45	293.22	280.47	267.72	254.97
25945	.4921"	12.500	14.0	124	77	45	293.22	280.47	267.72	254.97
25950	.4961"	12.600	14.0	124	77	45	293.22	280.47	267.72	254.97
25955	.5000"	12.700	14.0	124	77	45	293.22	280.47	267.72	254.97
25960	.5039"	12.800	14.0	124	77	45	293.22	280.47	267.72	254.97
25961	.5051"	12.830	14.0	124	77	45	293.22	280.47	267.72	254.97
25963	.5079"	12.900	14.0	124	77	45	293.22	280.47	267.72	254.97
25964	.5098"	12.950	14.0	124	77	45	293.22	280.47	267.72	254.97

continued →

1280KD - 2 Flute (continued)

13.000mm - 20.000mm
(.5118" - .7874")

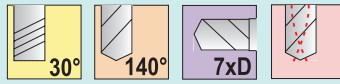
HIGH PERFORMANCE
DRILLS

EDP#	$d1$ Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	$l4$ Shank Length	1-11	12-24	25-49	50-100
	Decimal	Metric								
25965	.5118"	13.000	14.0	124	77	45	289.54	276.95	264.36	251.77
25975	.5157"	13.100	14.0	124	77	45	289.54	276.95	264.36	251.77
25981	.5236"	13.300	14.0	124	77	45	289.54	276.95	264.36	251.77
25985	.5315"	13.500	14.0	124	77	45	285.82	273.39	260.97	248.54
25995	.5394"	13.700	14.0	124	77	45	285.82	273.39	260.97	248.54
26005	.5433"	13.800	14.0	124	77	45	285.82	273.39	260.97	248.54
26015	.5512"	14.000	14.0	124	77	45	282.14	269.87	257.61	245.34
26025	.5551"	14.100	16.0	133	83	48	391.35	374.33	357.32	340.30
26027	.5591"	14.200	16.0	133	83	48	391.35	374.33	357.32	340.30
26035	.5610"	14.250	16.0	133	83	48	391.35	374.33	357.32	340.30
26045	.5630"	14.300	16.0	133	83	48	391.35	374.33	357.32	340.30
26055	.5709"	14.500	16.0	133	83	48	387.29	370.45	353.61	336.77
26065	.5787"	14.700	16.0	133	83	48	387.29	370.45	353.61	336.77
26067	.5827"	14.800	16.0	133	83	48	387.29	370.45	353.61	336.77
26075	.5906"	15.000	16.0	133	83	48	383.26	366.60	349.93	333.27
26085	.5945"	15.100	16.0	133	83	48	383.26	366.60	349.93	333.27
26095	.6102"	15.500	16.0	133	83	48	379.18	362.69	346.21	329.72
26105	.6181"	15.700	16.0	133	83	48	379.18	362.69	346.21	329.72
26107	.6220"	15.800	16.0	133	83	48	379.18	362.69	346.21	329.72
26115	.6299"	16.000	16.0	133	83	48	375.14	358.83	342.52	326.21
26118	.6331"	16.080	18.0	143	93	48	475.78	455.09	434.41	413.72
26119	.6339"	16.100	18.0	143	93	48	475.78	455.09	434.41	413.72
26123	.6378"	16.200	18.0	143	93	48	475.78	455.09	434.41	413.72
26125	.6398"	16.250	18.0	143	93	48	475.78	455.09	434.41	413.72
26135	.6496"	16.500	18.0	143	93	48	468.37	448.01	427.64	407.28
26145	.6555"	16.650	18.0	143	93	48	468.37	448.01	427.64	407.28
26155	.6693"	17.000	18.0	143	93	48	460.85	440.81	420.78	400.74
26165	.6713"	17.050	18.0	143	93	48	460.85	440.81	420.78	400.74
26175	.6870"	17.450	18.0	143	93	48	460.85	440.81	420.78	400.74
26185	.6890"	17.500	18.0	143	93	48	453.50	433.79	414.07	394.35
26195	.7027"	17.850	18.0	143	93	48	453.50	433.79	414.07	394.35
26205	.7087"	18.000	18.0	143	93	48	446.00	426.61	407.22	387.83
26215	.7185"	18.250	20.0	153	101	50	571.92	547.05	522.19	497.32
26225	.7283"	18.500	20.0	153	101	50	564.35	539.81	515.28	490.74
26235	.7342"	18.650	20.0	153	101	50	564.35	539.81	515.28	490.74
26245	.7480"	19.000	20.0	153	101	50	557.01	532.80	508.58	484.36
26255	.7500"	19.050	20.0	153	101	50	557.01	532.80	508.58	484.36
26256	.7520"	19.100	20.0	153	101	50	557.01	532.80	508.58	484.36
26257	.7539"	19.150	20.0	153	101	50	557.01	532.80	508.58	484.36
26258	.7559"	19.200	20.0	153	101	50	557.01	532.80	508.58	484.36
26259	.7579"	19.250	20.0	153	101	50	557.01	532.80	508.58	484.36
26260	.7590"	19.280	20.0	153	101	50	557.01	532.80	508.58	484.36
26261	.7598"	19.300	20.0	153	101	50	557.01	532.80	508.58	484.36
26265	.7638"	19.400	20.0	153	101	50	557.01	532.80	508.58	484.36
26275	.7677"	19.500	20.0	153	101	50	549.03	525.16	501.29	477.42
26281	.7795"	19.800	20.0	153	101	50	549.03	525.16	501.29	477.42
26285	.7815"	19.850	20.0	153	101	50	549.03	525.16	501.29	477.42
26295	.7874"	20.000	20.0	153	101	50	541.35	517.81	494.28	470.74

TOLERANCES

d	+.0000" - .0005" (+.0000 - .0127mm)	
l₁	≤ 1/8"	+ .125" - .062" (+3.175 - 1.588mm)
	> 1/8"	+ .125" - .125" (+3.175 - 3.175mm)
l₂	≤ 1/8"	+ .125" - .062" (+3.175 - 1.588mm)
	> 1/8"	+ .125" - .125" (+3.175 - 3.175mm)

Technical information: page 256-257



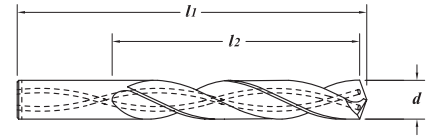
1880KH - 2 Flute

.1575" - .2756"
(4.000mm - 7.000mm)

HIGH PERFORMANCE DRILLS

Balinit® HELICA Coated

- High performance - high penetration solid submicron grain carbide drill
- Coolant through capabilities for high pressure coolant systems
- Up to 70% faster than standard carbide drills
- 30° helix for better chip evacuation
- Honed cutting edge
- Recommended to run in high nickel, high temperature alloys, cobalt-based alloys, stainless steels and tool steels
- Live tooling recommended on lathe processes



EDP#	d † Diameter		l ₁ Overall Length	l ₂ Flute Length	1-11	12-24	25-49	50-100
	Decimal	Metric						
26441	.1575	4.000	75	38	58.79	56.23	53.68	51.12
26446	.1590	#21	4.039	3"	59.18	56.61	54.03	51.46
26451	.1610	#20	4.089	3"	59.65	57.06	54.46	51.87
26456	.1660	#19	4.216	3"	60.10	57.49	54.87	52.26
26461	.1695	#18	4.305	3-1/2"	60.50	57.87	55.24	52.61
26466	.1719	11/64"	4.366	3-1/2"	60.94	58.29	55.64	52.99
26471	.1730	#17	4.394	3-1/2"	61.34	58.67	56.01	53.34
26476	.1770	#16	4.496	3-1/2"	61.81	59.13	56.44	53.75
26481	.1772		4.500	88	62.26	59.55	56.85	54.14
26486	.1800	#15	4.572	3-1/2"	62.66	59.94	57.21	54.49
26491	.1820	#14	4.623	3-1/2"	63.07	60.32	57.58	54.84
26496	.1850	#13	4.699	3-1/2"	63.51	60.75	57.99	55.23
26501	.1875	3/16"	4.763	4"	64.00	61.22	58.43	55.65
26506	.1890	#12	4.801	4"	64.39	61.59	58.79	55.99
26511	.1910	#11	4.851	4"	64.80	61.99	59.17	56.35
26516	.1935	#10	4.915	4"	65.26	62.43	59.59	56.75
26521	.1960	#9	4.978	4"	65.65	62.80	59.94	57.09
26526	.1969		5.000	100	66.10	63.23	60.35	57.48
26531	.1990	#8	5.055	4"	66.45	63.56	60.67	57.78
26536	.2010	#7	5.105	4"	66.75	63.84	60.94	58.04
26541	.2031	13/64"	5.159	4"	67.24	64.32	61.39	58.47
26546	.2040	#6	5.182	4"	67.74	64.79	61.85	58.90
26551	.2055	#5	5.220	4"	68.18	65.22	62.25	59.29
26556	.2090	#4	5.309	4"	68.64	65.66	62.67	59.69
26561	.2130	#3	5.410	4"	69.10	66.10	63.09	60.09
26566	.2165		5.500	100	69.53	66.51	63.48	60.46
26571	.2188	7/32"	5.558	4"	69.93	66.89	63.85	60.81
26576	.2210	#2	5.613	4"	71.05	67.96	64.87	61.78
26581	.2280	#1	5.791	4-1/8"	81.40	77.86	74.32	70.78
26586	.2340	A	5.944	4-1/8"	85.94	82.20	78.47	74.73
26591	.2344	15/64"	5.954	4-1/8"	86.07	82.32	78.58	74.84
26596	.2362		6.000	105	86.25	82.50	78.75	75.00
26601	.2380	B	6.045	4-1/8"	90.01	86.10	82.18	78.27
26606	.2420	C	6.147	4-1/4"	90.37	86.44	82.51	78.58
26611	.2460	D	6.248	4-1/4"	90.71	86.77	82.82	78.88
26616	.2500	1/4" / E	6.350	4-1/4"	91.02	87.07	83.11	79.15
26621	.2559		6.500	105	91.99	87.99	83.99	79.99
26626	.2570	F	6.528	4-3/8"	95.52	91.37	87.21	83.06
26631	.2610	G	6.629	4-3/8"	96.51	92.31	88.12	83.92
26636	.2656	17/64"	6.746	4-3/8"	97.44	93.20	88.97	84.73
26641	.2660	H	6.756	4-3/8"	98.45	94.17	89.89	85.61
26646	.2720	I	6.909	4-3/8"	98.56	94.27	89.99	85.70
26651	.2756		7.000	110	99.49	95.16	90.84	86.51

continued →

1880KH - 2 Flute (continued)

.2770" - .6299"
(7.036mm - 16.000mm)

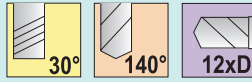
EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
26656	.2770	J	7.036	4-3/8"	2-3/8"	104.51	99.97	95.42	90.88
26661	.2810	K	7.137	4-7/16"	2-7/16"	105.51	100.93	96.34	91.75
26666	.2812	9/32"	7.142	4-7/16"	2-7/16"	106.49	101.86	97.23	92.60
26671	.2900	L	7.366	4-7/16"	2-7/16"	106.89	102.25	97.60	92.95
26676	.2950	M	7.493	4-7/16"	2-7/16"	107.42	102.75	98.08	93.41
26681	.2953		7.500	115	66	107.42	102.75	98.08	93.41
26686	.2969	19/64"	7.541	4-9/16"	2-9/16"	115.97	110.92	105.88	100.84
26691	.3020	N	7.671	4-9/16"	2-9/16"	118.21	113.07	107.93	102.79
26696	.3125	5/16"	7.938	4-11/16"	2-9/16"	118.42	113.27	108.12	102.97
26701	.3150		8.000	120	69	122.67	117.34	112.00	106.67
26706	.3160	O	8.026	4-11/16"	2-11/16"	124.74	119.32	113.89	108.47
26711	.3230	P	8.204	4-11/16"	2-11/16"	125.01	119.57	114.14	108.70
26716	.3281	21/64"	8.334	4-11/16"	2-11/16"	125.71	120.24	114.78	109.31
26721	.3320	Q	8.433	4-15/16"	2-15/16"	126.32	120.82	115.33	109.84
26726	.3346		8.500	125	75	126.87	121.35	115.84	110.32
26731	.3390	R	8.611	4-15/16"	2-15/16"	132.87	127.09	121.32	115.54
26736	.3438	11/32"	8.733	4-15/16"	2-15/16"	135.69	129.79	123.89	117.99
26741	.3480	S	8.839	5"	3"	138.26	132.25	126.24	120.23
26746	.3543		9.000	125	77	138.78	132.75	126.71	120.68
26751	.3580	T	9.093	5"	3"	152.28	145.66	139.04	132.42
26756	.3594	23/64"	9.129	5"	3"	152.82	146.18	139.53	132.89
26761	.3680	U	9.347	5"	3"	161.69	154.66	147.63	140.60
26766	.3740		9.500	130	80	162.70	155.63	148.55	141.48
26771	.3750	3/8"	9.525	5-1/8"	3-1/8"	167.00	159.74	152.48	145.22
26776	.3770	V	9.576	5-1/8"	3-1/8"	169.63	162.25	154.88	147.50
26781	.3860	W	9.804	5-1/8"	3-1/8"	170.21	162.81	155.41	148.01
26786	.3906	25/64"	9.921	5-1/4"	3-1/4"	171.25	163.80	156.36	148.91
26791	.3937		10.000	135	83	174.60	167.01	159.42	151.83
26796	.3970	X	10.084	5-1/4"	3-1/4"	180.41	172.57	164.72	156.88
26801	.4040	Y	10.262	5-3/8"	3-3/8"	183.99	175.99	167.99	159.99
26806	.4062	13/32"	10.317	5-3/8"	3-3/8"	185.04	176.99	168.95	160.90
26811	.4130	Z	10.490	5-3/8"	3-3/8"	188.09	179.92	171.74	163.56
26816	.4134		10.500	135	86	188.09	179.92	171.74	163.56
26821	.4219	27/64"	10.716	5-7/16"	3-7/16"	190.44	182.16	173.88	165.60
26826	.4331		11.000	135	88	197.81	189.21	180.61	172.01
26831	.4375	7/16"	11.113	5-7/16"	3-7/16"	202.04	193.26	184.47	175.69
26836	.4528		11.500	140	91	209.22	200.12	191.03	181.93
26841	.4531	29/64"	11.509	5-9/16"	3-13/16"	215.75	206.37	196.99	187.61
26846	.4688	15/32"	11.908	5-9/16"	3-13/16"	221.15	211.53	201.92	192.30
26851	.4724		12.000	140	98	226.84	216.98	207.11	197.25
26856	.4844	31/64"	12.304	5-9/16"	3-13/16"	232.73	222.61	212.49	202.37
26861	.4921		12.500	150	102	234.01	223.84	213.66	203.49
26866	.5000	1/2"	12.700	6"	4"	234.86	224.65	214.44	204.23
26871	.5118		13.000	150	102	245.88	235.19	224.50	213.81
26876	.5156	33/64"	13.096	6"	4"	256.22	245.08	233.94	222.80
26881	.5312	17/32"	13.492	6-1/8"	4-1/8"	260.38	249.06	237.74	226.42
26886	.5315		13.500	155	105	264.42	252.92	241.43	229.93
26891	.5469	35/64"	13.891	6-1/8"	4-1/8"	278.90	266.77	254.65	242.52
26896	.5512		14.000	155	105	283.00	270.70	258.39	246.09
26901	.5625	9/16"	14.288	6-1/4"	4-3/8"	306.74	293.40	280.07	266.73
26906	.5709		14.500	160	109	309.17	295.72	282.28	268.84
26911	.5781	37/64"	14.684	6-1/4"	4-3/8"	309.99	296.52	283.04	269.56
26916	.5906		15.000	160	112	314.02	300.37	286.71	273.06
26921	.5938	19/32"	15.083	6-3/8"	4-3/8"	322.17	308.17	294.16	280.15
26926	.6094	39/64"	15.479	6-7/16"	4-7/16"	362.56	346.80	331.03	315.27
26931	.6102		15.500	165	113	363.57	347.77	331.96	316.15
26936	.6250	5/8"	15.875	6-9/16"	4-9/16"	373.64	357.39	341.15	324.90
26941	.6299		16.000	165	117	378.53	362.08	345.62	329.16

TOLERANCES

d_1	+0.000" -0.004" (+0.000 -0.10mm)
d_2	[h6] +0.000" -0.003" (+0.000 -0.08mm)

Technical information: page 254-255

1850H - 2 Flute



NEW SERIES

0.792mm - 1.450mm
(.0312" - .0571")

HIGH PERFORMANCE DRILLS

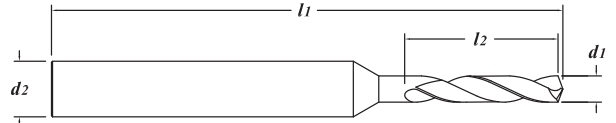
Balinit® HELICA Coated

High performance solid submicron grain carbide drill on 3mm or 1/8" diameter shank
30° helix for better chip evacuation

Recommended to run in high nickel, high temperature alloys, cobalt-based alloys, stainless steels and tool steels

Balinit® HELICA is a multi-layer AlCr-based coating designed exclusively for high performance drilling

Live tooling recommended on lathe processes



EDP#	d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
	Decimal	1/32"	Metric							
00510	.0312"	1/32"	0.792	1/8"	2"	7/16"	44.47	42.54	40.60	38.67
00512	.0315"		0.800	3.0	50	12.0	43.85	41.94	40.04	38.13
00514	.0319"		0.810	3.0	50	12.0	43.85	41.94	40.04	38.13
00516	.0320"	#67	0.812	1/8"	2"	7/16"	44.47	42.54	40.60	38.67
00518	.0323"		0.820	3.0	50	12.0	43.85	41.94	40.04	38.13
00520	.0327"		0.830	3.0	50	12.0	43.85	41.94	40.04	38.13
00522	.0330"	#66	0.838	1/8"	2"	7/16"	44.47	42.54	40.60	38.67
00524	.0331"		0.840	3.0	50	12.0	43.85	41.94	40.04	38.13
00526	.0335"		0.850	3.0	50	12.0	43.85	41.94	40.04	38.13
00528	.0339"		0.860	3.0	50	13.0	43.85	41.94	40.04	38.13
00530	.0343"		0.870	3.0	50	13.0	43.85	41.94	40.04	38.13
00532	.0346"		0.880	3.0	50	13.0	43.85	41.94	40.04	38.13
00534	.0350"	#65	0.890	3.0	50	13.0	43.85	41.94	40.04	38.13
00536	.0354"		0.900	3.0	50	13.0	43.85	41.94	40.04	38.13
00538	.0358"		0.910	3.0	50	13.0	43.85	41.94	40.04	38.13
00540	.0360"	#64	0.914	1/8"	2"	1/2"	44.47	42.54	40.60	38.67
00542	.0362"		0.920	3.0	50	13.0	43.85	41.94	40.04	38.13
00544	.0366"		0.930	3.0	50	13.0	43.85	41.94	40.04	38.13
00546	.0370"	#63	0.940	3.0	50	14.0	43.85	41.94	40.04	38.13
00548	.0374"		0.950	3.0	50	14.0	43.85	41.94	40.04	38.13
00550	.0378"		0.960	3.0	50	14.0	43.85	41.94	40.04	38.13
00552	.0380"	#62	0.965	1/8"	2"	9/16"	44.47	42.54	40.60	38.67
00554	.0382"		0.970	3.0	50	14.0	43.85	41.94	40.04	38.13
00556	.0386"		0.980	3.0	50	14.0	43.85	41.94	40.04	38.13
00558	.0390"	#61	0.990	3.0	50	14.0	43.85	41.94	40.04	38.13
00560	.0394"		1.000	3.0	50	14.0	43.85	41.94	40.04	38.13
00562	.0400"	#60	1.016	1/8"	2"	9/16"	44.06	42.14	40.23	38.31
00564	.0410"	#59	1.041	1/8"	2"	9/16"	44.06	42.14	40.23	38.31
00566	.0413"		1.050	3.0	50	15.0	43.49	41.60	39.71	37.82
00568	.0420"	#58	1.066	1/8"	2"	9/16"	44.06	42.14	40.23	38.31
00570	.0430"	#57	1.092	1/8"	2"	9/16"	44.06	42.14	40.23	38.31
00572	.0433"		1.100	3.0	50	16.0	43.49	41.60	39.71	37.82
00574	.0453"		1.150	3.0	50	16.0	43.49	41.60	39.71	37.82
00576	.0465"	#56	1.181	1/8"	2"	5/8"	44.06	42.14	40.23	38.31
00578	.0469"	3/64"	1.191	1/8"	2"	5/8"	44.06	42.14	40.23	38.31
00580	.0472"		1.200	3.0	50	18.0	43.49	41.60	39.71	37.82
00582	.0492"		1.250	3.0	50	18.0	43.49	41.60	39.71	37.82
00584	.0512"		1.300	3.0	50	18.0	43.02	41.15	39.28	37.41
00586	.0520"	#55	1.320	1/8"	2"	3/4"	43.64	41.75	39.85	37.95
00588	.0531"		1.350	3.0	50	19.0	43.02	41.15	39.28	37.41
00590	.0550"	#54	1.397	1/8"	2"	3/4"	43.64	41.75	39.85	37.95
00592	.0551"		1.400	3.0	65	20.0	45.00	43.04	41.09	39.13
00594	.0571"		1.450	3.0	65	21.0	45.00	43.04	41.09	39.13

continued →

1850H - 2 Flute (continued)

1.500mm - 3.175mm
(.0591" - .1250")

HIGH PERFORMANCE
DRILLS

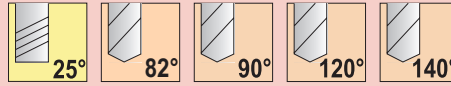
EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
	Decimal	Metric							
00596	.0591"	1.500	3.0	65	21.0	45.00	43.04	41.09	39.13
00598	.0595"	#53 1.511	1/8"	2-1/2"	13/16"	45.64	43.66	41.67	39.69
00600	.0610"	1.550	3.0	65	22.0	44.61	42.67	40.73	38.79
00602	.0625"	1/16" 1.587	1/8"	2-1/2"	13/16"	45.24	43.27	41.31	39.34
00604	.0630"	1.600	3.0	65	22.0	44.61	42.67	40.73	38.79
00606	.0635"	#52 1.613	1/8"	2-1/2"	7/8"	45.24	43.27	41.31	39.34
00608	.0650"	1.650	3.0	65	23.0	44.61	42.67	40.73	38.79
00610	.0669"	1.700	3.0	65	23.0	44.61	42.67	40.73	38.79
00612	.0670"	#51 1.702	1/8"	2-1/2"	7/8"	45.24	43.27	41.31	39.34
00614	.0689"	1.750	3.0	65	24.0	44.61	42.67	40.73	38.79
00616	.0700"	#50 1.778	1/8"	2-1/2"	1"	44.79	42.85	40.90	38.95
00618	.0709"	1.800	3.0	65	26.0	44.18	42.26	40.34	38.42
00620	.0728"	1.850	3.0	65	26.0	44.18	42.26	40.34	38.42
00622	.0730"	#49 1.854	1/8"	2-1/2"	1"	44.79	42.85	40.90	38.95
00624	.0748"	1.900	3.0	65	27.0	44.18	42.26	40.34	38.42
00626	.0760"	#48 1.930	1/8"	2-1/2"	1-1/8"	47.20	45.14	43.09	41.04
00628	.0768"	1.950	3.0	65	28.0	46.55	44.53	42.50	40.48
00630	.0781"	5/64" 1.983	1/8"	2-1/2"	1-1/8"	47.20	45.14	43.09	41.04
00632	.0785"	#47 1.994	1/8"	2-1/2"	1-1/8"	47.20	45.14	43.09	41.04
00634	.0787"	2.000	3.0	65	28.0	46.55	44.53	42.50	40.48
00636	.0807"	2.050	3.0	65	28.0	46.12	44.11	42.11	40.10
00638	.0810"	#46 2.057	1/8"	2-1/2"	1-1/8"	46.81	44.77	42.74	40.70
00640	.0820"	#45 2.083	1/8"	2-1/2"	1-1/8"	46.81	44.77	42.74	40.70
00642	.0827"	2.100	3.0	65	29.0	46.12	44.11	42.11	40.10
00644	.0846"	2.150	3.0	65	29.0	46.12	44.11	42.11	40.10
00646	.0860"	#44 2.184	1/8"	2-1/2"	1-3/16"	46.81	44.77	42.74	40.70
00648	.0866"	2.200	3.0	65	31.0	46.12	44.11	42.11	40.10
00650	.0886"	2.250	3.0	65	31.0	46.12	44.11	42.11	40.10
00652	.0890"	#43 2.260	1/8"	2-1/2"	1-1/4"	46.81	44.77	42.74	40.70
00654	.0906"	2.300	3.0	65	32.0	45.69	43.70	41.72	39.73
00656	.0925"	2.350	3.0	65	32.0	45.69	43.70	41.72	39.73
00658	.0935"	#42 2.375	1/8"	3"	1-5/16"	46.35	44.33	42.32	40.30
00660	.0938"	3/32" 2.382	1/8"	3"	1-5/16"	46.35	44.33	42.32	40.30
00662	.0945"	2.400	3.0	75	34.0	45.69	43.70	41.72	39.73
00664	.0960"	#41 2.438	1/8"	3"	1-11/32"	46.35	44.33	42.32	40.30
00666	.0965"	2.450	3.0	75	34.0	45.69	43.70	41.72	39.73
00668	.0980"	#40 2.489	1/8"	3"	1-3/8"	46.35	44.33	42.32	40.30
00670	.0984"	2.500	3.0	75	35.0	45.69	43.70	41.72	39.73
00672	.0995"	#39 2.527	1/8"	3"	1-3/8"	46.35	44.33	42.32	40.30
00674	.1004"	2.550	3.0	75	35.0	45.30	43.33	41.36	39.39
00676	.1015"	#38 2.578	1/8"	3"	1-13/32"	45.95	43.96	41.96	39.96
00678	.1024"	2.600	3.0	75	36.0	45.30	43.33	41.36	39.39
00680	.1040"	#37 2.641	1/8"	3"	1-7/16"	45.95	43.96	41.96	39.96
00682	.1043"	2.650	3.0	75	37.0	45.30	43.33	41.36	39.39
00684	.1063"	2.700	3.0	75	38.0	45.30	43.33	41.36	39.39
00686	.1065"	#36 2.705	1/8"	3"	1-1/2"	45.95	43.96	41.96	39.96
00688	.1083"	2.750	3.0	75	39.0	45.30	43.33	41.36	39.39
00690	.1094"	7/64" 2.778	1/8"	3"	1-9/16"	45.95	43.96	41.96	39.96
00692	.1100"	#35 2.794	1/8"	3"	1-9/16"	45.95	43.96	41.96	39.96
00694	.1102"	2.800	3.0	75	39.0	45.30	43.33	41.36	39.39
00696	.1110"	#34 2.819	1/8"	3"	1-5/8"	45.95	43.96	41.96	39.96
00698	.1122"	2.850	3.0	75	40.0	45.30	43.33	41.36	39.39
00700	.1130"	#33 2.870	1/8"	3"	1-5/8"	45.95	43.96	41.96	39.96
00702	.1142"	2.900	3.0	75	40.0	45.30	43.33	41.36	39.39
00704	.1160"	#32 2.946	1/8"	3"	1-5/8"	45.95	43.96	41.96	39.96
00706	.1161"	2.950	3.0	75	42.0	45.30	43.33	41.36	39.39
00708	.1181"	3.000	3.0	75	42.0	42.73	40.88	39.02	37.16
00710	.1200"	#31 3.048	1/8"	3"	1-3/4"	45.95	43.96	41.96	39.96
00712	.1250"	1/8" 3.175	1/8"	3"	1-3/4"	43.40	41.51	39.63	37.74

TOLERANCES

<i>d</i>	+0.000° -0.005° (+0.000 -0.127mm)
<i>l₁</i>	+0.125° -0.125° (+3.175 -3.175mm)

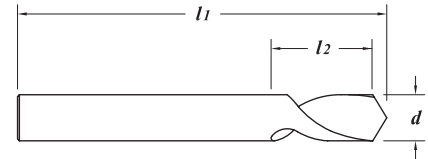
Technical information: page 250-253

1600 - 2 Flute



N/C Spotting

- Solid submicron grain carbide drill
- For spotting to stabilize long drills
- Rough, angled or spherical surfaces
- No O.D. clearance
- For locating on true position
- Live tooling recommended on lathe processes



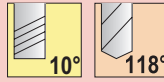
DRILLS

NEW

	82° EDP#	90° EDP#	120° EDP#	140° EDP#	<i>d</i> † Diameter		<i>l₁</i> Overall Length	<i>l₂</i> Flute Length	1-11	12-24	25-49	50-100
					Decimal	Metric						
NEW	91650	91500	91572	91240	.0787	2.000	50	10	9.43	9.02	8.61	8.20
NEW	91652	91505	91575	91245	.0938	3/32"	2"	3/8"	10.68	10.22	9.75	9.29
	91654	91510	91580	91250	.1181	3.000	50	10	12.58	12.03	11.49	10.94
	91656	91000	91100	91260	.1250	1/8"	2"	3/8"	12.58	12.03	11.49	10.94
	91658	91520	91590	91270	.1575	4.000	50	12	16.46	15.74	15.03	14.31
	91660	91010	91110	91280	.1875	3/16"	3"	3/4"	16.46	15.74	15.03	14.31
	91662	91530	91600	91290	.1969	5.000	65	15	17.30	16.54	15.79	15.04
	91664	91540	91610	91300	.2362	6.000	65	20	19.54	18.69	17.84	16.99
	91666	91020	91120	91310	.2500	1/4"	3"	3/4"	19.54	18.69	17.84	16.99
	91668	91025	91125	91315	.3125	5/16"	3"	1"	23.63	22.61	21.58	20.55
	91670	91550	91620	91320	.3150	8.000	75	25	23.63	22.61	21.58	20.55
	91672	91030	91130	91330	.3750	3/8"	3"	1"	25.63	24.52	23.40	22.29
	91674	91560	91630	91340	.3937	10.000	88	25	35.36	33.83	32.29	30.75
	91676	91565	91635	91345	.4375	7/16"	4"	1"	39.48	37.76	36.05	34.33
	91678	91570	91640	91350	.4724	12.000	100	30	42.50	40.66	38.81	36.96
	91680	91040	91140	91360	.5000	1/2"	4"	1"	44.21	42.28	40.36	38.44
	91682	91050	91170	91370	.5512	14.000	100	30	76.18	72.86	69.55	66.24
	91684	91060	91180	91380	.5625	9/16"	4"	1"	83.06	79.45	75.84	72.23
	91686	91070	91190	91390	.6250	5/8"	5"	1"	101.91	97.48	93.05	88.62
	91688	91080	91200	91400	.6299	16.000	125	30	104.64	100.09	95.54	90.99
	91690	91090	91210	91410	.7087	18.000	125	30	143.54	137.30	131.06	124.82
	91692	91150	91220	91420	.7500	3/4"	5"	1"	147.44	141.03	134.62	128.21
	91694	91160	91230	91430	.7874	20.000	125	30	159.63	152.69	145.75	138.81

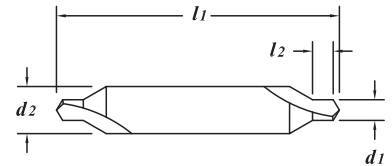
TOLERANCES

$d1$	+0.003" -0.000" (+.0076 -0.0000mm)
$d2$	-0.0001" -0.0004" (-0.0025 -0.0102mm)



Combined Drill and Countersink

Solid submicron grain carbide drill
 For center drilling applications
 60° included countersink angle
 Live tooling recommended on lathe processes
 Drill length ($l2$) is equal to drill diameter ($d1$)



EDP #	Number	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Drill Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
58030	1	.0469	3/64"	1.191	1/8"	1-1/2"	.0469	14.12	13.51	12.89	12.28
58040	2	.0781	5/64"	1.984	3/16"	2"	.0781	22.23	21.26	20.30	19.33
58050	3	.1094	7/64"	2.779	1/4"	2"	.1094	25.32	24.22	23.12	22.02
58060	4	.1250	1/8"	3.175	5/16"	2-1/8"	.1250	35.44	33.90	32.36	30.82
58070	5	.1875	3/16"	4.763	7/16"	2-3/4"	.1875	50.62	48.42	46.22	44.02
58080	6	.2188	7/32"	5.558	1/2"	3"	.2188	67.39	64.46	61.53	58.60
58090	7	.2500	1/4"	6.350	5/8"	3-1/8"	.2500	90.19	86.27	82.35	78.43
58100	8	.3125	5/16"	7.938	3/4"	3-3/8"	.3125	114.69	109.70	104.72	99.73



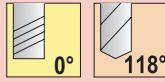
Packaging



Shipping

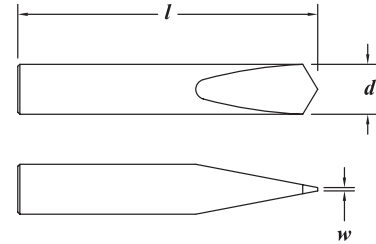
TOLERANCES

$d \mid +.0000'' - .0005'' (+.0000 - .0127\text{mm})$



Spade

Solid submicron grain carbide drill
 For shallow hole drilling / burnishing to a depth of 1 to 1.5 times the diameter
 Live tooling recommended on lathe processes



EDP#	d^\dagger Diameter		l Overall Length	w Spade Width	1-11	12-24	25-49	50-100	
	Decimal	Metric							
57030	.0625	1/16"	1.588	1-5/8"	.010"	6.88	6.58	6.28	5.98
57040	.0781	5/64"	1.984	1-11/16"	.010"	7.25	6.93	6.62	6.30
57050	.0938	3/32"	2.383	1-11/16"	.015"	7.25	6.93	6.62	6.30
57060	.1094	7/64"	2.779	1-11/16"	.015"	8.02	7.67	7.32	6.97
57070	.1250	1/8"	3.175	1-11/16"	.015"	8.02	7.67	7.32	6.97
57080	.1562	5/32"	3.967	1-11/16"	.020"	8.40	8.03	7.67	7.30
57090	.1875	3/16"	4.763	2"	.020"	8.98	8.59	8.20	7.81
57100	.2188	7/32"	5.558	2"	.025"	12.35	11.81	11.28	10.74
57110	.2500	1/4"	6.350	2"	.025"	14.43	13.81	13.18	12.55
57120	.2812	9/32"	7.142	2"	.030"	16.64	15.92	15.19	14.47
57130	.3125	5/16"	7.938	2"	.030"	20.09	19.22	18.34	17.47
57140	.3438	11/32"	8.733	2-1/2"	.035"	21.75	20.80	19.86	18.91
57150	.3750	3/8"	9.525	2-1/2"	.035"	23.43	22.41	21.39	20.37
57160	.4062	13/32"	10.317	2-1/2"	.045"	27.92	26.71	25.49	24.28
57170	.4375	7/16"	11.113	2-1/2"	.050"	31.29	29.93	28.57	27.21
57180	.4688	15/32"	11.908	2-1/2"	.055"	36.09	34.52	32.95	31.38
57190	.5000	1/2"	12.700	3"	.060"	39.30	37.59	35.88	34.17

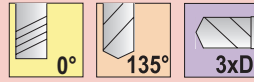
1500 - 2 Flute

Technical information: page 250-253

TOLERANCES

<i>d</i>	+.0000" -.0005" (+.0000 -.0127mm)	
<i>l1</i>	≤ 1/8"	+.125" -.062" (+3.175 -1.588mm)
	> 1/8"	+.125" -.125" (+3.175 -3.175mm)
<i>l2</i>	≤ 1/8"	+.125" -.062" (+3.175 -1.588mm)
	> 1/8"	+.125" -.125" (+3.175 -3.175mm)

.0625" - .1660"
(1.588mm - 4.216mm)

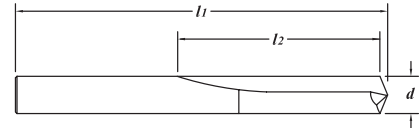


Hard Metal

Solid submicron grain carbide drill
Straight flute design provides excellent rigidity
Materials 40 Rc and higher

Recommended for high nickel, cobalt based and powdered metals

Live tooling recommended on lathe processes

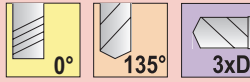


EDP#	<i>d</i> † Diameter		<i>l1</i> Overall Length	<i>l2</i> Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
59165	.0625	1/16"	1.588	1-3/4"	5/8"	9.72	9.30	8.87	8.45
59180	.0700	#50	1.778	1-3/4"	3/4"	9.72	9.30	8.87	8.45
59185	.0730	#49	1.854	1-3/4"	3/4"	9.72	9.30	8.87	8.45
59190	.0760	#48	1.930	1-3/4"	3/4"	9.72	9.30	8.87	8.45
59195	.0781	5/64"	1.984	1-3/4"	3/4"	9.72	9.30	8.87	8.45
59200	.0785	#47	1.994	1-3/4"	7/8"	9.72	9.30	8.87	8.45
39000	.0787		2.000	50	22	9.72	9.30	8.87	8.45
59210	.0810	#46	2.057	2"	7/8"	9.72	9.30	8.87	8.45
59215	.0820	#45	2.083	2"	7/8"	9.72	9.30	8.87	8.45
59220	.0860	#44	2.184	2"	7/8"	9.72	9.30	8.87	8.45
59225	.0890	#43	2.261	2"	7/8"	9.72	9.30	8.87	8.45
59230	.0935	#42	2.375	2"	7/8"	9.72	9.30	8.87	8.45
59235	.0938	3/32"	2.383	2"	7/8"	9.72	9.30	8.87	8.45
59240	.0960	#41	2.438	2"	7/8"	11.07	10.59	10.11	9.63
59245	.0980	#40	2.489	2"	7/8"	11.07	10.59	10.11	9.63
39050	.0984		2.500	50	22	11.07	10.59	10.11	9.63
59255	.0995	#39	2.527	2"	7/8"	11.07	10.59	10.11	9.63
59260	.1015	#38	2.578	2"	7/8"	11.07	10.59	10.11	9.63
59265	.1040	#37	2.642	2"	7/8"	11.07	10.59	10.11	9.63
59270	.1065	#36	2.705	2"	7/8"	11.07	10.59	10.11	9.63
59275	.1094	7/64"	2.779	2"	1"	11.07	10.59	10.11	9.63
59280	.1100	#35	2.794	2"	1"	11.51	11.01	10.51	10.01
59285	.1110	#34	2.819	2"	1"	11.51	11.01	10.51	10.01
59290	.1130	#33	2.870	2"	1"	11.51	11.01	10.51	10.01
59295	.1160	#32	2.946	2"	1"	11.51	11.01	10.51	10.01
39100	.1181		3.000	50	25	11.51	11.01	10.51	10.01
59305	.1200	#31	3.048	2"	1"	11.51	11.01	10.51	10.01
59310	.1250	1/8"	3.175	2"	1"	10.61	10.15	9.69	9.23
59315	.1285	#30	3.264	2"	1"	12.52	11.98	11.43	10.89
59320	.1360	#29	3.454	2"	1"	12.52	11.98	11.43	10.89
39150	.1378		3.500	50	25	12.52	11.98	11.43	10.89
59330	.1405	#28	3.569	2"	1"	12.52	11.98	11.43	10.89
59335	.1406	9/64"	3.571	2"	1"	12.52	11.98	11.43	10.89
59340	.1440	#27	3.658	2"	1"	12.86	12.30	11.74	11.18
59345	.1470	#26	3.734	2"	1"	13.51	12.93	12.34	11.75
59350	.1495	#25	3.797	2"	1"	13.51	12.93	12.34	11.75
59355	.1520	#24	3.861	2"	1"	13.51	12.93	12.34	11.75
59360	.1540	#23	3.912	2"	1"	13.51	12.93	12.34	11.75
59365	.1562	5/32"	3.967	2-1/2"	1-1/8"	13.51	12.93	12.34	11.75
59370	.1570	#22	3.988	2-1/2"	1-1/8"	14.64	14.00	13.37	12.73
39200	.1575		4.000	63	28	14.64	14.00	13.37	12.73
59380	.1590	#21	4.039	2-1/2"	1-1/8"	14.98	14.33	13.68	13.03
59385	.1610	#20	4.089	2-1/2"	1-1/8"	14.98	14.33	13.68	13.03
59390	.1660	#19	4.216	2-1/2"	1-1/8"	15.54	14.86	14.19	13.51

EDP#	d^+ Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
59395	.1695	#18	4.305	2-1/2"	1-3/16"	15.54	14.86	14.19	13.51
59400	.1719	11/64"	4.366	2-1/2"	1-3/16"	15.54	14.86	14.19	13.51
59405	.1730	#17	4.394	2-1/2"	1-3/16"	15.88	15.19	14.50	13.81
59410	.1770	#16	4.496	2-1/2"	1-3/16"	15.88	15.19	14.50	13.81
39250	.1772		4.500	63	28	15.88	15.19	14.50	13.81
59420	.1800	#15	4.572	2-1/2"	1-3/16"	15.88	15.19	14.50	13.81
59425	.1820	#14	4.623	2-1/2"	1-3/16"	16.77	16.04	15.31	14.58
59430	.1850	#13	4.700	2-1/2"	1-3/16"	16.77	16.04	15.31	14.58
59435	.1875	3/16"	4.763	2-1/2"	1-3/16"	16.11	15.41	14.71	14.01
59440	.1890	#12	4.801	2-1/2"	1-3/16"	16.65	15.93	15.20	14.48
59445	.1910	#11	4.851	2-1/2"	1-3/16"	16.65	15.93	15.20	14.48
59450	.1935	#10	4.915	2-1/2"	1-1/4"	17.64	16.87	16.11	15.34
59455	.1960	#9	4.978	2-1/2"	1-1/4"	17.64	16.87	16.11	15.34
39300	.1969		5.000	63	32	17.64	16.87	16.11	15.34
59465	.1990	#8	5.055	2-1/2"	1-1/4"	18.23	17.44	16.64	15.85
59470	.2010	#7	5.105	2-1/2"	1-1/4"	18.23	17.44	16.64	15.85
59475	.2031	13/64"	5.159	2-1/2"	1-1/4"	18.23	17.44	16.64	15.85
59480	.2040	#6	5.182	2-1/2"	1-1/4"	19.23	18.39	17.56	16.72
59485	.2055	#5	5.220	2-1/2"	1-1/4"	19.23	18.39	17.56	16.72
59490	.2090	#4	5.309	2-1/2"	1-1/4"	19.23	18.39	17.56	16.72
59495	.2130	#3	5.410	2-1/2"	1-1/4"	19.23	18.39	17.56	16.72
39350	.2165		5.500	63	32	19.23	18.39	17.56	16.72
59505	.2188	7/32"	5.558	2-1/2"	1-1/2"	19.23	18.39	17.56	16.72
59510	.2210	#2	5.613	2-1/2"	1-1/2"	20.57	19.68	18.78	17.89
59515	.2280	#1	5.791	2-1/2"	1-1/2"	20.57	19.68	18.78	17.89
59525	.2344	15/64"	5.954	2-1/2"	1-1/2"	22.92	21.92	20.93	19.93
39400	.2362		6.000	63	38	22.92	21.92	20.93	19.93
59550	.2500	1/4"	6.350	2-1/2"	1-1/2"	21.59	20.65	19.71	18.77
39450	.2559		6.500	63	38	26.16	25.03	23.89	22.75
59570	.2656	17/64"	6.746	2-1/2"	1-1/2"	26.16	25.03	23.89	22.75
39500	.2756		7.000	63	38	26.82	25.65	24.49	23.32
59600	.2812	9/32"	7.142	2-1/2"	1-1/2"	26.82	25.65	24.49	23.32
39520	.2953		7.500	63	41	28.18	26.95	25.73	24.50
59620	.2969	19/64"	7.541	2-1/2"	1-5/8"	28.18	26.95	25.73	24.50
59630	.3125	5/16"	7.938	2-1/2"	1-5/8"	28.18	26.95	25.73	24.50
39540	.3150		8.000	63	41	29.64	28.35	27.06	25.77
59650	.3281	21/64"	8.334	3"	1-5/8"	30.51	29.18	27.86	26.53
39560	.3346		8.500	76	41	34.09	32.60	31.12	29.64
59670	.3438	11/32"	8.733	3"	1-5/8"	34.09	32.60	31.12	29.64
39580	.3543		9.000	76	41	37.01	35.40	33.79	32.18
59690	.3594	23/64"	9.129	3"	1-3/4"	37.01	35.40	33.79	32.18
39600	.3740		9.500	76	41	40.35	38.60	36.84	35.09
59705	.3750	3/8"	9.525	3"	1-3/4"	40.35	38.60	36.84	35.09
59720	.3906	25/64"	9.921	3"	1-3/4"	45.60	43.62	41.63	39.65
39620	.3937		10.000	76	44	45.60	43.62	41.63	39.65
59740	.4062	13/32"	10.317	3"	1-3/4"	50.96	48.74	46.53	44.31
39640	.4134		10.500	76	44	53.33	51.01	48.69	46.37
59755	.4219	27/64"	10.716	3"	1-3/4"	56.11	53.67	51.23	48.79
39660	.4331		11.000	76	44	57.12	54.64	52.15	49.67
59765	.4375	7/16"	11.113	3"	1-3/4"	57.12	54.64	52.15	49.67
39680	.4528		11.500	76	44	58.78	56.22	53.67	51.11
59775	.4531	29/64"	11.509	3"	1-3/4"	59.89	57.29	54.68	52.08
59780	.4688	15/32"	11.908	3"	1-3/4"	59.89	57.29	54.68	52.08
39700	.4724		12.000	76	44	59.89	57.29	54.68	52.08
59790	.4844	31/64"	12.304	3"	1-3/4"	59.89	57.29	54.68	52.08
39720	.4921		12.500	76	44	61.25	58.59	55.92	53.26
59800	.5000	1/2"	12.700	3"	1-3/4"	61.25	58.59	55.92	53.26

TOLERANCES	
d	+0.000" - .0005" (+0.0000 - .0127mm)
l_1	$\leq 1/8"$ +.125" - .062" (+3.175 - 1.588mm)
	$> 1/8"$ +.125" - .125" (+3.175 - 3.175mm)
l_2	$\leq 1/8"$ +.125" - .062" (+3.175 - 1.588mm)
	$> 1/8"$ +.125" - .125" (+3.175 - 3.175mm)

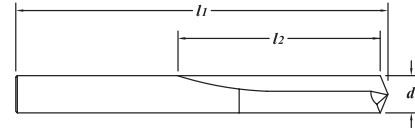
.0625" - .1660"
(1.588mm - 4.216mm)



DRILLS

Hard Metal - *Balinit*® HARDLUBE Coated

- Solid submicron grain carbide drill
- Straight flute design provides excellent rigidity
- Materials 40 Rc and higher
- Excellent heat resistance and lubricity
- Up to 40% faster than uncoated
- Recommended for high nickel, cobalt based and powdered metals
- Live tooling recommended on lathe processes



EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
59166	.0625	1/16"	1.588	1-3/4"	5/8"	11.66	11.15	10.65	10.14
59181	.0700	#50	1.778	1-3/4"	3/4"	11.66	11.15	10.65	10.14
59186	.0730	#49	1.854	1-3/4"	3/4"	11.66	11.15	10.65	10.14
59191	.0760	#48	1.930	1-3/4"	3/4"	11.66	11.15	10.65	10.14
59196	.0781	5/64"	1.984	1-3/4"	3/4"	11.66	11.15	10.65	10.14
59201	.0785	#47	1.994	1-3/4"	7/8"	11.66	11.15	10.65	10.14
39001	.0787		2.000	50	22	11.66	11.15	10.65	10.14
59211	.0810	#46	2.057	2"	7/8"	11.66	11.15	10.65	10.14
59216	.0820	#45	2.083	2"	7/8"	11.66	11.15	10.65	10.14
59221	.0860	#44	2.184	2"	7/8"	11.66	11.15	10.65	10.14
59226	.0890	#43	2.261	2"	7/8"	11.66	11.15	10.65	10.14
59231	.0935	#42	2.375	2"	7/8"	11.66	11.15	10.65	10.14
59236	.0938	3/32"	2.383	2"	7/8"	11.66	11.15	10.65	10.14
59241	.0960	#41	2.438	2"	7/8"	12.98	12.42	11.85	11.29
59246	.0980	#40	2.489	2"	7/8"	12.98	12.42	11.85	11.29
39051	.0984		2.500	50	22	12.98	12.42	11.85	11.29
59256	.0995	#39	2.527	2"	7/8"	12.98	12.42	11.85	11.29
59261	.1015	#38	2.578	2"	7/8"	12.98	12.42	11.85	11.29
59266	.1040	#37	2.642	2"	7/8"	12.98	12.42	11.85	11.29
59271	.1065	#36	2.705	2"	7/8"	12.98	12.42	11.85	11.29
59276	.1094	7/64"	2.779	2"	1"	12.98	12.42	11.85	11.29
59281	.1100	#35	2.794	2"	1"	13.46	12.87	12.29	11.70
59286	.1110	#34	2.819	2"	1"	13.46	12.87	12.29	11.70
59291	.1130	#33	2.870	2"	1"	13.46	12.87	12.29	11.70
59296	.1160	#32	2.946	2"	1"	13.46	12.87	12.29	11.70
39101	.1181		3.000	50	25	13.46	12.87	12.29	11.70
59306	.1200	#31	3.048	2"	1"	13.46	12.87	12.29	11.70
59311	.1250	1/8"	3.175	2"	1"	12.54	11.99	11.45	10.90
59316	.1285	#30	3.264	2"	1"	14.44	13.82	13.19	12.56
59321	.1360	#29	3.454	2"	1"	14.44	13.82	13.19	12.56
39151	.1378		3.500	50	25	14.44	13.82	13.19	12.56
59331	.1405	#28	3.569	2"	1"	14.44	13.82	13.19	12.56
59336	.1406	9/64"	3.571	2"	1"	14.44	13.82	13.19	12.56
59341	.1440	#27	3.658	2"	1"	14.78	14.14	13.49	12.85
59346	.1470	#26	3.734	2"	1"	15.46	14.78	14.11	13.44
59351	.1495	#25	3.797	2"	1"	15.46	14.78	14.11	13.44
59356	.1520	#24	3.861	2"	1"	15.46	14.78	14.11	13.44
59361	.1540	#23	3.912	2"	1"	15.46	14.78	14.11	13.44
59366	.1562	5/32"	3.967	2-1/2"	1-1/8"	15.46	14.78	14.11	13.44
59371	.1570	#22	3.988	2-1/2"	1-1/8"	16.56	15.84	15.12	14.40
39201	.1575		4.000	63	28	16.56	15.84	15.12	14.40
59381	.1590	#21	4.039	2-1/2"	1-1/8"	16.91	16.17	15.44	14.70
59386	.1610	#20	4.089	2-1/2"	1-1/8"	16.91	16.17	15.44	14.70
59391	.1660	#19	4.216	2-1/2"	1-1/8"	17.47	16.71	15.95	15.19

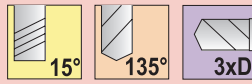
EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
59396	.1695	#18	4.305	2-1/2"	1-3/16"	17.47	16.71	15.95	15.19
59401	.1719	11/64"	4.366	2-1/2"	1-3/16"	17.47	16.71	15.95	15.19
59406	.1730	#17	4.394	2-1/2"	1-3/16"	17.81	17.04	16.26	15.49
59411	.1770	#16	4.496	2-1/2"	1-3/16"	17.81	17.04	16.26	15.49
39251	.1772		4.500	63	28	17.81	17.04	16.26	15.49
59421	.1800	#15	4.572	2-1/2"	1-3/16"	17.81	17.04	16.26	15.49
59426	.1820	#14	4.623	2-1/2"	1-3/16"	18.68	17.86	17.05	16.24
59431	.1850	#13	4.700	2-1/2"	1-3/16"	18.68	17.86	17.05	16.24
59436	.1875	3/16"	4.763	2-1/2"	1-3/16"	18.02	17.24	16.45	15.67
59441	.1890	#12	4.801	2-1/2"	1-3/16"	19.94	19.07	18.21	17.34
59446	.1910	#11	4.851	2-1/2"	1-3/16"	19.94	19.07	18.21	17.34
59451	.1935	#10	4.915	2-1/2"	1-1/4"	20.95	20.04	19.13	18.22
59456	.1960	#9	4.978	2-1/2"	1-1/4"	20.95	20.04	19.13	18.22
39301	.1969		5.000	63	32	20.95	20.04	19.13	18.22
59466	.1990	#8	5.055	2-1/2"	1-1/4"	21.52	20.58	19.65	18.71
59471	.2010	#7	5.105	2-1/2"	1-1/4"	21.52	20.58	19.65	18.71
59476	.2031	13/64"	5.159	2-1/2"	1-1/4"	21.52	20.58	19.65	18.71
59481	.2040	#6	5.182	2-1/2"	1-1/4"	22.54	21.56	20.58	19.60
59486	.2055	#5	5.220	2-1/2"	1-1/4"	22.54	21.56	20.58	19.60
59491	.2090	#4	5.309	2-1/2"	1-1/4"	22.54	21.56	20.58	19.60
59496	.2130	#3	5.410	2-1/2"	1-1/4"	22.54	21.56	20.58	19.60
39351	.2165		5.500	63	32	22.54	21.56	20.58	19.60
59506	.2188	7/32"	5.558	2-1/2"	1-1/2"	22.54	21.56	20.58	19.60
59511	.2210	#2	5.613	2-1/2"	1-1/2"	23.89	22.85	21.81	20.77
59516	.2280	#1	5.791	2-1/2"	1-1/2"	23.89	22.85	21.81	20.77
59526	.2344	15/64"	5.954	2-1/2"	1-1/2"	26.21	25.07	23.93	22.79
39401	.2362		6.000	63	38	26.21	25.07	23.93	22.79
59551	.2500	1/4"	6.350	2-1/2"	1-1/2"	24.87	23.79	22.71	21.63
39451	.2559		6.500	63	38	32.04	30.65	29.25	27.86
59571	.2656	17/64"	6.746	2-1/2"	1-1/2"	32.04	30.65	29.25	27.86
39501	.2756		7.000	63	38	34.65	33.14	31.64	30.13
59601	.2812	9/32"	7.142	2-1/2"	1-1/2"	34.65	33.14	31.64	30.13
39521	.2953		7.500	63	41	34.05	32.57	31.09	29.61
59621	.2969	19/64"	7.541	2-1/2"	1-5/8"	34.05	32.57	31.09	29.61
59631	.3125	5/16"	7.938	2-1/2"	1-5/8"	34.05	32.57	31.09	29.61
39541	.3150		8.000	63	41	35.52	33.98	32.43	30.89
59651	.3281	21/64"	8.334	3"	1-5/8"	36.39	34.80	33.22	31.64
39561	.3346		8.500	76	41	39.96	38.23	36.49	34.75
59671	.3438	11/32"	8.733	3"	1-5/8"	39.96	38.23	36.49	34.75
39581	.3543		9.000	76	41	43.25	41.37	39.49	37.61
59691	.3594	23/64"	9.129	3"	1-3/4"	43.25	41.37	39.49	37.61
39601	.3740		9.500	76	41	46.62	44.59	42.57	40.54
59706	.3750	3/8"	9.525	3"	1-3/4"	46.62	44.59	42.57	40.54
59721	.3906	25/64"	9.921	3"	1-3/4"	52.37	50.09	47.82	45.54
39621	.3937		10.000	76	44	52.37	50.09	47.82	45.54
59741	.4062	13/32"	10.317	3"	1-3/4"	61.20	58.54	55.88	53.22
39641	.4134		10.500	76	44	60.11	57.50	54.88	52.27
59756	.4219	27/64"	10.716	3"	1-3/4"	62.92	60.18	57.45	54.71
39661	.4331		11.000	76	44	63.91	61.13	58.35	55.57
59766	.4375	7/16"	11.113	3"	1-3/4"	63.91	61.13	58.35	55.57
39681	.4528		11.500	76	44	65.56	62.71	59.86	57.01
59776	.4531	29/64"	11.509	3"	1-3/4"	66.68	63.78	60.88	57.98
59781	.4688	15/32"	11.908	3"	1-3/4"	66.68	63.78	60.88	57.98
39701	.4724		12.000	76	44	66.68	63.78	60.88	57.98
59791	.4844	31/64"	12.304	3"	1-3/4"	66.68	63.78	60.88	57.98
39721	.4921		12.500	76	44	68.01	65.05	62.10	59.14
59801	.5000	1/2"	12.700	3"	1-3/4"	68.01	65.05	62.10	59.14

1510 - 2 Flute

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TOLERANCES		
d	+0.000" -0.005" (+0.000 -0.127mm)	
l_1	≤ 1/8"	+0.125" -0.062" (+3.175 -1.588mm)
	> 1/8"	+0.125" -0.125" (+3.175 -3.175mm)
l_2	≤ 1/8"	+0.125" -0.062" (+3.175 -1.588mm)
	> 1/8"	+0.125" -0.125" (+3.175 -3.175mm)

.0625" - .1575"
(1.588mm - 4.000mm)

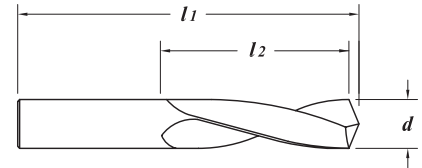


DRILLS

Solid submicron grain carbide drill
Heavy web for extra rigidity and added strength
Thinned point

Recommended to run in titanium, inconel, hastalloy, waspalloy, and stainless steel

Live tooling recommended on lathe processes



EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
19070	.0625	1/16"	1.588	1-3/4"	5/8"	7.15	6.84	6.53	6.22
19075	.0635	#52	1.613	1-3/4"	11/16"	7.26	6.94	6.63	6.31
19080	.0670	#51	1.702	1-3/4"	11/16"	7.37	7.05	6.73	6.41
19085	.0700	#50	1.778	1-3/4"	11/16"	7.56	7.23	6.90	6.57
19090	.0730	#49	1.854	1-3/4"	11/16"	7.73	7.39	7.06	6.72
19095	.0760	#48	1.930	1-3/4"	11/16"	7.99	7.65	7.30	6.95
19100	.0781	5/64"	1.984	1-3/4"	11/16"	8.29	7.93	7.57	7.21
19105	.0785	#47	1.994	1-3/4"	3/4"	8.57	8.20	7.82	7.45
19115	.0787		2.000	45	19	8.71	8.33	7.95	7.57
19120	.0810	#46	2.057	1-3/4"	3/4"	8.84	8.46	8.07	7.69
19125	.0820	#45	2.083	1-3/4"	3/4"	9.10	8.70	8.31	7.91
19130	.0860	#44	2.184	1-3/4"	3/4"	9.41	9.00	8.59	8.18
19135	.0890	#43	2.261	1-3/4"	3/4"	9.68	9.26	8.84	8.42
19140	.0935	#42	2.375	1-3/4"	3/4"	9.81	9.38	8.96	8.53
19145	.0938	3/32"	2.383	1-3/4"	3/4"	10.04	9.60	9.17	8.73
19150	.0960	#41	2.438	1-13/16"	13/16"	10.12	9.68	9.24	8.80
19155	.0980	#40	2.489	1-13/16"	13/16"	10.26	9.81	9.37	8.92
19160	.0984		2.500	46	21	10.33	9.88	9.43	8.98
19165	.0995	#39	2.527	1-13/16"	13/16"	10.37	9.92	9.47	9.02
19170	.1015	#38	2.578	1-13/16"	13/16"	10.47	10.01	9.56	9.10
19175	.1040	#37	2.642	1-13/16"	13/16"	10.56	10.10	9.64	9.18
19180	.1065	#36	2.705	1-13/16"	13/16"	10.64	10.18	9.71	9.25
19185	.1094	7/64"	2.779	1-13/16"	13/16"	10.68	10.22	9.75	9.29
19190	.1100	#35	2.794	1-7/8"	7/8"	10.75	10.29	9.82	9.35
19195	.1110	#34	2.819	1-7/8"	7/8"	10.88	10.41	9.93	9.46
19200	.1130	#33	2.870	1-7/8"	7/8"	10.96	10.48	10.01	9.53
19205	.1160	#32	2.946	1-7/8"	7/8"	11.04	10.56	10.08	9.60
19210	.1181		3.000	48	22	11.14	10.66	10.17	9.69
19215	.1200	#31	3.048	1-7/8"	7/8"	11.26	10.77	10.28	9.79
19220	.1250	1/8"	3.175	1-7/8"	7/8"	11.37	10.88	10.38	9.89
19225	.1285	#30	3.264	1-15/16"	15/16"	11.67	11.17	10.66	10.15
19230	.1360	#29	3.454	1-15/16"	15/16"	11.98	11.46	10.94	10.42
19235	.1378		3.500	49	24	12.36	11.83	11.29	10.75
19240	.1405	#28	3.569	1-15/16"	15/16"	12.52	11.98	11.43	10.89
19245	.1406	9/64"	3.571	1-15/16"	15/16"	12.66	12.11	11.56	11.01
19250	.1440	#27	3.658	2-1/16"	1"	13.78	13.18	12.58	11.98
19255	.1470	#26	3.734	2-1/16"	1"	13.92	13.31	12.71	12.10
19260	.1495	#25	3.797	2-1/16"	1"	14.10	13.49	12.87	12.26
19265	.1520	#24	3.861	2-1/16"	1"	14.12	13.51	12.89	12.28
19270	.1540	#23	3.912	2-1/16"	1"	14.21	13.60	12.98	12.36
19275	.1562	5/32"	3.967	2-1/16"	1"	14.31	13.68	13.06	12.44
19280	.1570	#22	3.988	2-1/8"	1-1/16"	15.19	14.53	13.87	13.21
19285	.1575		4.000	54	27	15.40	14.73	14.06	13.39

EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
19290	.1590	#21	4.039	2-1/8"	1-1/16"	15.58	14.91	14.23	13.55
19295	.1610	#20	4.089	2-1/8"	1-1/16"	15.71	15.03	14.34	13.66
19300	.1660	#19	4.216	2-1/8"	1-1/16"	16.34	15.63	14.92	14.21
19305	.1695	#18	4.305	2-1/8"	1-1/16"	16.54	15.82	15.10	14.38
19310	.1719	11/64"	4.366	2-1/8"	1-1/16"	16.86	16.13	15.39	14.66
19315	.1730	#17	4.394	2-3/16"	1-1/8"	17.11	16.37	15.62	14.88
19320	.1770	#16	4.496	2-3/16"	1-1/8"	17.30	16.54	15.79	15.04
19325	.1772		4.500	56	29	17.39	16.63	15.88	15.12
19330	.1800	#15	4.572	2-3/16"	1-1/8"	17.47	16.71	15.95	15.19
19335	.1820	#14	4.623	2-3/16"	1-1/8"	17.86	17.08	16.31	15.53
19340	.1850	#13	4.700	2-3/16"	1-1/8"	18.00	17.22	16.43	15.65
19345	.1875	3/16"	4.763	2-3/16"	1-1/8"	18.07	17.28	16.50	15.71
19350	.1890	#12	4.801	2-1/4"	1-3/16"	18.66	17.85	17.04	16.23
19355	.1910	#11	4.851	2-1/4"	1-3/16"	18.88	18.06	17.24	16.42
19360	.1935	#10	4.915	2-1/4"	1-3/16"	19.75	18.89	18.03	17.17
19365	.1960	#9	4.978	2-1/4"	1-3/16"	20.26	19.38	18.50	17.62
19370	.1969		5.000	57	30	20.37	19.48	18.60	17.71
19375	.1990	#8	5.055	2-1/4"	1-3/16"	20.53	19.64	18.74	17.85
19380	.2010	#7	5.105	2-1/4"	1-3/16"	21.13	20.21	19.29	18.37
19385	.2031	13/64"	5.159	2-1/4"	1-3/16"	21.28	20.35	19.43	18.50
19390	.2040	#6	5.182	2-3/8"	1-1/4"	21.71	20.77	19.82	18.88
19395	.2055	#5	5.220	2-3/8"	1-1/4"	22.15	21.19	20.22	19.26
19400	.2090	#4	5.309	2-3/8"	1-1/4"	22.56	21.58	20.60	19.62
19405	.2130	#3	5.410	2-3/8"	1-1/4"	22.95	21.96	20.96	19.96
19410	.2165		5.500	60	32	23.12	22.11	21.11	20.10
19415	.2188	7/32"	5.558	2-3/8"	1-1/4"	23.30	22.29	21.27	20.26
19420	.2210	#2	5.613	2-7/16"	1-5/16"	23.84	22.80	21.77	20.73
19425	.2280	#1	5.791	2-7/16"	1-5/16"	24.01	22.97	21.92	20.88
19430	.2340	A	5.944	2-7/16"	1-5/16"	24.06	23.01	21.97	20.92
19435	.2344	15/64"	5.954	2-7/16"	1-5/16"	24.10	23.06	22.01	20.96
19440	.2362		6.000	64	35	24.17	23.12	22.07	21.02
19445	.2380	B	6.045	2-1/2"	1-3/8"	24.28	23.22	22.17	21.11
19450	.2420	C	6.147	2-1/2"	1-3/8"	24.45	23.39	22.32	21.26
19455	.2460	D	6.248	2-1/2"	1-3/8"	24.66	23.58	22.51	21.44
19460	.2500	1/4" / E	6.350	2-1/2"	1-3/8"	24.79	23.72	22.64	21.56
19465	.2559		6.500	67	37	25.40	24.30	23.19	22.09
19470	.2570	F	6.528	2-5/8"	1-7/16"	25.93	24.81	23.68	22.55
19475	.2610	G	6.629	2-5/8"	1-7/16"	26.46	25.31	24.16	23.01
19480	.2656	17/64"	6.746	2-5/8"	1-7/16"	27.00	25.83	24.65	23.48
19485	.2660	H	6.756	2-11/16"	1-1/2"	27.77	26.57	25.36	24.15
19490	.2720	I	6.909	2-11/16"	1-1/2"	28.09	26.87	25.65	24.43
19495	.2756		7.000	68	38	28.32	27.09	25.86	24.63
19500	.2770	J	7.036	2-11/16"	1-1/2"	28.58	27.34	26.09	24.85
19505	.2810	K	7.137	2-11/16"	1-1/2"	28.83	27.58	26.32	25.07
19510	.2812	9/32"	7.142	2-11/16"	1-1/2"	28.98	27.72	26.46	25.20
19515	.2900	L	7.366	2-3/4"	1-9/16"	30.05	28.74	27.44	26.13
19520	.2950	M	7.493	2-3/4"	1-9/16"	32.17	30.77	29.37	27.97
19525	.2953		7.500	70	40	32.17	30.77	29.37	27.97
19530	.2969	19/64"	7.541	2-3/4"	1-9/16"	32.34	30.93	29.53	28.12
19535	.3020	N	7.671	2-15/16"	1-5/8"	34.06	32.58	31.10	29.62
19540	.3125	5/16"	7.938	2-15/16"	1-5/8"	34.19	32.70	31.22	29.73
19545	.3150		8.000	75	43	36.69	35.09	33.50	31.90
19550	.3160	O	8.026	2-15/16"	1-11/16"	36.69	35.09	33.50	31.90
19555	.3230	P	8.204	2-15/16"	1-11/16"	37.01	35.40	33.79	32.18
19560	.3281	21/64"	8.334	2-15/16"	1-11/16"	37.23	35.61	33.99	32.37
19565	.3320	Q	8.433	3"	1-11/16"	38.09	36.43	34.78	33.12
19570	.3346		8.500	76	43	38.46	36.78	35.11	33.44

continued →

1510 - 2 Flute (continued)

.3390" - .6299"
(8.611mm - 16.000mm)

DRILLS

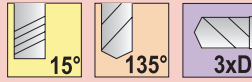
EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
19575	.3390	R	8.611	3"	1-11/16"	39.65	37.93	36.20	34.48
19580	.3438	11/32"	8.733	3"	1-11/16"	41.26	39.47	37.67	35.88
19585	.3480	S	8.839	3-1/16"	1-3/4"	41.83	40.01	38.19	36.37
19590	.3543		9.000	78	44	42.08	40.25	38.42	36.59
19595	.3580	T	9.093	3-1/16"	1-3/4"	42.24	40.40	38.57	36.73
19600	.3594	23/64"	9.129	3-1/16"	1-3/4"	42.53	40.68	38.83	36.98
19605	.3680	U	9.347	3-1/8"	1-13/16"	46.58	44.55	42.53	40.50
19610	.3740		9.500	79	46	47.02	44.98	42.93	40.89
19615	.3750	3/8"	9.525	3-1/8"	1-13/16"	47.38	45.32	43.26	41.20
19620	.3770	V	9.576	3-1/4"	1-7/8"	48.30	46.20	44.10	42.00
19625	.3860	W	9.804	3-1/4"	1-7/8"	49.31	47.17	45.02	42.88
19630	.3906	25/64"	9.921	3-1/4"	1-7/8"	50.06	47.88	45.71	43.53
19635	.3937		10.000	84	49	51.85	49.60	47.34	45.09
19640	.3970	X	10.084	3-5/16"	1-15/16"	53.36	51.04	48.72	46.40
19645	.4040	Y	10.262	3-5/16"	1-15/16"	53.79	51.45	49.11	46.77
19650	.4062	13/32"	10.317	3-5/16"	1-15/16"	55.74	53.32	50.89	48.47
19655	.4130	Z	10.490	3-3/8"	2"	56.34	53.89	51.44	48.99
19660	.4134		10.500	86	51	56.34	53.89	51.44	48.99
19665	.4219	27/64"	10.716	3-3/8"	2"	56.96	54.48	52.01	49.53
19670	.4331		11.000	87	52	61.87	59.18	56.49	53.80
19675	.4375	7/16"	11.113	3-7/16"	2-1/16"	61.87	59.18	56.49	53.80
19680	.4528		11.500	91	54	67.09	64.17	61.26	58.34
19685	.4531	29/64"	11.509	3-9/16"	2-1/8"	67.09	64.17	61.26	58.34
19690	.4688	15/32"	11.908	3-5/8"	2-1/8"	70.97	67.88	64.80	61.71
19695	.4724		12.000	94	56	71.22	68.12	65.03	61.93
19700	.4844	31/64"	12.304	3-11/16"	2-3/16"	71.78	68.66	65.54	62.42
19705	.4921		12.500	95	56	72.58	69.42	66.27	63.11
19710	.5000	1/2"	12.700	3-3/4"	2-1/4"	73.11	69.93	66.75	63.57
19715	.5118		13.000	107	60	95.68	91.52	87.36	83.20
19720	.5156	33/64"	13.096	4-1/4"	2-3/8"	98.24	93.97	89.70	85.43
19725	.5312	17/32"	13.492	4-1/4"	2-3/8"	100.80	96.42	92.03	87.65
19730	.5315		13.500	107	60	103.39	98.89	94.40	89.90
19735	.5469	35/64"	13.891	4-1/4"	2-3/8"	105.94	101.33	96.73	92.12
19740	.5512		14.000	107	60	108.53	103.81	99.09	94.37
19745	.5625	9/16"	14.287	4-1/2"	2-1/2"	118.34	113.19	108.05	102.90
19750	.5709		14.500	115	65	120.80	115.54	110.29	105.04
19755	.5781	37/64"	14.683	4-1/2"	2-1/2"	123.28	117.92	112.56	107.20
19760	.5906		15.000	115	65	125.79	120.32	114.85	109.38
19765	.5938	19/32"	15.082	4-1/2"	2-1/2"	126.51	121.01	115.51	110.01
19770	.6094	39/64"	15.478	4-1/2"	2-1/2"	127.21	121.68	116.15	110.62
19775	.6102		15.500	115	65	127.94	122.38	116.81	111.25
19780	.6250	5/8"	15.875	4-1/2"	2-1/2"	128.65	123.06	117.46	111.87
19785	.6299		16.000	115	65	132.08	126.34	120.59	114.85

TOLERANCES

<i>d</i>	+.0000" - .0005" (+.0000 - .0127mm)	
<i>l₁</i>	≤ 1/8"	+ .125" - .062" (+3.175 - 1.588mm)
	> 1/8"	+ .125" - .125" (+3.175 - 3.175mm)
<i>l₂</i>	≤ 1/8"	+ .125" - .062" (+3.175 - 1.588mm)
	> 1/8"	+ .125" - .125" (+3.175 - 3.175mm)

Technical information: page 250-253

1510H - 2 Flute



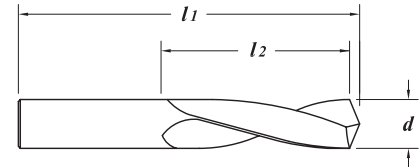
.0625" - .1575"
(1.588mm - 4.000mm)

Balinit® HARDLUBE Coated

- Solid submicron grain carbide drill
- Excellent heat resistance and lubricity
- Up to 40% faster than uncoated
- Heavy web for extra rigidity and added strength
- Thinned point

Recommended to run in titanium, inconel, hastalloy, waspallory, and stainless steel

Live tooling recommended on lathe processes



EDP#	<i>d</i> † Diameter		<i>l₁</i> Overall Length	<i>l₂</i> Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
19071	.0625	1/16"	1.588	1-3/4"	5/8"	9.06	8.67	8.27	7.88
19076	.0635	#52	1.613	1-3/4"	11/16"	9.18	8.78	8.38	7.98
19081	.0670	#51	1.702	1-3/4"	11/16"	9.28	8.88	8.47	8.07
19086	.0700	#50	1.778	1-3/4"	11/16"	9.46	9.05	8.64	8.23
19091	.0730	#49	1.854	1-3/4"	11/16"	9.66	9.24	8.82	8.40
19096	.0760	#48	1.930	1-3/4"	11/16"	9.90	9.47	9.04	8.61
19101	.0781	5/64"	1.984	1-3/4"	11/16"	10.21	9.77	9.32	8.88
19106	.0785	#47	1.994	1-3/4"	3/4"	10.48	10.02	9.57	9.11
19116	.0787		2.000	45	19	10.61	10.15	9.69	9.23
19121	.0810	#46	2.057	1-3/4"	3/4"	10.75	10.29	9.82	9.35
19126	.0820	#45	2.083	1-3/4"	3/4"	11.03	10.55	10.07	9.59
19131	.0860	#44	2.184	1-3/4"	3/4"	11.32	10.82	10.33	9.84
19136	.0890	#43	2.261	1-3/4"	3/4"	11.60	11.10	10.59	10.09
19141	.0935	#42	2.375	1-3/4"	3/4"	11.72	11.21	10.70	10.19
19146	.0938	3/32"	2.383	1-3/4"	3/4"	11.96	11.44	10.92	10.40
19151	.0960	#41	2.438	1-13/16"	13/16"	12.04	11.52	10.99	10.47
19156	.0980	#40	2.489	1-13/16"	13/16"	12.18	11.65	11.12	10.59
19161	.0984		2.500	46	21	12.25	11.72	11.18	10.65
19166	.0995	#39	2.527	1-13/16"	13/16"	12.31	11.77	11.24	10.70
19171	.1015	#38	2.578	1-13/16"	13/16"	12.37	11.84	11.30	10.76
19176	.1040	#37	2.642	1-13/16"	13/16"	12.45	11.91	11.37	10.83
19181	.1065	#36	2.705	1-13/16"	13/16"	12.54	11.99	11.45	10.90
19186	.1094	7/64"	2.779	1-13/16"	13/16"	12.62	12.07	11.52	10.97
19191	.1100	#35	2.794	1-7/8"	7/8"	12.67	12.12	11.57	11.02
19196	.1110	#34	2.819	1-7/8"	7/8"	12.79	12.23	11.68	11.12
19201	.1130	#33	2.870	1-7/8"	7/8"	12.87	12.31	11.75	11.19
19206	.1160	#32	2.946	1-7/8"	7/8"	12.96	12.40	11.83	11.27
19211	.1181		3.000	48	22	13.06	12.50	11.93	11.36
19216	.1200	#31	3.048	1-7/8"	7/8"	13.16	12.58	12.01	11.44
19221	.1250	1/8"	3.175	1-7/8"	7/8"	13.29	12.72	12.14	11.56
19226	.1285	#30	3.264	1-15/16"	15/16"	13.59	13.00	12.41	11.82
19231	.1360	#29	3.454	1-15/16"	15/16"	13.89	13.29	12.68	12.08
19236	.1378		3.500	49	24	14.28	13.66	13.04	12.42
19241	.1405	#28	3.569	1-15/16"	15/16"	14.44	13.82	13.19	12.56
19246	.1406	9/64"	3.571	1-15/16"	15/16"	14.56	13.93	13.29	12.66
19251	.1440	#27	3.658	2-1/16"	1"	15.70	15.02	14.33	13.65
19256	.1470	#26	3.734	2-1/16"	1"	15.84	15.15	14.46	13.77
19261	.1495	#25	3.797	2-1/16"	1"	16.02	15.32	14.63	13.93
19266	.1520	#24	3.861	2-1/16"	1"	16.04	15.35	14.65	13.95
19271	.1540	#23	3.912	2-1/16"	1"	16.13	15.43	14.73	14.03
19276	.1562	5/32"	3.967	2-1/16"	1"	16.22	15.51	14.81	14.10
19281	.1570	#22	3.988	2-1/8"	1-1/16"	17.11	16.37	15.62	14.88
19286	.1575		4.000	54	27	17.30	16.54	15.79	15.04

continued →

1510H - 2 Flute (continued)

.1590" - .3346"
(4.039mm - 8.500mm)

DRILLS

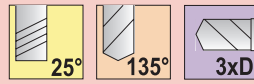
EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
19291	.1590	#21	4.039	2-1/8"	1-1/16"	17.49	16.73	15.97	15.21
19296	.1610	#20	4.089	2-1/8"	1-1/16"	17.62	16.85	16.09	15.32
19301	.1660	#19	4.216	2-1/8"	1-1/16"	18.25	17.46	16.66	15.87
19306	.1695	#18	4.305	2-1/8"	1-1/16"	18.45	17.64	16.84	16.04
19311	.1719	11/64"	4.366	2-1/8"	1-1/16"	18.78	17.96	17.15	16.33
19316	.1730	#17	4.394	2-3/16"	1-1/8"	19.02	18.19	17.37	16.54
19321	.1770	#16	4.496	2-3/16"	1-1/8"	19.22	18.38	17.55	16.71
19326	.1772		4.500	56	29	19.30	18.46	17.62	16.78
19331	.1800	#15	4.572	2-3/16"	1-1/8"	19.38	18.54	17.69	16.85
19336	.1820	#14	4.623	2-3/16"	1-1/8"	19.78	18.92	18.06	17.20
19341	.1850	#13	4.700	2-3/16"	1-1/8"	19.92	19.05	18.19	17.32
19346	.1875	3/16"	4.763	2-3/16"	1-1/8"	19.98	19.11	18.24	17.37
19351	.1890	#12	4.801	2-1/4"	1-3/16"	21.97	21.01	20.06	19.10
19356	.1910	#11	4.851	2-1/4"	1-3/16"	22.20	21.23	20.27	19.30
19361	.1935	#10	4.915	2-1/4"	1-3/16"	23.07	22.07	21.06	20.06
19366	.1960	#9	4.978	2-1/4"	1-3/16"	23.58	22.55	21.53	20.50
19371	.1969		5.000	57	30	23.69	22.66	21.63	20.60
19376	.1990	#8	5.055	2-1/4"	1-3/16"	23.82	22.78	21.75	20.71
19381	.2010	#7	5.105	2-1/4"	1-3/16"	24.44	23.38	22.31	21.25
19386	.2031	13/64"	5.159	2-1/4"	1-3/16"	24.58	23.51	22.44	21.37
19391	.2040	#6	5.182	2-3/8"	1-1/4"	25.02	23.94	22.85	21.76
19396	.2055	#5	5.220	2-3/8"	1-1/4"	25.47	24.37	23.26	22.15
19401	.2090	#4	5.309	2-3/8"	1-1/4"	25.85	24.73	23.60	22.48
19406	.2130	#3	5.410	2-3/8"	1-1/4"	26.25	25.11	23.97	22.83
19411	.2165		5.500	60	32	26.44	25.29	24.14	22.99
19416	.2188	7/32"	5.558	2-3/8"	1-1/4"	26.60	25.44	24.29	23.13
19421	.2210	#2	5.613	2-7/16"	1-5/16"	27.16	25.98	24.80	23.62
19426	.2280	#1	5.791	2-7/16"	1-5/16"	27.31	26.13	24.94	23.75
19431	.2340	A	5.944	2-7/16"	1-5/16"	27.38	26.19	25.00	23.81
19436	.2344	15/64"	5.954	2-7/16"	1-5/16"	27.42	26.22	25.03	23.84
19441	.2362		6.000	64	35	27.50	26.30	25.11	23.91
19446	.2380	B	6.045	2-1/2"	1-3/8"	27.59	26.39	25.19	23.99
19451	.2420	C	6.147	2-1/2"	1-3/8"	27.76	26.55	25.35	24.14
19456	.2460	D	6.248	2-1/2"	1-3/8"	27.95	26.73	25.52	24.30
19461	.2500	1/4" / E	6.350	2-1/2"	1-3/8"	28.12	26.90	25.67	24.45
19466	.2559		6.500	67	37	31.28	29.92	28.56	27.20
19471	.2570	F	6.528	2-5/8"	1-7/16"	31.82	30.44	29.05	27.67
19476	.2610	G	6.629	2-5/8"	1-7/16"	32.34	30.93	29.53	28.12
19481	.2656	17/64"	6.746	2-5/8"	1-7/16"	32.88	31.45	30.02	28.59
19486	.2660	H	6.756	2-11/16"	1-1/2"	33.65	32.19	30.72	29.26
19491	.2720	I	6.909	2-11/16"	1-1/2"	33.96	32.48	31.01	29.53
19496	.2756		7.000	68	38	34.19	32.70	31.22	29.73
19501	.2770	J	7.036	2-11/16"	1-1/2"	34.45	32.96	31.46	29.96
19506	.2810	K	7.137	2-11/16"	1-1/2"	34.71	33.20	31.69	30.18
19511	.2812	9/32"	7.142	2-11/16"	1-1/2"	34.83	33.32	31.80	30.29
19516	.2900	L	7.366	2-3/4"	1-9/16"	35.91	34.35	32.79	31.23
19521	.2950	M	7.493	2-3/4"	1-9/16"	38.03	36.38	34.72	33.07
19526	.2953		7.500	70	40	38.03	36.38	34.72	33.07
19531	.2969	19/64"	7.541	2-3/4"	1-9/16"	38.19	36.53	34.87	33.21
19536	.3020	N	7.671	2-15/16"	1-5/8"	39.94	38.20	36.47	34.73
19541	.3125	5/16"	7.938	2-15/16"	1-5/8"	40.08	38.34	36.59	34.85
19546	.3150		8.000	75	43	42.56	40.71	38.86	37.01
19551	.3160	O	8.026	2-15/16"	1-11/16"	42.56	40.71	38.86	37.01
19556	.3230	P	8.204	2-15/16"	1-11/16"	42.87	41.01	39.14	37.28
19561	.3281	21/64"	8.334	2-15/16"	1-11/16"	43.10	41.23	39.35	37.48
19566	.3320	Q	8.433	3"	1-11/16"	43.96	42.05	40.14	38.23
19571	.3346		8.500	76	43	44.32	42.39	40.47	38.54

EDP#	d^+ Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
19576	.3390	R	8.611	3"	1-11/16"	45.52	43.54	41.56	39.58
19581	.3438	11/32"	8.733	3"	1-11/16"	47.14	45.09	43.04	40.99
19586	.3480	S	8.839	3-1/16"	1-3/4"	49.78	47.62	45.45	43.29
19591	.3543		9.000	78	44	50.06	47.88	45.71	43.53
19596	.3580	T	9.093	3-1/16"	1-3/4"	50.19	48.00	45.82	43.64
19601	.3594	23/64"	9.129	3-1/16"	1-3/4"	50.50	48.30	46.11	43.91
19606	.3680	U	9.347	3-1/8"	1-13/16"	54.54	52.17	49.80	47.43
19611	.3740		9.500	79	46	54.98	52.59	50.20	47.81
19616	.3750	3/8"	9.525	3-1/8"	1-13/16"	55.35	52.94	50.54	48.13
19621	.3770	V	9.576	3-1/4"	1-7/8"	57.42	54.92	52.43	49.93
19626	.3860	W	9.804	3-1/4"	1-7/8"	58.43	55.89	53.35	50.81
19631	.3906	25/64"	9.921	3-1/4"	1-7/8"	59.16	56.58	54.01	51.44
19636	.3937		10.000	84	49	60.95	58.30	55.65	53.00
19641	.3970	X	10.084	3-5/16"	1-15/16"	62.49	59.77	57.06	54.34
19646	.4040	Y	10.262	3-5/16"	1-15/16"	62.92	60.18	57.45	54.71
19651	.4062	13/32"	10.317	3-5/16"	1-15/16"	64.84	62.02	59.20	56.38
19656	.4130	Z	10.490	3-3/8"	2"	65.45	62.60	59.76	56.91
19661	.4134		10.500	86	51	65.45	62.60	59.76	56.91
19666	.4219	27/64"	10.716	3-3/8"	2"	66.07	63.20	60.32	57.45
19671	.4331		11.000	87	52	70.97	67.88	64.80	61.71
19676	.4375	7/16"	11.113	3-7/16"	2-1/16"	70.97	67.88	64.80	61.71
19681	.4528		11.500	91	54	76.21	72.90	69.58	66.27
19686	.4531	29/64"	11.509	3-9/16"	2-1/8"	76.21	72.90	69.58	66.27
19691	.4688	15/32"	11.908	3-5/8"	2-1/8"	80.07	76.59	73.11	69.63
19696	.4724		12.000	94	56	80.34	76.85	73.35	69.86
19701	.4844	31/64"	12.304	3-11/16"	2-3/16"	80.88	77.36	73.85	70.33
19706	.4921		12.500	95	56	81.71	78.16	74.60	71.05
19711	.5000	1/2"	12.700	3-3/4"	2-1/4"	82.23	78.65	75.08	71.50
19716	.5118		13.000	107	60	108.89	104.16	99.42	94.69
19721	.5156	33/64"	13.096	4-1/4"	2-3/8"	111.45	106.60	101.76	96.91
19726	.5312	17/32"	13.492	4-1/4"	2-3/8"	114.01	109.05	104.10	99.14
19731	.5315		13.500	107	60	116.58	111.51	106.44	101.37
19736	.5469	35/64"	13.891	4-1/4"	2-3/8"	119.13	113.95	108.77	103.59
19741	.5512		14.000	107	60	121.73	116.44	111.14	105.85
19746	.5625	9/16"	14.287	4-1/2"	2-1/2"	131.55	125.83	120.11	114.39
19751	.5709		14.500	115	65	134.01	128.18	122.36	116.53
19756	.5781	37/64"	14.683	4-1/2"	2-1/2"	136.48	130.55	124.61	118.68
19761	.5906		15.000	115	65	138.98	132.94	126.89	120.85
19766	.5938	19/32"	15.082	4-1/2"	2-1/2"	139.71	133.64	127.56	121.49
19771	.6094	39/64"	15.478	4-1/2"	2-1/2"	140.42	134.31	128.21	122.10
19776	.6102		15.500	115	65	141.14	135.00	128.87	122.73
19781	.6250	5/8"	15.875	4-1/2"	2-1/2"	141.86	135.70	129.53	123.36
19786	.6299		16.000	115	65	145.29	138.97	132.66	126.34

TOLERANCES

<i>d</i>	+.0000" -.0005" (+.0000 -.0127mm)	
<i>l₁</i>	≤ 1/8"	+ .125" -.062" (+3.175 -1.588mm)
	> 1/8"	+ .125" -.125" (+3.175 -3.175mm)
<i>l₂</i>	≤ 1/8"	+ .125" -.062" (+3.175 -1.588mm)
	> 1/8"	+ .125" -.125" (+3.175 -3.175mm)

.0625" - .1575"
(1.588mm - 4.000mm)

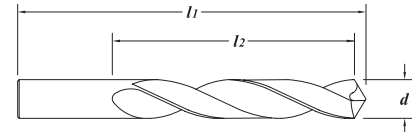


DRILLS

Solid submicron grain carbide drill
No spotting required in most applications
4-facet self-centering point

Recommended to run in stainless steel alloys, mild steels and titanium alloys

Live tooling recommended on lathe processes



EDP#	<i>d</i> † Diameter		<i>l₁</i> Overall Length	<i>l₂</i> Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
77165	.0625	1/16"	1.588	1-3/4"	5/8"	6.79	6.49	6.20	5.90
77170	.0635	#52	1.613	1-3/4"	11/16"	6.89	6.59	6.29	5.99
77175	.0670	#51	1.702	1-3/4"	11/16"	6.99	6.69	6.38	6.08
77180	.0700	#50	1.778	1-3/4"	11/16"	7.16	6.85	6.54	6.23
77185	.0730	#49	1.854	1-3/4"	11/16"	7.35	7.03	6.71	6.39
77190	.0760	#48	1.930	1-3/4"	11/16"	7.59	7.26	6.93	6.60
77195	.0781	5/64"	1.984	1-3/4"	11/16"	7.88	7.54	7.19	6.85
77200	.0785	#47	1.994	1-3/4"	3/4"	8.14	7.79	7.43	7.08
77205	.0787		2.000	45	19	8.27	7.91	7.55	7.19
77210	.0810	#46	2.057	1-3/4"	3/4"	8.40	8.03	7.67	7.30
77215	.0820	#45	2.083	1-3/4"	3/4"	8.65	8.27	7.90	7.52
77220	.0860	#44	2.184	1-3/4"	3/4"	8.94	8.55	8.16	7.77
77225	.0890	#43	2.261	1-3/4"	3/4"	9.19	8.79	8.39	7.99
77230	.0935	#42	2.375	1-3/4"	3/4"	9.32	8.91	8.51	8.10
77235	.0938	3/32"	2.383	1-3/4"	3/4"	9.53	9.12	8.70	8.29
77240	.0960	#41	2.438	1-13/16"	13/16"	9.61	9.20	8.78	8.36
77245	.0980	#40	2.489	1-13/16"	13/16"	9.76	9.34	8.91	8.49
77250	.0984		2.500	46	21	9.81	9.38	8.96	8.53
77255	.0995	#39	2.527	1-13/16"	13/16"	9.86	9.43	9.00	8.57
77260	.1015	#38	2.578	1-13/16"	13/16"	9.95	9.52	9.08	8.65
77265	.1040	#37	2.642	1-13/16"	13/16"	10.02	9.58	9.15	8.71
77270	.1065	#36	2.705	1-13/16"	13/16"	10.09	9.65	9.21	8.77
77275	.1094	7/64"	2.779	1-13/16"	13/16"	10.15	9.71	9.27	8.83
77280	.1100	#35	2.794	1-7/8"	7/8"	10.22	9.78	9.33	8.89
77285	.1110	#34	2.819	1-7/8"	7/8"	10.34	9.89	9.44	8.99
77290	.1130	#33	2.870	1-7/8"	7/8"	10.41	9.96	9.50	9.05
77295	.1160	#32	2.946	1-7/8"	7/8"	10.48	10.02	9.57	9.11
77300	.1181		3.000	48	22	10.60	10.14	9.68	9.22
77305	.1200	#31	3.048	1-7/8"	7/8"	10.67	10.21	9.74	9.28
77310	.1250	1/8"	3.175	1-7/8"	7/8"	10.79	10.32	9.85	9.38
77315	.1285	#30	3.264	1-15/16"	15/16"	11.09	10.60	10.12	9.64
77320	.1360	#29	3.454	1-15/16"	15/16"	11.37	10.88	10.38	9.89
77325	.1378		3.500	49	24	11.74	11.23	10.72	10.21
77330	.1405	#28	3.569	1-15/16"	15/16"	11.90	11.39	10.87	10.35
77335	.1406	9/64"	3.571	1-15/16"	15/16"	12.02	11.50	10.97	10.45
77340	.1440	#27	3.658	2-1/16"	1"	13.08	12.51	11.94	11.37
77345	.1470	#26	3.734	2-1/16"	1"	13.21	12.64	12.06	11.49
77350	.1495	#25	3.797	2-1/16"	1"	13.39	12.80	12.22	11.64
77355	.1520	#24	3.861	2-1/16"	1"	13.41	12.83	12.24	11.66
77360	.1540	#23	3.912	2-1/16"	1"	13.50	12.91	12.33	11.74
77365	.1562	5/32"	3.967	2-1/16"	1"	13.59	13.00	12.41	11.82
77370	.1570	#22	3.988	2-1/8"	1-1/16"	14.44	13.82	13.19	12.56
77375	.1575		4.000	54	27	14.63	13.99	13.36	12.72

EDP#	d^+ Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
77380	.1590	#21	4.039	2-1/8"	1-1/16"	14.80	14.16	13.51	12.87
77385	.1610	#20	4.089	2-1/8"	1-1/16"	14.90	14.26	13.61	12.96
77390	.1660	#19	4.216	2-1/8"	1-1/16"	15.51	14.84	14.16	13.49
77395	.1695	#18	4.305	2-1/8"	1-1/16"	15.71	15.03	14.34	13.66
77400	.1719	11/64"	4.366	2-1/8"	1-1/16"	16.03	15.33	14.64	13.94
77405	.1730	#17	4.394	2-3/16"	1-1/8"	16.25	15.54	14.84	14.13
77410	.1770	#16	4.496	2-3/16"	1-1/8"	16.43	15.72	15.00	14.29
77415	.1772		4.500	56	29	16.51	15.80	15.08	14.36
77420	.1800	#15	4.572	2-3/16"	1-1/8"	16.58	15.86	15.14	14.42
77425	.1820	#14	4.623	2-3/16"	1-1/8"	16.96	16.23	15.49	14.75
77430	.1850	#13	4.700	2-3/16"	1-1/8"	17.10	16.36	15.61	14.87
77435	.1875	3/16"	4.763	2-3/16"	1-1/8"	17.17	16.42	15.68	14.93
77440	.1890	#12	4.801	2-1/4"	1-3/16"	17.73	16.96	16.19	15.42
77445	.1910	#11	4.851	2-1/4"	1-3/16"	17.93	17.15	16.37	15.59
77450	.1935	#10	4.915	2-1/4"	1-3/16"	18.78	17.96	17.15	16.33
77455	.1960	#9	4.978	2-1/4"	1-3/16"	19.25	18.41	17.58	16.74
77460	.1969		5.000	57	30	19.37	18.52	17.68	16.84
77465	.1990	#8	5.055	2-1/4"	1-3/16"	19.49	18.65	17.80	16.95
77470	.2010	#7	5.105	2-1/4"	1-3/16"	20.07	19.20	18.32	17.45
77475	.2031	13/64"	5.159	2-1/4"	1-3/16"	20.22	19.34	18.46	17.58
77480	.2040	#6	5.182	2-3/8"	1-1/4"	20.63	19.73	18.84	17.94
77485	.2055	#5	5.220	2-3/8"	1-1/4"	21.06	20.14	19.23	18.31
77490	.2090	#4	5.309	2-3/8"	1-1/4"	21.42	20.49	19.56	18.63
77495	.2130	#3	5.410	2-3/8"	1-1/4"	21.79	20.85	19.90	18.95
77500	.2165		5.500	60	32	21.97	21.01	20.06	19.10
77505	.2188	7/32"	5.558	2-3/8"	1-1/4"	22.13	21.16	20.20	19.24
77510	.2210	#2	5.613	2-7/16"	1-5/16"	22.67	21.68	20.70	19.71
77515	.2280	#1	5.791	2-7/16"	1-5/16"	22.80	21.81	20.82	19.83
77520	.2340	A	5.944	2-7/16"	1-5/16"	22.85	21.86	20.86	19.87
77525	.2344	15/64"	5.954	2-7/16"	1-5/16"	22.91	21.91	20.92	19.92
77530	.2362		6.000	64	35	22.99	21.99	20.99	19.99
77535	.2380	B	6.045	2-1/2"	1-3/8"	23.07	22.07	21.06	20.06
77540	.2420	C	6.147	2-1/2"	1-3/8"	23.24	22.23	21.22	20.21
77545	.2460	D	6.248	2-1/2"	1-3/8"	23.41	22.40	21.38	20.36
77550	.2500	1/4" / E	6.350	2-1/2"	1-3/8"	23.58	22.55	21.53	20.50
77555	.2559		6.500	67	37	24.14	23.09	22.04	20.99
77560	.2570	F	6.528	2-5/8"	1-7/16"	24.66	23.58	22.51	21.44
77565	.2610	G	6.629	2-5/8"	1-7/16"	25.13	24.04	22.94	21.85
77570	.2656	17/64"	6.746	2-5/8"	1-7/16"	25.66	24.54	23.43	22.31
77575	.2660	H	6.756	2-11/16"	1-1/2"	26.38	25.23	24.09	22.94
77580	.2720	I	6.909	2-11/16"	1-1/2"	26.69	25.53	24.37	23.21
77585	.2756		7.000	68	38	26.90	25.73	24.56	23.39
77590	.2770	J	7.036	2-11/16"	1-1/2"	27.16	25.98	24.80	23.62
77595	.2810	K	7.137	2-11/16"	1-1/2"	27.40	26.21	25.02	23.83
77600	.2812	9/32"	7.142	2-11/16"	1-1/2"	27.53	26.33	25.14	23.94
77605	.2900	L	7.366	2-3/4"	1-9/16"	28.55	27.31	26.07	24.83
77610	.2950	M	7.493	2-3/4"	1-9/16"	30.56	29.23	27.90	26.57
77615	.2953		7.500	70	40	30.56	29.23	27.90	26.57
77620	.2969	19/64"	7.541	2-3/4"	1-9/16"	30.71	29.37	28.04	26.70
77625	.3020	N	7.671	2-15/16"	1-5/8"	32.36	30.95	29.55	28.14
77630	.3125	5/16"	7.938	2-15/16"	1-5/8"	32.48	31.06	29.65	28.24
77635	.3150		8.000	75	43	34.83	33.32	31.80	30.29
77640	.3160	O	8.026	2-15/16"	1-11/16"	34.83	33.32	31.80	30.29
77645	.3230	P	8.204	2-15/16"	1-11/16"	35.14	33.62	32.09	30.56
77650	.3281	21/64"	8.334	2-15/16"	1-11/16"	35.36	33.83	32.29	30.75
77655	.3320	Q	8.433	3"	1-11/16"	36.18	34.61	33.03	31.46
77660	.3346		8.500	76	43	36.51	34.93	33.34	31.75

continued →

1520 - 2 Flute (continued)

.3390" - .5000"
(8.611mm - 12.700mm)

DRILLS

EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
77665	.3390	R	8.611	3"	1-11/16"	37.67	36.04	34.40	32.76
77670	.3438	11/32"	8.733	3"	1-11/16"	39.22	37.51	35.81	34.10
77675	.3480	S	8.839	3-1/16"	1-3/4"	39.74	38.02	36.29	34.56
77680	.3543		9.000	78	44	39.97	38.24	36.50	34.76
77685	.3580	T	9.093	3-1/16"	1-3/4"	40.14	38.39	36.65	34.90
77690	.3594	23/64"	9.129	3-1/16"	1-3/4"	40.41	38.65	36.90	35.14
77695	.3680	U	9.347	3-1/8"	1-13/16"	44.26	42.34	40.41	38.49
77700	.3740		9.500	79	46	44.68	42.74	40.79	38.85
77705	.3750	3/8"	9.525	3-1/8"	1-13/16"	45.02	43.07	41.11	39.15
77710	.3770	V	9.576	3-1/4"	1-7/8"	45.87	43.88	41.88	39.89
77715	.3860	W	9.804	3-1/4"	1-7/8"	46.84	44.80	42.77	40.73
77720	.3906	25/64"	9.921	3-1/4"	1-7/8"	47.54	45.47	43.41	41.34
77725	.3937		10.000	84	49	49.25	47.11	44.97	42.83
77730	.3970	X	10.084	3-5/16"	1-15/16"	50.69	48.49	46.28	44.08
77735	.4040	Y	10.262	3-5/16"	1-15/16"	51.12	48.90	46.67	44.45
77740	.4062	13/32"	10.317	3-5/16"	1-15/16"	52.96	50.66	48.35	46.05
77745	.4130	Z	10.490	3-3/8"	2"	53.53	51.21	48.88	46.55
77750	.4134		10.500	86	51	53.53	51.21	48.88	46.55
77755	.4219	27/64"	10.716	3-3/8"	2"	54.11	51.76	49.40	47.05
77760	.4331		11.000	87	52	58.75	56.20	53.64	51.09
77765	.4375	7/16"	11.113	3-7/16"	2-1/16"	58.75	56.20	53.64	51.09
77770	.4528		11.500	91	54	63.74	60.97	58.20	55.43
77775	.4531	29/64"	11.509	3-9/16"	2-1/8"	63.74	60.97	58.20	55.43
77780	.4688	15/32"	11.908	3-5/8"	2-1/8"	67.42	64.49	61.56	58.63
77785	.4724		12.000	94	56	67.68	64.74	61.79	58.85
77790	.4844	31/64"	12.304	3-11/16"	2-3/16"	68.18	65.22	62.25	59.29
77795	.4921		12.500	95	56	68.97	65.97	62.97	59.97
77800	.5000	1/2"	12.700	3-3/4"	2-1/4"	69.46	66.44	63.42	60.40



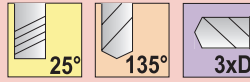
Drill and Reamer Manufacturing

TOLERANCES

<i>d</i>	+.0000" - .0005" (+.0000 - .0127mm)	
<i>l₁</i>	≤ 1/8"	+ .125" - .062" (+3.175 - 1.588mm)
	> 1/8"	+ .125" - .125" (+3.175 - 3.175mm)
<i>l₂</i>	≤ 1/8"	+ .125" - .062" (+3.175 - 1.588mm)
	> 1/8"	+ .125" - .125" (+3.175 - 3.175mm)

Technical information: page 250-253

1520H - 2 Flute



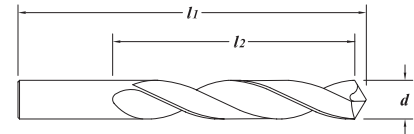
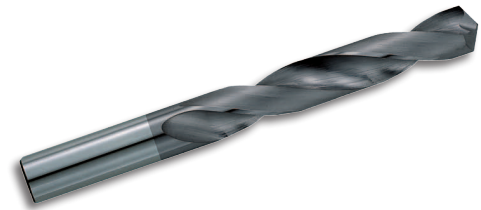
.0625" - .1575"
(1.588mm - 4.000mm)

Balinit® HARDLUBE Coated

- Solid submicron grain carbide drill
- Excellent heat resistance and lubricity
- No spotting required in most applications
- 4-facet self-centering point

Recommended to run in stainless steel alloys, mild steels and titanium alloys

Live tooling recommended on lathe processes



DRILLS

EDP#	<i>d</i> † Diameter		<i>l₁</i> Overall Length	<i>l₂</i> Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
77166	.0625	1/16"	1.588	1-3/4"	5/8"	8.71	8.33	7.95	7.57
77171	.0635	#52	1.613	1-3/4"	11/16"	8.82	8.44	8.05	7.67
77176	.0670	#51	1.702	1-3/4"	11/16"	8.92	8.54	8.15	7.76
77181	.0700	#50	1.778	1-3/4"	11/16"	9.07	8.68	8.28	7.89
77186	.0730	#49	1.854	1-3/4"	11/16"	9.27	8.87	8.46	8.06
77191	.0760	#48	1.930	1-3/4"	11/16"	9.51	9.10	8.68	8.27
77196	.0781	5/64"	1.984	1-3/4"	11/16"	9.79	9.36	8.94	8.51
77201	.0785	#47	1.994	1-3/4"	3/4"	10.05	9.61	9.18	8.74
77206	.0787		2.000	45	19	10.20	9.76	9.31	8.87
77211	.0810	#46	2.057	1-3/4"	3/4"	10.32	9.87	9.42	8.97
77216	.0820	#45	2.083	1-3/4"	3/4"	10.57	10.11	9.65	9.19
77221	.0860	#44	2.184	1-3/4"	3/4"	10.86	10.38	9.91	9.44
77226	.0890	#43	2.261	1-3/4"	3/4"	11.10	10.62	10.13	9.65
77231	.0935	#42	2.375	1-3/4"	3/4"	11.25	10.76	10.27	9.78
77236	.0938	3/32"	2.383	1-3/4"	3/4"	11.45	10.96	10.46	9.96
77241	.0960	#41	2.438	1-13/16"	13/16"	11.53	11.03	10.53	10.03
77246	.0980	#40	2.489	1-13/16"	13/16"	11.67	11.17	10.66	10.15
77251	.0984		2.500	46	21	11.72	11.21	10.70	10.19
77256	.0995	#39	2.527	1-13/16"	13/16"	11.78	11.26	10.75	10.24
77261	.1015	#38	2.578	1-13/16"	13/16"	11.88	11.36	10.85	10.33
77266	.1040	#37	2.642	1-13/16"	13/16"	11.93	11.41	10.89	10.37
77271	.1065	#36	2.705	1-13/16"	13/16"	12.01	11.48	10.96	10.44
77276	.1094	7/64"	2.779	1-13/16"	13/16"	12.06	11.54	11.01	10.49
77281	.1100	#35	2.794	1-7/8"	7/8"	12.13	11.61	11.08	10.55
77286	.1110	#34	2.819	1-7/8"	7/8"	12.26	11.73	11.19	10.66
77291	.1130	#33	2.870	1-7/8"	7/8"	12.33	11.79	11.26	10.72
77296	.1160	#32	2.946	1-7/8"	7/8"	12.41	11.87	11.33	10.79
77301	.1181		3.000	48	22	12.51	11.97	11.42	10.88
77306	.1200	#31	3.048	1-7/8"	7/8"	12.59	12.05	11.50	10.95
77311	.1250	1/8"	3.175	1-7/8"	7/8"	12.72	12.17	11.61	11.06
77316	.1285	#30	3.264	1-15/16"	15/16"	13.00	12.43	11.87	11.30
77321	.1360	#29	3.454	1-15/16"	15/16"	13.29	12.72	12.14	11.56
77326	.1378		3.500	49	24	13.67	13.08	12.48	11.89
77331	.1405	#28	3.569	1-15/16"	15/16"	13.81	13.21	12.61	12.01
77336	.1406	9/64"	3.571	1-15/16"	15/16"	13.94	13.33	12.73	12.12
77341	.1440	#27	3.658	2-1/16"	1"	15.00	14.34	13.69	13.04
77346	.1470	#26	3.734	2-1/16"	1"	15.15	14.49	13.83	13.17
77351	.1495	#25	3.797	2-1/16"	1"	15.28	14.62	13.95	13.29
77356	.1520	#24	3.861	2-1/16"	1"	15.33	14.66	14.00	13.33
77361	.1540	#23	3.912	2-1/16"	1"	15.42	14.75	14.08	13.41
77366	.1562	5/32"	3.967	2-1/16"	1"	15.50	14.83	14.15	13.48
77371	.1570	#22	3.988	2-1/8"	1-1/16"	16.36	15.65	14.94	14.23
77376	.1575		4.000	54	27	16.54	15.82	15.10	14.38

continued →

1520H - 2 Flute (continued)

.1590" - .3346"
(4.039mm - 8.500mm)

DRILLS

EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
77381	.1590	#21	4.039	2-1/8"	1-1/16"	16.73	16.01	15.28	14.55
77386	.1610	#20	4.089	2-1/8"	1-1/16"	16.84	16.10	15.37	14.64
77391	.1660	#19	4.216	2-1/8"	1-1/16"	17.43	16.68	15.92	15.16
77396	.1695	#18	4.305	2-1/8"	1-1/16"	17.62	16.85	16.09	15.32
77401	.1719	11/64"	4.366	2-1/8"	1-1/16"	17.93	17.15	16.37	15.59
77406	.1730	#17	4.394	2-3/16"	1-1/8"	18.17	17.38	16.59	15.80
77411	.1770	#16	4.496	2-3/16"	1-1/8"	18.34	17.55	16.75	15.95
77416	.1772		4.500	56	29	18.43	17.63	16.83	16.03
77421	.1800	#15	4.572	2-3/16"	1-1/8"	18.52	17.71	16.91	16.10
77426	.1820	#14	4.623	2-3/16"	1-1/8"	18.88	18.06	17.24	16.42
77431	.1850	#13	4.700	2-3/16"	1-1/8"	19.01	18.18	17.36	16.53
77436	.1875	3/16"	4.763	2-3/16"	1-1/8"	19.07	18.24	17.41	16.58
77441	.1890	#12	4.801	2-1/4"	1-3/16"	21.05	20.13	19.22	18.30
77446	.1910	#11	4.851	2-1/4"	1-3/16"	21.24	20.32	19.39	18.47
77451	.1935	#10	4.915	2-1/4"	1-3/16"	22.07	21.11	20.15	19.19
77456	.1960	#9	4.978	2-1/4"	1-3/16"	22.56	21.58	20.60	19.62
77461	.1969		5.000	57	30	22.67	21.68	20.70	19.71
77466	.1990	#8	5.055	2-1/4"	1-3/16"	22.78	21.79	20.80	19.81
77471	.2010	#7	5.105	2-1/4"	1-3/16"	23.38	22.36	21.35	20.33
77476	.2031	13/64"	5.159	2-1/4"	1-3/16"	23.52	22.50	21.47	20.45
77481	.2040	#6	5.182	2-3/8"	1-1/4"	23.94	22.90	21.86	20.82
77486	.2055	#5	5.220	2-3/8"	1-1/4"	24.36	23.30	22.24	21.18
77491	.2090	#4	5.309	2-3/8"	1-1/4"	24.75	23.67	22.60	21.52
77496	.2130	#3	5.410	2-3/8"	1-1/4"	25.10	24.01	22.92	21.83
77501	.2165		5.500	60	32	25.29	24.19	23.09	21.99
77506	.2188	7/32"	5.558	2-3/8"	1-1/4"	25.43	24.32	23.22	22.11
77511	.2210	#2	5.613	2-7/16"	1-5/16"	25.98	24.85	23.72	22.59
77516	.2280	#1	5.791	2-7/16"	1-5/16"	26.12	24.98	23.85	22.71
77521	.2340	A	5.944	2-7/16"	1-5/16"	26.16	25.03	23.89	22.75
77526	.2344	15/64"	5.954	2-7/16"	1-5/16"	26.21	25.07	23.93	22.79
77531	.2362		6.000	64	35	26.28	25.14	23.99	22.85
77536	.2380	B	6.045	2-1/2"	1-3/8"	26.37	25.22	24.08	22.93
77541	.2420	C	6.147	2-1/2"	1-3/8"	26.54	25.39	24.23	23.08
77546	.2460	D	6.248	2-1/2"	1-3/8"	26.71	25.55	24.39	23.23
77551	.2500	1/4" / E	6.350	2-1/2"	1-3/8"	26.88	25.71	24.54	23.37
77556	.2559		6.500	67	37	30.00	28.70	27.39	26.09
77561	.2570	F	6.528	2-5/8"	1-7/16"	30.51	29.18	27.86	26.53
77566	.2610	G	6.629	2-5/8"	1-7/16"	31.00	29.66	28.31	26.96
77571	.2656	17/64"	6.746	2-5/8"	1-7/16"	31.53	30.16	28.79	27.42
77576	.2660	H	6.756	2-11/16"	1-1/2"	32.26	30.86	29.45	28.05
77581	.2720	I	6.909	2-11/16"	1-1/2"	32.56	31.14	29.73	28.31
77586	.2756		7.000	68	38	32.78	31.35	29.93	28.50
77591	.2770	J	7.036	2-11/16"	1-1/2"	33.03	31.59	30.16	28.72
77596	.2810	K	7.137	2-11/16"	1-1/2"	33.26	31.81	30.37	28.92
77601	.2812	9/32"	7.142	2-11/16"	1-1/2"	33.41	31.96	30.50	29.05
77606	.2900	L	7.366	2-3/4"	1-9/16"	34.41	32.91	31.42	29.92
77611	.2950	M	7.493	2-3/4"	1-9/16"	36.41	34.83	33.24	31.66
77616	.2953		7.500	70	40	36.41	34.83	33.24	31.66
77621	.2969	19/64"	7.541	2-3/4"	1-9/16"	36.58	34.99	33.40	31.81
77626	.3020	N	7.671	2-15/16"	1-5/8"	38.24	36.58	34.91	33.25
77631	.3125	5/16"	7.938	2-15/16"	1-5/8"	38.36	36.70	35.03	33.36
77636	.3150		8.000	75	43	40.71	38.94	37.17	35.40
77641	.3160	O	8.026	2-15/16"	1-11/16"	40.71	38.94	37.17	35.40
77646	.3230	P	8.204	2-15/16"	1-11/16"	41.01	39.23	37.44	35.66
77651	.3281	21/64"	8.334	2-15/16"	1-11/16"	41.24	39.45	37.65	35.86
77656	.3320	Q	8.433	3"	1-11/16"	42.06	40.23	38.40	36.57
77661	.3346		8.500	76	43	42.39	40.55	38.70	36.86

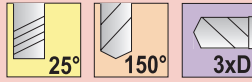
EDP#	d^+ Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
77666	.3390	R	8.611	3"	1-11/16"	43.55	41.66	39.76	37.87
77671	.3438	11/32"	8.733	3"	1-11/16"	45.08	43.12	41.16	39.20
77676	.3480	S	8.839	3-1/16"	1-3/4"	47.69	45.62	43.54	41.47
77681	.3543		9.000	78	44	47.93	45.85	43.76	41.68
77686	.3580	T	9.093	3-1/16"	1-3/4"	48.08	45.99	43.90	41.81
77691	.3594	23/64"	9.129	3-1/16"	1-3/4"	48.38	46.28	44.17	42.07
77696	.3680	U	9.347	3-1/8"	1-13/16"	52.21	49.94	47.67	45.40
77701	.3740		9.500	79	46	52.62	50.34	48.05	45.76
77706	.3750	3/8"	9.525	3-1/8"	1-13/16"	52.97	50.67	48.36	46.06
77711	.3770	V	9.576	3-1/4"	1-7/8"	55.00	52.61	50.22	47.83
77716	.3860	W	9.804	3-1/4"	1-7/8"	55.97	53.54	51.10	48.67
77721	.3906	25/64"	9.921	3-1/4"	1-7/8"	56.66	54.20	51.73	49.27
77726	.3937		10.000	84	49	58.37	55.84	53.30	50.76
77731	.3970	X	10.084	3-5/16"	1-15/16"	59.80	57.20	54.60	52.00
77736	.4040	Y	10.262	3-5/16"	1-15/16"	60.21	57.60	54.98	52.36
77741	.4062	13/32"	10.317	3-5/16"	1-15/16"	62.08	59.38	56.68	53.98
77746	.4130	Z	10.490	3-3/8"	2"	62.63	59.91	57.18	54.46
77751	.4134		10.500	86	51	62.63	59.91	57.18	54.46
77756	.4219	27/64"	10.716	3-3/8"	2"	63.23	60.48	57.73	54.98
77761	.4331		11.000	87	52	67.87	64.92	61.97	59.02
77766	.4375	7/16"	11.113	3-7/16"	2-1/16"	67.87	64.92	61.97	59.02
77771	.4528		11.500	91	54	72.85	69.69	66.52	63.35
77776	.4531	29/64"	11.509	3-9/16"	2-1/8"	72.85	69.69	66.52	63.35
77781	.4688	15/32"	11.908	3-5/8"	2-1/8"	76.54	73.22	69.89	66.56
77786	.4724		12.000	94	56	76.77	73.44	70.10	66.76
77791	.4844	31/64"	12.304	3-11/16"	2-3/16"	77.30	73.94	70.58	67.22
77796	.4921		12.500	95	56	78.06	74.67	71.27	67.88
77801	.5000	1/2"	12.700	3-3/4"	2-1/4"	78.56	75.14	71.73	68.31



Regrind Prep

TOLERANCES

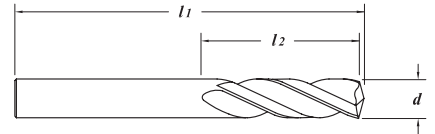
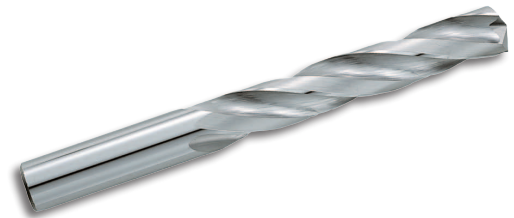
d	+.0000"-.0005" (+.0000-.0127mm)	
l_1	$\leq 1/8"$	+ .125"-.062" (+3.175-1.588mm)
	$> 1/8"$	+ .125"-.125" (+3.175-3.175mm)
l_2	$\leq 1/8"$	+ .125"-.062" (+3.175-1.588mm)
	$> 1/8"$	+ .125"-.125" (+3.175-3.175mm)



.1094" - .2165"
(2.779mm - 5.500mm)

DRILLS

- Solid submicron grain carbide drill
- Near reamer finishes
- Stub length reduces deflection and vibration
- Tighter tolerance holes
- Improved roundness and straightness
- Recommended for cast iron and materials with high silicon content
- Live tooling recommended on lathe processes

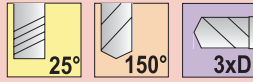


EDP#	d †		l_1	l_2	1-11	12-24	25-49	50-100	
	Decimal	Diameter Metric							Overall Length
78275	.1094	7/64"	2.779	1-13/16"	13/16"	12.16	11.63	11.10	10.57
78280	.1100	#35	2.794	1-7/8"	7/8"	12.31	11.77	11.24	10.70
78285	.1110	#34	2.819	1-7/8"	7/8"	12.44	11.90	11.36	10.82
78290	.1130	#33	2.870	1-7/8"	7/8"	12.67	12.12	11.57	11.02
78295	.1160	#32	2.946	1-7/8"	7/8"	12.85	12.29	11.73	11.17
78300	.1181		3.000	48	22	12.96	12.40	11.83	11.27
78305	.1200	#31	3.048	1-7/8"	7/8"	13.05	12.49	11.92	11.35
78310	.1250	1/8"	3.175	1-7/8"	7/8"	13.21	12.64	12.06	11.49
78315	.1285	#30	3.264	1-15/16"	15/16"	13.56	12.97	12.38	11.79
78320	.1360	#29	3.454	1-15/16"	15/16"	13.92	13.31	12.71	12.10
78325	.1378		3.500	49	24	14.38	13.75	13.13	12.50
78330	.1405	#28	3.569	1-15/16"	15/16"	14.55	13.92	13.28	12.65
78335	.1406	9/64"	3.571	1-15/16"	15/16"	14.73	14.09	13.45	12.81
78340	.1440	#27	3.658	2-1/16"	1"	15.88	15.19	14.50	13.81
78345	.1470	#26	3.734	2-1/16"	1"	16.10	15.40	14.70	14.00
78350	.1495	#25	3.797	2-1/16"	1"	16.24	15.53	14.83	14.12
78355	.1520	#24	3.861	2-1/16"	1"	16.27	15.57	14.86	14.15
78360	.1540	#23	3.912	2-1/16"	1"	16.42	15.71	14.99	14.28
78365	.1562	5/32"	3.967	2-1/16"	1"	16.49	15.77	15.06	14.34
78370	.1570	#22	3.988	2-1/8"	1-1/16"	17.54	16.78	16.01	15.25
78375	.1575		4.000	54	27	17.54	16.78	16.01	15.25
78380	.1590	#21	4.039	2-1/8"	1-1/16"	17.95	17.17	16.39	15.61
78385	.1610	#20	4.089	2-1/8"	1-1/16"	17.95	17.17	16.39	15.61
78390	.1660	#19	4.216	2-1/8"	1-1/16"	18.10	17.31	16.53	15.74
78395	.1695	#18	4.305	2-1/8"	1-1/16"	18.22	17.42	16.63	15.84
78400	.1719	11/64"	4.366	2-1/8"	1-1/16"	18.33	17.53	16.74	15.94
78405	.1730	#17	4.394	2-3/16"	1-1/8"	19.18	18.35	17.51	16.68
78410	.1770	#16	4.496	2-3/16"	1-1/8"	19.38	18.54	17.69	16.85
78415	.1772		4.500	56	29	19.48	18.63	17.79	16.94
78420	.1800	#15	4.572	2-3/16"	1-1/8"	19.57	18.72	17.87	17.02
78425	.1820	#14	4.623	2-3/16"	1-1/8"	20.01	19.14	18.27	17.40
78430	.1850	#13	4.700	2-3/16"	1-1/8"	20.13	19.25	18.38	17.50
78435	.1875	3/16"	4.763	2-3/16"	1-1/8"	20.13	19.25	18.38	17.50
78440	.1890	#12	4.801	2-1/4"	1-3/16"	20.27	19.39	18.51	17.63
78445	.1910	#11	4.851	2-1/4"	1-3/16"	20.50	19.61	18.72	17.83
78450	.1935	#10	4.915	2-1/4"	1-3/16"	21.46	20.53	19.59	18.66
78455	.1960	#9	4.978	2-1/4"	1-3/16"	21.99	21.03	20.08	19.12
78460	.1969		5.000	57	30	22.13	21.16	20.20	19.24
78465	.1990	#8	5.055	2-1/4"	1-3/16"	22.29	21.32	20.35	19.38
78470	.2010	#7	5.105	2-1/4"	1-3/16"	22.95	21.96	20.96	19.96
78475	.2031	13/64"	5.159	2-1/4"	1-3/16"	23.82	22.78	21.75	20.71
78480	.2040	#6	5.182	2-3/8"	1-1/4"	23.97	22.92	21.88	20.84
78485	.2055	#5	5.220	2-3/8"	1-1/4"	24.07	23.02	21.98	20.93
78490	.2090	#4	5.309	2-3/8"	1-1/4"	24.48	23.42	22.35	21.29
78495	.2130	#3	5.410	2-3/8"	1-1/4"	24.90	23.82	22.73	21.65
78500	.2165		5.500	60	32	25.10	24.01	22.92	21.83

EDP#	<i>d</i> [†] Diameter		<i>l</i> ₁ Overall Length	<i>l</i> ₂ Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
78505	.2188	7/32"	5.558	2-3/8"	1-1/4"	25.31	24.21	23.11	22.01
78510	.2210	#2	5.613	2-7/16"	1-5/16"	25.92	24.79	23.67	22.54
78515	.2280	#1	5.791	2-7/16"	1-5/16"	26.06	24.93	23.79	22.66
78520	.2340	A	5.944	2-7/16"	1-5/16"	26.19	25.05	23.91	22.77
78525	.2344	15/64"	5.954	2-7/16"	1-5/16"	26.34	25.19	24.05	22.90
78530	.2362		6.000	64	35	26.39	25.25	24.10	22.95
78535	.2380	B	6.045	2-1/2"	1-3/8"	26.51	25.36	24.20	23.05
78540	.2420	C	6.147	2-1/2"	1-3/8"	26.70	25.54	24.38	23.22
78545	.2460	D	6.248	2-1/2"	1-3/8"	26.88	25.71	24.54	23.37
78550	.2500	1/4" / E	6.350	2-1/2"	1-3/8"	27.07	25.89	24.72	23.54
78555	.2559		6.500	67	37	27.75	26.54	25.34	24.13
78560	.2570	F	6.528	2-5/8"	1-7/16"	28.31	27.08	25.85	24.62
78565	.2610	G	6.629	2-5/8"	1-7/16"	28.75	27.50	26.25	25.00
78570	.2656	17/64"	6.746	2-5/8"	1-7/16"	29.30	28.03	26.75	25.48
78575	.2660	H	6.756	2-11/16"	1-1/2"	30.16	28.85	27.54	26.23
78580	.2720	I	6.909	2-11/16"	1-1/2"	30.53	29.21	27.88	26.55
78585	.2756		7.000	68	38	30.75	29.41	28.08	26.74
78590	.2770	J	7.036	2-11/16"	1-1/2"	31.02	29.67	28.32	26.97
78595	.2810	K	7.137	2-11/16"	1-1/2"	31.30	29.94	28.58	27.22
78600	.2812	9/32"	7.142	2-11/16"	1-1/2"	32.41	31.00	29.59	28.18
78605	.2900	L	7.366	2-3/4"	1-9/16"	33.61	32.15	30.69	29.23
78610	.2950	M	7.493	2-3/4"	1-9/16"	34.58	33.08	31.57	30.07
78615	.2953		7.500	70	40	34.58	33.08	31.57	30.07
78620	.2969	19/64"	7.541	2-3/4"	1-9/16"	34.58	33.08	31.57	30.07
78625	.3020	N	7.671	2-15/16"	1-5/8"	35.96	34.40	32.83	31.27
78630	.3125	5/16"	7.938	2-15/16"	1-5/8"	36.11	34.54	32.97	31.40
78635	.3150		8.000	75	43	38.72	37.04	35.35	33.67
78640	.3160	O	8.026	2-15/16"	1-11/16"	38.72	37.04	35.35	33.67
78645	.3230	P	8.204	2-15/16"	1-11/16"	38.72	37.04	35.35	33.67
78650	.3281	21/64"	8.334	2-15/16"	1-11/16"	40.41	38.65	36.90	35.14
78655	.3320	Q	8.433	3"	1-11/16"	41.35	39.56	37.76	35.96
78660	.3346		8.500	76	43	41.73	39.92	38.10	36.29
78665	.3390	R	8.611	3"	1-11/16"	43.02	41.15	39.28	37.41
78670	.3438	11/32"	8.733	3"	1-11/16"	44.80	42.86	40.91	38.96
78675	.3480	S	8.839	3-1/16"	1-3/4"	48.24	46.15	44.05	41.95
78680	.3543		9.000	78	44	48.56	46.45	44.34	42.23
78685	.3580	T	9.093	3-1/16"	1-3/4"	48.73	46.61	44.49	42.37
78690	.3594	23/64"	9.129	3-1/16"	1-3/4"	49.12	46.98	44.85	42.71
78695	.3680	U	9.347	3-1/8"	1-13/16"	52.43	50.15	47.87	45.59
78700	.3740		9.500	79	46	53.34	51.02	48.70	46.38
78705	.3750	3/8"	9.525	3-1/8"	1-13/16"	53.34	51.02	48.70	46.38
78710	.3770	V	9.576	3-1/4"	1-7/8"	53.97	51.62	49.28	46.93
78715	.3860	W	9.804	3-1/4"	1-7/8"	57.48	54.98	52.48	49.98
78720	.3906	25/64"	9.921	3-1/4"	1-7/8"	58.33	55.79	53.26	50.72
78725	.3937		10.000	84	49	60.42	57.79	55.17	52.54
78730	.3970	X	10.084	3-5/16"	1-15/16"	62.23	59.52	56.82	54.11
78735	.4040	Y	10.262	3-5/16"	1-15/16"	62.70	59.97	57.25	54.52
78740	.4062	13/32"	10.317	3-5/16"	1-15/16"	64.98	62.15	59.33	56.50
78745	.4130	Z	10.490	3-3/8"	2"	65.65	62.80	59.94	57.09
78750	.4134		10.500	86	51	65.65	62.80	59.94	57.09
78755	.4219	27/64"	10.716	3-3/8"	2"	66.40	63.51	60.63	57.74
78760	.4331		11.000	87	52	71.36	68.26	65.15	62.05
78765	.4375	7/16"	11.113	3-7/16"	2-1/16"	71.36	68.26	65.15	62.05
78770	.4528		11.500	91	54	77.41	74.04	70.68	67.31
78775	.4531	29/64"	11.509	3-9/16"	2-1/8"	77.41	74.04	70.68	67.31
78780	.4688	15/32"	11.908	3-5/8"	2-1/8"	81.90	78.34	74.78	71.22
78785	.4724		12.000	94	56	82.16	78.58	75.01	71.44
78790	.4844	31/64"	12.304	3-11/16"	2-3/16"	82.44	78.86	75.27	71.69
78795	.4921		12.500	95	56	83.85	80.20	76.56	72.91
78800	.5000	1/2"	12.700	3-3/4"	2-1/4"	84.32	80.65	76.99	73.32

TOLERANCES		
<i>d</i>	+.0000" - .0005" (+.0000 - .0127mm)	
<i>l₁</i>	≤ 1/8"	+ .125" - .062" (+3.175 - 1.588mm)
	> 1/8"	+ .125" - .125" (+3.175 - 3.175mm)
<i>l₂</i>	≤ 1/8"	+ .125" - .062" (+3.175 - 1.588mm)
	> 1/8"	+ .125" - .125" (+3.175 - 3.175mm)

.1094" - .2165"
(2.779mm - 5.500mm)



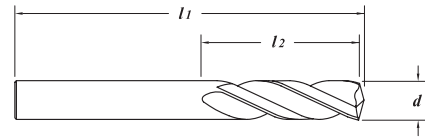
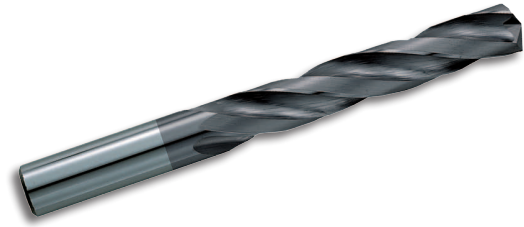
DRILLS

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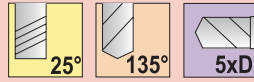


EDP#	<i>d</i> † Diameter		<i>l₁</i> Overall Length	<i>l₂</i> Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
78276	.1094	7/64"	2.779	1-13/16"	13/16"	14.09	13.48	12.86	12.25
78281	.1100	#35	2.794	1-7/8"	7/8"	14.20	13.59	12.97	12.35
78286	.1110	#34	2.819	1-7/8"	7/8"	14.36	13.74	13.11	12.49
78291	.1130	#33	2.870	1-7/8"	7/8"	14.57	13.94	13.30	12.67
78296	.1160	#32	2.946	1-7/8"	7/8"	14.75	14.11	13.47	12.83
78301	.1181		3.000	48	22	14.87	14.22	13.58	12.93
78306	.1200	#31	3.048	1-7/8"	7/8"	14.97	14.32	13.67	13.02
78311	.1250	1/8"	3.175	1-7/8"	7/8"	15.15	14.49	13.83	13.17
78316	.1285	#30	3.264	1-15/16"	15/16"	15.48	14.81	14.13	13.46
78321	.1360	#29	3.454	1-15/16"	15/16"	15.84	15.15	14.46	13.77
78326	.1378		3.500	49	24	16.30	15.59	14.88	14.17
78331	.1405	#28	3.569	1-15/16"	15/16"	16.47	15.75	15.04	14.32
78336	.1406	9/64"	3.571	1-15/16"	15/16"	16.64	15.92	15.19	14.47
78341	.1440	#27	3.658	2-1/16"	1"	17.80	17.03	16.25	15.48
78346	.1470	#26	3.734	2-1/16"	1"	18.00	17.22	16.43	15.65
78351	.1495	#25	3.797	2-1/16"	1"	18.16	17.37	16.58	15.79
78356	.1520	#24	3.861	2-1/16"	1"	18.19	17.40	16.61	15.82
78361	.1540	#23	3.912	2-1/16"	1"	18.33	17.53	16.74	15.94
78366	.1562	5/32"	3.967	2-1/16"	1"	18.42	17.62	16.82	16.02
78371	.1570	#22	3.988	2-1/8"	1-1/16"	19.47	18.62	17.78	16.93
78376	.1575		4.000	54	27	19.47	18.62	17.78	16.93
78381	.1590	#21	4.039	2-1/8"	1-1/16"	19.86	19.00	18.13	17.27
78386	.1610	#20	4.089	2-1/8"	1-1/16"	19.86	19.00	18.13	17.27
78391	.1660	#19	4.216	2-1/8"	1-1/16"	20.01	19.14	18.27	17.40
78396	.1695	#18	4.305	2-1/8"	1-1/16"	20.13	19.25	18.38	17.50
78401	.1719	11/64"	4.366	2-1/8"	1-1/16"	20.25	19.37	18.49	17.61
78406	.1730	#17	4.394	2-3/16"	1-1/8"	21.08	20.16	19.25	18.33
78411	.1770	#16	4.496	2-3/16"	1-1/8"	21.30	20.37	19.45	18.52
78416	.1772		4.500	56	29	21.39	20.46	19.53	18.60
78421	.1800	#15	4.572	2-3/16"	1-1/8"	21.48	20.55	19.61	18.68
78426	.1820	#14	4.623	2-3/16"	1-1/8"	21.93	20.98	20.02	19.07
78431	.1850	#13	4.700	2-3/16"	1-1/8"	22.03	21.08	20.12	19.16
78436	.1875	3/16"	4.763	2-3/16"	1-1/8"	22.03	21.08	20.12	19.16
78441	.1890	#12	4.801	2-1/4"	1-3/16"	23.60	22.57	21.55	20.52
78446	.1910	#11	4.851	2-1/4"	1-3/16"	23.81	22.77	21.74	20.70
78451	.1935	#10	4.915	2-1/4"	1-3/16"	24.77	23.69	22.62	21.54
78456	.1960	#9	4.978	2-1/4"	1-3/16"	25.30	24.20	23.10	22.00
78461	.1969		5.000	57	30	25.43	24.32	23.22	22.11
78466	.1990	#8	5.055	2-1/4"	1-3/16"	25.59	24.48	23.36	22.25
78471	.2010	#7	5.105	2-1/4"	1-3/16"	26.25	25.11	23.97	22.83
78476	.2031	13/64"	5.159	2-1/4"	1-3/16"	27.13	25.95	24.77	23.59
78481	.2040	#6	5.182	2-3/8"	1-1/4"	27.27	26.08	24.90	23.71
78486	.2055	#5	5.220	2-3/8"	1-1/4"	27.39	26.20	25.01	23.82
78491	.2090	#4	5.309	2-3/8"	1-1/4"	27.80	26.59	25.38	24.17
78496	.2130	#3	5.410	2-3/8"	1-1/4"	28.22	26.99	25.77	24.54
78501	.2165		5.500	60	32	28.41	27.17	25.94	24.70

EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
78506	.2188	7/32"	5.558	2-3/8"	1-1/4"	28.60	27.36	26.11	24.87
78511	.2210	#2	5.613	2-7/16"	1-5/16"	29.23	27.96	26.69	25.42
78516	.2280	#1	5.791	2-7/16"	1-5/16"	29.35	28.07	26.80	25.52
78521	.2340	A	5.944	2-7/16"	1-5/16"	29.51	28.23	26.94	25.66
78526	.2344	15/64"	5.954	2-7/16"	1-5/16"	29.62	28.34	27.05	25.76
78531	.2362		6.000	64	35	29.70	28.41	27.12	25.83
78536	.2380	B	6.045	2-1/2"	1-3/8"	29.81	28.51	27.22	25.92
78541	.2420	C	6.147	2-1/2"	1-3/8"	30.00	28.70	27.39	26.09
78546	.2460	D	6.248	2-1/2"	1-3/8"	30.18	28.86	27.55	26.24
78551	.2500	1/4" / E	6.350	2-1/2"	1-3/8"	30.36	29.04	27.72	26.40
78556	.2559		6.500	67	37	33.61	32.15	30.69	29.23
78561	.2570	F	6.528	2-5/8"	1-7/16"	34.18	32.69	31.21	29.72
78566	.2610	G	6.629	2-5/8"	1-7/16"	34.62	33.11	31.61	30.10
78571	.2656	17/64"	6.746	2-5/8"	1-7/16"	35.18	33.65	32.12	30.59
78576	.2660	H	6.756	2-11/16"	1-1/2"	36.04	34.47	32.91	31.34
78581	.2720	I	6.909	2-11/16"	1-1/2"	36.40	34.82	33.23	31.65
78586	.2756		7.000	68	38	36.60	35.01	33.42	31.83
78591	.2770	J	7.036	2-11/16"	1-1/2"	36.88	35.28	33.67	32.07
78596	.2810	K	7.137	2-11/16"	1-1/2"	37.18	35.56	33.95	32.33
78601	.2812	9/32"	7.142	2-11/16"	1-1/2"	38.27	36.61	34.94	33.28
78606	.2900	L	7.366	2-3/4"	1-9/16"	39.48	37.76	36.05	34.33
78611	.2950	M	7.493	2-3/4"	1-9/16"	40.46	38.70	36.94	35.18
78616	.2953		7.500	70	40	40.46	38.70	36.94	35.18
78621	.2969	19/64"	7.541	2-3/4"	1-9/16"	40.46	38.70	36.94	35.18
78626	.3020	N	7.671	2-15/16"	1-5/8"	41.83	40.01	38.19	36.37
78631	.3125	5/16"	7.938	2-15/16"	1-5/8"	41.98	40.15	38.33	36.50
78636	.3150		8.000	75	43	44.60	42.66	40.72	38.78
78641	.3160	O	8.026	2-15/16"	1-11/16"	44.60	42.66	40.72	38.78
78646	.3230	P	8.204	2-15/16"	1-11/16"	44.60	42.66	40.72	38.78
78651	.3281	21/64"	8.334	2-15/16"	1-11/16"	46.29	44.28	42.26	40.25
78656	.3320	Q	8.433	3"	1-11/16"	47.23	45.18	43.12	41.07
78661	.3346		8.500	76	43	47.61	45.54	43.47	41.40
78666	.3390	R	8.611	3"	1-11/16"	48.90	46.77	44.65	42.52
78671	.3438	11/32"	8.733	3"	1-11/16"	50.68	48.48	46.27	44.07
78676	.3480	S	8.839	3-1/16"	1-3/4"	57.36	54.87	52.37	49.88
78681	.3543		9.000	78	44	57.67	55.17	52.66	50.15
78686	.3580	T	9.093	3-1/16"	1-3/4"	57.82	55.31	52.79	50.28
78691	.3594	23/64"	9.129	3-1/16"	1-3/4"	58.21	55.68	53.15	50.62
78696	.3680	U	9.347	3-1/8"	1-13/16"	61.55	58.87	56.20	53.52
78701	.3740		9.500	79	46	62.45	59.73	57.02	54.30
78706	.3750	3/8"	9.525	3-1/8"	1-13/16"	62.45	59.73	57.02	54.30
78711	.3770	V	9.576	3-1/4"	1-7/8"	63.07	60.32	57.58	54.84
78716	.3860	W	9.804	3-1/4"	1-7/8"	66.60	63.70	60.81	57.91
78721	.3906	25/64"	9.921	3-1/4"	1-7/8"	67.42	64.49	61.56	58.63
78726	.3937		10.000	84	49	69.53	66.51	63.48	60.46
78731	.3970	X	10.084	3-5/16"	1-15/16"	71.33	68.23	65.13	62.03
78736	.4040	Y	10.262	3-5/16"	1-15/16"	71.82	68.70	65.57	62.45
78741	.4062	13/32"	10.317	3-5/16"	1-15/16"	74.08	70.86	67.64	64.42
78746	.4130	Z	10.490	3-3/8"	2"	74.75	71.50	68.25	65.00
78751	.4134		10.500	86	51	74.75	71.50	68.25	65.00
78756	.4219	27/64"	10.716	3-3/8"	2"	75.52	72.24	68.95	65.67
78761	.4331		11.000	87	52	80.47	76.97	73.47	69.97
78766	.4375	7/16"	11.113	3-7/16"	2-1/16"	80.47	76.97	73.47	69.97
78771	.4528		11.500	91	54	86.53	82.76	79.00	75.24
78776	.4531	29/64"	11.509	3-9/16"	2-1/8"	86.53	82.76	79.00	75.24
78781	.4688	15/32"	11.908	3-5/8"	2-1/8"	91.01	87.05	83.10	79.14
78786	.4724		12.000	94	56	91.26	87.30	83.33	79.36
78791	.4844	31/64"	12.304	3-11/16"	2-3/16"	91.54	87.56	83.58	79.60
78796	.4921		12.500	95	56	92.95	88.91	84.87	80.83
78801	.5000	1/2"	12.700	3-3/4"	2-1/4"	93.44	89.38	85.31	81.25

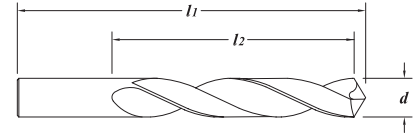
TOLERANCES	
d	+0.000" -0.005" (+0.000 -0.127mm)
l_1	$\leq 1/8"$ +.125" -0.062" (+3.175 -1.588mm)
	$> 1/8"$ +.125" -.125" (+3.175 -3.175mm)
l_2	$\leq 1/8"$ +.125" -0.062" (+3.175 -1.588mm)
	$> 1/8"$ +.125" -.125" (+3.175 -3.175mm)

.0625" - .1575"
(1.588mm - 4.000mm)



DRILLS

- Solid submicron grain carbide drill
- No spotting required in most applications
- 4-facet self-centering point
- Adaptability when converting from high-speed steel
- Recommended to run in stainless steel alloys, mild steels and titanium alloys
- Live tooling recommended on lathe processes



EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
89165	.0625	1/16"	1.588	1-3/4"	3/4"	6.79	6.49	6.20	5.90
89170	.0635	#52	1.613	1-3/4"	3/4"	6.89	6.59	6.29	5.99
89175	.0670	#51	1.702	1-3/4"	3/4"	6.99	6.69	6.38	6.08
89180	.0700	#50	1.778	1-3/4"	7/8"	7.16	6.85	6.54	6.23
89185	.0730	#49	1.854	1-3/4"	7/8"	7.35	7.03	6.71	6.39
89190	.0760	#48	1.930	1-3/4"	7/8"	7.59	7.26	6.93	6.60
89195	.0781	5/64"	1.984	1-3/4"	7/8"	7.88	7.54	7.19	6.85
89200	.0785	#47	1.994	1-3/4"	7/8"	8.14	7.79	7.43	7.08
89205	.0787		2.000	44	22	8.27	7.91	7.55	7.19
89210	.0810	#46	2.057	1-3/4"	7/8"	8.40	8.03	7.67	7.30
89215	.0820	#45	2.083	1-3/4"	7/8"	8.65	8.27	7.90	7.52
89220	.0860	#44	2.184	2"	1"	8.94	8.55	8.16	7.77
89225	.0890	#43	2.261	2"	1"	9.19	8.79	8.39	7.99
89230	.0935	#42	2.375	2"	1"	9.32	8.91	8.51	8.10
89235	.0938	3/32"	2.383	2"	1"	9.53	9.12	8.70	8.29
89240	.0960	#41	2.438	2"	1"	9.61	9.20	8.78	8.36
89245	.0980	#40	2.489	2"	1"	9.76	9.34	8.91	8.49
89250	.0984		2.500	57	32	9.81	9.38	8.96	8.53
89255	.0995	#39	2.527	2-1/4"	1-1/4"	9.86	9.43	9.00	8.57
89260	.1015	#38	2.578	2-1/4"	1-1/4"	9.98	9.55	9.11	8.68
89265	.1040	#37	2.642	2-1/4"	1-1/4"	10.11	9.67	9.23	8.79
89270	.1065	#36	2.705	2-1/4"	1-1/4"	10.24	9.79	9.35	8.90
89275	.1094	7/64"	2.779	2-1/4"	1-1/4"	10.41	9.96	9.50	9.05
89280	.1100	#35	2.794	2-1/4"	1-1/4"	10.52	10.07	9.61	9.15
89285	.1110	#34	2.819	2-1/4"	1-1/4"	10.65	10.19	9.72	9.26
89290	.1130	#33	2.870	2-1/4"	1-1/4"	10.84	10.37	9.90	9.43
89295	.1160	#32	2.946	2-1/4"	1-1/4"	10.96	10.48	10.01	9.53
89300	.1181		3.000	57	32	11.07	10.59	10.11	9.63
89305	.1200	#31	3.048	2-1/4"	1-1/4"	11.14	10.66	10.17	9.69
89310	.1250	1/8"	3.175	2-1/4"	1-1/4"	11.28	10.79	10.30	9.81
89315	.1285	#30	3.264	2-1/4"	1-1/4"	11.57	11.07	10.56	10.06
89320	.1360	#29	3.454	2-1/2"	1-3/8"	11.93	11.41	10.89	10.37
89325	.1378		3.500	63	35	12.32	11.78	11.25	10.71
89330	.1405	#28	3.569	2-1/2"	1-3/8"	12.44	11.90	11.36	10.82
89335	.1406	9/64"	3.571	2-1/2"	1-3/8"	12.58	12.03	11.49	10.94
89340	.1440	#27	3.658	2-1/2"	1-3/8"	13.08	12.51	11.94	11.37
89345	.1470	#26	3.734	2-1/2"	1-3/8"	13.21	12.64	12.06	11.49
89350	.1495	#25	3.797	2-1/2"	1-3/8"	13.39	12.80	12.22	11.64
89355	.1520	#24	3.861	2-1/2"	1-3/8"	13.41	12.83	12.24	11.66
89360	.1540	#23	3.912	2-1/2"	1-3/8"	13.50	12.91	12.33	11.74
89365	.1562	5/32"	3.967	2-1/2"	1-3/8"	13.59	13.00	12.41	11.82
89370	.1570	#22	3.988	2-1/2"	1-3/8"	14.44	13.82	13.19	12.56
89375	.1575		4.000	63	35	14.63	13.99	13.36	12.72

EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
89380	.1590	#21	4.039	2-1/2"	1-3/8"	14.80	14.16	13.51	12.87
89385	.1610	#20	4.089	2-1/2"	1-3/8"	14.90	14.26	13.61	12.96
89390	.1660	#19	4.216	2-3/4"	1-5/8"	15.51	14.84	14.16	13.49
89395	.1695	#18	4.305	2-3/4"	1-5/8"	15.71	15.03	14.34	13.66
89400	.1719	11/64"	4.366	2-3/4"	1-5/8"	16.03	15.33	14.64	13.94
89405	.1730	#17	4.394	2-3/4"	1-5/8"	16.25	15.54	14.84	14.13
89410	.1770	#16	4.496	2-3/4"	1-5/8"	16.43	15.72	15.00	14.29
89415	.1772		4.500	70	41	16.51	15.80	15.08	14.36
89420	.1800	#15	4.572	2-3/4"	1-5/8"	16.58	15.86	15.14	14.42
89425	.1820	#14	4.623	2-3/4"	1-5/8"	16.96	16.23	15.49	14.75
89430	.1850	#13	4.700	2-3/4"	1-5/8"	17.10	16.36	15.61	14.87
89435	.1875	3/16"	4.763	2-3/4"	1-5/8"	17.17	16.42	15.68	14.93
89440	.1890	#12	4.801	2-3/4"	1-5/8"	17.73	16.96	16.19	15.42
89445	.1910	#11	4.851	2-3/4"	1-5/8"	17.93	17.15	16.37	15.59
89450	.1935	#10	4.915	2-3/4"	1-5/8"	18.78	17.96	17.15	16.33
89455	.1960	#9	4.978	3"	1-3/4"	19.25	18.41	17.58	16.74
89460	.1969		5.000	76	44	19.37	18.52	17.68	16.84
89465	.1990	#8	5.055	3"	1-3/4"	19.49	18.65	17.80	16.95
89470	.2010	#7	5.105	3"	1-3/4"	20.07	19.20	18.32	17.45
89475	.2031	13/64"	5.159	3"	1-3/4"	20.22	19.34	18.46	17.58
89480	.2040	#6	5.182	3"	1-3/4"	20.63	19.73	18.84	17.94
89485	.2055	#5	5.220	3"	1-3/4"	21.06	20.14	19.23	18.31
89490	.2090	#4	5.309	3"	1-3/4"	21.42	20.49	19.56	18.63
89495	.2130	#3	5.410	3"	1-3/4"	21.79	20.85	19.90	18.95
89500	.2165		5.500	76	44	21.97	21.01	20.06	19.10
89505	.2188	7/32"	5.558	3"	1-3/4"	22.13	21.16	20.20	19.24
89510	.2210	#2	5.613	3"	1-3/4"	22.67	21.68	20.70	19.71
89515	.2280	#1	5.791	3"	1-3/4"	22.80	21.81	20.82	19.83
89520	.2340	A	5.944	3-1/4"	2"	23.07	22.07	21.06	20.06
89525	.2344	15/64"	5.954	3-1/4"	2"	23.13	22.12	21.12	20.11
89530	.2362		6.000	82	50	23.22	22.21	21.20	20.19
89535	.2380	B	6.045	3-1/4"	2"	23.30	22.29	21.27	20.26
89540	.2420	C	6.147	3-1/4"	2"	23.47	22.45	21.43	20.41
89545	.2460	D	6.248	3-1/4"	2"	23.64	22.62	21.59	20.56
89550	.2500	1/4" / E	6.350	3-1/4"	2"	23.81	22.77	21.74	20.70
89555	.2559		6.500	82	50	24.39	23.33	22.27	21.21
89560	.2570	F	6.528	3-1/4"	2"	24.89	23.80	22.72	21.64
89565	.2610	G	6.629	3-1/2"	2-1/8"	25.40	24.30	23.19	22.09
89570	.2656	17/64"	6.746	3-1/2"	2-1/8"	25.91	24.78	23.66	22.53
89575	.2660	H	6.756	3-1/2"	2-1/8"	26.66	25.50	24.34	23.18
89580	.2720	I	6.909	3-1/2"	2-1/8"	26.96	25.78	24.61	23.44
89585	.2756		7.000	88	54	27.17	25.99	24.81	23.63
89590	.2770	J	7.036	3-1/2"	2-1/8"	27.42	26.22	25.03	23.84
89595	.2810	K	7.137	3-1/2"	2-1/8"	27.66	26.46	25.25	24.05
89600	.2812	9/32"	7.142	3-1/2"	2-1/8"	27.83	26.62	25.41	24.20
89605	.2900	L	7.366	3-1/2"	2-1/8"	28.83	27.58	26.32	25.07
89610	.2950	M	7.493	3-3/4"	2-3/8"	30.85	29.51	28.17	26.83
89615	.2953		7.500	95	60	30.85	29.51	28.17	26.83
89620	.2969	19/64"	7.541	3-3/4"	2-3/8"	30.85	29.51	28.17	26.83
89625	.3020	N	7.671	3-3/4"	2-3/8"	32.69	31.27	29.85	28.43
89630	.3125	5/16"	7.938	3-3/4"	2-3/8"	32.81	31.38	29.96	28.53
89635	.3150		8.000	95	60	35.20	33.67	32.14	30.61
89640	.3160	O	8.026	3-3/4"	2-3/8"	35.20	33.67	32.14	30.61
89645	.3230	P	8.204	3-3/4"	2-3/8"	35.20	33.67	32.14	30.61
89650	.3281	21/64"	8.334	4"	2-1/2"	35.73	34.18	32.62	31.07
89655	.3320	Q	8.433	4"	2-1/2"	36.56	34.97	33.38	31.79
89660	.3346		8.500	101	63	36.88	35.28	33.67	32.07

continued →

1205 - 2 Flute (continued)

.3390" - .6299"
(8.611mm - 16.000mm)

DRILLS

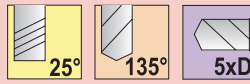
EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
89665	.3390	R	8.611	4"	2-1/2"	38.07	36.41	34.76	33.10
89670	.3438	11/32"	8.733	4"	2-1/2"	39.61	37.88	36.16	34.44
89675	.3480	S	8.839	4"	2-1/2"	39.74	38.02	36.29	34.56
89680	.3543		9.000	101	63	39.97	38.24	36.50	34.76
89685	.3580	T	9.093	4-1/4"	2-3/4"	40.34	38.59	36.83	35.08
89690	.3594	23/64"	9.129	4-1/4"	2-3/4"	40.62	38.85	37.09	35.32
89695	.3680	U	9.347	4-1/4"	2-3/4"	46.10	44.10	42.09	40.09
89700	.3740		9.500	107	70	46.53	44.51	42.48	40.46
89705	.3750	3/8"	9.525	4-1/4"	2-3/4"	46.90	44.86	42.82	40.78
89710	.3770	V	9.576	4-1/4"	2-3/4"	47.78	45.71	43.63	41.55
89715	.3860	W	9.804	4-1/2"	2-7/8"	48.81	46.68	44.56	42.44
89720	.3906	25/64"	9.921	4-1/2"	2-7/8"	49.53	47.38	45.22	43.07
89725	.3937		10.000	114	73	51.31	49.08	46.85	44.62
89730	.3970	X	10.084	4-1/2"	2-7/8"	52.82	50.52	48.23	45.93
89735	.4040	Y	10.262	4-1/2"	2-7/8"	53.25	50.93	48.62	46.30
89740	.4062	13/32"	10.317	4-1/2"	2-7/8"	55.17	52.77	50.37	47.97
89745	.4130	Z	10.490	4-1/2"	2-7/8"	55.75	53.33	50.90	48.48
89750	.4134		10.500	114	73	55.75	53.33	50.90	48.48
89755	.4219	27/64"	10.716	4-1/2"	2-7/8"	56.37	53.92	51.47	49.02
89760	.4331		11.000	114	73	61.21	58.55	55.89	53.23
89765	.4375	7/16"	11.113	4-1/2"	2-7/8"	61.21	58.55	55.89	53.23
89770	.4528		11.500	120	76	66.40	63.51	60.63	57.74
89775	.4531	29/64"	11.509	4-3/4"	3"	66.40	63.51	60.63	57.74
89780	.4688	15/32"	11.908	4-3/4"	3"	70.24	67.19	64.13	61.08
89785	.4724		12.000	120	76	70.47	67.41	64.34	61.28
89790	.4844	31/64"	12.304	4-3/4"	3"	70.47	67.41	64.34	61.28
89795	.4921		12.500	120	76	72.35	69.20	66.06	62.91
89800	.5000	1/2"	12.700	4-3/4"	3"	72.35	69.20	66.06	62.91
89805	.5118		13.000	127	83	90.90	86.94	82.99	79.04
89810	.5156	33/64"	13.096	5"	3-1/4"	93.33	89.28	85.22	81.16
89815	.5312	17/32"	13.492	5"	3-1/4"	95.77	91.61	87.44	83.28
89820	.5315		13.500	127	83	98.21	93.94	89.67	85.40
89825	.5469	35/64"	13.891	5"	3-1/4"	100.65	96.27	91.90	87.52
89830	.5512		14.000	127	83	103.10	98.62	94.13	89.65
89835	.5625	9/16"	14.287	5"	3-1/4"	112.42	107.54	102.65	97.76
89840	.5709		14.500	127	83	114.77	109.78	104.79	99.80
89845	.5781	37/64"	14.683	5-1/4"	3-1/2"	117.12	112.02	106.93	101.84
89850	.5906		15.000	133	89	119.50	114.30	109.11	103.91
89855	.5938	19/32"	15.082	5-1/4"	3-1/2"	120.19	114.96	109.74	104.51
89860	.6094	39/64"	15.478	5-1/4"	3-1/2"	120.85	115.60	110.34	105.09
89865	.6102		15.500	133	89	121.54	116.26	110.97	105.69
89870	.6250	5/8"	15.875	5-1/4"	3-1/2"	122.21	116.90	111.58	106.27
89875	.6299		16.000	133	89	125.48	120.02	114.57	109.11

TOLERANCES

<i>d</i>	+.0000" -.0005" (+.0000 -.0127mm)	
<i>l1</i>	≤ 1/8"	+ .125" -.062" (+3.175 -1.588mm)
	> 1/8"	+ .125" -.125" (+3.175 -3.175mm)
<i>l2</i>	≤ 1/8"	+ .125" -.062" (+3.175 -1.588mm)
	> 1/8"	+ .125" -.125" (+3.175 -3.175mm)

Technical information: page 250-253

1205H - 2 Flute



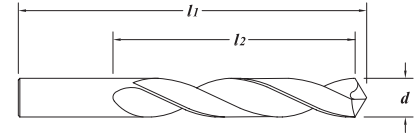
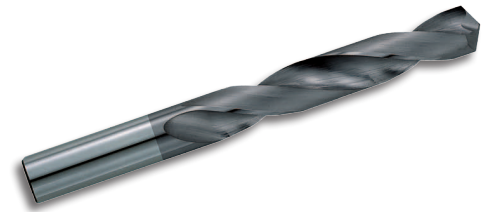
.0625" - .1575"
(1.588mm - 4.000mm)

Balinit® HARDLUBE Coated

- Solid submicron grain carbide drill
- Excellent heat resistance and lubricity
- Up to 40% faster than uncoated
- No spotting required in most applications
- 4-facet self-centering point
- Adaptability when converting from high-speed steel

Recommended to run in stainless steel alloys, mild steels and titanium alloys

Live tooling recommended on lathe processes



DRILLS

EDP#	<i>d</i> †		<i>l1</i>	<i>l2</i>	1-11	12-24	25-49	50-100	
	Decimal	Diameter Metric							
89166	.0625	1/16"	1.588	1-3/4"	3/4"	8.71	8.33	7.95	7.57
89171	.0635	#52	1.613	1-3/4"	3/4"	8.82	8.44	8.05	7.67
89176	.0670	#51	1.702	1-3/4"	3/4"	8.92	8.54	8.15	7.76
89181	.0700	#50	1.778	1-3/4"	7/8"	9.07	8.68	8.28	7.89
89186	.0730	#49	1.854	1-3/4"	7/8"	9.28	8.88	8.47	8.07
89191	.0760	#48	1.930	1-3/4"	7/8"	9.51	9.10	8.68	8.27
89196	.0781	5/64"	1.984	1-3/4"	7/8"	9.81	9.38	8.96	8.53
89201	.0785	#47	1.994	1-3/4"	7/8"	10.07	9.64	9.20	8.76
89206	.0787		2.000	44	22	10.20	9.76	9.31	8.87
89211	.0810	#46	2.057	1-3/4"	7/8"	10.33	9.88	9.43	8.98
89216	.0820	#45	2.083	1-3/4"	7/8"	10.58	10.12	9.66	9.20
89221	.0860	#44	2.184	2"	1"	10.87	10.40	9.92	9.45
89226	.0890	#43	2.261	2"	1"	11.11	10.63	10.14	9.66
89231	.0935	#42	2.375	2"	1"	11.25	10.76	10.27	9.78
89236	.0938	3/32"	2.383	2"	1"	11.45	10.96	10.46	9.96
89241	.0960	#41	2.438	2"	1"	11.56	11.06	10.55	10.05
89246	.0980	#40	2.489	2"	1"	11.70	11.19	10.68	10.17
89251	.0984		2.500	57	32	11.72	11.21	10.70	10.19
89256	.0995	#39	2.527	2-1/4"	1-1/4"	11.78	11.26	10.75	10.24
89261	.1015	#38	2.578	2-1/4"	1-1/4"	11.91	11.40	10.88	10.36
89266	.1040	#37	2.642	2-1/4"	1-1/4"	12.02	11.50	10.97	10.45
89271	.1065	#36	2.705	2-1/4"	1-1/4"	12.16	11.63	11.10	10.57
89276	.1094	7/64"	2.779	2-1/4"	1-1/4"	12.34	11.80	11.27	10.73
89281	.1100	#35	2.794	2-1/4"	1-1/4"	12.44	11.90	11.36	10.82
89286	.1110	#34	2.819	2-1/4"	1-1/4"	12.57	12.02	11.48	10.93
89291	.1130	#33	2.870	2-1/4"	1-1/4"	12.77	12.21	11.66	11.10
89296	.1160	#32	2.946	2-1/4"	1-1/4"	12.87	12.31	11.75	11.19
89301	.1181		3.000	57	32	12.98	12.42	11.85	11.29
89306	.1200	#31	3.048	2-1/4"	1-1/4"	13.08	12.51	11.94	11.37
89311	.1250	1/8"	3.175	2-1/4"	1-1/4"	13.19	12.62	12.04	11.47
89316	.1285	#30	3.264	2-1/4"	1-1/4"	13.49	12.90	12.32	11.73
89321	.1360	#29	3.454	2-1/2"	1-3/8"	13.85	13.24	12.64	12.04
89326	.1378		3.500	63	35	14.23	13.61	12.99	12.37
89331	.1405	#28	3.569	2-1/2"	1-3/8"	14.38	13.75	13.13	12.50
89336	.1406	9/64"	3.571	2-1/2"	1-3/8"	14.51	13.88	13.25	12.62
89341	.1440	#27	3.658	2-1/2"	1-3/8"	15.01	14.36	13.70	13.05
89346	.1470	#26	3.734	2-1/2"	1-3/8"	15.15	14.49	13.83	13.17
89351	.1495	#25	3.797	2-1/2"	1-3/8"	15.28	14.62	13.95	13.29
89356	.1520	#24	3.861	2-1/2"	1-3/8"	15.35	14.69	14.02	13.35
89361	.1540	#23	3.912	2-1/2"	1-3/8"	15.43	14.76	14.09	13.42
89366	.1562	5/32"	3.967	2-1/2"	1-3/8"	15.50	14.83	14.15	13.48
89371	.1570	#22	3.988	2-1/2"	1-3/8"	16.36	15.65	14.94	14.23
89376	.1575		4.000	63	35	16.55	15.83	15.11	14.39

continued →

1205H - 2 Flute (continued)

.1590" - .3346"
(4.039mm - 8.500mm)

DRILLS

EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
89381	.1590	#21	4.039	2-1/2"	1-3/8"	16.73	16.01	15.28	14.55
89386	.1610	#20	4.089	2-1/2"	1-3/8"	16.84	16.10	15.37	14.64
89391	.1660	#19	4.216	2-3/4"	1-5/8"	17.45	16.69	15.93	15.17
89396	.1695	#18	4.305	2-3/4"	1-5/8"	17.62	16.85	16.09	15.32
89401	.1719	11/64"	4.366	2-3/4"	1-5/8"	17.93	17.15	16.37	15.59
89406	.1730	#17	4.394	2-3/4"	1-5/8"	18.19	17.40	16.61	15.82
89411	.1770	#16	4.496	2-3/4"	1-5/8"	18.34	17.55	16.75	15.95
89416	.1772		4.500	70	41	18.45	17.64	16.84	16.04
89421	.1800	#15	4.572	2-3/4"	1-5/8"	18.52	17.71	16.91	16.10
89426	.1820	#14	4.623	2-3/4"	1-5/8"	18.88	18.06	17.24	16.42
89431	.1850	#13	4.700	2-3/4"	1-5/8"	19.02	18.19	17.37	16.54
89436	.1875	3/16"	4.763	2-3/4"	1-5/8"	19.10	18.27	17.44	16.61
89441	.1890	#12	4.801	2-3/4"	1-5/8"	21.05	20.13	19.22	18.30
89446	.1910	#11	4.851	2-3/4"	1-5/8"	21.24	20.32	19.39	18.47
89451	.1935	#10	4.915	2-3/4"	1-5/8"	22.07	21.11	20.15	19.19
89456	.1960	#9	4.978	3"	1-3/4"	22.56	21.58	20.60	19.62
89461	.1969		5.000	76	44	22.67	21.68	20.70	19.71
89466	.1990	#8	5.055	3"	1-3/4"	22.77	21.78	20.79	19.80
89471	.2010	#7	5.105	3"	1-3/4"	23.37	22.35	21.34	20.32
89476	.2031	13/64"	5.159	3"	1-3/4"	23.52	22.50	21.47	20.45
89481	.2040	#6	5.182	3"	1-3/4"	23.94	22.90	21.86	20.82
89486	.2055	#5	5.220	3"	1-3/4"	24.36	23.30	22.24	21.18
89491	.2090	#4	5.309	3"	1-3/4"	24.75	23.67	22.60	21.52
89496	.2130	#3	5.410	3"	1-3/4"	25.10	24.01	22.92	21.83
89501	.2165		5.500	76	44	25.27	24.17	23.07	21.97
89506	.2188	7/32"	5.558	3"	1-3/4"	25.42	24.31	23.21	22.10
89511	.2210	#2	5.613	3"	1-3/4"	25.94	24.82	23.69	22.56
89516	.2280	#1	5.791	3"	1-3/4"	26.11	24.97	23.84	22.70
89521	.2340	A	5.944	3-1/4"	2"	26.47	25.32	24.17	23.02
89526	.2344	15/64"	5.954	3-1/4"	2"	26.55	25.40	24.24	23.09
89531	.2362		6.000	82	50	26.63	25.48	24.32	23.16
89536	.2380	B	6.045	3-1/4"	2"	26.71	25.55	24.39	23.23
89541	.2420	C	6.147	3-1/4"	2"	26.89	25.72	24.55	23.38
89546	.2460	D	6.248	3-1/4"	2"	27.07	25.89	24.72	23.54
89551	.2500	1/4" / E	6.350	3-1/4"	2"	27.22	26.04	24.85	23.67
89556	.2559		6.500	82	50	30.65	29.32	27.98	26.65
89561	.2570	F	6.528	3-1/4"	2"	31.18	29.82	28.47	27.11
89566	.2610	G	6.629	3-1/2"	2-1/8"	31.65	30.27	28.90	27.52
89571	.2656	17/64"	6.746	3-1/2"	2-1/8"	32.18	30.78	29.38	27.98
89576	.2660	H	6.756	3-1/2"	2-1/8"	32.91	31.48	30.05	28.62
89581	.2720	I	6.909	3-1/2"	2-1/8"	33.22	31.78	30.33	28.89
89586	.2756		7.000	88	54	33.43	31.98	30.52	29.07
89591	.2770	J	7.036	3-1/2"	2-1/8"	33.67	32.21	30.74	29.28
89596	.2810	K	7.137	3-1/2"	2-1/8"	33.93	32.45	30.98	29.50
89601	.2812	9/32"	7.142	3-1/2"	2-1/8"	34.06	32.58	31.10	29.62
89606	.2900	L	7.366	3-1/2"	2-1/8"	35.10	33.57	32.05	30.52
89611	.2950	M	7.493	3-3/4"	2-3/8"	37.11	35.50	33.88	32.27
89616	.2953		7.500	95	60	37.11	35.50	33.88	32.27
89621	.2969	19/64"	7.541	3-3/4"	2-3/8"	37.11	35.50	33.88	32.27
89626	.3020	N	7.671	3-3/4"	2-3/8"	38.95	37.26	35.56	33.87
89631	.3125	5/16"	7.938	3-3/4"	2-3/8"	39.09	37.39	35.69	33.99
89636	.3150		8.000	95	60	41.46	39.66	37.85	36.05
89641	.3160	O	8.026	3-3/4"	2-3/8"	41.46	39.66	37.85	36.05
89646	.3230	P	8.204	3-3/4"	2-3/8"	41.46	39.66	37.85	36.05
89651	.3281	21/64"	8.334	4"	2-1/2"	41.98	40.15	38.33	36.50
89656	.3320	Q	8.433	4"	2-1/2"	42.83	40.96	39.10	37.24
89661	.3346		8.500	101	63	43.13	41.25	39.38	37.50

1205H - 2 Flute (continued)

.3390" - .6299"
(8.611mm - 16.000mm)

DRILLS

EDP#	d^+ Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
89666	.3390	R	8.611	4"	2-1/2"	44.31	42.38	40.46	38.53
89671	.3438	11/32"	8.733	4"	2-1/2"	45.86	43.87	41.87	39.88
89676	.3480	S	8.839	4"	2-1/2"	47.68	45.61	43.53	41.46
89681	.3543		9.000	101	63	47.94	45.86	43.77	41.69
89686	.3580	T	9.093	4-1/4"	2-3/4"	49.84	47.67	45.51	43.34
89691	.3594	23/64"	9.129	4-1/4"	2-3/4"	50.15	47.97	45.79	43.61
89696	.3680	U	9.347	4-1/4"	2-3/4"	55.64	53.22	50.80	48.38
89701	.3740		9.500	107	70	56.04	53.60	51.17	48.73
89706	.3750	3/8"	9.525	4-1/4"	2-3/4"	56.42	53.97	51.51	49.06
89711	.3770	V	9.576	4-1/4"	2-3/4"	57.80	55.29	52.77	50.26
89716	.3860	W	9.804	4-1/2"	2-7/8"	58.82	56.27	53.71	51.15
89721	.3906	25/64"	9.921	4-1/2"	2-7/8"	59.54	56.95	54.36	51.77
89726	.3937		10.000	114	73	61.33	58.66	56.00	53.33
89731	.3970	X	10.084	4-1/2"	2-7/8"	62.82	60.09	57.36	54.63
89736	.4040	Y	10.262	4-1/2"	2-7/8"	63.25	60.50	57.75	55.00
89741	.4062	13/32"	10.317	4-1/2"	2-7/8"	65.18	62.35	59.51	56.68
89746	.4130	Z	10.490	4-1/2"	2-7/8"	65.78	62.92	60.06	57.20
89751	.4134		10.500	114	73	65.78	62.92	60.06	57.20
89756	.4219	27/64"	10.716	4-1/2"	2-7/8"	66.39	63.50	60.62	57.73
89761	.4331		11.000	114	73	71.22	68.12	65.03	61.93
89766	.4375	7/16"	11.113	4-1/2"	2-7/8"	71.22	68.12	65.03	61.93
89771	.4528		11.500	120	76	76.42	73.10	69.77	66.45
89776	.4531	29/64"	11.509	4-3/4"	3"	76.42	73.10	69.77	66.45
89781	.4688	15/32"	11.908	4-3/4"	3"	80.25	76.76	73.27	69.78
89786	.4724		12.000	120	76	80.49	76.99	73.49	69.99
89791	.4844	31/64"	12.304	4-3/4"	3"	80.49	76.99	73.49	69.99
89796	.4921		12.500	120	76	82.36	78.78	75.20	71.62
89801	.5000	1/2"	12.700	4-3/4"	3"	82.36	78.78	75.20	71.62
89806	.5118		13.000	127	83	103.65	99.14	94.64	90.13
89811	.5156	33/64"	13.096	5"	3-1/4"	106.09	101.48	96.86	92.25
89816	.5312	17/32"	13.492	5"	3-1/4"	108.53	103.81	99.09	94.37
89821	.5315		13.500	127	83	110.96	106.14	101.31	96.49
89826	.5469	35/64"	13.891	5"	3-1/4"	113.39	108.46	103.53	98.60
89831	.5512		14.000	127	83	115.85	110.81	105.78	100.74
89836	.5625	9/16"	14.287	5"	3-1/4"	125.18	119.74	114.29	108.85
89841	.5709		14.500	127	83	127.51	121.97	116.42	110.88
89846	.5781	37/64"	14.683	5-1/4"	3-1/2"	129.87	124.22	118.58	112.93
89851	.5906		15.000	133	89	132.24	126.49	120.74	114.99
89856	.5938	19/32"	15.082	5-1/4"	3-1/2"	132.95	127.17	121.39	115.61
89861	.6094	39/64"	15.478	5-1/4"	3-1/2"	133.61	127.80	121.99	116.18
89866	.6102		15.500	133	89	134.30	128.46	122.62	116.78
89871	.6250	5/8"	15.875	5-1/4"	3-1/2"	134.98	129.11	123.24	117.37
89876	.6299		16.000	133	89	138.23	132.22	126.21	120.20

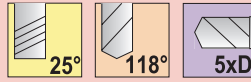
1200 - 2 Flute

Technical information: page 250-253

TOLERANCES

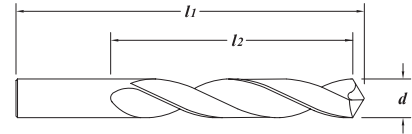
d	+.0000" - .0005" (+.0000 - .0127mm)	
l_1	$\leq 1/8"$	+ .125" - .062" (+3.175 - 1.588mm)
	$> 1/8"$	+ .125" - .125" (+3.175 - 3.175mm)
l_2	$\leq 1/8"$	+ .125" - .062" (+3.175 - 1.588mm)
	$> 1/8"$	+ .125" - .125" (+3.175 - 3.175mm)

.0625" - .1575"
(1.588mm - 4.000mm)



DRILLS

Solid submicron grain carbide drill
General purpose jobber style
Cam point ($\leq 1/8"$ diameter - 4-facet point)
Live tooling recommended on lathe processes



EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
56165	.0625	1/16"	1.588	1-3/4"	3/4"	6.79	6.49	6.20	5.90
56170	.0635	#52	1.613	1-3/4"	3/4"	6.89	6.59	6.29	5.99
56175	.0670	#51	1.702	1-3/4"	3/4"	6.99	6.69	6.38	6.08
56180	.0700	#50	1.778	1-3/4"	7/8"	7.16	6.85	6.54	6.23
56185	.0730	#49	1.854	1-3/4"	7/8"	7.35	7.03	6.71	6.39
56190	.0760	#48	1.930	1-3/4"	7/8"	7.59	7.26	6.93	6.60
56195	.0781	5/64"	1.984	1-3/4"	7/8"	7.88	7.54	7.19	6.85
56200	.0785	#47	1.994	1-3/4"	7/8"	8.14	7.79	7.43	7.08
56205	.0787		2.000	44	22	8.27	7.91	7.55	7.19
56210	.0810	#46	2.057	1-3/4"	7/8"	8.40	8.03	7.67	7.30
56215	.0820	#45	2.083	1-3/4"	7/8"	8.65	8.27	7.90	7.52
56220	.0860	#44	2.184	2"	1"	8.94	8.55	8.16	7.77
56225	.0890	#43	2.261	2"	1"	9.19	8.79	8.39	7.99
56230	.0935	#42	2.375	2"	1"	9.32	8.91	8.51	8.10
56235	.0938	3/32"	2.383	2"	1"	9.53	9.12	8.70	8.29
56240	.0960	#41	2.438	2"	1"	9.61	9.20	8.78	8.36
56245	.0980	#40	2.489	2"	1"	9.76	9.34	8.91	8.49
56250	.0984		2.500	57	32	9.81	9.38	8.96	8.53
56255	.0995	#39	2.527	2-1/4"	1-1/4"	9.86	9.43	9.00	8.57
56260	.1015	#38	2.578	2-1/4"	1-1/4"	9.98	9.55	9.11	8.68
56265	.1040	#37	2.642	2-1/4"	1-1/4"	10.11	9.67	9.23	8.79
56270	.1065	#36	2.705	2-1/4"	1-1/4"	10.24	9.79	9.35	8.90
56275	.1094	7/64"	2.779	2-1/4"	1-1/4"	10.41	9.96	9.50	9.05
56280	.1100	#35	2.794	2-1/4"	1-1/4"	10.52	10.07	9.61	9.15
56285	.1110	#34	2.819	2-1/4"	1-1/4"	10.65	10.19	9.72	9.26
56290	.1130	#33	2.870	2-1/4"	1-1/4"	10.84	10.37	9.90	9.43
56295	.1160	#32	2.946	2-1/4"	1-1/4"	10.96	10.48	10.01	9.53
56300	.1181		3.000	57	32	11.07	10.59	10.11	9.63
56305	.1200	#31	3.048	2-1/4"	1-1/4"	11.14	10.66	10.17	9.69
56310	.1250	1/8"	3.175	2-1/4"	1-1/4"	11.28	10.79	10.30	9.81
56315	.1285	#30	3.264	2-1/4"	1-1/4"	11.57	11.07	10.56	10.06
56320	.1360	#29	3.454	2-1/2"	1-3/8"	11.93	11.41	10.89	10.37
56325	.1378		3.500	63	35	12.32	11.78	11.25	10.71
56330	.1405	#28	3.569	2-1/2"	1-3/8"	12.44	11.90	11.36	10.82
56335	.1406	9/64"	3.571	2-1/2"	1-3/8"	12.58	12.03	11.49	10.94
56340	.1440	#27	3.658	2-1/2"	1-3/8"	13.08	12.51	11.94	11.37
56345	.1470	#26	3.734	2-1/2"	1-3/8"	13.21	12.64	12.06	11.49
56350	.1495	#25	3.797	2-1/2"	1-3/8"	13.39	12.80	12.22	11.64
56355	.1520	#24	3.861	2-1/2"	1-3/8"	13.41	12.83	12.24	11.66
56360	.1540	#23	3.912	2-1/2"	1-3/8"	13.50	12.91	12.33	11.74
56365	.1562	5/32"	3.967	2-1/2"	1-3/8"	13.59	13.00	12.41	11.82
56370	.1570	#22	3.988	2-1/2"	1-3/8"	14.44	13.82	13.19	12.56
56375	.1575		4.000	63	35	14.63	13.99	13.36	12.72

EDP#	d^+ Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
56380	.1590	#21	4.039	2-1/2"	1-3/8"	14.80	14.16	13.51	12.87
56385	.1610	#20	4.089	2-1/2"	1-3/8"	14.90	14.26	13.61	12.96
56390	.1660	#19	4.216	2-3/4"	1-5/8"	15.51	14.84	14.16	13.49
56395	.1695	#18	4.305	2-3/4"	1-5/8"	15.71	15.03	14.34	13.66
56400	.1719	11/64"	4.366	2-3/4"	1-5/8"	16.03	15.33	14.64	13.94
56405	.1730	#17	4.394	2-3/4"	1-5/8"	16.25	15.54	14.84	14.13
56410	.1770	#16	4.496	2-3/4"	1-5/8"	16.43	15.72	15.00	14.29
56415	.1772		4.500	70	41	16.51	15.80	15.08	14.36
56420	.1800	#15	4.572	2-3/4"	1-5/8"	16.58	15.86	15.14	14.42
56425	.1820	#14	4.623	2-3/4"	1-5/8"	16.96	16.23	15.49	14.75
56430	.1850	#13	4.700	2-3/4"	1-5/8"	17.10	16.36	15.61	14.87
56435	.1875	3/16"	4.763	2-3/4"	1-5/8"	17.17	16.42	15.68	14.93
56440	.1890	#12	4.801	2-3/4"	1-5/8"	17.73	16.96	16.19	15.42
56445	.1910	#11	4.851	2-3/4"	1-5/8"	17.93	17.15	16.37	15.59
56450	.1935	#10	4.915	2-3/4"	1-5/8"	18.78	17.96	17.15	16.33
56455	.1960	#9	4.978	3"	1-3/4"	19.25	18.41	17.58	16.74
56460	.1969		5.000	76	44	19.37	18.52	17.68	16.84
56465	.1990	#8	5.055	3"	1-3/4"	19.49	18.65	17.80	16.95
56470	.2010	#7	5.105	3"	1-3/4"	20.07	19.20	18.32	17.45
56475	.2031	13/64"	5.159	3"	1-3/4"	20.22	19.34	18.46	17.58
56480	.2040	#6	5.182	3"	1-3/4"	20.63	19.73	18.84	17.94
56485	.2055	#5	5.220	3"	1-3/4"	21.06	20.14	19.23	18.31
56490	.2090	#4	5.309	3"	1-3/4"	21.42	20.49	19.56	18.63
56495	.2130	#3	5.410	3"	1-3/4"	21.79	20.85	19.90	18.95
56500	.2165		5.500	76	44	21.97	21.01	20.06	19.10
56505	.2188	7/32"	5.558	3"	1-3/4"	22.13	21.16	20.20	19.24
56510	.2210	#2	5.613	3"	1-3/4"	22.67	21.68	20.70	19.71
56515	.2280	#1	5.791	3"	1-3/4"	22.80	21.81	20.82	19.83
56520	.2340	A	5.944	3-1/4"	2"	23.07	22.07	21.06	20.06
56525	.2344	15/64"	5.954	3-1/4"	2"	23.13	22.12	21.12	20.11
56530	.2362		6.000	82	50	23.22	22.21	21.20	20.19
56535	.2380	B	6.045	3-1/4"	2"	23.30	22.29	21.27	20.26
56540	.2420	C	6.147	3-1/4"	2"	23.47	22.45	21.43	20.41
56545	.2460	D	6.248	3-1/4"	2"	23.64	22.62	21.59	20.56
56550	.2500	1/4" / E	6.350	3-1/4"	2"	23.81	22.77	21.74	20.70
56555	.2559		6.500	82	50	24.39	23.33	22.27	21.21
56560	.2570	F	6.528	3-1/4"	2"	24.89	23.80	22.72	21.64
56565	.2610	G	6.629	3-1/2"	2-1/8"	25.40	24.30	23.19	22.09
56570	.2656	17/64"	6.746	3-1/2"	2-1/8"	25.91	24.78	23.66	22.53
56575	.2660	H	6.756	3-1/2"	2-1/8"	26.66	25.50	24.34	23.18
56580	.2720	I	6.909	3-1/2"	2-1/8"	26.96	25.78	24.61	23.44
56585	.2756		7.000	88	54	27.17	25.99	24.81	23.63
56590	.2770	J	7.036	3-1/2"	2-1/8"	27.42	26.22	25.03	23.84
56595	.2810	K	7.137	3-1/2"	2-1/8"	27.66	26.46	25.25	24.05
56600	.2812	9/32"	7.142	3-1/2"	2-1/8"	27.83	26.62	25.41	24.20
56605	.2900	L	7.366	3-1/2"	2-1/8"	28.83	27.58	26.32	25.07
56610	.2950	M	7.493	3-3/4"	2-3/8"	30.85	29.51	28.17	26.83
56615	.2953		7.500	95	60	30.85	29.51	28.17	26.83
56620	.2969	19/64"	7.541	3-3/4"	2-3/8"	30.85	29.51	28.17	26.83
56625	.3020	N	7.671	3-3/4"	2-3/8"	32.69	31.27	29.85	28.43
56630	.3125	5/16"	7.938	3-3/4"	2-3/8"	32.81	31.38	29.96	28.53
56635	.3150		8.000	95	60	35.20	33.67	32.14	30.61
56640	.3160	O	8.026	3-3/4"	2-3/8"	35.20	33.67	32.14	30.61
56645	.3230	P	8.204	3-3/4"	2-3/8"	35.20	33.67	32.14	30.61
56650	.3281	21/64"	8.334	4"	2-1/2"	35.73	34.18	32.62	31.07
56655	.3320	Q	8.433	4"	2-1/2"	36.56	34.97	33.38	31.79
56660	.3346		8.500	101	63	36.88	35.28	33.67	32.07

continued →

1200 - 2 Flute (continued)

.3390" - .5000"
(8.611mm - 12.700mm)

DRILLS

EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
56665	.3390	R	8.611	4"	2-1/2"	38.07	36.41	34.76	33.10
56670	.3438	11/32"	8.733	4"	2-1/2"	39.61	37.88	36.16	34.44
56675	.3480	S	8.839	4"	2-1/2"	39.74	38.02	36.29	34.56
56680	.3543		9.000	101	63	39.97	38.24	36.50	34.76
56685	.3580	T	9.093	4-1/4"	2-3/4"	40.34	38.59	36.83	35.08
56690	.3594	23/64"	9.129	4-1/4"	2-3/4"	40.62	38.85	37.09	35.32
56695	.3680	U	9.347	4-1/4"	2-3/4"	46.10	44.10	42.09	40.09
56700	.3740		9.500	107	70	46.53	44.51	42.48	40.46
56705	.3750	3/8"	9.525	4-1/4"	2-3/4"	46.90	44.86	42.82	40.78
56710	.3770	V	9.576	4-1/4"	2-3/4"	47.78	45.71	43.63	41.55
56715	.3860	W	9.804	4-1/2"	2-7/8"	48.81	46.68	44.56	42.44
56720	.3906	25/64"	9.921	4-1/2"	2-7/8"	49.53	47.38	45.22	43.07
56725	.3937		10.000	114	73	51.31	49.08	46.85	44.62
56730	.3970	X	10.084	4-1/2"	2-7/8"	52.82	50.52	48.23	45.93
56735	.4040	Y	10.262	4-1/2"	2-7/8"	53.25	50.93	48.62	46.30
56740	.4062	13/32"	10.317	4-1/2"	2-7/8"	55.17	52.77	50.37	47.97
56745	.4130	Z	10.490	4-1/2"	2-7/8"	55.75	53.33	50.90	48.48
56750	.4134		10.500	114	73	55.75	53.33	50.90	48.48
56755	.4219	27/64"	10.716	4-1/2"	2-7/8"	56.37	53.92	51.47	49.02
56760	.4331		11.000	114	73	61.21	58.55	55.89	53.23
56765	.4375	7/16"	11.113	4-1/2"	2-7/8"	61.21	58.55	55.89	53.23
56770	.4528		11.500	120	76	66.40	63.51	60.63	57.74
56775	.4531	29/64"	11.509	4-3/4"	3"	66.40	63.51	60.63	57.74
56780	.4688	15/32"	11.908	4-3/4"	3"	70.24	67.19	64.13	61.08
56785	.4724		12.000	120	76	70.47	67.41	64.34	61.28
56790	.4844	31/64"	12.304	4-3/4"	3"	70.47	67.41	64.34	61.28
56795	.4921		12.500	120	76	72.35	69.20	66.06	62.91
56800	.5000	1/2"	12.700	4-3/4"	3"	72.35	69.20	66.06	62.91

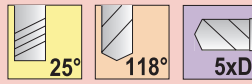


TOLERANCES

<i>d</i>	+.0000" - .0005" (+.0000 - .0127mm)	
<i>l1</i>	≤ 1/8"	+ .125" - .062" (+3.175 - 1.588mm)
	> 1/8"	+ .125" - .125" (+3.175 - 3.175mm)
<i>l2</i>	≤ 1/8"	+ .125" - .062" (+3.175 - 1.588mm)
	> 1/8"	+ .125" - .125" (+3.175 - 3.175mm)

Technical information: page 250-253

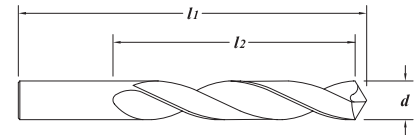
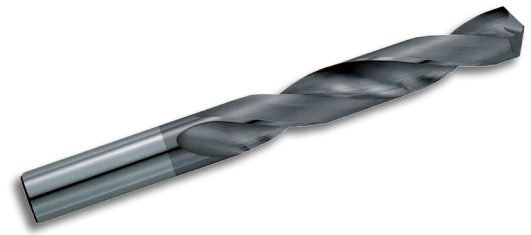
1200H - 2 Flute



.0625" - .1575"
(1.588mm - 4.000mm)

Balinit® HARDLUBE Coated

- Solid submicron grain carbide drill
- General purpose jobber style
- Excellent heat resistance and lubricity
- Up to 40% faster than uncoated
- Cam point (≤1/8" diameter is with 4-facet point)
- Live tooling recommended on lathe processes



DRILLS

EDP#	<i>d</i> † Diameter		<i>l1</i> Overall Length	<i>l2</i> Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
56166	.0625	1/16"	1.588	1-3/4"	3/4"	8.71	8.33	7.95	7.57
56171	.0635	#52	1.613	1-3/4"	3/4"	8.82	8.44	8.05	7.67
56176	.0670	#51	1.702	1-3/4"	3/4"	8.92	8.54	8.15	7.76
56181	.0700	#50	1.778	1-3/4"	7/8"	9.07	8.68	8.28	7.89
56186	.0730	#49	1.854	1-3/4"	7/8"	9.28	8.88	8.47	8.07
56191	.0760	#48	1.930	1-3/4"	7/8"	9.51	9.10	8.68	8.27
56196	.0781	5/64"	1.984	1-3/4"	7/8"	9.81	9.38	8.96	8.53
56201	.0785	#47	1.994	1-3/4"	7/8"	10.07	9.64	9.20	8.76
56206	.0787		2.000	44	22	10.20	9.76	9.31	8.87
56211	.0810	#46	2.057	1-3/4"	7/8"	10.33	9.88	9.43	8.98
56216	.0820	#45	2.083	1-3/4"	7/8"	10.58	10.12	9.66	9.20
56221	.0860	#44	2.184	2"	1"	10.87	10.40	9.92	9.45
56226	.0890	#43	2.261	2"	1"	11.11	10.63	10.14	9.66
56231	.0935	#42	2.375	2"	1"	11.25	10.76	10.27	9.78
56236	.0938	3/32"	2.383	2"	1"	11.45	10.96	10.46	9.96
56241	.0960	#41	2.438	2"	1"	11.56	11.06	10.55	10.05
56246	.0980	#40	2.489	2"	1"	11.70	11.19	10.68	10.17
56251	.0984		2.500	57	32	11.72	11.21	10.70	10.19
56256	.0995	#39	2.527	2-1/4"	1-1/4"	11.78	11.26	10.75	10.24
56261	.1015	#38	2.578	2-1/4"	1-1/4"	11.91	11.40	10.88	10.36
56266	.1040	#37	2.642	2-1/4"	1-1/4"	12.02	11.50	10.97	10.45
56271	.1065	#36	2.705	2-1/4"	1-1/4"	12.16	11.63	11.10	10.57
56276	.1094	7/64"	2.779	2-1/4"	1-1/4"	12.34	11.80	11.27	10.73
56281	.1100	#35	2.794	2-1/4"	1-1/4"	12.44	11.90	11.36	10.82
56286	.1110	#34	2.819	2-1/4"	1-1/4"	12.57	12.02	11.48	10.93
56291	.1130	#33	2.870	2-1/4"	1-1/4"	12.77	12.21	11.66	11.10
56296	.1160	#32	2.946	2-1/4"	1-1/4"	12.87	12.31	11.75	11.19
56301	.1181		3.000	57	32	12.98	12.42	11.85	11.29
56306	.1200	#31	3.048	2-1/4"	1-1/4"	13.08	12.51	11.94	11.37
56311	.1250	1/8"	3.175	2-1/4"	1-1/4"	13.19	12.62	12.04	11.47
56316	.1285	#30	3.264	2-1/4"	1-1/4"	13.49	12.90	12.32	11.73
56321	.1360	#29	3.454	2-1/2"	1-3/8"	13.85	13.24	12.64	12.04
56326	.1378		3.500	63	35	14.23	13.61	12.99	12.37
56331	.1405	#28	3.569	2-1/2"	1-3/8"	14.38	13.75	13.13	12.50
56336	.1406	9/64"	3.571	2-1/2"	1-3/8"	14.51	13.88	13.25	12.62
56341	.1440	#27	3.658	2-1/2"	1-3/8"	15.01	14.36	13.70	13.05
56346	.1470	#26	3.734	2-1/2"	1-3/8"	15.15	14.49	13.83	13.17
56351	.1495	#25	3.797	2-1/2"	1-3/8"	15.28	14.62	13.95	13.29
56356	.1520	#24	3.861	2-1/2"	1-3/8"	15.35	14.69	14.02	13.35
56361	.1540	#23	3.912	2-1/2"	1-3/8"	15.43	14.76	14.09	13.42
56366	.1562	5/32"	3.967	2-1/2"	1-3/8"	15.50	14.83	14.15	13.48
56371	.1570	#22	3.988	2-1/2"	1-3/8"	16.36	15.65	14.94	14.23
56376	.1575		4.000	63	35	16.55	15.83	15.11	14.39

continued →

1200H - 2 Flute (continued)

.1590" - .3346"
(4.039mm - 8.500mm)

DRILLS

EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
56381	.1590	#21	4.039	2-1/2"	1-3/8"	16.73	16.01	15.28	14.55
56386	.1610	#20	4.089	2-1/2"	1-3/8"	16.84	16.10	15.37	14.64
56391	.1660	#19	4.216	2-3/4"	1-5/8"	17.45	16.69	15.93	15.17
56396	.1695	#18	4.305	2-3/4"	1-5/8"	17.62	16.85	16.09	15.32
56401	.1719	11/64"	4.366	2-3/4"	1-5/8"	17.93	17.15	16.37	15.59
56406	.1730	#17	4.394	2-3/4"	1-5/8"	18.19	17.40	16.61	15.82
56411	.1770	#16	4.496	2-3/4"	1-5/8"	18.34	17.55	16.75	15.95
56416	.1772		4.500	70	41	18.45	17.64	16.84	16.04
56421	.1800	#15	4.572	2-3/4"	1-5/8"	18.52	17.71	16.91	16.10
56426	.1820	#14	4.623	2-3/4"	1-5/8"	18.88	18.06	17.24	16.42
56431	.1850	#13	4.700	2-3/4"	1-5/8"	19.02	18.19	17.37	16.54
56436	.1875	3/16"	4.763	2-3/4"	1-5/8"	19.10	18.27	17.44	16.61
56441	.1890	#12	4.801	2-3/4"	1-5/8"	21.05	20.13	19.22	18.30
56446	.1910	#11	4.851	2-3/4"	1-5/8"	21.24	20.32	19.39	18.47
56451	.1935	#10	4.915	2-3/4"	1-5/8"	22.07	21.11	20.15	19.19
56456	.1960	#9	4.978	3"	1-3/4"	22.56	21.58	20.60	19.62
56461	.1969		5.000	76	44	22.67	21.68	20.70	19.71
56466	.1990	#8	5.055	3"	1-3/4"	22.77	21.78	20.79	19.80
56471	.2010	#7	5.105	3"	1-3/4"	23.37	22.35	21.34	20.32
56476	.2031	13/64"	5.159	3"	1-3/4"	23.52	22.50	21.47	20.45
56481	.2040	#6	5.182	3"	1-3/4"	23.94	22.90	21.86	20.82
56486	.2055	#5	5.220	3"	1-3/4"	24.36	23.30	22.24	21.18
56491	.2090	#4	5.309	3"	1-3/4"	24.75	23.67	22.60	21.52
56496	.2130	#3	5.410	3"	1-3/4"	25.10	24.01	22.92	21.83
56501	.2165		5.500	76	44	25.27	24.17	23.07	21.97
56506	.2188	7/32"	5.558	3"	1-3/4"	25.42	24.31	23.21	22.10
56511	.2210	#2	5.613	3"	1-3/4"	25.94	24.82	23.69	22.56
56516	.2280	#1	5.791	3"	1-3/4"	26.11	24.97	23.84	22.70
56521	.2340	A	5.944	3-1/4"	2"	26.47	25.32	24.17	23.02
56526	.2344	15/64"	5.954	3-1/4"	2"	26.55	25.40	24.24	23.09
56531	.2362		6.000	82	50	26.63	25.48	24.32	23.16
56536	.2380	B	6.045	3-1/4"	2"	26.71	25.55	24.39	23.23
56541	.2420	C	6.147	3-1/4"	2"	26.89	25.72	24.55	23.38
56546	.2460	D	6.248	3-1/4"	2"	27.07	25.89	24.72	23.54
56551	.2500	1/4" / E	6.350	3-1/4"	2"	27.22	26.04	24.85	23.67
56556	.2559		6.500	82	50	30.65	29.32	27.98	26.65
56561	.2570	F	6.528	3-1/4"	2"	31.18	29.82	28.47	27.11
56566	.2610	G	6.629	3-1/2"	2-1/8"	31.65	30.27	28.90	27.52
56571	.2656	17/64"	6.746	3-1/2"	2-1/8"	32.18	30.78	29.38	27.98
56576	.2660	H	6.756	3-1/2"	2-1/8"	32.91	31.48	30.05	28.62
56581	.2720	I	6.909	3-1/2"	2-1/8"	33.22	31.78	30.33	28.89
56586	.2756		7.000	88	54	33.43	31.98	30.52	29.07
56591	.2770	J	7.036	3-1/2"	2-1/8"	33.67	32.21	30.74	29.28
56596	.2810	K	7.137	3-1/2"	2-1/8"	33.93	32.45	30.98	29.50
56601	.2812	9/32"	7.142	3-1/2"	2-1/8"	34.06	32.58	31.10	29.62
56606	.2900	L	7.366	3-1/2"	2-1/8"	35.10	33.57	32.05	30.52
56611	.2950	M	7.493	3-3/4"	2-3/8"	37.11	35.50	33.88	32.27
56616	.2953		7.500	95	60	37.11	35.50	33.88	32.27
56621	.2969	19/64"	7.541	3-3/4"	2-3/8"	37.11	35.50	33.88	32.27
56626	.3020	N	7.671	3-3/4"	2-3/8"	38.95	37.26	35.56	33.87
56631	.3125	5/16"	7.938	3-3/4"	2-3/8"	39.09	37.39	35.69	33.99
56636	.3150		8.000	95	60	41.46	39.66	37.85	36.05
56641	.3160	O	8.026	3-3/4"	2-3/8"	41.46	39.66	37.85	36.05
56646	.3230	P	8.204	3-3/4"	2-3/8"	41.46	39.66	37.85	36.05
56651	.3281	21/64"	8.334	4"	2-1/2"	41.98	40.15	38.33	36.50
56656	.3320	Q	8.433	4"	2-1/2"	42.83	40.96	39.10	37.24
56661	.3346		8.500	101	63	43.13	41.25	39.38	37.50

EDP#	d^+ Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
56666	.3390	R	8.611	4"	2-1/2"	44.31	42.38	40.46	38.53
56671	.3438	11/32"	8.733	4"	2-1/2"	45.86	43.87	41.87	39.88
56676	.3480	S	8.839	4"	2-1/2"	47.68	45.61	43.53	41.46
56681	.3543		9.000	101	63	47.94	45.86	43.77	41.69
56686	.3580	T	9.093	4-1/4"	2-3/4"	49.84	47.67	45.51	43.34
56691	.3594	23/64"	9.129	4-1/4"	2-3/4"	50.15	47.97	45.79	43.61
56696	.3680	U	9.347	4-1/4"	2-3/4"	55.64	53.22	50.80	48.38
56701	.3740		9.500	107	70	56.04	53.60	51.17	48.73
56706	.3750	3/8"	9.525	4-1/4"	2-3/4"	56.42	53.97	51.51	49.06
56711	.3770	V	9.576	4-1/4"	2-3/4"	57.80	55.29	52.77	50.26
56716	.3860	W	9.804	4-1/2"	2-7/8"	58.82	56.27	53.71	51.15
56721	.3906	25/64"	9.921	4-1/2"	2-7/8"	59.54	56.95	54.36	51.77
56726	.3937		10.000	114	73	61.33	58.66	56.00	53.33
56731	.3970	X	10.084	4-1/2"	2-7/8"	62.82	60.09	57.36	54.63
56736	.4040	Y	10.262	4-1/2"	2-7/8"	63.25	60.50	57.75	55.00
56741	.4062	13/32"	10.317	4-1/2"	2-7/8"	65.18	62.35	59.51	56.68
56746	.4130	Z	10.490	4-1/2"	2-7/8"	65.78	62.92	60.06	57.20
56751	.4134		10.500	114	73	65.78	62.92	60.06	57.20
56756	.4219	27/64"	10.716	4-1/2"	2-7/8"	66.39	63.50	60.62	57.73
56761	.4331		11.000	114	73	71.22	68.12	65.03	61.93
56766	.4375	7/16"	11.113	4-1/2"	2-7/8"	71.22	68.12	65.03	61.93
56771	.4528		11.500	120	76	76.42	73.10	69.77	66.45
56776	.4531	29/64"	11.509	4-3/4"	3"	76.42	73.10	69.77	66.45
56781	.4688	15/32"	11.908	4-3/4"	3"	80.25	76.76	73.27	69.78
56786	.4724		12.000	120	76	80.49	76.99	73.49	69.99
56791	.4844	31/64"	12.304	4-3/4"	3"	80.49	76.99	73.49	69.99
56796	.4921		12.500	120	76	82.36	78.78	75.20	71.62
56801	.5000	1/2"	12.700	4-3/4"	3"	82.36	78.78	75.20	71.62



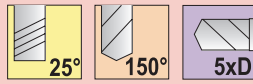
Reamer Manufacturing

1100 - 3 Flute

Technical information: page 250-253

TOLERANCES		
d	+0.000" -0.005" (+0.000 -0.127mm)	
l_1	≤ 1/8"	+0.125" -0.062" (+3.175 -1.588mm)
	> 1/8"	+0.125" -0.125" (+3.175 -3.175mm)
l_2	≤ 1/8"	+0.125" -0.062" (+3.175 -1.588mm)
	> 1/8"	+0.125" -0.125" (+3.175 -3.175mm)

.1094" - .2165"
(2.779mm - 5.500mm)

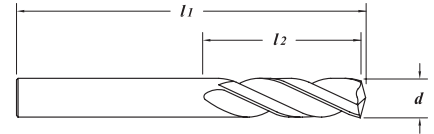


DRILLS

- Solid submicron grain carbide drill
- Near reamer finishes
- Tighter tolerance holes
- Improved roundness and straightness

Recommended for cast iron and materials with high silicon content

Live tooling recommended on lathe processes



EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
90275	.1094	7/64"	2.779	2-1/4"	1-1/4"	12.64	12.09	11.54	10.99
90280	.1100	#35	2.794	2-1/4"	1-1/4"	12.77	12.21	11.66	11.10
90285	.1110	#34	2.819	2-1/4"	1-1/4"	12.94	12.38	11.81	11.25
90290	.1130	#33	2.870	2-1/4"	1-1/4"	13.14	12.57	12.00	11.43
90295	.1160	#32	2.946	2-1/4"	1-1/4"	13.32	12.74	12.16	11.58
90300	.1181		3.000	57	32	13.42	12.84	12.25	11.67
90305	.1200	#31	3.048	2-1/4"	1-1/4"	13.51	12.93	12.34	11.75
90310	.1250	1/8"	3.175	2-1/4"	1-1/4"	13.70	13.10	12.51	11.91
90315	.1285	#30	3.264	2-1/4"	1-1/4"	14.03	13.42	12.81	12.20
90320	.1360	#29	3.454	2-1/2"	1-3/8"	14.47	13.84	13.21	12.58
90325	.1378		3.500	63	35	14.93	14.28	13.63	12.98
90330	.1405	#28	3.569	2-1/2"	1-3/8"	15.10	14.44	13.79	13.13
90335	.1406	9/64"	3.571	2-1/2"	1-3/8"	15.27	14.61	13.94	13.28
90340	.1440	#27	3.658	2-1/2"	1-3/8"	15.88	15.19	14.50	13.81
90345	.1470	#26	3.734	2-1/2"	1-3/8"	16.10	15.40	14.70	14.00
90350	.1495	#25	3.797	2-1/2"	1-3/8"	16.24	15.53	14.83	14.12
90355	.1520	#24	3.861	2-1/2"	1-3/8"	16.27	15.57	14.86	14.15
90360	.1540	#23	3.912	2-1/2"	1-3/8"	16.42	15.71	14.99	14.28
90365	.1562	5/32"	3.967	2-1/2"	1-3/8"	16.49	15.77	15.06	14.34
90370	.1570	#22	3.988	2-1/2"	1-3/8"	17.54	16.78	16.01	15.25
90375	.1575		4.000	63	35	17.54	16.78	16.01	15.25
90380	.1590	#21	4.039	2-1/2"	1-3/8"	17.95	17.17	16.39	15.61
90385	.1610	#20	4.089	2-1/2"	1-3/8"	17.95	17.17	16.39	15.61
90390	.1660	#19	4.216	2-3/4"	1-5/8"	18.10	17.31	16.53	15.74
90395	.1695	#18	4.305	2-3/4"	1-5/8"	18.22	17.42	16.63	15.84
90400	.1719	11/64"	4.366	2-3/4"	1-5/8"	18.33	17.53	16.74	15.94
90405	.1730	#17	4.394	2-3/4"	1-5/8"	19.18	18.35	17.51	16.68
90410	.1770	#16	4.496	2-3/4"	1-5/8"	19.38	18.54	17.69	16.85
90415	.1772		4.500	70	41	19.48	18.63	17.79	16.94
90420	.1800	#15	4.572	2-3/4"	1-5/8"	19.57	18.72	17.87	17.02
90425	.1820	#14	4.623	2-3/4"	1-5/8"	20.01	19.14	18.27	17.40
90430	.1850	#13	4.700	2-3/4"	1-5/8"	20.13	19.25	18.38	17.50
90435	.1875	3/16"	4.763	2-3/4"	1-5/8"	20.13	19.25	18.38	17.50
90440	.1890	#12	4.801	2-3/4"	1-5/8"	20.27	19.39	18.51	17.63
90445	.1910	#11	4.851	2-3/4"	1-5/8"	20.50	19.61	18.72	17.83
90450	.1935	#10	4.915	2-3/4"	1-5/8"	21.46	20.53	19.59	18.66
90455	.1960	#9	4.978	3"	1-3/4"	21.99	21.03	20.08	19.12
90460	.1969		5.000	76	44	22.13	21.16	20.20	19.24
90465	.1990	#8	5.055	3"	1-3/4"	22.29	21.32	20.35	19.38
90470	.2010	#7	5.105	3"	1-3/4"	22.95	21.96	20.96	19.96
90475	.2031	13/64"	5.159	3"	1-3/4"	23.82	22.78	21.75	20.71
90480	.2040	#6	5.182	3"	1-3/4"	23.97	22.92	21.88	20.84
90485	.2055	#5	5.220	3"	1-3/4"	24.07	23.02	21.98	20.93
90490	.2090	#4	5.309	3"	1-3/4"	24.48	23.42	22.35	21.29
90495	.2130	#3	5.410	3"	1-3/4"	24.90	23.82	22.73	21.65
90500	.2165		5.500	76	44	25.10	24.01	22.92	21.83

1100 - 3 Flute (continued)

.2188" - .5000"
(5.558mm - 12.700mm)

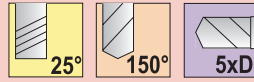
DRILLS

EDP#	<i>d</i> [†] Diameter		<i>l</i> ₁ Overall Length	<i>l</i> ₂ Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
90505	.2188	7/32"	5.558	3"	1-3/4"	25.31	24.21	23.11	22.01
90510	.2210	#2	5.613	3"	1-3/4"	25.92	24.79	23.67	22.54
90515	.2280	#1	5.791	3"	1-3/4"	26.06	24.93	23.79	22.66
90520	.2340	A	5.944	3-1/4"	2"	26.35	25.20	24.06	22.91
90525	.2344	15/64"	5.954	3-1/4"	2"	26.45	25.30	24.15	23.00
90530	.2362		6.000	82	50	26.53	25.38	24.22	23.07
90535	.2380	B	6.045	3-1/4"	2"	26.63	25.48	24.32	23.16
90540	.2420	C	6.147	3-1/4"	2"	26.82	25.65	24.49	23.32
90545	.2460	D	6.248	3-1/4"	2"	27.01	25.84	24.66	23.49
90550	.2500	1/4" / E	6.350	3-1/4"	2"	27.21	26.03	24.84	23.66
90555	.2559		6.500	82	50	27.88	26.66	25.45	24.24
90560	.2570	F	6.528	3-1/4"	2"	28.46	27.23	25.99	24.75
90565	.2610	G	6.629	3-1/2"	2-1/8"	29.95	28.64	27.34	26.04
90570	.2656	17/64"	6.746	3-1/2"	2-1/8"	30.53	29.21	27.88	26.55
90575	.2660	H	6.756	3-1/2"	2-1/8"	31.41	30.04	28.68	27.31
90580	.2720	I	6.909	3-1/2"	2-1/8"	31.80	30.42	29.03	27.65
90585	.2756		7.000	88	54	32.03	30.64	29.24	27.85
90590	.2770	J	7.036	3-1/2"	2-1/8"	32.30	30.90	29.49	28.09
90595	.2810	K	7.137	3-1/2"	2-1/8"	32.60	31.19	29.77	28.35
90600	.2812	9/32"	7.142	3-1/2"	2-1/8"	33.76	32.30	30.83	29.36
90605	.2900	L	7.366	3-1/2"	2-1/8"	35.02	33.50	31.97	30.45
90610	.2950	M	7.493	3-3/4"	2-3/8"	37.18	35.56	33.95	32.33
90615	.2953		7.500	95	60	37.18	35.56	33.95	32.33
90620	.2969	19/64"	7.541	3-3/4"	2-3/8"	37.18	35.56	33.95	32.33
90625	.3020	N	7.671	3-3/4"	2-3/8"	37.46	35.83	34.20	32.57
90630	.3125	5/16"	7.938	3-3/4"	2-3/8"	37.50	35.87	34.24	32.61
90635	.3150		8.000	95	60	40.24	38.49	36.74	34.99
90640	.3160	O	8.026	3-3/4"	2-3/8"	40.24	38.49	36.74	34.99
90645	.3230	P	8.204	3-3/4"	2-3/8"	40.24	38.49	36.74	34.99
90650	.3281	21/64"	8.334	4"	2-1/2"	42.09	40.26	38.43	36.60
90655	.3320	Q	8.433	4"	2-1/2"	43.09	41.22	39.34	37.47
90660	.3346		8.500	101	63	43.47	41.58	39.69	37.80
90665	.3390	R	8.611	4"	2-1/2"	44.82	42.87	40.92	38.97
90670	.3438	11/32"	8.733	4"	2-1/2"	46.69	44.66	42.63	40.60
90675	.3480	S	8.839	4"	2-1/2"	48.24	46.15	44.05	41.95
90680	.3543		9.000	101	63	48.56	46.45	44.34	42.23
90685	.3580	T	9.093	4-1/4"	2-3/4"	48.96	46.83	44.70	42.57
90690	.3594	23/64"	9.129	4-1/4"	2-3/4"	49.36	47.21	45.07	42.92
90695	.3680	U	9.347	4-1/4"	2-3/4"	52.70	50.41	48.12	45.83
90700	.3740		9.500	107	70	53.60	51.27	48.94	46.61
90705	.3750	3/8"	9.525	4-1/4"	2-3/4"	53.60	51.27	48.94	46.61
90710	.3770	V	9.576	4-1/4"	2-3/4"	55.65	53.23	50.81	48.39
90715	.3860	W	9.804	4-1/2"	2-7/8"	59.25	56.67	54.10	51.52
90720	.3906	25/64"	9.921	4-1/2"	2-7/8"	60.12	57.51	54.89	52.28
90725	.3937		10.000	114	73	62.31	59.60	56.89	54.18
90730	.3970	X	10.084	4-1/2"	2-7/8"	64.16	61.37	58.58	55.79
90735	.4040	Y	10.262	4-1/2"	2-7/8"	64.64	61.83	59.02	56.21
90740	.4062	13/32"	10.317	4-1/2"	2-7/8"	67.00	64.09	61.17	58.26
90745	.4130	Z	10.490	4-1/2"	2-7/8"	67.69	64.75	61.80	58.86
90750	.4134		10.500	114	73	67.69	64.75	61.80	58.86
90755	.4219	27/64"	10.716	4-1/2"	2-7/8"	68.45	65.47	62.50	59.52
90760	.4331		11.000	114	73	74.32	71.09	67.86	64.63
90765	.4375	7/16"	11.113	4-1/2"	2-7/8"	74.32	71.09	67.86	64.63
90770	.4528		11.500	120	76	80.65	77.14	73.64	70.13
90775	.4531	29/64"	11.509	4-3/4"	3"	80.65	77.14	73.64	70.13
90780	.4688	15/32"	11.908	4-3/4"	3"	85.32	81.61	77.90	74.19
90785	.4724		12.000	120	76	85.58	81.86	78.14	74.42
90790	.4844	31/64"	12.304	4-3/4"	3"	85.58	81.86	78.14	74.42
90795	.4921		12.500	120	76	87.84	84.02	80.20	76.38
90800	.5000	1/2"	12.700	4-3/4"	3"	87.84	84.02	80.20	76.38

TOLERANCES

<i>d</i>	+.0000" - .0005" (+.0000 - .0127mm)	
<i>l₁</i>	≤ 1/8"	+ .125" - .062" (+3.175 - 1.588mm)
	> 1/8"	+ .125" - .125" (+3.175 - 3.175mm)
<i>l₂</i>	≤ 1/8"	+ .125" - .062" (+3.175 - 1.588mm)
	> 1/8"	+ .125" - .125" (+3.175 - 3.175mm)

.1094" - .2165"
(2.779mm - 5.500mm)



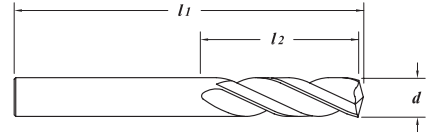
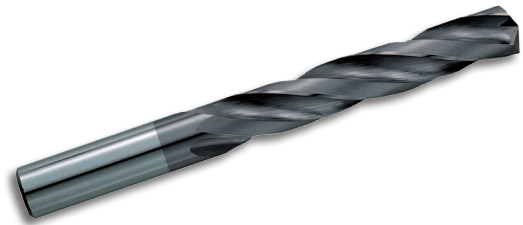
DRILLS

Balinit® HARDLUBE Coated

- Solid submicron grain carbide drill
- Near reamer finishes
- Excellent heat resistance and lubricity
- Up to 40% faster than uncoated
- Tighter tolerance holes
- Improved roundness and straightness

Recommended for cast iron and materials with high silicon content

Live tooling recommended on lathe processes



EDP#	<i>d</i> † Diameter		<i>l₁</i> Overall Length	<i>l₂</i> Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
90276	.1094	7/64"	2.779	2-1/4"	1-1/4"	14.55	13.92	13.28	12.65
90281	.1100	#35	2.794	2-1/4"	1-1/4"	14.70	14.06	13.42	12.78
90286	.1110	#34	2.819	2-1/4"	1-1/4"	14.85	14.20	13.56	12.91
90291	.1130	#33	2.870	2-1/4"	1-1/4"	15.08	14.42	13.77	13.11
90296	.1160	#32	2.946	2-1/4"	1-1/4"	15.23	14.56	13.90	13.24
90301	.1181		3.000	57	32	15.35	14.69	14.02	13.35
90306	.1200	#31	3.048	2-1/4"	1-1/4"	15.46	14.78	14.11	13.44
90311	.1250	1/8"	3.175	2-1/4"	1-1/4"	15.61	14.93	14.25	13.57
90316	.1285	#30	3.264	2-1/4"	1-1/4"	15.95	15.26	14.56	13.87
90321	.1360	#29	3.454	2-1/2"	1-3/8"	16.41	15.70	14.98	14.27
90326	.1378		3.500	63	35	16.86	16.13	15.39	14.66
90331	.1405	#28	3.569	2-1/2"	1-3/8"	17.04	16.30	15.56	14.82
90336	.1406	9/64"	3.571	2-1/2"	1-3/8"	17.19	16.45	15.70	14.95
90341	.1440	#27	3.658	2-1/2"	1-3/8"	17.81	17.04	16.26	15.49
90346	.1470	#26	3.734	2-1/2"	1-3/8"	18.01	17.23	16.44	15.66
90351	.1495	#25	3.797	2-1/2"	1-3/8"	18.17	17.38	16.59	15.80
90356	.1520	#24	3.861	2-1/2"	1-3/8"	18.19	17.40	16.61	15.82
90361	.1540	#23	3.912	2-1/2"	1-3/8"	18.34	17.55	16.75	15.95
90366	.1562	5/32"	3.967	2-1/2"	1-3/8"	18.42	17.62	16.82	16.02
90371	.1570	#22	3.988	2-1/2"	1-3/8"	19.47	18.62	17.78	16.93
90376	.1575		4.000	63	35	19.47	18.62	17.78	16.93
90381	.1590	#21	4.039	2-1/2"	1-3/8"	19.90	19.03	18.17	17.30
90386	.1610	#20	4.089	2-1/2"	1-3/8"	19.90	19.03	18.17	17.30
90391	.1660	#19	4.216	2-3/4"	1-5/8"	20.02	19.15	18.28	17.41
90396	.1695	#18	4.305	2-3/4"	1-5/8"	20.14	19.26	18.39	17.51
90401	.1719	11/64"	4.366	2-3/4"	1-5/8"	20.25	19.37	18.49	17.61
90406	.1730	#17	4.394	2-3/4"	1-5/8"	21.08	20.16	19.25	18.33
90411	.1770	#16	4.496	2-3/4"	1-5/8"	21.31	20.38	19.46	18.53
90416	.1772		4.500	70	41	21.40	20.47	19.54	18.61
90421	.1800	#15	4.572	2-3/4"	1-5/8"	21.51	20.57	19.64	18.70
90426	.1820	#14	4.623	2-3/4"	1-5/8"	21.94	20.99	20.03	19.08
90431	.1850	#13	4.700	2-3/4"	1-5/8"	22.03	21.08	20.12	19.16
90436	.1875	3/16"	4.763	2-3/4"	1-5/8"	22.03	21.08	20.12	19.16
90441	.1890	#12	4.801	2-3/4"	1-5/8"	23.58	22.55	21.53	20.50
90446	.1910	#11	4.851	2-3/4"	1-5/8"	23.79	22.76	21.72	20.69
90451	.1935	#10	4.915	2-3/4"	1-5/8"	24.77	23.69	22.62	21.54
90456	.1960	#9	4.978	3"	1-3/4"	25.30	24.20	23.10	22.00
90461	.1969		5.000	76	44	25.42	24.31	23.21	22.10
90466	.1990	#8	5.055	3"	1-3/4"	25.58	24.46	23.35	22.24
90471	.2010	#7	5.105	3"	1-3/4"	26.25	25.11	23.97	22.83
90476	.2031	13/64"	5.159	3"	1-3/4"	27.12	25.94	24.76	23.58
90481	.2040	#6	5.182	3"	1-3/4"	27.27	26.08	24.90	23.71
90486	.2055	#5	5.220	3"	1-3/4"	27.38	26.19	25.00	23.81
90491	.2090	#4	5.309	3"	1-3/4"	27.80	26.59	25.38	24.17
90496	.2130	#3	5.410	3"	1-3/4"	28.22	26.99	25.77	24.54
90501	.2165		5.500	76	44	28.41	27.17	25.94	24.70

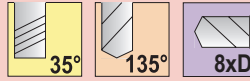
1100H - 3 Flute (continued)

.2188" - .5000"
(5.558mm - 12.700mm)

DRILLS

EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
90506	.2188	7/32"	5.558	3"	1-3/4"	28.60	27.36	26.11	24.87
90511	.2210	#2	5.613	3"	1-3/4"	29.21	27.94	26.67	25.40
90516	.2280	#1	5.791	3"	1-3/4"	29.35	28.07	26.80	25.52
90521	.2340	A	5.944	3-1/4"	2"	29.76	28.47	27.17	25.88
90526	.2344	15/64"	5.954	3-1/4"	2"	29.85	28.56	27.26	25.96
90531	.2362		6.000	82	50	29.95	28.64	27.34	26.04
90536	.2380	B	6.045	3-1/4"	2"	30.05	28.74	27.44	26.13
90541	.2420	C	6.147	3-1/4"	2"	30.23	28.92	27.60	26.29
90546	.2460	D	6.248	3-1/4"	2"	30.44	29.12	27.79	26.47
90551	.2500	1/4" / E	6.350	3-1/4"	2"	30.61	29.28	27.95	26.62
90556	.2559		6.500	82	50	34.14	32.66	31.17	29.69
90561	.2570	F	6.528	3-1/4"	2"	34.71	33.20	31.69	30.18
90566	.2610	G	6.629	3-1/2"	2-1/8"	36.20	34.63	33.05	31.48
90571	.2656	17/64"	6.746	3-1/2"	2-1/8"	36.79	35.19	33.59	31.99
90576	.2660	H	6.756	3-1/2"	2-1/8"	37.66	36.03	34.39	32.75
90581	.2720	I	6.909	3-1/2"	2-1/8"	38.07	36.41	34.76	33.10
90586	.2756		7.000	88	54	38.28	36.62	34.95	33.29
90591	.2770	J	7.036	3-1/2"	2-1/8"	38.58	36.91	35.23	33.55
90596	.2810	K	7.137	3-1/2"	2-1/8"	38.87	37.18	35.49	33.80
90601	.2812	9/32"	7.142	3-1/2"	2-1/8"	40.03	38.29	36.55	34.81
90606	.2900	L	7.366	3-1/2"	2-1/8"	41.29	39.49	37.70	35.90
90611	.2950	M	7.493	3-3/4"	2-3/8"	43.44	41.55	39.66	37.77
90616	.2953		7.500	95	60	43.44	41.55	39.66	37.77
90621	.2969	19/64"	7.541	3-3/4"	2-3/8"	43.44	41.55	39.66	37.77
90626	.3020	N	7.671	3-3/4"	2-3/8"	43.72	41.82	39.92	38.02
90631	.3125	5/16"	7.938	3-3/4"	2-3/8"	43.76	41.86	39.95	38.05
90636	.3150		8.000	95	60	46.49	44.47	42.45	40.43
90641	.3160	O	8.026	3-3/4"	2-3/8"	46.49	44.47	42.45	40.43
90646	.3230	P	8.204	3-3/4"	2-3/8"	46.49	44.47	42.45	40.43
90651	.3281	21/64"	8.334	4"	2-1/2"	48.37	46.27	44.16	42.06
90656	.3320	Q	8.433	4"	2-1/2"	49.36	47.21	45.07	42.92
90661	.3346		8.500	101	63	49.74	47.58	45.41	43.25
90666	.3390	R	8.611	4"	2-1/2"	51.11	48.88	46.66	44.44
90671	.3438	11/32"	8.733	4"	2-1/2"	52.93	50.63	48.33	46.03
90676	.3480	S	8.839	4"	2-1/2"	56.19	53.75	51.30	48.86
90681	.3543		9.000	101	63	56.51	54.05	51.60	49.14
90686	.3580	T	9.093	4-1/4"	2-3/4"	58.48	55.94	53.39	50.85
90691	.3594	23/64"	9.129	4-1/4"	2-3/4"	58.86	56.30	53.74	51.18
90696	.3680	U	9.347	4-1/4"	2-3/4"	62.22	59.51	56.81	54.10
90701	.3740		9.500	107	70	63.12	60.38	57.63	54.89
90706	.3750	3/8"	9.525	4-1/4"	2-3/4"	63.12	60.38	57.63	54.89
90711	.3770	V	9.576	4-1/4"	2-3/4"	65.67	62.81	59.96	57.10
90716	.3860	W	9.804	4-1/2"	2-7/8"	69.26	66.25	63.24	60.23
90721	.3906	25/64"	9.921	4-1/2"	2-7/8"	70.13	67.08	64.03	60.98
90726	.3937		10.000	114	73	72.30	69.16	66.01	62.87
90731	.3970	X	10.084	4-1/2"	2-7/8"	74.16	70.94	67.71	64.49
90736	.4040	Y	10.262	4-1/2"	2-7/8"	74.66	71.41	68.17	64.92
90741	.4062	13/32"	10.317	4-1/2"	2-7/8"	77.00	73.66	70.31	66.96
90746	.4130	Z	10.490	4-1/2"	2-7/8"	77.68	74.31	70.93	67.55
90751	.4134		10.500	114	73	77.68	74.31	70.93	67.55
90756	.4219	27/64"	10.716	4-1/2"	2-7/8"	78.46	75.05	71.64	68.23
90761	.4331		11.000	114	73	84.32	80.65	76.99	73.32
90766	.4375	7/16"	11.113	4-1/2"	2-7/8"	84.32	80.65	76.99	73.32
90771	.4528		11.500	120	76	90.65	86.71	82.77	78.83
90776	.4531	29/64"	11.509	4-3/4"	3"	90.65	86.71	82.77	78.83
90781	.4688	15/32"	11.908	4-3/4"	3"	95.32	91.18	87.03	82.89
90786	.4724		12.000	120	76	95.58	91.42	87.27	83.11
90791	.4844	31/64"	12.304	4-3/4"	3"	95.58	91.42	87.27	83.11
90796	.4921		12.500	120	76	97.87	93.61	89.36	85.10
90801	.5000	1/2"	12.700	4-3/4"	3"	97.87	93.61	89.36	85.10

TOLERANCES	
d	+0.000" -0.005" (+0.000 -0.127mm)
l_1	+0.125" -0.125" (+3.175 -3.175mm)
l_2	+0.125" -0.125" (+3.175 -3.175mm)



.1875" - .3230"
(4.763mm - 8.204mm)

DRILLS

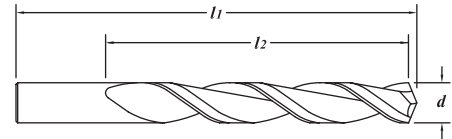
Parabolic - Balinit® HARDLUBE Coated

Solid submicron grain carbide drill
Wide open flutes and high helix remove chips quickly

Recommended for deep holes in soft, non-ferrous materials (aluminum, brass and bronze)

4-facet point

Live tooling recommended on lathe processes



EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
22436	.1875	3/16"	4.763	3-13/16"	2-5/16"	23.69	22.66	21.63	20.60
22441	.1890	#12	4.801	3-13/16"	2-5/16"	24.23	23.18	22.12	21.07
22446	.1910	#11	4.851	3-13/16"	2-5/16"	24.78	23.71	22.63	21.55
22451	.1935	#10	4.915	3-15/16"	2-7/16"	25.33	24.23	23.13	22.03
22456	.1960	#9	4.978	3-15/16"	2-7/16"	25.90	24.77	23.65	22.52
22461	.1969		5.000	100	62	26.45	25.30	24.15	23.00
22466	.1990	#8	5.055	3-15/16"	2-7/16"	26.90	25.73	24.56	23.39
22471	.2010	#7	5.105	3-15/16"	2-7/16"	27.38	26.19	25.00	23.81
22476	.2031	13/64"	5.159	3-15/16"	2-7/16"	27.83	26.62	25.41	24.20
22481	.2040	#6	5.182	3-15/16"	2-7/16"	28.28	27.05	25.82	24.59
22486	.2055	#5	5.220	4"	2-1/2"	28.75	27.50	26.25	25.00
22491	.2090	#4	5.309	4"	2-1/2"	29.20	27.93	26.66	25.39
22496	.2130	#3	5.410	4"	2-1/2"	29.65	28.36	27.07	25.78
22501	.2165		5.499	102	64	30.13	28.82	27.51	26.20
22506	.2188	7/32"	5.558	4"	2-1/2"	30.58	29.25	27.92	26.59
22511	.2210	#2	5.613	4"	2-1/2"	31.03	29.68	28.33	26.98
22516	.2280	#1	5.791	4-1/8"	2-5/8"	31.50	30.13	28.76	27.39
22521	.2340	A	5.944	4-1/8"	2-5/8"	31.95	30.56	29.17	27.78
22526	.2344	15/64"	5.954	4-1/8"	2-5/8"	32.41	31.00	29.59	28.18
22531	.2362		6.000	105	67	32.94	31.50	30.07	28.64
22536	.2380	B	6.045	4-1/8"	2-5/8"	33.10	31.66	30.22	28.78
22541	.2420	C	6.147	4-1/4"	2-3/4"	33.29	31.85	30.40	28.95
22546	.2460	D	6.248	4-1/4"	2-3/4"	33.44	31.99	30.53	29.08
22551	.2500	1/4" / E	6.350	4-1/4"	2-3/4"	33.61	32.15	30.69	29.23
22556	.2559		6.500	108	70	34.73	33.22	31.71	30.20
22561	.2570	F	6.528	4-3/8"	2-7/8"	36.20	34.63	33.05	31.48
22566	.2610	G	6.629	4-3/8"	2-7/8"	37.18	35.56	33.95	32.33
22571	.2656	17/64"	6.746	4-3/8"	2-7/8"	38.26	36.60	34.93	33.27
22576	.2660	H	6.756	4-3/8"	2-7/8"	39.51	37.80	36.08	34.36
22581	.2720	I	6.909	4-3/8"	2-7/8"	40.70	38.93	37.16	35.39
22586	.2756		7.000	111	73	41.93	40.11	38.28	36.46
22591	.2770	J	7.036	4-3/8"	2-7/8"	42.85	40.99	39.12	37.26
22596	.2810	K	7.137	4-7/16"	2-15/16"	43.76	41.86	39.95	38.05
22601	.2812	9/32"	7.142	4-7/16"	2-15/16"	44.72	42.78	40.83	38.89
22606	.2900	L	7.366	4-7/16"	2-15/16"	45.69	43.70	41.72	39.73
22611	.2950	M	7.493	4-7/16"	2-15/16"	46.62	44.59	42.57	40.54
22616	.2953		7.500	116	78	47.53	45.46	43.40	41.33
22621	.2969	19/64"	7.541	4-9/16"	3-1/16"	47.63	45.56	43.49	41.42
22626	.3020	N	7.671	4-9/16"	3-1/16"	47.73	45.65	43.58	41.50
22631	.3125	5/16"	7.938	4-11/16"	3-3/16"	47.77	45.69	43.62	41.54
22636	.3150		8.000	119	81	50.51	48.31	46.12	43.92
22641	.3160	O	8.026	4-11/16"	3-3/16"	51.66	49.41	47.17	44.92
22646	.3230	P	8.204	4-11/16"	3-3/16"	52.82	50.52	48.23	45.93

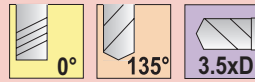
1800H - 2 Flute (continued)

.3281" - .6299"
(8.334mm - 16.000mm)

DRILLS

EDP#	d^+ Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
22651	.3281	21/64"	8.334	4-11/16"	3-3/16"	53.97	51.62	49.28	46.93
22656	.3320	Q	8.433	4-15/16"	3-7/16"	55.17	52.77	50.37	47.97
22661	.3346		8.500	125	87	56.32	53.87	51.42	48.97
22666	.3390	R	8.611	4-15/16"	3-7/16"	58.09	55.56	53.04	50.51
22671	.3438	11/32"	8.733	4-15/16"	3-7/16"	59.81	57.21	54.61	52.01
22676	.3480	S	8.839	5"	3-1/2"	61.62	58.94	56.26	53.58
22681	.3543		9.000	127	89	63.39	60.63	57.88	55.12
22686	.3580	T	9.093	5"	3-1/2"	63.65	60.89	58.12	55.35
22691	.3594	23/64"	9.129	5"	3-1/2"	63.92	61.14	58.36	55.58
22696	.3680	U	9.347	5"	3-1/2"	64.16	61.37	58.58	55.79
22701	.3740		9.500	130	92	64.41	61.61	58.81	56.01
22706	.3750	3/8"	9.525	5-1/8"	3-5/8"	64.70	61.89	59.07	56.26
22711	.3770	V	9.576	5-1/8"	3-5/8"	66.84	63.93	61.03	58.12
22716	.3860	W	9.804	5-1/8"	3-5/8"	68.97	65.97	62.97	59.97
22721	.3906	25/64"	9.921	5-1/4"	3-3/4"	71.15	68.06	64.96	61.87
22726	.3937		10.000	133	95	73.27	70.08	66.90	63.71
22731	.3970	X	10.084	5-1/4"	3-3/4"	76.03	72.72	69.42	66.11
22736	.4040	Y	10.262	5-3/8"	3-7/8"	78.76	75.34	71.91	68.49
22741	.4062	13/32"	10.317	5-3/8"	3-7/8"	81.57	78.02	74.48	70.93
22746	.4130	Z	10.490	5-3/8"	3-7/8"	85.95	82.21	78.48	74.74
22751	.4134		10.500	137	98	85.95	82.21	78.48	74.74
22756	.4219	27/64"	10.716	5-7/16"	3-15/16"	89.86	85.95	82.05	78.14
22761	.4331		11.000	138	100	92.64	88.62	84.59	80.56
22766	.4375	7/16"	11.113	5-7/16"	3-15/16"	92.64	88.62	84.59	80.56
22771	.4528		11.500	141	103	93.96	89.87	85.79	81.70
22776	.4531	29/64"	11.509	5-9/16"	4-5/16"	93.96	89.87	85.79	81.70
22781	.4688	15/32"	11.908	5-9/16"	4-5/16"	95.24	91.10	86.96	82.82
22786	.4724		12.000	141	110	96.57	92.37	88.17	83.97
22791	.4844	31/64"	12.304	5-9/16"	4-5/16"	96.57	92.37	88.17	83.97
22796	.4921		12.500	152	114	98.82	94.52	90.23	85.93
22801	.5000	1/2"	12.700	6"	4-1/2"	98.82	94.52	90.23	85.93
22806	.5118		13.000	152	114	117.71	112.60	107.48	102.36
22811	.5156	33/64"	13.096	6"	4-1/2"	124.91	119.48	114.05	108.62
22816	.5312	17/32"	13.492	6-1/8"	4-5/8"	132.10	126.36	120.61	114.87
22821	.5315		13.500	156	117	132.10	126.36	120.61	114.87
22826	.5469	35/64"	13.891	6-1/8"	4-5/8"	139.31	133.25	127.20	121.14
22831	.5512		14.000	156	117	146.45	140.09	133.72	127.35
22836	.5625	9/16"	14.287	6-1/4"	4-3/4"	156.92	150.10	143.27	136.45
22841	.5709		14.500	159	121	162.06	155.01	147.97	140.92
22846	.5781	37/64"	14.684	6-1/4"	4-3/4"	162.91	155.83	148.74	141.66
22851	.5906		15.000	162	124	167.13	159.86	152.60	145.33
22856	.5938	19/32"	15.082	6-3/8"	4-7/8"	167.13	159.86	152.60	145.33
22861	.6094	39/64"	15.478	6-7/16"	4-15/16"	169.02	161.67	154.32	146.97
22866	.6102		15.500	164	125	169.02	161.67	154.32	146.97
22871	.6250	5/8"	15.875	6-9/16"	5-1/16"	170.89	163.46	156.03	148.60
22876	.6299		16.000	167	129	174.56	166.97	159.38	151.79

TOLERANCES	
<i>d</i>	+0.000" -0.005" (+0.000 -0.127mm)
<i>l₁</i>	≤ 1/8" +.125" -0.062" (+3.175 -1.588mm)
	> 1/8" +.125" -0.125" (+3.175 -3.175mm)
<i>l₂</i>	≤ 1/8" +.125" -0.062" (+3.175 -1.588mm)
	> 1/8" +.125" -0.125" (+3.175 -3.175mm)

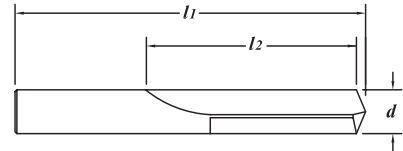
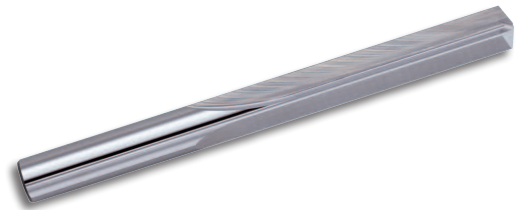


Double Margin

Solid submicron grain carbide drill
 Strong core geometry with double margins for chip breakage and clearance
 'G' style flutes
 4-facet point

Recommended for fast drilling in aircraft alloys, cast aluminum and high silicon content materials

Live tooling recommended on lathe processes



EDP#	<i>d</i> [†]		<i>l₁</i> Overall Length	<i>l₂</i> Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Diameter							Metric
57460	.1250	1/8"	3.175	3-1/4"	1-1/4"	17.18	16.43	15.69	14.94
57470	.1575		4.000	86	35	19.61	18.76	17.90	17.05
57480	.1875	3/16"	4.762	3-5/8"	1-5/8"	22.32	21.35	20.38	19.41
57490	.1969		5.000	95	44	24.06	23.01	21.97	20.92
57500	.2362		6.000	101	51	27.62	26.42	25.22	24.02
57510	.2500	1/4"	6.350	4"	2"	28.31	27.08	25.85	24.62
57520	.3125	5/16"	7.937	4-3/8"	2-3/8"	43.19	41.32	39.44	37.56
57530	.3150		8.000	111	60	45.92	43.92	41.93	39.93
57540	.3750	3/8"	9.525	4-3/4"	2-3/4"	56.80	54.33	51.86	49.39
57550	.3937		10.000	124	73	65.58	62.73	59.88	57.03
57560	.4375	7/16"	11.113	5-1/8"	3-1/8"	78.82	75.39	71.97	68.54
57570	.4724		12.000	136	86	88.87	85.01	81.14	77.28
57580	.5000	1/2"	12.700	5-1/2"	3-1/2"	91.14	87.18	83.21	79.25
57590	.5512		14.000	150	100	123.51	118.14	112.77	107.40
57600	.5625	9/16"	14.287	6"	4"	134.00	128.17	122.35	116.52
57610	.5906		15.000	157	106	156.30	149.50	142.71	135.91
57620	.6250	5/8"	15.875	6-3/8"	4-3/8"	160.05	153.09	146.13	139.17
57630	.6299		16.000	164	113	163.73	156.61	149.49	142.37

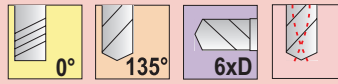


TOLERANCES

<i>d</i>	+.0000" - .0005" (+.0000 - .0127mm)	
<i>l1</i>	≤ 1/8"	+ .125" - .062" (+3.175 - 1.588mm)
	> 1/8"	+ .125" - .125" (+3.175 - 3.175mm)
<i>l2</i>	≤ 1/8"	+ .125" - .062" (+3.175 - 1.588mm)
	> 1/8"	+ .125" - .125" (+3.175 - 3.175mm)

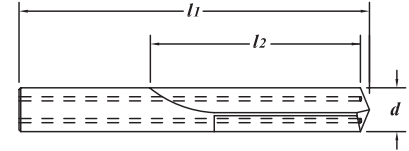
Technical information: page 250-253

1700K - 2 Flute



Double Margin

- Solid submicron grain carbide drill
- Coolant fed for accelerated feed rates and chip clearance
- Strong core geometry with double margins for chip breakage and clearance
- 'G' style flutes
- 4-facet point
- Recommended for fast drilling in aircraft alloys, cast aluminum and high silicon content materials
- Live tooling recommended on lathe processes



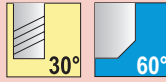
EDP#	<i>d</i> [†] Diameter		<i>l1</i> Overall Length	<i>l2</i> Flute Length	1-11	12-24	25-49	50-100
	Decimal	Metric						
57710	.2362	6.000	110	59	51.52	49.28	47.04	44.80
57720	.2500	1/4"	6.350	4-1/2"	56.71	54.24	51.78	49.31
57730	.3125	5/16"	7.937	5"	67.07	64.15	61.24	58.32
57740	.3150		8.000	129	69.79	66.76	63.72	60.69
57750	.3750	3/8"	9.525	5-1/2"	86.79	83.02	79.24	75.47
57760	.3937		10.000	144	94.13	90.04	85.94	81.85
57770	.4375	7/16"	11.113	6"	110.92	106.10	101.27	96.45
57780	.4724		12.000	160	180.00	172.17	164.35	156.52
57790	.5000	1/2"	12.700	6-1/2"	190.41	182.13	173.85	165.57
57800	.5512		14.000	179	236.49	226.20	215.92	205.64
57810	.5625	9/16"	14.287	7-1/8"	261.48	250.11	238.74	227.37
57820	.5906		15.000	187	264.53	253.03	241.53	230.03
57830	.6250	5/8"	15.875	7-5/8"	286.79	274.32	261.85	249.38
57840	.6299		16.000	195	290.48	277.85	265.22	252.59

DRILLS



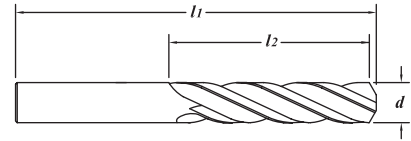
TOLERANCES

<i>d</i>	+0.000" -0.005" (+0.000 -0.127mm)
<i>l1</i>	+0.125" -0.125" (+3.175 -3.175mm)
<i>l2</i>	+0.125" -0.125" (+3.175 -3.175mm)



Core

Solid submicron grain carbide drill
 Cored applications only
 Gets to finish diameter when too much material remains for reamer
 60° lead chamfer allows easy follow through from existing hole
 Live tooling recommended on lathe processes



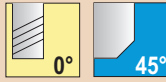
EDP#	<i>d</i> [†] Diameter		<i>l1</i> Overall Length	<i>l2</i> Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
58500	.1875	3/16"	4.763	4"	2-1/2"	21.72	20.78	19.83	18.89
58510	.1969		5.000	102	64	22.29	21.32	20.35	19.38
58520	.2362		6.000	102	64	24.01	22.97	21.92	20.88
58530	.2500	1/4"	6.350	4"	2-1/2"	24.08	23.03	21.99	20.94
58540	.2756		7.000	102	64	29.85	28.56	27.26	25.96
58550	.3125	5/16"	7.938	4"	2-1/2"	32.81	31.38	29.96	28.53
58560	.3150		8.000	102	64	33.06	31.63	30.19	28.75
58570	.3543		9.000	127	89	45.40	43.43	41.45	39.48
58580	.3750	3/8"	9.525	5"	3-1/2"	50.68	48.48	46.27	44.07
58590	.3937		10.000	127	89	58.33	55.79	53.26	50.72
58600	.4331		11.000	127	89	62.95	60.21	57.48	54.74
58610	.4375	7/16"	11.113	5"	3-1/2"	63.63	60.86	58.10	55.33
58620	.4724		12.000	127	89	71.15	68.06	64.96	61.87
58630	.5000	1/2"	12.700	5"	3-1/2"	73.62	70.42	67.22	64.02
58640	.5118		13.000	152	114	91.82	87.82	83.83	79.84
58650	.5512		14.000	152	114	104.14	99.62	95.09	90.56
58660	.5625	9/16"	14.287	6"	4-1/2"	113.56	108.63	103.69	98.75
58670	.5906		15.000	152	114	120.70	115.46	110.21	104.96
58680	.6250	5/8"	15.875	6"	4-1/2"	123.45	118.09	112.72	107.35
58690	.6299		16.000	152	114	126.75	121.24	115.73	110.22



Coating Center



NEW SERIES



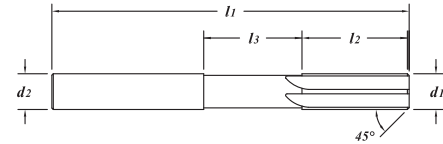
.0590" - .0820"
(1.499mm - 2.083mm)

TOLERANCES

<i>d1</i>	.0590" - .2509" (1.498 - 6.372mm)	+0.002" - .0000" (+0.050 - .0000mm)
	.2510" - .5020" (6.375 - 12.750mm)	+0.003" - .0000" (+0.075 - .0000mm)
<i>d2</i>	.0590" - .2509" (1.498 - 6.372mm)	+0.002" - .0000" (+0.050 - .0000mm)
	.2510" - .5020" (6.375 - 12.750mm)	+0.003" - .0000" (+0.075 - .0000mm)

REAMERS

Solid Carbide Submicron Grain
Straight - RHC Flutes
Standard 45° Lead Chamfer
Neck diameter is .010" ±.002" less than (*d1*) fluted diameter



EDP#	<i>d1</i> † Diameter		<i>d2</i> Shank Diameter	<i>l1</i> Overall Length	<i>l2</i> Flute Length	<i>l3</i> Neck Length	Number Flutes	1-11	12-24	25-49	50-100
	Decimal	Metric									
95066	.0590	1.499	.0590"	1-1/2"	3/8"	.250"	4	13.56	12.97	12.38	11.79
95069	.0591	1.500	.0591"	1-1/2"	3/8"	.250"	4	13.56	12.97	12.38	11.79
95072	.0595	#53 1.511	.0595"	1-1/2"	3/8"	.250"	4	13.56	12.97	12.38	11.79
95075	.0600	1.524	.0600"	1-1/2"	3/8"	.250"	4	13.56	12.97	12.38	11.79
95078	.0605	1.537	.0605"	1-1/2"	3/8"	.250"	4	13.56	12.97	12.38	11.79
95081	.0610	1.549	.0610"	1-1/2"	3/8"	.250"	4	13.56	12.97	12.38	11.79
95084	.0615	1.562	.0615"	1-1/2"	3/8"	.250"	4	13.56	12.97	12.38	11.79
95087	.0620	1.575	.0620"	1-1/2"	3/8"	.250"	4	13.56	12.97	12.38	11.79
95090	.0625	1/16" 1.588	.0625"	1-1/2"	3/8"	.250"	4	13.56	12.97	12.38	11.79
95093	.0630	1.600	.0630"	1-1/2"	3/8"	.250"	4	13.56	12.97	12.38	11.79
95096	.0635	#52 1.613	.0635"	1-1/2"	3/8"	.250"	4	13.56	12.97	12.38	11.79
95099	.0640	1.626	.0640"	1-1/2"	3/8"	.250"	4	13.56	12.97	12.38	11.79
95102	.0645	1.638	.0645"	1-1/2"	3/8"	.250"	4	13.56	12.97	12.38	11.79
95105	.0650	1.651	.0650"	1-1/2"	3/8"	.250"	4	13.56	12.97	12.38	11.79
95108	.0660	1.676	.0660"	1-3/4"	1/2"	.250"	4	13.56	12.97	12.38	11.79
95111	.0670	#51 1.702	.0670"	1-3/4"	1/2"	.250"	4	13.56	12.97	12.38	11.79
95114	.0680	1.727	.0680"	1-3/4"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95117	.0690	1.753	.0690"	1-3/4"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95120	.0700	#50 1.778	.0700"	1-3/4"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95123	.0710	1.803	.0710"	1-3/4"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95126	.0720	1.829	.0720"	1-3/4"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95129	.0730	#49 1.854	.0730"	1-3/4"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95132	.0740	1.880	.0740"	1-3/4"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95135	.0750	1.905	.0750"	1-3/4"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95138	.0760	#48 1.930	.0760"	1-3/4"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95141	.0770	1.956	.0770"	1-3/4"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95144	.0780	1.981	.0780"	1-3/4"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95147	.0781	5/64" 1.984	.0781"	1-3/4"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95150	.0785	#47 1.994	.0785"	1-3/4"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95153	.0787	2.000	.0787"	1-3/4"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95156	.0790	2.007	.0790"	1-3/4"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95159	.0800	2.032	.0800"	1-3/4"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95162	.0810	#46 2.057	.0810"	2"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95165	.0820	#45 2.083	.0820"	2"	1/2"	.375"	4	13.56	12.97	12.38	11.79

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Neck Length	Number Flutes	1-11	12-24	25-49	50-100
	Decimal	Metric									
95168	.0830	2.108	.0830"	2"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95171	.0840	2.134	.0840"	2"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95174	.0850	2.159	.0850"	2"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95177	.0860 #44	2.184	.0860"	2"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95180	.0870	2.210	.0870"	2"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95183	.0880	2.235	.0880"	2"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95186	.0890 #43	2.261	.0890"	2"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95189	.0900	2.286	.0900"	2"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95192	.0910	2.311	.0910"	2"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95195	.0915	2.324	.0915"	2"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95198	.0920	2.337	.0920"	2"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95201	.0925	2.350	.0925"	2"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95204	.0930	2.362	.0930"	2"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95207	.0935 #42	2.375	.0935"	2"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95210	.0938 3/32"	2.383	.0938"	2"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95213	.0940	2.388	.0940"	2"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95216	.0945	2.400	.0945"	2"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95219	.0950	2.413	.0950"	2"	1/2"	.375"	4	13.56	12.97	12.38	11.79
95222	.0960 #41	2.438	.0960"	2-1/4"	5/8"	.375"	4	15.25	14.59	13.92	13.26
95225	.0970	2.464	.0970"	2-1/4"	5/8"	.375"	4	15.25	14.59	13.92	13.26
95228	.0980 #40	2.489	.0980"	2-1/4"	5/8"	.375"	4	15.25	14.59	13.92	13.26
95231	.0984	2.500	.0984"	2-1/4"	5/8"	.375"	4	15.25	14.59	13.92	13.26
95234	.0990	2.515	.0990"	2-1/4"	5/8"	.500"	4	15.25	14.59	13.92	13.26
95237	.0995 #39	2.527	.0995"	2-1/4"	5/8"	.500"	4	15.25	14.59	13.92	13.26
95240	.1000	2.540	.1000"	2-1/4"	5/8"	.500"	4	15.25	14.59	13.92	13.26
95243	.1010	2.565	.1010"	2-1/4"	5/8"	.500"	4	15.25	14.59	13.92	13.26
95246	.1015 #38	2.578	.1015"	2-1/4"	5/8"	.500"	4	15.25	14.59	13.92	13.26
95249	.1020	2.591	.1020"	2-1/4"	5/8"	.500"	4	15.25	14.59	13.92	13.26
95252	.1030	2.616	.1030"	2-1/4"	5/8"	.500"	4	15.25	14.59	13.92	13.26
95255	.1040 #37	2.642	.1040"	2-1/4"	5/8"	.500"	4	15.25	14.59	13.92	13.26
95258	.1050	2.667	.1050"	2-1/4"	5/8"	.500"	4	15.25	14.59	13.92	13.26
95261	.1060	2.692	.1060"	2-1/4"	5/8"	.500"	4	15.25	14.59	13.92	13.26
95264	.1065 #36	2.705	.1065"	2-1/4"	5/8"	.500"	4	15.25	14.59	13.92	13.26
95267	.1070	2.718	.1070"	2-1/4"	5/8"	.500"	4	15.25	14.59	13.92	13.26
95270	.1080	2.743	.1080"	2-1/4"	5/8"	.500"	4	15.25	14.59	13.92	13.26
95273	.1090	2.769	.1090"	2-1/4"	5/8"	.500"	4	15.25	14.59	13.92	13.26
95276	.1094 7/64"	2.779	.1094"	2-1/4"	5/8"	.500"	4	15.25	14.59	13.92	13.26
95279	.1100 #35	2.794	.1100"	2-1/4"	5/8"	.500"	4	15.36	14.70	14.03	13.36
95282	.1110 #34	2.819	.1110"	2-1/4"	5/8"	.500"	4	15.36	14.70	14.03	13.36
95285	.1120	2.845	.1120"	2-1/4"	5/8"	.500"	4	15.36	14.70	14.03	13.36
95288	.1130 #33	2.870	.1130"	2-1/4"	5/8"	.500"	4	15.36	14.70	14.03	13.36
95291	.1140	2.896	.1140"	2-1/4"	5/8"	.500"	4	15.36	14.70	14.03	13.36
95294	.1150	2.921	.1150"	2-1/4"	5/8"	.500"	4	15.36	14.70	14.03	13.36
95297	.1160 #32	2.946	.1160"	2-1/4"	5/8"	.500"	4	15.36	14.70	14.03	13.36
95300	.1170	2.972	.1170"	2-1/4"	5/8"	.500"	4	15.36	14.70	14.03	13.36
95303	.1180	2.997	.1180"	2-1/4"	5/8"	.500"	4	15.36	14.70	14.03	13.36
95306	.1181	3.000	.1181"	2-1/4"	5/8"	.500"	4	15.36	14.70	14.03	13.36
95309	.1190	3.023	.1190"	2-1/4"	5/8"	.500"	4	15.36	14.70	14.03	13.36

continued →

4100 (continued)

.1200" - .1550"
(3.048mm - 3.937mm)

REAMERS

EDP#	$d1$ †		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	$l3$ Neck Length	Number Flutes	1-11	12-24	25-49	50-100	
	Decimal	Diameter Metric										
95312	.1200	#31	3.048	.1200"	2-1/4"	5/8"	.500"	4	15.36	14.70	14.03	13.36
95315	.1210		3.073	.1210"	2-1/4"	5/8"	.500"	4	15.36	14.70	14.03	13.36
95318	.1220		3.099	.1220"	2-1/4"	5/8"	.500"	4	15.36	14.70	14.03	13.36
95321	.1230		3.124	.1230"	2-1/4"	5/8"	.500"	4	15.36	14.70	14.03	13.36
95324	.1235		3.137	.1235"	2-1/4"	5/8"	.500"	4	15.36	14.70	14.03	13.36
95327	.1240		3.150	.1240"	2-1/4"	5/8"	.500"	4	15.36	14.70	14.03	13.36
95330	.1245		3.162	.1245"	2-1/4"	5/8"	.500"	4	15.36	14.70	14.03	13.36
95333	.1248		3.170	.1248"	2-1/4"	5/8"	.500"	4	15.36	14.70	14.03	13.36
95336	.1250	1/8"	3.175	.1250"	2-1/4"	5/8"	.500"	4	15.36	14.70	14.03	13.36
95339	.1255		3.188	.1255"	2-1/4"	5/8"	.500"	4	15.99	15.29	14.60	13.90
95342	.1260		3.200	.1260"	2-1/4"	5/8"	.500"	4	15.99	15.29	14.60	13.90
95345	.1265		3.213	.1265"	2-1/4"	5/8"	.500"	4	15.99	15.29	14.60	13.90
95348	.1270		3.226	.1270"	2-1/4"	5/8"	.500"	4	15.99	15.29	14.60	13.90
95351	.1275		3.239	.1275"	2-1/4"	5/8"	.500"	4	15.99	15.29	14.60	13.90
95354	.1280		3.251	.1280"	2-1/4"	5/8"	.500"	4	15.99	15.29	14.60	13.90
95357	.1285	#30	3.264	.1285"	2-1/4"	5/8"	.500"	4	15.99	15.29	14.60	13.90
95360	.1290		3.277	.1290"	2-1/4"	5/8"	.500"	4	15.99	15.29	14.60	13.90
95363	.1300		3.302	.1300"	2-1/4"	5/8"	.500"	4	15.99	15.29	14.60	13.90
95366	.1310		3.327	.1310"	2-1/2"	3/4"	.500"	4	17.74	16.97	16.20	15.43
95369	.1320		3.353	.1320"	2-1/2"	3/4"	.500"	4	17.74	16.97	16.20	15.43
95372	.1330		3.378	.1330"	2-1/2"	3/4"	.500"	4	17.74	16.97	16.20	15.43
95375	.1340		3.404	.1340"	2-1/2"	3/4"	.500"	4	17.74	16.97	16.20	15.43
95378	.1350		3.429	.1350"	2-1/2"	3/4"	.500"	4	17.74	16.97	16.20	15.43
95381	.1360	#29	3.454	.1360"	2-1/2"	3/4"	.500"	4	17.74	16.97	16.20	15.43
95384	.1370		3.480	.1370"	2-1/2"	3/4"	.500"	4	17.74	16.97	16.20	15.43
95387	.1378		3.500	.1378"	2-1/2"	3/4"	.500"	4	17.74	16.97	16.20	15.43
95390	.1380		3.505	.1380"	2-1/2"	3/4"	.500"	4	17.74	16.97	16.20	15.43
95393	.1390		3.531	.1390"	2-1/2"	3/4"	.500"	4	17.74	16.97	16.20	15.43
95396	.1400		3.556	.1400"	2-1/2"	3/4"	.500"	4	17.74	16.97	16.20	15.43
95399	.1405	#28	3.569	.1405"	2-1/2"	3/4"	.500"	4	17.74	16.97	16.20	15.43
95402	.1406	9/64"	3.571	.1406"	2-1/2"	3/4"	.500"	4	17.74	16.97	16.20	15.43
95405	.1410		3.581	.1410"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70
95408	.1420		3.607	.1420"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70
95411	.1430		3.632	.1430"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70
95414	.1440	#27	3.658	.1440"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70
95417	.1450		3.683	.1450"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70
95420	.1460		3.708	.1460"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70
95423	.1470	#26	3.734	.1470"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70
95426	.1480		3.759	.1480"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70
95429	.1490		3.785	.1490"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70
95432	.1495	#25	3.797	.1495"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70
95435	.1500		3.810	.1500"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70
95438	.1510		3.835	.1510"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70
95441	.1520	#24	3.861	.1520"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70
95444	.1530		3.886	.1530"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70
95447	.1540	#23	3.912	.1540"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70
95450	.1545		3.924	.1545"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70
95453	.1550		3.937	.1550"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Neck Length	Number Flutes	1-11	12-24	25-49	50-100	
	Decimal	Metric										
95456	.1555		3.950	.1555"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70
95459	.1560		3.962	.1560"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70
95462	.1562	5/32"	3.967	.1562"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70
95465	.1565		3.975	.1565"	2-1/2"	3/4"	.500"	4	19.21	18.37	17.54	16.70
95468	.1570	#22	3.988	.1570"	2-1/2"	3/4"	.500"	4	21.36	20.43	19.50	18.57
95471	.1575		4.000	.1575"	2-1/2"	3/4"	.500"	4	21.36	20.43	19.50	18.57
95474	.1580		4.013	.1580"	2-1/2"	3/4"	.500"	4	21.36	20.43	19.50	18.57
95477	.1590	#21	4.039	.1590"	2-1/2"	3/4"	.500"	4	21.36	20.43	19.50	18.57
95480	.1600		4.064	.1600"	2-3/4"	7/8"	.625"	4	21.36	20.43	19.50	18.57
95483	.1610	#20	4.089	.1610"	2-3/4"	7/8"	.625"	4	21.36	20.43	19.50	18.57
95486	.1620		4.115	.1620"	2-3/4"	7/8"	.625"	4	21.36	20.43	19.50	18.57
95489	.1630		4.140	.1630"	2-3/4"	7/8"	.625"	4	21.36	20.43	19.50	18.57
95492	.1640		4.166	.1640"	2-3/4"	7/8"	.625"	4	21.36	20.43	19.50	18.57
95495	.1650		4.191	.1650"	2-3/4"	7/8"	.625"	4	21.36	20.43	19.50	18.57
95498	.1660	#19	4.216	.1660"	2-3/4"	7/8"	.625"	4	21.36	20.43	19.50	18.57
95501	.1670		4.242	.1670"	2-3/4"	7/8"	.625"	4	21.36	20.43	19.50	18.57
95504	.1680		4.267	.1680"	2-3/4"	7/8"	.625"	4	21.36	20.43	19.50	18.57
95507	.1690		4.293	.1690"	2-3/4"	7/8"	.625"	4	21.36	20.43	19.50	18.57
95510	.1695	#18	4.305	.1695"	2-3/4"	7/8"	.625"	4	21.36	20.43	19.50	18.57
95513	.1700		4.318	.1700"	2-3/4"	7/8"	.625"	4	21.36	20.43	19.50	18.57
95516	.1710		4.343	.1710"	2-3/4"	7/8"	.625"	4	21.36	20.43	19.50	18.57
95519	.1719	11/64"	4.366	.1719"	2-3/4"	7/8"	.625"	4	21.36	20.43	19.50	18.57
95522	.1720		4.369	.1720"	2-3/4"	7/8"	.625"	4	21.36	20.43	19.50	18.57
95525	.1730	#17	4.394	.1730"	2-3/4"	7/8"	.625"	4	22.22	21.25	20.29	19.32
95528	.1740		4.420	.1740"	2-3/4"	7/8"	.625"	4	22.22	21.25	20.29	19.32
95531	.1750		4.445	.1750"	2-3/4"	7/8"	.625"	4	22.22	21.25	20.29	19.32
95534	.1760		4.470	.1760"	2-3/4"	7/8"	.625"	4	22.22	21.25	20.29	19.32
95537	.1770	#16	4.496	.1770"	2-3/4"	7/8"	.625"	4	22.22	21.25	20.29	19.32
95540	.1772		4.500	.1772"	2-3/4"	7/8"	.625"	4	22.22	21.25	20.29	19.32
95543	.1780		4.521	.1780"	2-3/4"	7/8"	.625"	4	22.22	21.25	20.29	19.32
95546	.1790		4.547	.1790"	2-3/4"	7/8"	.625"	4	22.22	21.25	20.29	19.32
95549	.1800	#15	4.572	.1800"	2-3/4"	7/8"	.625"	4	22.22	21.25	20.29	19.32
95552	.1810		4.597	.1810"	2-3/4"	7/8"	.625"	4	22.22	21.25	20.29	19.32
95555	.1820	#14	4.623	.1820"	2-3/4"	7/8"	.625"	4	22.22	21.25	20.29	19.32
95558	.1830		4.648	.1830"	2-3/4"	7/8"	.625"	4	22.22	21.25	20.29	19.32
95561	.1840		4.674	.1840"	2-3/4"	7/8"	.625"	4	22.22	21.25	20.29	19.32
95564	.1850	#13	4.699	.1850"	2-3/4"	7/8"	.625"	4	22.22	21.25	20.29	19.32
95567	.1855		4.712	.1855"	2-3/4"	7/8"	.625"	4	22.22	21.25	20.29	19.32
95570	.1860		4.724	.1860"	2-3/4"	7/8"	.625"	4	22.22	21.25	20.29	19.32
95573	.1865		4.737	.1865"	2-3/4"	7/8"	.625"	4	22.22	21.25	20.29	19.32
95576	.1870		4.750	.1870"	2-3/4"	7/8"	.625"	4	22.22	21.25	20.29	19.32
95577	.1873		4.757	.1873"	2-3/4"	7/8"	.625"	4	22.22	21.25	20.29	19.32
95579	.1875	3/16"	4.763	.1875"	2-3/4"	7/8"	.625"	4	22.22	21.25	20.29	19.32
95582	.1880		4.775	.1880"	2-3/4"	7/8"	.625"	4	22.69	21.70	20.72	19.73
95585	.1885		4.788	.1885"	2-3/4"	7/8"	.625"	4	22.69	21.70	20.72	19.73
95588	.1890	#12	4.801	.1890"	2-3/4"	7/8"	.625"	4	22.69	21.70	20.72	19.73
95591	.1900		4.826	.1900"	2-3/4"	7/8"	.625"	4	22.69	21.70	20.72	19.73
95594	.1910	#11	4.851	.1910"	2-3/4"	7/8"	.625"	4	22.69	21.70	20.72	19.73

continued →

4100 (continued)

.1920" - .2330"
(4.877mm - 5.918mm)

REAMERS

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Neck Length	Number Flutes	1-11	12-24	25-49	50-100
	Decimal	Metric									
95597	.1920	4.877	.1920"	2-3/4"	7/8"	.625"	4	22.69	21.70	20.72	19.73
95600	.1930	4.902	.1930"	2-3/4"	7/8"	.625"	4	22.69	21.70	20.72	19.73
95603	.1935	#10 4.915	.1935"	2-3/4"	7/8"	.625"	4	22.69	21.70	20.72	19.73
95606	.1940	4.928	.1940"	2-3/4"	7/8"	.625"	4	22.69	21.70	20.72	19.73
95609	.1950	4.953	.1950"	2-3/4"	7/8"	.625"	4	22.69	21.70	20.72	19.73
95612	.1960	#9 4.978	.1960"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95615	.1969	5.000	.1969"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95618	.1970	5.004	.1970"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95621	.1980	5.029	.1980"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95624	.1990	#8 5.055	.1990"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95627	.2000	5.080	.2000"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95630	.2010	#7 5.105	.2010"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95633	.2020	5.131	.2020"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95636	.2030	5.156	.2030"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95639	.2031	13/64" 5.159	.2031"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95642	.2040	#6 5.182	.2040"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95645	.2050	5.207	.2050"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95648	.2055	#5 5.220	.2055"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95651	.2060	5.232	.2060"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95654	.2070	5.258	.2070"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95657	.2080	5.283	.2080"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95660	.2090	#4 5.309	.2090"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95663	.2100	5.334	.2100"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95666	.2110	5.359	.2110"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95669	.2120	5.385	.2120"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95672	.2130	#3 5.410	.2130"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95675	.2140	5.436	.2140"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95678	.2150	5.461	.2150"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95681	.2160	5.486	.2160"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95684	.2165	5.500	.2165"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95687	.2170	5.512	.2170"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95690	.2180	5.537	.2180"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95693	.2188	7/32" 5.558	.2188"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95696	.2190	5.563	.2190"	3"	1"	.625"	4	25.66	24.54	23.43	22.31
95699	.2200	5.588	.2200"	3"	1"	.625"	4	29.95	28.64	27.34	26.04
95702	.2210	#2 5.613	.2210"	3"	1"	.625"	4	29.95	28.64	27.34	26.04
95705	.2220	5.639	.2220"	3"	1"	.625"	4	29.95	28.64	27.34	26.04
95708	.2230	5.664	.2230"	3"	1"	.625"	4	29.95	28.64	27.34	26.04
95711	.2240	5.690	.2240"	3"	1"	.625"	4	29.95	28.64	27.34	26.04
95714	.2250	5.715	.2250"	3"	1"	.625"	4	29.95	28.64	27.34	26.04
95717	.2260	5.740	.2260"	3"	1"	.625"	4	29.95	28.64	27.34	26.04
95720	.2270	5.766	.2270"	3"	1"	.625"	4	29.95	28.64	27.34	26.04
95723	.2280	#1 5.791	.2280"	3"	1"	.625"	4	29.95	28.64	27.34	26.04
95726	.2290	5.817	.2290"	3"	1"	.625"	4	29.95	28.64	27.34	26.04
95729	.2300	5.842	.2300"	3"	1"	.625"	4	29.95	28.64	27.34	26.04
95732	.2310	5.867	.2310"	3"	1"	.625"	4	29.95	28.64	27.34	26.04
95735	.2320	5.893	.2320"	3"	1"	.625"	4	29.95	28.64	27.34	26.04
95738	.2330	5.918	.2330"	3"	1"	.625"	4	29.95	28.64	27.34	26.04

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Neck Length	Number Flutes	1-11	12-24	25-49	50-100	
	Decimal	Metric										
95741	.2340	A	5.944	.2340"	3"	1"	.625"	4	29.95	28.64	27.34	26.04
95744	.2344	15/64"	5.954	.2344"	3"	1"	.625"	4	29.95	28.64	27.34	26.04
95747	.2350		5.969	.2350"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95750	.2360		5.994	.2360"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95753	.2362		6.000	.2362"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95756	.2370		6.020	.2370"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95759	.2380	B	6.045	.2380"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95762	.2390		6.071	.2390"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95765	.2400		6.096	.2400"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95768	.2410		6.121	.2410"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95771	.2420	C	6.147	.2420"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95774	.2430		6.172	.2430"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95777	.2440		6.198	.2440"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95780	.2450		6.223	.2450"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95783	.2460	D	6.248	.2460"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95786	.2470		6.274	.2470"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95789	.2480		6.299	.2480"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95792	.2485		6.312	.2485"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95795	.2490		6.325	.2490"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95798	.2495		6.337	.2495"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95799	.2498		6.345	.2498"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95801	.2500	1/4" / E	6.350	.2500"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95802	.2502		6.355	.2502"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95804	.2505		6.363	.2505"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95807	.2510		6.375	.2510"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95810	.2515		6.388	.2515"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95813	.2520		6.401	.2520"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95816	.2530		6.426	.2530"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95819	.2540		6.452	.2540"	3"	1"	.625"	4	31.06	29.71	28.36	27.01
95822	.2550		6.477	.2550"	3-1/4"	1-1/8"	.625"	6	35.80	34.24	32.69	31.13
95825	.2559		6.500	.2559"	3-1/4"	1-1/8"	.625"	6	35.80	34.24	32.69	31.13
95828	.2560		6.502	.2560"	3-1/4"	1-1/8"	.625"	6	35.80	34.24	32.69	31.13
95831	.2570	F	6.528	.2570"	3-1/4"	1-1/8"	.625"	6	35.80	34.24	32.69	31.13
95834	.2580		6.553	.2580"	3-1/4"	1-1/8"	.625"	6	35.80	34.24	32.69	31.13
95837	.2590		6.579	.2590"	3-1/4"	1-1/8"	.625"	6	35.80	34.24	32.69	31.13
95840	.2600		6.604	.2600"	3-1/4"	1-1/8"	.625"	6	35.80	34.24	32.69	31.13
95843	.2610	G	6.629	.2610"	3-1/4"	1-1/8"	.625"	6	35.80	34.24	32.69	31.13
95846	.2620		6.655	.2620"	3-1/4"	1-1/8"	.625"	6	35.80	34.24	32.69	31.13
95849	.2630		6.680	.2630"	3-1/4"	1-1/8"	.625"	6	35.80	34.24	32.69	31.13
95852	.2640		6.706	.2640"	3-1/4"	1-1/8"	.625"	6	35.80	34.24	32.69	31.13
95855	.2650		6.731	.2650"	3-1/4"	1-1/8"	.625"	6	35.80	34.24	32.69	31.13
95858	.2656	17/64"	6.746	.2656"	3-1/4"	1-1/8"	.625"	6	35.80	34.24	32.69	31.13
95861	.2660	H	6.756	.2660"	3-1/4"	1-1/8"	.625"	6	35.80	34.24	32.69	31.13
95864	.2670		6.782	.2670"	3-1/4"	1-1/8"	.625"	6	35.80	34.24	32.69	31.13
95867	.2680		6.807	.2680"	3-1/4"	1-1/8"	.625"	6	35.80	34.24	32.69	31.13
95870	.2690		6.833	.2690"	3-1/4"	1-1/8"	.625"	6	35.80	34.24	32.69	31.13
95873	.2700		6.858	.2700"	3-1/4"	1-1/8"	.625"	6	35.80	34.24	32.69	31.13
95876	.2710		6.883	.2710"	3-1/4"	1-1/8"	.625"	6	35.80	34.24	32.69	31.13

continued →

4100 (continued)

.2720" - .3123"
(6.960mm - 7.932mm)

REAMERS

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Neck Length	Number Flutes	1-11	12-24	25-49	50-100	
	Decimal	Metric										
95879	.2720	I	6.909	.2720"	3-1/4"	1-1/8"	.750"	6	36.16	34.58	33.01	31.44
95882	.2730		6.934	.2730"	3-1/4"	1-1/8"	.750"	6	36.16	34.58	33.01	31.44
95885	.2740		6.960	.2740"	3-1/4"	1-1/8"	.750"	6	36.16	34.58	33.01	31.44
95888	.2750		6.985	.2750"	3-1/4"	1-1/8"	.750"	6	36.16	34.58	33.01	31.44
95891	.2756		7.000	.2756"	3-1/4"	1-1/8"	.750"	6	36.16	34.58	33.01	31.44
95894	.2760		7.010	.2760"	3-1/4"	1-1/8"	.750"	6	36.16	34.58	33.01	31.44
95897	.2770	J	7.036	.2770"	3-1/4"	1-1/8"	.750"	6	36.16	34.58	33.01	31.44
95900	.2780		7.061	.2780"	3-1/4"	1-1/8"	.750"	6	36.16	34.58	33.01	31.44
95903	.2790		7.087	.2790"	3-1/4"	1-1/8"	.750"	6	36.16	34.58	33.01	31.44
95906	.2800		7.112	.2800"	3-1/4"	1-1/8"	.750"	6	36.16	34.58	33.01	31.44
95909	.2810	K	7.137	.2810"	3-1/4"	1-1/8"	.750"	6	36.16	34.58	33.01	31.44
95912	.2812	9/32"	7.142	.2812"	3-1/4"	1-1/8"	.750"	6	36.16	34.58	33.01	31.44
95915	.2820		7.163	.2820"	3-1/4"	1-1/8"	.750"	6	39.13	37.43	35.73	34.03
95918	.2830		7.188	.2830"	3-1/4"	1-1/8"	.750"	6	39.13	37.43	35.73	34.03
95921	.2840		7.214	.2840"	3-1/4"	1-1/8"	.750"	6	39.13	37.43	35.73	34.03
95924	.2850		7.239	.2850"	3-1/4"	1-1/8"	.750"	6	39.13	37.43	35.73	34.03
95927	.2860		7.264	.2860"	3-1/4"	1-1/8"	.750"	6	39.13	37.43	35.73	34.03
95930	.2870		7.290	.2870"	3-1/4"	1-1/8"	.750"	6	39.13	37.43	35.73	34.03
95933	.2880		7.315	.2880"	3-1/4"	1-1/8"	.750"	6	39.13	37.43	35.73	34.03
95936	.2890		7.341	.2890"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95939	.2900	L	7.366	.2900"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95942	.2910		7.391	.2910"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95945	.2920		7.417	.2920"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95948	.2930		7.442	.2930"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95951	.2940		7.468	.2940"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95954	.2950	M	7.493	.2950"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95957	.2953		7.500	.2953"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95960	.2960		7.518	.2960"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95963	.2969	19/64"	7.541	.2969"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95966	.2970		7.544	.2970"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95969	.2980		7.569	.2980"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95972	.2990		7.595	.2990"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95975	.3000		7.620	.3000"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95978	.3010		7.645	.3010"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95981	.3020	N	7.671	.3020"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95984	.3030		7.696	.3030"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95987	.3040		7.722	.3040"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95990	.3050		7.747	.3050"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95993	.3060		7.772	.3060"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95996	.3070		7.798	.3070"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
95999	.3080		7.823	.3080"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
96002	.3090		7.849	.3090"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
96005	.3100		7.874	.3100"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
96006	.3105		7.887	.3105"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
96008	.3110		7.899	.3110"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
96011	.3115		7.912	.3115"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
96014	.3120		7.925	.3120"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
96015	.3123		7.932	.3123"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Neck Length	Number Flutes	1-11	12-24	25-49	50-100	
	Decimal	Metric										
96017	.3125	5/16"	7.938	.3125"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
96021	.3130		7.950	.3130"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
96023	.3135		7.963	.3135"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
96026	.3140		7.976	.3140"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
96029	.3150		8.000	.3150"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
96032	.3160	O	8.026	.3160"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
96035	.3170		8.052	.3170"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
96038	.3180		8.077	.3180"	3-1/4"	1-1/8"	.750"	6	39.43	37.72	36.00	34.29
96041	.3190		8.103	.3190"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96044	.3200		8.128	.3200"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96047	.3210		8.153	.3210"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96050	.3220		8.179	.3220"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96053	.3230	P	8.204	.3230"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96056	.3240		8.230	.3240"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96059	.3250		8.255	.3250"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96062	.3260		8.280	.3260"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96065	.3270		8.306	.3270"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96068	.3280		8.331	.3280"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96071	.3281	21/64"	8.334	.3281"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96074	.3290		8.357	.3290"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96077	.3300		8.382	.3300"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96079	.3310		8.407	.3310"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96083	.3320	Q	8.433	.3320"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96086	.3330		8.458	.3330"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96089	.3340		8.484	.3340"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96092	.3346		8.500	.3346"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96095	.3350		8.509	.3350"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96098	.3360		8.534	.3360"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96101	.3370		8.560	.3370"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96104	.3380		8.585	.3380"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96107	.3390	R	8.611	.3390"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96110	.3400		8.636	.3400"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96113	.3410		8.661	.3410"	3-1/2"	1-1/4"	.750"	6	48.59	46.48	44.36	42.25
96116	.3420		8.687	.3420"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96119	.3430		8.712	.3430"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96122	.3438	11/32"	8.733	.3438"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96125	.3440		8.738	.3440"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96128	.3450		8.763	.3450"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96131	.3460		8.788	.3460"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96134	.3470		8.814	.3470"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96137	.3480	S	8.839	.3480"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96141	.3490		8.865	.3490"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96143	.3500		8.890	.3500"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96146	.3510		8.915	.3510"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96149	.3520		8.941	.3520"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96152	.3530		8.966	.3530"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96155	.3540		8.992	.3540"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96158	.3543		9.000	.3543"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72

continued →

4100 (continued)

.3550" - .3950"
(9.017mm - 10.033mm)

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Neck Length	Number Flutes	1-11	12-24	25-49	50-100
	Decimal	Metric									
96161	.3550	9.017	.3550"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96164	.3560	9.042	.3560"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96167	.3570	9.068	.3570"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96170	.3580	T 9.093	.3580"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96173	.3590	9.119	.3590"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96176	.3594	23/64" 9.129	.3594"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96179	.3600	9.144	.3600"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96182	.3610	9.169	.3610"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96185	.3620	9.195	.3620"	3-1/2"	1-1/4"	.750"	6	51.43	49.19	46.96	44.72
96188	.3630	9.220	.3630"	3-1/2"	1-1/4"	.750"	6	52.99	50.69	48.38	46.08
96191	.3640	9.246	.3640"	3-1/2"	1-1/4"	.750"	6	52.99	50.69	48.38	46.08
96194	.3650	9.271	.3650"	3-1/2"	1-1/4"	.750"	6	52.99	50.69	48.38	46.08
96197	.3660	9.296	.3660"	3-1/2"	1-1/4"	.750"	6	52.99	50.69	48.38	46.08
96199	.3670	9.322	.3670"	3-1/2"	1-1/4"	.750"	6	52.99	50.69	48.38	46.08
96203	.3680	U 9.347	.3680"	3-1/2"	1-1/4"	.750"	6	52.99	50.69	48.38	46.08
96206	.3690	9.373	.3690"	3-1/2"	1-1/4"	.750"	6	52.99	50.69	48.38	46.08
96209	.3700	9.398	.3700"	3-1/2"	1-1/4"	.750"	6	52.99	50.69	48.38	46.08
96212	.3710	9.423	.3710"	3-1/2"	1-1/4"	.750"	6	52.99	50.69	48.38	46.08
96215	.3720	9.449	.3720"	3-1/2"	1-1/4"	.750"	6	52.99	50.69	48.38	46.08
96218	.3730	9.474	.3730"	3-1/2"	1-1/4"	.750"	6	52.99	50.69	48.38	46.08
96221	.3740	9.500	.3740"	3-1/2"	1-1/4"	.750"	6	52.99	50.69	48.38	46.08
96224	.3745	9.512	.3745"	3-1/2"	1-1/4"	.750"	6	52.99	50.69	48.38	46.08
96225	.3748	9.520	.3748"	3-1/2"	1-1/4"	.750"	6	52.99	50.69	48.38	46.08
96227	.3750	3/8" 9.525	.3750"	3-1/2"	1-1/4"	.750"	6	52.99	50.69	48.38	46.08
96230	.3755	9.538	.3755"	3-1/2"	1-1/4"	.750"	6	52.99	50.69	48.38	46.08
96233	.3760	9.550	.3760"	3-1/2"	1-1/4"	.750"	6	52.99	50.69	48.38	46.08
96236	.3765	9.563	.3765"	3-1/2"	1-1/4"	.750"	6	52.99	50.69	48.38	46.08
96239	.3770	V 9.576	.3770"	3-1/2"	1-1/4"	.750"	6	52.99	50.69	48.38	46.08
96242	.3780	9.601	.3780"	3-1/2"	1-1/4"	.750"	6	62.15	59.44	56.74	54.04
96245	.3790	9.627	.3790"	3-1/2"	1-1/4"	.750"	6	62.15	59.44	56.74	54.04
96248	.3800	9.652	.3800"	3-1/2"	1-1/4"	.750"	6	62.15	59.44	56.74	54.04
96251	.3810	9.677	.3810"	3-1/2"	1-1/4"	.750"	6	62.15	59.44	56.74	54.04
96254	.3820	9.703	.3820"	3-1/2"	1-1/4"	.750"	6	62.15	59.44	56.74	54.04
96257	.3830	9.728	.3830"	3-1/2"	1-1/4"	.750"	6	62.15	59.44	56.74	54.04
96260	.3840	9.754	.3840"	3-1/2"	1-1/4"	.750"	6	62.15	59.44	56.74	54.04
96263	.3850	9.779	.3850"	3-1/2"	1-1/4"	.750"	6	62.15	59.44	56.74	54.04
96266	.3860	W 9.804	.3860"	3-1/2"	1-1/4"	.750"	6	62.15	59.44	56.74	54.04
96269	.3870	9.830	.3870"	3-1/2"	1-1/4"	.750"	6	62.15	59.44	56.74	54.04
96272	.3880	9.855	.3880"	3-1/2"	1-1/4"	.750"	6	62.15	59.44	56.74	54.04
96275	.3890	9.881	.3890"	3-1/2"	1-1/4"	.750"	6	62.15	59.44	56.74	54.04
96278	.3900	9.906	.3900"	3-1/2"	1-1/4"	.750"	6	62.15	59.44	56.74	54.04
96281	.3906	25/64" 9.921	.3906"	3-1/2"	1-1/4"	.750"	6	62.15	59.44	56.74	54.04
96284	.3910	9.931	.3910"	3-1/2"	1-1/4"	.750"	6	62.15	59.44	56.74	54.04
96287	.3920	9.957	.3920"	3-1/2"	1-1/4"	.750"	6	62.15	59.44	56.74	54.04
96290	.3930	9.982	.3930"	3-1/2"	1-1/4"	.750"	6	62.15	59.44	56.74	54.04
96293	.3937	10.000	.3937"	3-1/2"	1-1/4"	.750"	6	64.34	61.55	58.75	55.95
96296	.3940	10.008	.3940"	3-1/2"	1-1/4"	.750"	6	64.34	61.55	58.75	55.95
96299	.3950	10.033	.3950"	3-1/2"	1-1/4"	.750"	6	64.34	61.55	58.75	55.95

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Neck Length	Number Flutes	1-11	12-24	25-49	50-100
	Decimal	Metric									
96302	.3960	10.058	.3960"	3-1/2"	1-1/4"	.750"	6	64.34	61.55	58.75	55.95
96305	.3970	X 10.084	.3970"	3-1/2"	1-1/4"	.750"	6	64.34	61.55	58.75	55.95
96308	.3980	10.109	.3980"	3-1/2"	1-1/4"	.750"	6	64.34	61.55	58.75	55.95
96311	.3990	10.135	.3990"	3-1/2"	1-1/4"	.750"	6	64.34	61.55	58.75	55.95
96314	.4000	10.160	.4000"	3-1/2"	1-1/4"	.750"	6	64.34	61.55	58.75	55.95
96317	.4010	10.185	.4010"	3-1/2"	1-1/4"	.750"	6	64.34	61.55	58.75	55.95
96319	.4020	10.211	.4020"	3-1/2"	1-1/4"	.750"	6	64.34	61.55	58.75	55.95
96323	.4030	10.236	.4030"	3-1/2"	1-1/4"	.750"	6	64.34	61.55	58.75	55.95
96326	.4040	Y 10.262	.4040"	3-1/2"	1-1/4"	.750"	6	64.34	61.55	58.75	55.95
96329	.4050	10.287	.4050"	3-1/2"	1-1/4"	.750"	6	64.34	61.55	58.75	55.95
96332	.4060	10.312	.4060"	3-1/2"	1-1/4"	.750"	6	64.34	61.55	58.75	55.95
96335	.4062	13/32" 10.317	.4062"	3-1/2"	1-1/4"	.750"	6	64.34	61.55	58.75	55.95
96338	.4070	10.338	.4070"	3-1/2"	1-1/4"	.750"	6	64.34	61.55	58.75	55.95
96341	.4080	10.363	.4080"	3-1/2"	1-1/4"	.750"	6	64.34	61.55	58.75	55.95
96344	.4090	10.389	.4090"	3-1/2"	1-1/4"	.750"	6	64.34	61.55	58.75	55.95
96347	.4100	10.414	.4100"	3-1/2"	1-1/4"	.750"	6	64.34	61.55	58.75	55.95
96350	.4110	10.439	.4110"	3-1/2"	1-1/4"	.750"	6	66.60	63.70	60.81	57.91
96353	.4120	10.465	.4120"	3-1/2"	1-1/4"	.750"	6	66.60	63.70	60.81	57.91
96356	.4130	Z 10.490	.4130"	3-1/2"	1-1/4"	.750"	6	66.60	63.70	60.81	57.91
96359	.4134	10.500	.4134"	3-1/2"	1-1/4"	.750"	6	66.60	63.70	60.81	57.91
96362	.4140	10.516	.4140"	3-1/2"	1-1/4"	.750"	6	66.60	63.70	60.81	57.91
96365	.4150	10.541	.4150"	3-1/2"	1-1/4"	.750"	6	66.60	63.70	60.81	57.91
96366	.4160	10.566	.4160"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96367	.4170	10.592	.4170"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96368	.4180	10.617	.4180"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96369	.4190	10.643	.4190"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96371	.4200	10.668	.4200"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96374	.4210	10.693	.4210"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96377	.4219	27/64" 10.716	.4219"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96380	.4220	10.719	.4220"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96383	.4230	10.744	.4230"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96386	.4240	10.770	.4240"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96389	.4250	10.795	.4250"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96392	.4260	10.820	.4260"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96395	.4270	10.846	.4270"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96398	.4280	10.871	.4280"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96401	.4290	10.897	.4290"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96404	.4300	10.922	.4300"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96407	.4310	10.947	.4310"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96410	.4320	10.973	.4320"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96413	.4330	10.998	.4330"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96416	.4331	11.000	.4331"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96419	.4340	11.024	.4340"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96422	.4350	11.049	.4350"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96425	.4360	11.074	.4360"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96428	.4365	11.087	.4365"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96431	.4370	11.100	.4370"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96432	.4373	11.107	.4373"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91

continued →

4100 (continued)

.4375" - .4790"
(11.113mm - 12.167mm)

REAMERS

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Neck Length	Number Flutes	1-11	12-24	25-49	50-100	
	Decimal	Metric										
96434	.4375	7/16"	11.113	.4375"	4"	1-3/8"	.750"	6	66.60	63.70	60.81	57.91
96437	.4380		11.125	.4380"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96440	.4385		11.138	.4385"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96443	.4390		11.151	.4390"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96446	.4400		11.176	.4400"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96449	.4410		11.201	.4410"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96452	.4420		11.227	.4420"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96455	.4430		11.252	.4430"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96458	.4440		11.278	.4440"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96461	.4450		11.303	.4450"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96464	.4460		11.328	.4460"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96467	.4470		11.354	.4470"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96470	.4480		11.379	.4480"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96473	.4490		11.405	.4490"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96476	.4500		11.430	.4500"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96479	.4510		11.455	.4510"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96482	.4520		11.481	.4520"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96485	.4528		11.500	.4528"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96488	.4530		11.506	.4530"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96491	.4531	29/64"	11.509	.4531"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96494	.4540		11.532	.4540"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96497	.4550		11.557	.4550"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96500	.4560		11.582	.4560"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96503	.4570		11.608	.4570"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96506	.4580		11.633	.4580"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96509	.4590		11.659	.4590"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96512	.4600		11.684	.4600"	4"	1-3/8"	.750"	6	71.39	68.29	65.18	62.08
96515	.4610		11.709	.4610"	4"	1-3/8"	.750"	6	73.53	70.33	67.14	63.94
96518	.4620		11.735	.4620"	4"	1-3/8"	.750"	6	73.53	70.33	67.14	63.94
96521	.4630		11.760	.4630"	4"	1-3/8"	.750"	6	73.53	70.33	67.14	63.94
96524	.4640		11.786	.4640"	4"	1-3/8"	.750"	6	73.53	70.33	67.14	63.94
96527	.4650		11.811	.4650"	4"	1-3/8"	.750"	6	73.53	70.33	67.14	63.94
96530	.4660		11.836	.4660"	4"	1-3/8"	.750"	6	73.53	70.33	67.14	63.94
96533	.4670		11.862	.4670"	4"	1-3/8"	.750"	6	73.53	70.33	67.14	63.94
96536	.4680		11.887	.4680"	4"	1-3/8"	.750"	6	73.53	70.33	67.14	63.94
96539	.4688	15/32"	11.908	.4688"	4"	1-3/8"	.750"	6	73.53	70.33	67.14	63.94
96542	.4690		11.913	.4690"	4"	1-3/8"	.750"	6	73.53	70.33	67.14	63.94
96545	.4700		11.938	.4700"	4"	1-1/2"	.750"	6	73.53	70.33	67.14	63.94
96548	.4710		11.963	.4710"	4"	1-1/2"	.750"	6	73.53	70.33	67.14	63.94
96551	.4720		11.989	.4720"	4"	1-1/2"	.750"	6	73.53	70.33	67.14	63.94
96554	.4724		12.000	.4724"	4"	1-1/2"	.750"	6	73.53	70.33	67.14	63.94
96557	.4730		12.014	.4730"	4"	1-1/2"	.750"	6	73.53	70.33	67.14	63.94
96561	.4740		12.040	.4740"	4"	1-1/2"	.750"	6	73.53	70.33	67.14	63.94
96563	.4750		12.065	.4750"	4"	1-1/2"	.750"	6	73.53	70.33	67.14	63.94
96566	.4760		12.090	.4760"	4"	1-1/2"	.750"	6	73.53	70.33	67.14	63.94
96569	.4770		12.116	.4770"	4"	1-1/2"	.750"	6	73.53	70.33	67.14	63.94
96572	.4780		12.141	.4780"	4"	1-1/2"	.750"	6	73.53	70.33	67.14	63.94
96575	.4790		12.167	.4790"	4"	1-1/2"	.750"	6	73.53	70.33	67.14	63.94

EDP#	$d1^{\dagger}$ Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	$l3$ Neck Length	Number Flutes	1-11	12-24	25-49	50-100	
	Decimal	Metric										
96578	.4800	12.192	.4800"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96581	.4810	12.217	.4810"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96584	.4820	12.243	.4820"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96587	.4830	12.268	.4830"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96590	.4840	12.294	.4840"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96593	.4844	31/64"	12.304	.4844"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34
96596	.4850	12.319	.4850"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96599	.4860	12.344	.4860"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96602	.4870	12.370	.4870"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96605	.4880	12.395	.4880"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96608	.4890	12.421	.4890"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96611	.4900	12.446	.4900"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96614	.4910	12.471	.4910"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96617	.4920	12.497	.4920"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96620	.4921	12.500	.4921"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96623	.4930	12.522	.4930"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96626	.4940	12.548	.4940"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96629	.4950	12.573	.4950"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96632	.4960	12.598	.4960"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96635	.4970	12.624	.4970"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96638	.4980	12.649	.4980"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96641	.4990	12.675	.4990"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96644	.4995	12.687	.4995"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96645	.4998	12.695	.4998"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96647	.5000	1/2"	12.700	.5000"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34
96650	.5005	12.713	.5005"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96653	.5010	12.725	.5010"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	
96656	.5020	12.751	.5020"	4"	1-1/2"	.750"	6	75.14	71.87	68.61	65.34	



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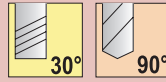
Neck diameter is .010" ±.002" less than fluted diameter

Diameter		Overall Length	Flute Length	No. of Flutes
Decimal	Metric			
.0590" - .0650"	1.499 - 1.651	1-1/2"	3/8"	4
.0660" - .0800"	1.676 - 2.032	1-3/4"	1/2"	4
.0810" - .0950"	2.057 - 2.413	2"	1/2"	4
.0960" - .1300"	2.438 - 3.302	2-1/4"	5/8"	4
.1310" - .1590"	3.327 - 4.039	2-1/2"	3/4"	4
.1600" - .1950"	4.064 - 4.953	2-3/4"	7/8"	4
.1960" - .2540"	4.978 - 6.452	3"	1"	4
.2550" - .3180"	6.477 - 8.077	3-1/4"	1-1/8"	6
.3190" - .4150"	8.103 - 10.541	3-1/2"	1-1/4"	6
.4160" - .4690"	10.566 - 11.913	4"	1-3/8"	6
.4700" - .5020"	11.938 - 12.751	4"	1-1/2"	6
.5030" - .5700"	12.776 - 14.478	4"	1-5/8"	6
.5710" - .7500"	14.503 - 19.050	4"	1-3/4"	6

152M - 2 Flute

NEW SERIES

Technical information: page 244-249



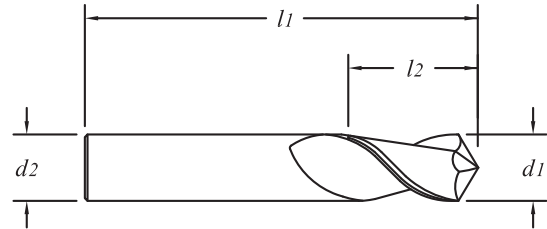
TOLERANCES		
d_1	+.000" - .002" (+.000 / -.050mm)	
d_2	1/8" - 3/16"	+0.000" - .0003" (+.0000 / -.0075mm)
	1/4" - 3/4"	-.0001" - .0004" (-.0025 / -.0100mm)

Solid submicron grain carbide drill/end mill

Included angle to a point - center cutting

Tools do not have drill point geometry

Extremely versatile



EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
57200	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	10.65	10.19	9.72	9.26
57210	.1875	3/16"	4.763	3/16"	2"	5/8"	14.03	13.42	12.81	12.20
57220	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	17.42	16.67	15.91	15.15
57230	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	22.85	21.86	20.86	19.87
57240	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	27.96	26.74	25.53	24.31
57250	.4375	7/16"	11.113	7/16"	2-3/4"	1"	34.41	32.91	31.42	29.92
57260	.5000	1/2"	12.700	1/2"	3"	1"	52.05	49.79	47.52	45.26
57270	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	84.18	80.52	76.86	73.20
57280	.7500	3/4"	19.050	3/4"	4"	1-1/2"	123.88	118.49	113.11	107.72

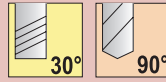
TOLERANCES

<i>d1</i>	+.000" - .002" (+.000 / -.050mm)	
<i>d2</i>	1/8" - 3/16"	+ .0000" - .0003" (+.0000 / -.0075mm)
	1/4" - 3/4"	- .0001" - .0004" (-.0025 / -.0100mm)

Technical information: page 244-249

152MA - 2 Flute

NEW SERIES



DRILL MILLS

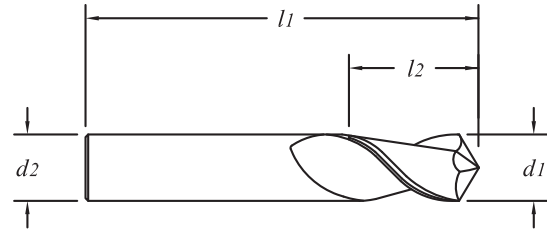
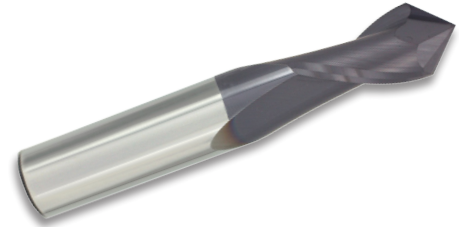
TiALN Coated

Solid submicron grain carbide drill/end mill

Included angle to a point - center cutting

Tools do not have drill point geometry

Extremely versatile

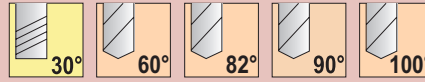


EDP#	<i>d1</i> † Diameter		<i>d2</i> Shank Diameter	<i>l1</i> Overall Length	<i>l2</i> Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
57207	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	13.11	12.54	11.97	11.40
57217	.1875	3/16"	4.763	3/16"	2"	5/8"	16.49	15.77	15.06	14.34
57227	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	22.49	21.52	20.54	19.56
57237	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	30.49	29.16	27.84	26.51
57247	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	35.60	34.06	32.51	30.96
57257	.4375	7/16"	11.113	7/16"	2-3/4"	1"	43.06	41.18	39.31	37.44
57267	.5000	1/2"	12.700	1/2"	3"	1"	60.73	58.09	55.45	52.81
57277	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	96.69	92.49	88.28	84.08
57287	.7500	3/4"	19.050	3/4"	4"	1-1/2"	138.66	132.63	126.60	120.57

154M - 4 Flute

NEW SERIES

Technical information: page 244-249



TOLERANCES

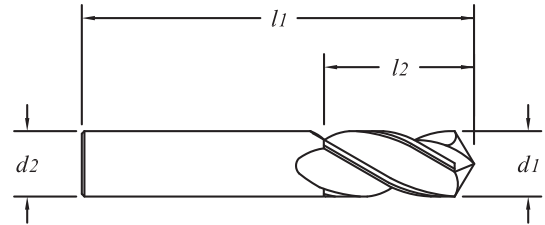
$d1$	+.000" - .002" (+.000 / -.050mm)	
$d2$	3mm - 6mm	+.0000" - .0003" (+.0000 / -.0075mm)
	1/4" - 20mm	-.0001" - .0004" (-.0025 / -.0100mm)

Solid submicron grain carbide drill/end mill

Included angle to a point - center cutting

Tools do not have drill point geometry

Extremely versatile



	NEW 60° EDP#	NEW 82° EDP#	NEW 90° EDP#	NEW 100° EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
					Decimal	Metric								
NEW	-	57344	58198	57384	.1181	3.000	3.0	38	12	11.19	10.70	10.22	9.73	
	-	57346	58200	57386	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	10.65	10.19	9.72	9.26
NEW	-	57348	58202	57388	.1575		4.000	4.0	50	14	14.73	14.09	13.45	12.81
	-	57350	58210	57390	.1875	3/16"	4.763	3/16"	2"	5/8"	14.03	13.42	12.81	12.20
NEW	-	57352	58212	57392	.1969		5.000	5.0	65	16	17.86	17.08	16.31	15.53
NEW	57314	57354	58214	57394	.2362		6.000	6.0	65	19	18.31	17.51	16.72	15.92
	57316	57356	58220	57396	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	17.42	16.67	15.91	15.15
	57318	57358	58230	57398	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	22.85	21.86	20.86	19.87
NEW	57320	57360	58232	57400	.3150		8.000	8.0	65	22	24.04	22.99	21.95	20.90
	57322	57362	58240	57402	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	27.96	26.74	25.53	24.31
NEW	57324	57364	58242	57404	.3937		10.000	10.0	70	25	34.33	32.84	31.34	29.85
	57326	57366	58250	57406	.4375	7/16"	11.113	7/16"	2-3/4"	1"	34.41	32.91	31.42	29.92
NEW	57328	57368	58252	57408	.4724		12.000	12.0	75	25	54.66	52.28	49.91	47.53
	57330	57370	58260	57410	.5000	1/2"	12.700	1/2"	3"	1"	52.05	49.79	47.52	45.26
	57332	57372	58270	57412	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	84.18	80.52	76.86	73.20
NEW	57334	57374	58272	57414	.6299		16.000	16.0	88	32	88.37	84.52	80.68	76.84
	57336	57376	58280	57416	.7500	3/4"	19.050	3/4"	4"	1-1/2"	123.88	118.49	113.11	107.72
NEW	57338	57378	58282	57418	.7874		20.000	20.0	100	38	174.40	166.82	159.23	151.65

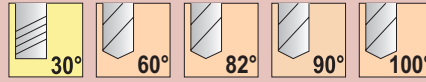
TOLERANCES

d_1		+0.000" -0.002" (+0.000 / -0.050mm)
d_2	3mm - 6mm	+0.0000" -0.0003" (+0.0000 / -0.0075mm)
	1/4" - 20mm	-0.0001" -0.0004" (-0.0025 / -0.0100mm)

Technical information: page 244-249

154MA - 4 Flute

NEW SERIES



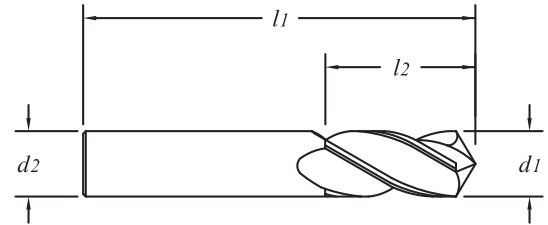
TiALN Coated

Solid submicron grain carbide drill/end mill

Included angle to a point - center cutting

Tools do not have drill point geometry

Extremely versatile



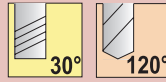
DRILL MILLS

	NEW 60° EDP#	NEW 82° EDP#	90° EDP#	NEW 100° EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
					Decimal	Metric								
NEW	-	58344	58205	58384	.1181	3.000	3.0	38	12	13.65	13.06	12.46	11.87	
	-	58346	58207	58386	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	13.11	12.54	11.97	11.40
NEW	-	58348	58209	58388	.1575	4.000	4.0	50	14	17.19	16.45	15.70	14.95	
	-	58350	58217	58390	.1875	3/16"	4.763	3/16"	2"	5/8"	16.49	15.77	15.06	14.34
NEW	-	58352	58219	58392	.1969	5.000	5.0	65	16	22.94	21.95	20.95	19.95	
NEW	58314	58354	58221	58394	.2362	6.000	6.0	65	19	23.39	22.37	21.36	20.34	
	58316	58356	58227	58396	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	22.49	21.52	20.54	19.56
	58318	58358	58237	58398	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	30.49	29.16	27.84	26.51
NEW	58320	58360	58239	58400	.3150	8.000	8.0	65	22	31.63	30.25	28.88	27.50	
	58322	58362	58247	58402	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	35.60	34.06	32.51	30.96
NEW	58324	58364	58249	58404	.3937	10.000	10.0	70	25	42.99	41.12	39.25	37.38	
	58326	58366	58257	58406	.4375	7/16"	11.113	7/16"	2-3/4"	1"	43.06	41.18	39.31	37.44
NEW	58328	58368	58259	58408	.4724	12.000	12.0	75	25	63.31	60.56	57.80	55.05	
	58330	58370	58267	58410	.5000	1/2"	12.700	1/2"	3"	60.73	58.09	55.45	52.81	
	58332	58372	58277	58412	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	96.69	92.49	88.28	84.08
NEW	58334	58374	58279	58414	.6299	16.000	16.0	88	32	100.89	96.50	92.12	87.73	
	58336	58376	58287	58416	.7500	3/4"	19.050	3/4"	4"	138.66	132.63	126.60	120.57	
NEW	58338	58378	58289	58418	.7874	20.000	20.0	100	38	196.24	187.70	179.17	170.64	

152D - 2 Flute

Technical information: page 244-249

NEW SERIES

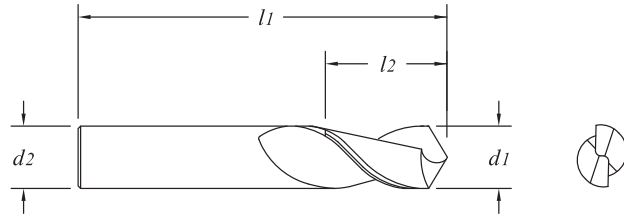


TOLERANCES

$d1$	+.000" -.002" (+.000 / -.050mm)	
$d2$	3mm - 6mm	+0.0000" -.0003" (+.0000 / -.0075mm)
	1/4" - 20mm	-.0001" -.0004" (-.0025 / -.0100mm)

DRILL MILLS

Solid submicron grain carbide drill/end mill
 Recommended for drilling and milling of mild steels and non-ferrous materials
 Four-facet drill point geometry
 Extremely versatile



EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100
	Decimal	Metric							
57420	.1181	3.000	3.0	38	12	11.19	10.70	10.22	9.73
57422	.1250	1/8"	3.175	1/8"	1-1/2"	10.65	10.19	9.72	9.26
57424	.1575	4.000	4.0	50	14	14.73	14.09	13.45	12.81
57426	.1875	3/16"	4.762	3/16"	2"	14.03	13.42	12.81	12.20
57428	.1969	5.000	5.0	65	16	17.86	17.08	16.31	15.53
57430	.2362	6.000	6.0	65	19	18.31	17.51	16.72	15.92
57432	.2500	1/4"	6.350	1/4"	2-1/2"	17.42	16.67	15.91	15.15
57434	.3125	5/16"	7.937	5/16"	2-1/2"	22.85	21.86	20.86	19.87
57436	.3150	8.000	8.0	65	22	24.04	22.99	21.95	20.90
57438	.3750	3/8"	9.525	3/8"	2-1/2"	27.96	26.74	25.53	24.31
57440	.3937	10.000	10.0	70	25	34.33	32.84	31.34	29.85
57442	.4375	7/16"	11.112	7/16"	2-3/4"	34.41	32.91	31.42	29.92
57444	.4724	12.000	12.0	75	25	54.66	52.28	49.91	47.53
57446	.5000	1/2"	12.700	1/2"	3"	52.05	49.79	47.52	45.26
57448	.6250	5/8"	15.875	5/8"	3-1/2"	84.18	80.52	76.86	73.20
57450	.6299	16.000	16.0	88	32	88.37	84.52	80.68	76.84
57452	.7500	3/4"	19.050	3/4"	4"	123.88	118.49	113.11	107.72
57454	.7874	20.000	20.0	100	38	174.40	166.82	159.23	151.65

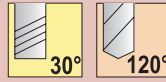
TOLERANCES

d_1	+.000" - .002" (+.000 / -.050mm)	
d_2	3mm - 6mm	+ .0000" - .0003" (+.0000 / -.0075mm)
	1/4" - 20mm	- .0001" - .0004" (-.0025 / -.0100mm)

Technical information: page 244-249

152DA - 2 Flute

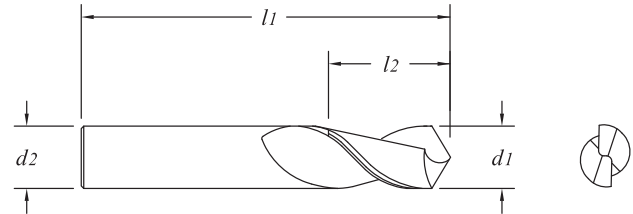
NEW SERIES



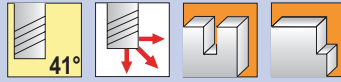
DRILL MILLS

TiALN Coated

Solid submicron grain carbide drill/end mill
 Recommended for drilling and milling of mild steels and non-ferrous materials
 Four-flute drill point geometry
 Extremely versatile



EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
	Decimal	Metric							
57421	.1181	3.000	3.0	38	12	13.65	13.06	12.46	11.87
57423	.1250	1/8"	3.175	1/8"	1-1/2"	13.11	12.54	11.97	11.40
57425	.1575	4.000	4.0	50	14	17.19	16.45	15.70	14.95
57427	.1875	3/16"	4.762	3/16"	2"	16.49	15.77	15.06	14.34
57429	.1969	5.000	5.0	65	16	22.94	21.95	20.95	19.95
57431	.2362	6.000	6.0	65	19	23.39	22.37	21.36	20.34
57433	.2500	1/4"	6.350	1/4"	2-1/2"	22.49	21.52	20.54	19.56
57435	.3125	5/16"	7.937	5/16"	2-1/2"	30.49	29.16	27.84	26.51
57437	.3150	8.000	8.0	65	22	31.63	30.25	28.88	27.50
57439	.3750	3/8"	9.525	3/8"	2-1/2"	35.60	34.06	32.51	30.96
57441	.3937	10.000	10.0	70	25	42.99	41.12	39.25	37.38
57443	.4375	7/16"	11.112	7/16"	2-3/4"	43.06	41.18	39.31	37.44
57445	.4724	12.000	12.0	75	25	63.31	60.56	57.80	55.05
57447	.5000	1/2"	12.700	1/2"	3"	60.73	58.09	55.45	52.81
57449	.6250	5/8"	15.875	5/8"	3-1/2"	96.69	92.49	88.28	84.08
57451	.6299	16.000	16.0	88	32	100.89	96.50	92.12	87.73
57453	.7500	3/4"	19.050	3/4"	4"	138.66	132.63	126.60	120.57
57455	.7874	20.000	20.0	100	38	196.24	187.70	179.17	170.64



TOLERANCES

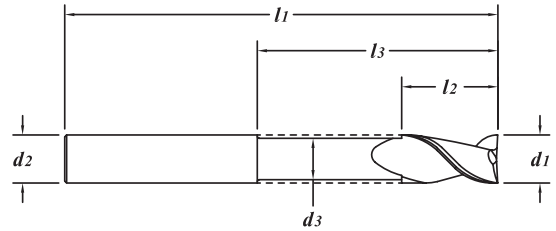
$d1$	+.000" -.001" (+.000 -.025mm)	
$d2$	3mm - 6mm	+ .0000" -.0003" (+.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)

HSAL - Square End - ALUMASTAR Coated

Solid submicron grain carbide end mill - center cutting
 Specific coating engineered to repel aluminum
 Engineered to run at 750-2500 SFM (225-750 M/Min.)

For high speed machining of aluminum

High velocity - high metal removal rate (for spindles 10,000 RPM and above)
 Need to use properly balanced holders
 Holds perpendicularity
 Flats can be added within 48 hours



EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	$l3$ Reach Length	$d3$ Neck Diameter	1-11	12-24	25-49	50-100
	Decimal	Metric									
41222	.1575	4.000	6.0	50	12	-	-	24.70	23.63	22.55	21.48
41232	.1575	4.000	6.0	65	6	16	3.7	30.92	29.58	28.23	26.89
41282	.1875	3/16"	4.763	2"	9/16"	-	-	18.62	17.81	17.00	16.19
41342	.1969	5.000	6.0	65	16	-	-	25.48	24.38	23.27	22.16
41352	.1969	5.000	6.0	75	8	20	4.7	43.34	41.46	39.57	37.69
41402	.2362	6.000	6.0	65	19	-	-	24.68	23.61	22.53	21.46
41412	.2362	6.000	6.0	75	10	25	5.7	41.95	40.13	38.30	36.48
41462	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	-	23.44	22.42	21.40	20.38
41542	.2756	7.000	8.0	65	19	-	-	37.84	36.19	34.55	32.90
41602	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	-	32.56	31.14	29.73	28.31
41662	.3150	8.000	8.0	65	19	-	-	34.28	32.79	31.30	29.81
41672	.3150	8.000	8.0	75	12	25	7.4	51.73	49.48	47.23	44.98
41722	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	-	38.25	36.59	34.92	33.26
41802	.3937	10.000	10.0	70	24	-	-	57.56	55.06	52.55	50.05
41812	.3937	10.000	10.0	75	12	30	9.4	63.73	60.96	58.19	55.42
41822	.3937	10.000	10.0	100	12	35	9.4	76.73	73.39	70.06	66.72
41882	.4724	12.000	12.0	75	32	-	-	64.38	61.58	58.78	55.98
41892	.4724	12.000	12.0	75	16	30	11.4	69.30	66.29	63.27	60.26
41902	.4724	12.000	12.0	100	16	35	11.4	94.54	90.43	86.32	82.21
41912	.4724	12.000	12.0	100	16	40	11.4	94.54	90.43	86.32	82.21
41942	.5000	1/2"	12.700	1/2"	3"	1-1/4"	-	61.17	58.51	55.85	53.19
42022	.6250	5/8"	15.875	5/8"	4"	1-5/8"	-	121.91	116.61	111.31	106.01
42072	.6299	16.000	16.0	75	16	30	15.4	120.75	115.50	110.25	105.00
42082	.6299	16.000	16.0	100	40	-	-	128.31	122.73	117.15	111.57
42092	.6299	16.000	16.0	100	20	40	15.4	133.22	127.42	121.63	115.84
42102	.6299	16.000	16.0	125	20	60	15.4	170.23	162.83	155.43	148.03
42142	.7500	3/4"	19.050	3/4"	4"	1-5/8"	-	155.99	149.20	142.42	135.64
42212	.7874	20.000	20.0	100	32	-	-	209.42	200.31	191.21	182.10
42222	.7874	20.000	20.0	100	20	40	19	214.33	205.01	195.69	186.37
42232	.7874	20.000	20.0	125	20	60	19	248.19	237.40	226.61	215.82
42242	.9843	25.000	25.0	100	38	-	-	241.64	231.13	220.63	210.12
42302	1.000	1"	25.400	1"	4"	1-5/8"	-	234.44	224.25	214.05	203.86

TOLERANCES

<i>d1</i>	+.000" - .001" (+.000 - .025mm)	
<i>d2</i>	3mm - 6mm	+.0000" - .0003" (+.0000 - .0075mm)
	1/4" - 1"	-.0001" - .0004" (-.0025 - .0100mm)
<i>r</i>	+.0005" - .0005" (+.0127 - .0127mm)	

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NEW SERIES

142R - 2 Flute

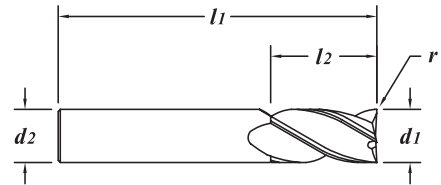
**HIGH PERFORMANCE
END MILLS**

HSAL - Corner Radius - ALUMASTAR Coated

Solid submicron grain carbide end mill - center cutting
 Specific coating engineered to repel aluminum
 Engineered to run at 750-2500 SFM (225-750 M/Min.)

For high speed machining of aluminum

High velocity - high metal removal rate (for spindles 10,000 RPM and above)
 Need to use properly balanced holders
 Holds perpendicularity
 Flats can be added within 48 hours



EDP#	<i>d1</i> † Diameter		<i>d2</i> Shank Diameter	<i>l1</i> Overall Length	<i>l2</i> Flute Length	<i>r</i> Corner Radius	1-11	12-24	25-49	50-100	
	Decimal	Metric									
39222	.1575	4.000	6.0	50	12	0.3	28.90	27.64	26.39	25.13	
39282	.1875	3/16"	4.763	3/16"	2"	.010"	21.44	20.50	19.57	18.64	
39342	.1969		5.000	6.0	65	16	0.3	29.82	28.52	27.23	25.93
39402	.2362		6.000	6.0	65	19	0.3	28.87	27.61	26.36	25.10
39462	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	27.43	26.24	25.04	23.85
39602	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	.015"	36.29	34.72	33.14	31.56
39662	.3150		8.000	8.0	65	19	0.5	38.19	36.53	34.87	33.21
39722	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	42.30	40.46	38.62	36.78
39802	.3937		10.000	10.0	70	24	0.5	64.87	62.05	59.23	56.41
39882	.4724		12.000	12.0	75	32	0.5	80.24	76.75	73.26	69.77
39942	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	76.23	72.92	69.60	66.29
40022	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.030"	131.86	126.13	120.39	114.66
40082	.6299		16.000	16.0	100	40	1.0	138.81	132.77	126.74	120.70
40142	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.030"	171.13	163.69	156.25	148.81
40182	.7874		20.000	20.0	100	40	1.0	240.22	229.78	219.33	208.89
40242	.9843		25.000	25.0	100	40	1.0	277.96	265.87	253.79	241.70
40302	1.000	1"	25.400	1"	4"	1-5/8"	.060"	291.85	279.16	266.47	253.78

142B - 2 Flute

Technical information: page 232



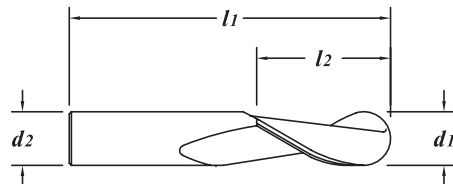
TOLERANCES		
d_1	+.000" -.001" (+.000 -.025mm)	
d_2	3mm - 6mm	+.0000" -.0003" (+.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)
Ball radius	+.0000" -.0005" (+.0000 -.0127mm)	

HSAL - Ball End - ALUMASTAR Coated

Solid submicron grain carbide end mill - center cutting
 Specific coating engineered to repel aluminum
 Engineered to run at 750-2500 SFM (225-750 M/Min.)

For high speed machining of aluminum

High velocity - high metal removal rate (for spindles 10,000 RPM and above)
 Need to use properly balanced holders
 Holds perpendicularity
 Flats can be added within 48 hours



EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
	Decimal	Metric							
42522	.1575	4.000	6.0	50	12	28.90	27.64	26.39	25.13
42582	.1875	3/16"	4.763	3/16"	2"	21.44	20.50	19.57	18.64
42642	.1969		5.000	6.0	65	29.82	28.52	27.23	25.93
42702	.2362		6.000	6.0	65	28.87	27.61	26.36	25.10
42762	.2500	1/4"	6.350	1/4"	2-1/2"	27.43	26.24	25.04	23.85
42842	.2756		7.000	8.0	65	41.98	40.15	38.33	36.50
42902	.3125	5/16"	7.938	5/16"	2-1/2"	36.29	34.72	33.14	31.56
42962	.3150		8.000	8.0	65	38.19	36.53	34.87	33.21
43022	.3750	3/8"	9.525	3/8"	2-1/2"	42.30	40.46	38.62	36.78
43102	.3937		10.000	10.0	70	64.87	62.05	59.23	56.41
43182	.4724		12.000	12.0	75	80.24	76.75	73.26	69.77
43242	.5000	1/2"	12.700	1/2"	3"	76.23	72.92	69.60	66.29
43322	.6250	5/8"	15.875	5/8"	4"	131.86	126.13	120.39	114.66
43382	.6299		16.000	16.0	100	138.81	132.77	126.74	120.70
43442	.7500	3/4"	19.050	3/4"	4"	171.13	163.69	156.25	148.81
43482	.7874		20.000	20.0	100	240.22	229.78	219.33	208.89
43542	.9843		25.000	25.0	100	277.96	265.87	253.79	241.70
43602	1.000	1"	25.400	1"	4"	291.85	279.16	266.47	253.78

TOLERANCES

d_1	+.000" - .001" (+.000 - .025mm)	
d_2	3mm - 6mm	+.0000" - .0003" (+.0000 - .0075mm)
	1/4" - 1"	-.0001" - .0004" (-.0025 - .0100mm)

Technical information: page 232



143M - 3 Flute

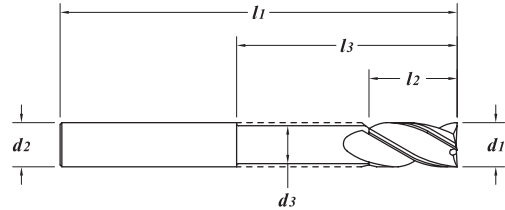
.1575" - .3937"
(4.000mm - 10.000mm)

HSAL - ALUMASTAR Coated

Solid submicron grain carbide end mill - center cutting
Specific coating engineered to repel aluminum
Engineered to run at 750-2500 SFM (225-750 M/Min.)

For high speed machining of aluminum

High velocity - high metal removal rate (for 5,000-25,000 RPM spindles)
Need to use properly balanced holders
Holds perpendicularity
Flats can be added within 48 hours



EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Reach Length	d_3 Neck Diameter	1-11	12-24	25-49	50-100
	Decimal	Metric									
41223	.1575	4.000	6.0	50	12	-	-	24.70	23.63	22.55	21.48
41243	.1575	4.000	6.0	65	6	16	3.7	30.92	29.58	28.23	26.89
41273	.1875	3/16"	4.763	3/16"	2"	5/16"	-	18.62	17.81	17.00	16.19
41283	.1875	3/16"	4.763	3/16"	2"	9/16"	-	18.62	17.81	17.00	16.19
41303	.1875	3/16"	4.763	3/16"	3"	7/32"	3/4"	34.95	33.43	31.91	30.39
41313	.1875	3/16"	4.763	3/16"	3"	1"	-	30.04	28.73	27.43	26.12
41343	.1969	5.000	6.0	65	16	-	-	25.48	24.38	23.27	22.16
41363	.1969	5.000	6.0	75	8	20	4.7	43.34	41.46	39.57	37.69
41403	.2362	6.000	6.0	65	19	-	-	24.68	23.61	22.53	21.46
41423	.2362	6.000	6.0	75	10	25	5.7	41.95	40.13	38.30	36.48
41453	.2500	1/4"	6.350	1/4"	2-1/2"	3/8"	-	23.44	22.42	21.40	20.38
41463	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	-	23.44	22.42	21.40	20.38
41473	.2500	1/4"	6.350	1/4"	3"	1"	-	35.54	33.99	32.45	30.90
41493	.2500	1/4"	6.350	1/4"	4"	3/8"	1-1/8"	42.38	40.54	38.69	36.85
41503	.2500	1/4"	6.350	1/4"	4"	3/8"	2-1/8"	47.29	45.23	43.18	41.12
41513	.2500	1/4"	6.350	1/4"	4"	1-5/8"	-	37.47	35.84	34.21	32.58
41543	.2756	7.000	8.0	65	19	-	-	37.84	36.19	34.55	32.90
41563	.2756	7.000	8.0	75	12	25	6.4	56.84	54.37	51.90	49.43
41593	.3125	5/16"	7.938	5/16"	2-1/2"	7/16"	-	32.56	31.14	29.73	28.31
41603	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	-	32.56	31.14	29.73	28.31
41623	.3125	5/16"	7.938	5/16"	4"	7/16"	1-1/8"	55.60	53.19	50.77	48.35
41663	.3150	8.000	8.0	65	19	-	-	34.28	32.79	31.30	29.81
41683	.3150	8.000	8.0	75	12	25	7.4	51.73	49.48	47.23	44.98
41693	.3150	8.000	8.0	100	12	55	7.4	63.42	60.67	57.91	55.15
41713	.3750	3/8"	9.525	3/8"	2-1/2"	1/2"	-	38.25	36.59	34.92	33.26
41723	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	-	38.25	36.59	34.92	33.26
41733	.3750	3/8"	9.525	3/8"	3"	1"	-	49.31	47.17	45.02	42.88
41763	.3750	3/8"	9.525	3/8"	4"	1/2"	2-1/8"	64.64	61.83	59.02	56.21
41773	.3750	3/8"	9.525	3/8"	4"	1-5/8"	-	54.82	52.44	50.05	47.67
42363	.3750	3/8"	9.525	3/8"	4"	2"	-	54.82	52.44	50.05	47.67
41783	.3750	3/8"	9.525	3/8"	6"	1/2"	4"	97.93	93.68	89.42	85.16
41803	.3937	10.000	10.0	70	24	-	-	57.56	55.06	52.55	50.05
41843	.3937	10.000	10.0	100	12	35	9.4	76.73	73.39	70.06	66.72
41853	.3937	10.000	10.0	100	12	55	9.4	81.64	78.09	74.54	70.99
41863	.3937	10.000	10.0	150	12	110	9.4	114.40	109.43	104.45	99.48

continued →

143M - 3 Flute (continued)

.4724" - 1.000"
(12.000mm - 25.400mm)

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Reach Length	d_3 Neck Diameter	1-11	12-24	25-49	50-100	
	Decimal	Metric										
41883	.4724	12.000	12.0	75	32	-	-	64.38	61.58	58.78	55.98	
41893	.4724	12.000	12.0	100	50	-	-	84.18	80.52	76.86	73.20	
41903	.4724	12.000	12.0	100	16	35	11.4	94.54	90.43	86.32	82.21	
41913	.4724	12.000	12.0	100	16	55	11.4	94.54	90.43	86.32	82.21	
41923	.4724	12.000	12.0	150	16	110	11.4	144.52	138.24	131.95	125.67	
41933	.5000	1/2"	12.700	1/2"	3"	5/8"	-	61.17	58.51	55.85	53.19	
41943	.5000	1/2"	12.700	1/2"	3"	1-1/4"	-	61.17	58.51	55.85	53.19	
41963	.5000	1/2"	12.700	1/2"	4"	1-5/8"	-	79.97	76.49	73.02	69.54	
41973	.5000	1/2"	12.700	1/2"	4"	2"	-	79.97	76.49	73.02	69.54	
41983	.5000	1/2"	12.700	1/2"	4"	5/8"	2-1/8"	.475"	89.80	85.90	81.99	78.09
41993	.5000	1/2"	12.700	1/2"	6"	5/8"	4-1/8"	.475"	137.30	131.33	125.36	119.39
42003	.5000	1/2"	12.700	1/2"	6"	3-1/8"	-	117.65	112.53	107.42	102.30	
42013	.6250	5/8"	15.875	5/8"	3-1/2"	3/4"	-	121.91	116.61	111.31	106.01	
42023	.6250	5/8"	15.875	5/8"	4"	1-5/8"	-	121.91	116.61	111.31	106.01	
42373	.6250	5/8"	15.875	5/8"	4"	2-1/8"	-	121.91	116.61	111.31	106.01	
42033	.6250	5/8"	15.875	5/8"	6"	3/4"	2-3/8"	.590"	170.15	162.76	155.36	147.96
42043	.6250	5/8"	15.875	5/8"	6"	3/4"	4-3/8"	.590"	179.98	172.15	164.33	156.50
42053	.6250	5/8"	15.875	5/8"	6"	3-1/4"	-	160.32	153.35	146.38	139.41	
42083	.6299	16.000	16.0	100	40	-	-	128.31	122.73	117.15	111.57	
42103	.6299	16.000	16.0	100	20	40	15.4	133.22	127.42	121.63	115.84	
42113	.6299	16.000	16.0	125	20	60	15.4	170.23	162.83	155.43	148.03	
42123	.6299	16.000	16.0	150	20	110	15.4	189.46	181.23	172.99	164.75	
42133	.7500	3/4"	19.050	3/4"	4"	1"	-	155.99	149.20	142.42	135.64	
42143	.7500	3/4"	19.050	3/4"	4"	1-5/8"	-	155.99	149.20	142.42	135.64	
42153	.7500	3/4"	19.050	3/4"	5"	2-1/4"	-	205.97	197.01	188.06	179.10	
42163	.7500	3/4"	19.050	3/4"	6"	1"	2-1/2"	.715"	224.07	214.32	204.58	194.84
42173	.7500	3/4"	19.050	3/4"	6"	1"	4-3/8"	.715"	231.00	220.96	210.91	200.87
42193	.7500	3/4"	19.050	3/4"	6"	3-1/4"	-	217.19	207.75	198.30	188.86	
42203	.7874	20.000	20.0	100	25	-	-	209.42	200.31	191.21	182.10	
42213	.7874	20.000	20.0	100	32	-	-	209.42	200.31	191.21	182.10	
42223	.7874	20.000	20.0	100	20	40	19.0	214.33	205.01	195.69	186.37	
42226	.7874	20.000	20.0	125	20	60	19.0	248.19	237.40	226.61	215.82	
42233	.7874	20.000	20.0	150	20	85	19.0	287.60	275.10	262.59	250.09	
42236	.7874	20.000	20.0	150	20	110	19.0	292.53	279.81	267.09	254.37	
42243	.9843	25.000	25.0	100	38	-	-	241.64	231.13	220.63	210.12	
42283	.9843	25.000	25.0	100	25	50	24.0	246.54	235.82	225.10	214.38	
42286	.9843	25.000	25.0	125	25	65	24.0	308.15	294.76	281.36	267.96	
42291	.9843	25.000	25.0	150	25	90	24.0	386.55	369.74	352.94	336.13	
42293	1.000	1"	25.400	1"	4"	1"	-	234.44	224.25	214.05	203.86	
42303	1.000	1"	25.400	1"	4"	1-5/8"	-	234.44	224.25	214.05	203.86	
42313	1.000	1"	25.400	1"	5"	2"	-	289.40	276.82	264.23	251.65	
42343	1.000	1"	25.400	1"	6"	1-1/4"	3-3/8"	.960"	374.96	358.66	342.35	326.05
42353	1.000	1"	25.400	1"	6"	3-1/4"	-	360.24	344.58	328.91	313.25	

TOLERANCES

$d1$	+.000" -.001" (+.000 -.025mm)	
$d2$	3mm - 6mm	+.0000" -.0003" (+.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)
r	+.0005" -.0005" (+.0127 -.0127mm)	

Technical information: page 232



143R - 3 Flute

.1575" - .4724"
(4.000mm - 12.000mm)

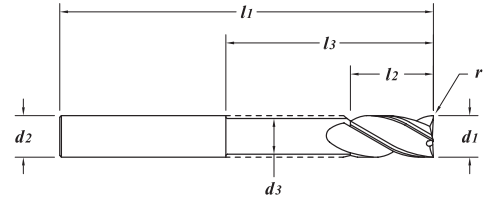
HIGH PERFORMANCE END MILLS

HSAL - Corner Radius - ALUMASTAR Coated

Solid submicron grain carbide end mill - center cutting
Specific coating engineered to repel aluminum
Engineered to run at 750-2500 SFM (225-750 M/Min.)

For high speed machining of aluminum

High velocity - high metal removal rate (for 5,000-25,000 RPM spindles)
Need to use properly balanced holders
Holds perpendicularity
Flats can be added within 48 hours



EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	$l3$ Reach Length	$d3$ Neck Diameter	1-11	12-24	25-49	50-100
	Decimal	Metric										
39223	.1575	4.000	6.0	50	12	0.3	-	-	28.90	27.64	26.39	25.13
39243	.1575	4.000	6.0	65	6	0.3	16	3.7	35.34	33.80	32.27	30.73
39283	.1875	3/16"	4.763	3/16"	2"	9/16"	.010"	-	21.44	20.50	19.57	18.64
39293	.1875	3/16"	4.763	3/16"	2"	9/16"	.030"	-	21.44	20.50	19.57	18.64
39303	.1875	3/16"	4.763	3/16"	3"	7/32"	.010"	3/4"	39.24	37.53	35.83	34.12
39313	.1875	3/16"	4.763	3/16"	3"	7/32"	.030"	3/4"	39.24	37.53	35.83	34.12
39343	.1969	5.000	6.0	65	16	0.3	-	-	29.82	28.52	27.23	25.93
39363	.1969	5.000	6.0	75	8	0.3	20	4.7	48.73	46.61	44.49	42.37
39403	.2362	6.000	6.0	65	19	0.3	-	-	28.87	27.61	26.36	25.10
39423	.2362	6.000	6.0	75	10	0.3	25	5.7	47.16	45.11	43.06	41.01
39453	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"	-	27.43	26.24	25.04	23.85
39463	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	-	27.43	26.24	25.04	23.85
39473	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	-	27.43	26.24	25.04	23.85
39493	.2500	1/4"	6.350	1/4"	4"	3/8"	.015"	1-1/8"	47.51	45.44	43.38	41.31
40403	.2500	1/4"	6.350	1/4"	4"	3/8"	.030"	1-1/8"	47.51	45.44	43.38	41.31
39503	.2500	1/4"	6.350	1/4"	4"	3/8"	.015"	2-1/8"	52.41	50.13	47.85	45.57
39543	.2756	7.000	8.0	65	19	0.3	-	-	41.98	40.15	38.33	36.50
39563	.2756	7.000	8.0	75	12	0.3	25	6.4	63.95	61.17	58.39	55.61
39593	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	.010"	-	36.29	34.72	33.14	31.56
39603	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	.015"	-	36.29	34.72	33.14	31.56
39613	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	.030"	-	36.29	34.72	33.14	31.56
39623	.3125	5/16"	7.938	5/16"	4"	7/16"	.015"	1-1/8"	62.46	59.74	57.03	54.31
39633	.3125	5/16"	7.938	5/16"	4"	7/16"	.030"	1-1/8"	62.46	59.74	57.03	54.31
39663	.3150	8.000	8.0	65	19	0.5	-	-	38.19	36.53	34.87	33.21
39683	.3150	8.000	8.0	75	12	0.5	25	7.4	58.19	55.66	53.13	50.60
39703	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.010"	-	42.30	40.46	38.62	36.78
39713	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.015"	-	42.30	40.46	38.62	36.78
39723	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	-	42.30	40.46	38.62	36.78
39733	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.060"	-	42.30	40.46	38.62	36.78
39763	.3750	3/8"	9.525	3/8"	4"	1/2"	.030"	2-1/8"	72.23	69.09	65.95	62.81
39773	.3750	3/8"	9.525	3/8"	4"	1/2"	.060"	2-1/8"	72.23	69.09	65.95	62.81
39783	.3750	3/8"	9.525	3/8"	6"	1/2"	.030"	4"	105.47	100.88	96.30	91.71
39803	.3937	10.000	10.0	70	24	0.5	-	-	64.87	62.05	59.23	56.41
39843	.3937	10.000	10.0	100	12	0.5	35	9.4	87.20	83.41	79.62	75.83
39883	.4724	12.000	12.0	75	32	0.5	-	-	80.24	76.75	73.26	69.77
39903	.4724	12.000	12.0	100	16	0.5	35	11.4	103.13	98.65	94.16	89.68

continued →

143R - 3 Flute (continued)

.5000" - 1.000"
(12.700mm - 25.400mm)

EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	$l3$ Reach Length	$d3$ Neck Diameter	1-11	12-24	25-49	50-100	
	Decimal	Metric											
39923	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.010"	-	-	76.23	72.92	69.60	66.29
39933	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.015"	-	-	76.23	72.92	69.60	66.29
39943	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	-	76.23	72.92	69.60	66.29
39953	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"	-	-	76.23	72.92	69.60	66.29
39963	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.120"	-	-	76.23	72.92	69.60	66.29
39973	.5000	1/2"	12.700	1/2"	4"	2"	.010"	-	-	88.15	84.32	80.48	76.65
40413	.5000	1/2"	12.700	1/2"	4"	2"	.030"	-	-	88.15	84.32	80.48	76.65
40423	.5000	1/2"	12.700	1/2"	4"	2"	.060"	-	-	88.15	84.32	80.48	76.65
40433	.5000	1/2"	12.700	1/2"	4"	5/8"	.010"	2-1/8"	.475"	97.97	93.71	89.45	85.19
39983	.5000	1/2"	12.700	1/2"	4"	5/8"	.030"	2-1/8"	.475"	97.97	93.71	89.45	85.19
40443	.5000	1/2"	12.700	1/2"	4"	5/8"	.060"	2-1/8"	.475"	97.97	93.71	89.45	85.19
40453	.5000	1/2"	12.700	1/2"	4"	5/8"	.120"	2-1/8"	.475"	97.97	93.71	89.45	85.19
39993	.5000	1/2"	12.700	1/2"	6"	5/8"	.030"	4-1/8"	.475"	147.03	140.64	134.24	127.85
40463	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.015"	-	-	131.86	126.13	120.39	114.66
40023	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.030"	-	-	131.86	126.13	120.39	114.66
40473	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.060"	-	-	131.86	126.13	120.39	114.66
40483	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.120"	-	-	131.86	126.13	120.39	114.66
40033	.6250	5/8"	15.875	5/8"	6"	3/4"	.030"	2-3/8"	.590"	188.53	180.33	172.14	163.94
40043	.6250	5/8"	15.875	5/8"	6"	3/4"	.030"	4-3/8"	.590"	198.38	189.75	181.13	172.50
40083	.6299		16.000	16.0	100	40	1.0	-	-	138.81	132.77	126.74	120.70
40103	.6299		16.000	16.0	100	20	1.0	40	15.4	143.72	137.47	131.22	124.97
40133	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.015"	-	-	171.13	163.69	156.25	148.81
40143	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.030"	-	-	171.13	163.69	156.25	148.81
40153	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.060"	-	-	171.13	163.69	156.25	148.81
40493	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.120"	-	-	171.13	163.69	156.25	148.81
40503	.7500	3/4"	19.050	3/4"	6"	1"	.015"	2-1/2"	.715"	255.04	243.95	232.86	221.77
40163	.7500	3/4"	19.050	3/4"	6"	1"	.030"	2-1/2"	.715"	255.04	243.95	232.86	221.77
40513	.7500	3/4"	19.050	3/4"	6"	1"	.060"	2-1/2"	.715"	255.04	243.95	232.86	221.77
40523	.7500	3/4"	19.050	3/4"	6"	1"	.120"	2-1/2"	.715"	255.04	243.95	232.86	221.77
40173	.7500	3/4"	19.050	3/4"	6"	1"	.030"	4-3/8"	.715"	261.96	250.57	239.18	227.79
40183	.7874		20.000	20.0	100	32	1.0	-	-	240.22	229.78	219.33	208.89
40223	.7874		20.000	20.0	100	20	1.0	40	19.0	245.12	234.47	223.81	213.15
40243	.9843		25.000	25.0	100	38	1.0	-	-	277.96	265.87	253.79	241.70
40283	.9843		25.000	25.0	100	25	1.0	50	24.0	282.87	270.57	258.27	245.97
40293	1.000	1"	25.400	1"	4"	1-5/8"	.030"	-	-	291.85	279.16	266.47	253.78
40303	1.000	1"	25.400	1"	4"	1-5/8"	.060"	-	-	291.85	279.16	266.47	253.78
40313	1.000	1"	25.400	1"	4"	1-5/8"	.120"	-	-	291.85	279.16	266.47	253.78
40343	1.000	1"	25.400	1"	6"	1-1/4"	.030"	3-3/8"	.960"	427.70	409.10	390.51	371.91
40353	1.000	1"	25.400	1"	6"	1-1/4"	.060"	3-3/8"	.960"	427.70	409.10	390.51	371.91
40363	1.000	1"	25.400	1"	6"	1-1/4"	.120"	3-3/8"	.960"	427.70	409.10	390.51	371.91

TOLERANCES

$d1$	+.000" - .001" (+.000 - .025mm)	
$d2$	3mm - 6mm	+ .0000" - .0003" (+.0000 - .0075mm)
	1/4" - 1"	- .0001" - .0004" (-.0025 - .0100mm)

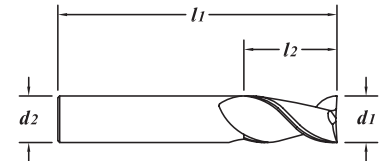
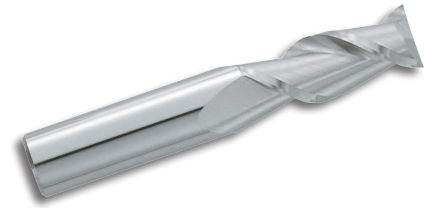
Technical information:
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242M (842M metric) - 2 Flute

HIGH PERFORMANCE END MILLS

Solid submicron grain carbide end mill - center cutting
 High performance machining
 Rigid work holding, machine stability and part integrity are critical!
 Excellent choice for slotting
 Polished cylindrical O.D. margin reduces chatter
Recommended for aluminum and titanium
 Sharp corners (Can be modified with a corner radius)
 Designed for spindles between 4,000-8,000 RPM, 1% diameter for chip load



EDP#	$d1$ †		$d2$	$l1$	$l2$	1-11	12-24	25-49	50-100	
	Decimal	Diameter								Metric
08910	.1181		3.000	3.0	38	8	11.07	10.59	10.11	9.63
08920	.1181		3.000	3.0	50	12	13.34	12.76	12.18	11.60
85160	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	10.40	9.94	9.49	9.04
85170	.1250	1/8"	3.175	1/8"	2"	1/2"	12.52	11.98	11.43	10.89
08950	.1575		4.000	6.0	50	8	18.00	17.22	16.43	15.65
08960	.1575		4.000	6.0	50	12	18.00	17.22	16.43	15.65
85180	.1875	3/16"	4.763	3/16"	2"	5/16"	12.98	12.42	11.85	11.29
85190	.1875	3/16"	4.763	3/16"	2"	9/16"	12.98	12.42	11.85	11.29
08990	.1969		5.000	6.0	50	10	16.94	16.20	15.47	14.73
09000	.1969		5.000	6.0	65	15	18.84	18.02	17.20	16.38
09010	.2362		6.000	6.0	50	12	14.42	13.79	13.17	12.54
09020	.2362		6.000	6.0	65	25	15.50	14.83	14.15	13.48
09030	.2362		6.000	6.0	100	50	28.09	26.87	25.65	24.43
85200	.2500	1/4"	6.350	1/4"	2"	1/2"	13.67	13.08	12.48	11.89
85220	.2500	1/4"	6.350	1/4"	2-1/2"	1"	14.78	14.14	13.49	12.85
85240	.2500	1/4"	6.350	1/4"	4"	2"	26.69	25.53	24.37	23.21
85300	.3125	5/16"	7.938	5/16"	3"	1-1/8"	31.19	29.83	28.48	27.12
09240	.3150		8.000	8.0	65	20	21.76	20.81	19.87	18.92
09040	.3150		8.000	8.0	75	30	32.87	31.44	30.01	28.58
09050	.3150		8.000	8.0	100	50	36.66	35.07	33.47	31.88
85400	.3750	3/8"	9.525	3/8"	2"	5/8"	23.10	22.10	21.09	20.09
85420	.3750	3/8"	9.525	3/8"	2-1/2"	1"	25.81	24.68	23.56	22.44
85440	.3750	3/8"	9.525	3/8"	4"	2"	38.55	36.87	35.20	33.52
09060	.3937		10.000	10.0	50	16	26.88	25.71	24.54	23.37
09070	.3937		10.000	10.0	70	25	31.41	30.04	28.68	27.31
09080	.3937		10.000	10.0	100	50	49.13	46.99	44.86	42.72
09090	.4724		12.000	12.0	65	20	40.14	38.39	36.65	34.90
09100	.4724		12.000	12.0	75	32	43.40	41.51	39.63	37.74
09110	.4724		12.000	12.0	100	50	59.80	57.20	54.60	52.00
85500	.5000	1/2"	12.700	1/2"	2-1/2"	3/4"	37.92	36.27	34.62	32.97
85520	.5000	1/2"	12.700	1/2"	3"	1-1/4"	41.33	39.53	37.74	35.94
85540	.5000	1/2"	12.700	1/2"	4"	2"	56.42	53.97	51.51	49.06
85600	.6250	5/8"	15.875	5/8"	3-1/2"	1-5/8"	79.71	76.24	72.78	69.31
85620	.6250	5/8"	15.875	5/8"	6"	3"	116.28	111.22	106.17	101.11
09120	.6299		16.000	16.0	88	40	83.69	80.05	76.41	72.77
09130	.6299		16.000	16.0	150	75	116.28	111.22	106.17	101.11
09140	.7087		18.000	18.0	100	45	122.73	117.39	112.06	106.72
85700	.7500	3/4"	19.050	3/4"	4"	1-3/4"	116.87	111.79	106.71	101.63
85720	.7500	3/4"	19.050	3/4"	6"	3"	185.24	177.19	169.13	161.08
09350	.7874		20.000	20.0	100	38	156.03	149.25	142.46	135.68
09150	.7874		20.000	20.0	150	75	195.14	186.66	178.17	169.69
09160	.9843		25.000	25.0	100	45	181.26	173.38	165.50	157.62
09170	.9843		25.000	25.0	150	75	300.71	287.64	274.56	261.49
85800	1.000	1"	25.400	1"	4"	1-3/4"	174.82	167.22	159.62	152.02
85820	1.000	1"	25.400	1"	6"	3"	314.94	301.25	287.55	273.86

253MA (853MA metric) - 3 Flute

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TOLERANCES

$d1$	+.000" -.002" (+.000 -.050mm)	
$d2$	3mm - 6mm	+0.000" -.0003" (+.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)

.1181" - .5625"
(3.000mm - 14.288mm)

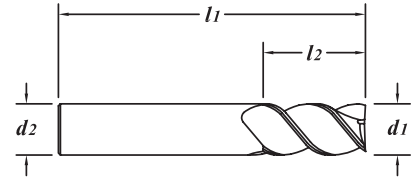


Balinit® X.CEED Coated

Uncoated - page 116
TiCN Coated - page 118



- Solid submicron grain carbide end mill - center cutting
- High performance machining
- Rigid work holding, machine stability and part integrity are critical!
- Dry or semi-dry machining
- Up to 40% faster than uncoated
- Slots stainless steel at an axial depth of 25% of diameter
- Recommended for stainless steel**
- Sharp corners (Can be modified with a corner radius)



EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
10347	.1181	3.000	3.0	38	8	13.56	12.97	12.38	11.79	
10357	.1181	3.000	3.0	50	12	16.34	15.63	14.92	14.21	
86137	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	12.88	12.32	11.76	11.20
86147	.1250	1/8"	3.175	1/8"	2"	1/2"	15.53	14.85	14.18	13.50
10387	.1575	4.000	6.0	50	8	21.92	20.97	20.01	19.06	
10397	.1575	4.000	6.0	50	12	21.92	20.97	20.01	19.06	
86157	.1875	3/16"	4.763	3/16"	2"	5/16"	14.72	14.08	13.44	12.80
86167	.1875	3/16"	4.763	3/16"	2"	9/16"	14.72	14.08	13.44	12.80
86187	.1875	3/16"	4.763	3/16"	3"	1"	25.67	24.55	23.44	22.32
10407	.1969	5.000	5.0	50	8	17.45	16.69	15.93	15.17	
10417	.1969	5.000	5.0	50	14	17.45	16.69	15.93	15.17	
10017	.2362	6.000	6.0	50	12	18.25	17.46	16.66	15.87	
10027	.2362	6.000	6.0	65	19	20.57	19.68	18.78	17.89	
10037	.2362	6.000	6.0	75	32	31.71	30.33	28.95	27.57	
86207	.2500	1/4"	6.350	1/4"	2"	1/2"	17.51	16.75	15.99	15.23
86227	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	19.86	19.00	18.13	17.27
86247	.2500	1/4"	6.350	1/4"	3"	1-1/4"	30.36	29.04	27.72	26.40
86267	.3125	5/16"	7.938	5/16"	2"	7/16"	24.21	23.16	22.10	21.05
86277	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	28.32	27.09	25.86	24.63
86287	.3125	5/16"	7.938	5/16"	4"	1-1/4"	44.49	42.56	40.62	38.69
10427	.3150	8.000	8.0	50	11	25.20	24.10	23.01	21.91	
10047	.3150	8.000	8.0	65	20	29.35	28.07	26.80	25.52	
10057	.3150	8.000	8.0	75	32	40.46	38.70	36.94	35.18	
86307	.3750	3/8"	9.525	3/8"	2"	1/2"	28.60	27.36	26.11	24.87
86327	.3750	3/8"	9.525	3/8"	2-1/2"	1"	33.42	31.97	30.51	29.06
86347	.3750	3/8"	9.525	3/8"	3-1/2"	1-1/2"	48.22	46.12	44.03	41.93
10067	.3937	10.000	10.0	50	12	33.10	31.66	30.22	28.78	
10077	.3937	10.000	10.0	75	25	46.75	44.72	42.68	40.65	
10087	.3937	10.000	10.0	88	38	59.19	56.62	54.04	51.47	
86367	.4375	7/16"	11.113	7/16"	2-1/2"	9/16"	40.17	38.42	36.68	34.93
86377	.4375	7/16"	11.113	7/16"	2-3/4"	1"	40.17	38.42	36.68	34.93
86387	.4375	7/16"	11.113	7/16"	4"	2"	64.24	61.45	58.65	55.86
10097	.4724	12.000	12.0	65	16	48.78	46.66	44.54	42.42	
10107	.4724	12.000	12.0	75	25	52.05	49.79	47.52	45.26	
10117	.4724	12.000	12.0	100	50	71.04	67.95	64.86	61.77	
86407	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	46.78	44.75	42.71	40.68
86427	.5000	1/2"	12.700	1/2"	3"	1"	49.98	47.81	45.63	43.46
86447	.5000	1/2"	12.700	1/2"	4"	2"	67.63	64.69	61.75	58.81
10437	.5512	14.000	14.0	65	16	72.84	69.67	66.51	63.34	
10447	.5512	14.000	14.0	75	25	77.99	74.60	71.21	67.82	
10457	.5512	14.000	14.0	100	50	94.66	90.54	86.43	82.31	
86467	.5625	9/16"	14.288	9/16"	3"	7/8"	78.21	74.81	71.41	68.01
86477	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	83.11	79.50	75.88	72.27
86487	.5625	9/16"	14.288	9/16"	6"	2-1/2"	125.71	120.24	114.78	109.31

253MA (853MA metric) - 3 Flute (continued)

.6250" - 1.000"
(15.875mm - 25.400mm)

HIGH PERFORMANCE
END MILLS

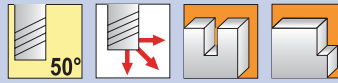
EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
86507	.6250	5/8"	15.875	5/8"	3"	7/8"	82.93	79.32	75.72	72.11
86527	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	92.22	88.21	84.20	80.19
86547	.6250	5/8"	15.875	5/8"	6"	2-1/2"	134.87	129.01	123.14	117.28
10127	.6299		16.000	16.0	75	20	86.74	82.97	79.20	75.43
10137	.6299		16.000	16.0	88	32	96.21	92.03	87.84	83.66
10147	.6299		16.000	16.0	150	65	134.87	129.01	123.14	117.28
10167	.7087		18.000	18.0	100	38	137.47	131.49	125.52	119.54
10177	.7087		18.000	18.0	150	75	196.35	187.81	179.28	170.74
86607	.7500	3/4"	19.050	3/4"	3-1/2"	1"	131.64	125.92	120.19	114.47
86627	.7500	3/4"	19.050	3/4"	4"	1-1/2"	131.64	125.92	120.19	114.47
86647	.7500	3/4"	19.050	3/4"	6"	3"	206.77	197.78	188.79	179.80
10467	.7874		20.000	20.0	75	22	159.44	152.50	145.57	138.64
10187	.7874		20.000	20.0	100	38	177.85	170.12	162.38	154.65
10197	.7874		20.000	20.0	150	75	223.09	213.39	203.69	193.99
10217	.9843		25.000	25.0	100	28	203.10	194.27	185.44	176.61
10487	.9843		25.000	25.0	100	50	203.10	194.27	185.44	176.61
10497	.9843		25.000	25.0	150	82	328.66	314.37	300.08	285.79
86697	1.000	1"	25.400	1"	4"	1-1/8"	196.66	188.11	179.56	171.01
86727	1.000	1"	25.400	1"	4"	2"	196.66	188.11	179.56	171.01
86747	1.000	1"	25.400	1"	6"	3-1/4"	342.90	327.99	313.08	298.17



V4-S series in 1018 material

253M (853M metric) - 3 Flute

Technical information:
page 229, 231



TOLERANCES		
d_1	+.000"-.002" (+.000-.050mm)	
d_2	3mm - 6mm	+.0000"-.0003" (+.0000-.0075mm)
	1/4" - 1"	-.0001"-.0004" (-.0025-.0100mm)

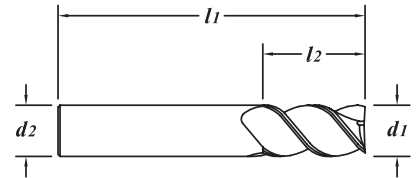
.1181" - .5625"
(3.000mm - 14.288mm)

X.CEED Coated - page 114
TiCN Coated - page 118

- Solid submicron grain carbide end mill - center cutting
- High performance machining
- Rigid work holding, machine stability and part integrity are critical!
- Slots aluminum at an axial depth of 25% of diameter

Recommended for aluminum and stainless steel

Sharp corners (Can be modified with a corner radius)



EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
10340	.1181	3.000	3.0	38	8	11.07	10.59	10.11	9.63	
10350	.1181	3.000	3.0	50	12	13.34	12.76	12.18	11.60	
86130	.1250	1/8"	3.175	1-1/2"	1/4"	10.40	9.94	9.49	9.04	
86140	.1250	1/8"	3.175	1/8"	1/2"	12.52	11.98	11.43	10.89	
10380	.1575	4.000	6.0	50	8	18.00	17.22	16.43	15.65	
10390	.1575	4.000	6.0	50	12	18.00	17.22	16.43	15.65	
86150	.1875	3/16"	4.763	3/16"	2"	5/16"	12.25	11.72	11.18	10.65
86160	.1875	3/16"	4.763	3/16"	2"	9/16"	12.25	11.72	11.18	10.65
86180	.1875	3/16"	4.763	3/16"	3"	1"	21.83	20.88	19.93	18.98
10400	.1969	5.000	5.0	50	8	13.60	13.01	12.42	11.83	
10410	.1969	5.000	5.0	50	14	13.60	13.01	12.42	11.83	
10010	.2362	6.000	6.0	50	12	14.42	13.79	13.17	12.54	
10020	.2362	6.000	6.0	65	19	15.50	14.83	14.15	13.48	
10030	.2362	6.000	6.0	75	32	26.61	25.45	24.30	23.14	
86200	.2500	1/4"	6.350	1/4"	2"	1/2"	13.67	13.08	12.48	11.89
86220	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	14.78	14.14	13.49	12.85
86240	.2500	1/4"	6.350	1/4"	3"	1-1/4"	25.30	24.20	23.10	22.00
86260	.3125	5/16"	7.938	5/16"	2"	7/16"	18.70	17.89	17.07	16.26
86270	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	20.72	19.82	18.92	18.02
86280	.3125	5/16"	7.938	5/16"	4"	1-1/4"	34.81	33.30	31.78	30.27
10420	.3150	8.000	8.0	50	11	19.71	18.85	18.00	17.14	
10040	.3150	8.000	8.0	65	20	21.76	20.81	19.87	18.92	
10050	.3150	8.000	8.0	75	32	32.87	31.44	30.01	28.58	
86300	.3750	3/8"	9.525	3/8"	2"	1/2"	23.10	22.10	21.09	20.09
86320	.3750	3/8"	9.525	3/8"	2-1/2"	1"	25.81	24.68	23.56	22.44
86340	.3750	3/8"	9.525	3/8"	3-1/2"	1-1/2"	38.55	36.87	35.20	33.52
10060	.3937	10.000	10.0	50	12	26.88	25.71	24.54	23.37	
10070	.3937	10.000	10.0	75	25	38.10	36.44	34.79	33.13	
10080	.3937	10.000	10.0	88	38	47.99	45.90	43.82	41.73	
86360	.4375	7/16"	11.113	7/16"	2-1/2"	9/16"	31.50	30.13	28.76	27.39
86370	.4375	7/16"	11.113	7/16"	2-3/4"	1"	31.50	30.13	28.76	27.39
86380	.4375	7/16"	11.113	7/16"	4"	2"	53.04	50.73	48.43	46.12
10090	.4724	12.000	12.0	65	16	40.14	38.39	36.65	34.90	
10100	.4724	12.000	12.0	75	25	43.40	41.51	39.63	37.74	
10110	.4724	12.000	12.0	100	50	59.80	57.20	54.60	52.00	
86400	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	38.12	36.47	34.81	33.15
86420	.5000	1/2"	12.700	1/2"	3"	1"	41.33	39.53	37.74	35.94
86440	.5000	1/2"	12.700	1/2"	4"	2"	56.42	53.97	51.51	49.06
10430	.5512	14.000	14.0	65	16	62.80	60.07	57.34	54.61	
10440	.5512	14.000	14.0	75	25	67.94	64.99	62.03	59.08	
10450	.5512	14.000	14.0	100	50	82.14	78.57	75.00	71.43	
86460	.5625	9/16"	14.288	9/16"	3"	7/8"	68.18	65.22	62.25	59.29
86470	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	70.59	67.52	64.45	61.38
86480	.5625	9/16"	14.288	9/16"	6"	2-1/2"	107.10	102.44	97.79	93.13

253M (853M metric) - 3 Flute (continued)

.6250" - 1.000"
(15.875mm - 25.400mm)

HIGH PERFORMANCE
END MILLS

EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
86500	.6250	5/8"	15.875	5/8"	3"	7/8"	72.90	69.73	66.56	63.39
86520	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	79.71	76.24	72.78	69.31
86540	.6250	5/8"	15.875	5/8"	6"	2-1/2"	116.28	111.22	106.17	101.11
10120	.6299		16.000	16.0	75	20	76.72	73.38	70.05	66.71
10130	.6299		16.000	16.0	88	32	83.69	80.05	76.41	72.77
10140	.6299		16.000	16.0	150	65	116.28	111.22	106.17	101.11
10160	.7087		18.000	18.0	100	38	122.71	117.37	112.04	106.70
10170	.7087		18.000	18.0	150	75	174.82	167.22	159.62	152.02
86600	.7500	3/4"	19.050	3/4"	3-1/2"	1"	116.87	111.79	106.71	101.63
86620	.7500	3/4"	19.050	3/4"	4"	1-1/2"	116.87	111.79	106.71	101.63
86640	.7500	3/4"	19.050	3/4"	6"	3"	185.24	177.19	169.13	161.08
10460	.7874		20.000	20.0	75	22	142.17	135.99	129.81	123.63
10180	.7874		20.000	20.0	100	38	156.03	149.25	142.46	135.68
10190	.7874		20.000	20.0	150	75	195.14	186.66	178.17	169.69
10210	.9843		25.000	25.0	100	28	181.26	173.38	165.50	157.62
10480	.9843		25.000	25.0	100	50	181.26	173.38	165.50	157.62
10490	.9843		25.000	25.0	150	82	300.71	287.64	274.56	261.49
86690	1.000	1"	25.400	1"	4"	1-1/8"	174.82	167.22	159.62	152.02
86720	1.000	1"	25.400	1"	4"	2"	174.82	167.22	159.62	152.02
86740	1.000	1"	25.400	1"	6"	3-1/4"	314.94	301.25	287.55	273.86

253MC - 3 Flute

Technical information: page 229, 231

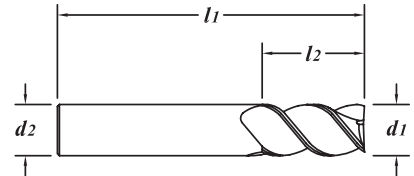


TOLERANCES		
$d1$	+.000" -.002" (+.000 -.050mm)	
$d2$	3mm - 6mm	+.0000" -.0003" (+.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)

TiCN Coated

X.CEED Coated - page 114
Uncoated - page 116

- Solid submicron grain carbide end mill - center cutting
- High performance machining
- Rigid work holding, machine stability and part integrity are critical!
- Improved abrasion resistance and lubricity
- Up to 25% faster than uncoated
- Slots aluminum and stainless steel at an axial depth of 25% of diameter
- Recommended for aluminum and 303 stainless steel**
- Sharp corners (Can be modified with a corner radius)



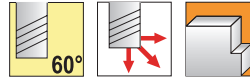
EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
86154	.1875	3/16"	4.763	3/16"	2"	5/16"	14.42	13.79	13.17	12.54
86164	.1875	3/16"	4.763	3/16"	2"	9/16"	14.42	13.79	13.17	12.54
86184	.1875	3/16"	4.763	3/16"	3"	1"	24.87	23.79	22.71	21.63
86204	.2500	1/4"	6.350	1/4"	2"	1/2"	16.73	16.01	15.28	14.55
86224	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	19.19	18.36	17.52	16.69
86244	.2500	1/4"	6.350	1/4"	3"	1-1/4"	29.69	28.40	27.11	25.82
86264	.3125	5/16"	7.938	5/16"	2"	7/16"	23.47	22.45	21.43	20.41
86274	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	26.61	25.45	24.30	23.14
86284	.3125	5/16"	7.938	5/16"	4"	1-1/4"	42.15	40.32	38.48	36.65
86304	.3750	3/8"	9.525	3/8"	2"	1/2"	27.88	26.66	25.45	24.24
86324	.3750	3/8"	9.525	3/8"	2-1/2"	1"	30.58	29.25	27.92	26.59
86344	.3750	3/8"	9.525	3/8"	3-1/2"	1-1/2"	45.86	43.87	41.87	39.88
86364	.4375	7/16"	11.113	7/16"	2-1/2"	9/16"	38.58	36.91	35.23	33.55
86374	.4375	7/16"	11.113	7/16"	2-3/4"	1"	38.58	36.91	35.23	33.55
86384	.4375	7/16"	11.113	7/16"	4"	2"	61.87	59.18	56.49	53.80
86404	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	45.20	43.23	41.27	39.30
86424	.5000	1/2"	12.700	1/2"	3"	1"	48.40	46.30	44.19	42.09
86444	.5000	1/2"	12.700	1/2"	4"	2"	65.26	62.43	59.59	56.75
86464	.5625	9/16"	14.288	9/16"	3"	7/8"	77.68	74.31	70.93	67.55
86474	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	81.62	78.07	74.52	70.97
86484	.5625	9/16"	14.288	9/16"	6"	2-1/2"	122.54	117.22	111.89	106.56
86504	.6250	5/8"	15.875	5/8"	3"	7/8"	82.40	78.82	75.23	71.65
86524	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	90.72	86.78	82.83	78.89
86544	.6250	5/8"	15.875	5/8"	6"	2-1/2"	131.73	126.01	120.28	114.55
86604	.7500	3/4"	19.050	3/4"	3-1/2"	1"	129.49	123.86	118.23	112.60
86624	.7500	3/4"	19.050	3/4"	4"	1-1/2"	129.49	123.86	118.23	112.60
86644	.7500	3/4"	19.050	3/4"	6"	3"	202.88	194.06	185.24	176.42
86694	1.000	1"	25.400	1"	4"	1-1/8"	193.79	185.36	176.94	168.51
86724	1.000	1"	25.400	1"	4"	2"	193.79	185.36	176.94	168.51
86744	1.000	1"	25.400	1"	6"	3-1/4"	339.88	325.11	310.33	295.55

TOLERANCES

$d1$	+.000"-.002" (+.000-.050mm)	
$d2$	3mm - 6mm	+.0000"-.0003" (+.0000-.0075mm)
	1/4" - 1"	-.0001"-.0004" (-.0025-.0100mm)

263M (863M metric) - 3 Flute - Uncoated
263MC - 3 Flute - TiCN Coated
263MA (863MA metric) - 3 Flute - *Balinit*® X.CEED Coated

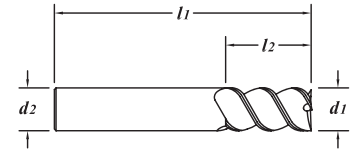
Technical information: page 229, 231



Solid submicron grain carbide end mill - center cutting
 High performance profiling
 Rigid work holding, machine stability and part integrity are critical!
 Modified end gash - will not cut square corner

Recommended for steels, stainless steel and high-temperature alloys

Can be modified with a corner radius

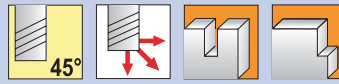


HIGH PERFORMANCE END MILLS

UNCOATED EDP#	TiCN EDP#	X.CEED EDP#	$d1$ †		$d2$	$l1$	$l2$	1-11	12-24	25-49	50-100	
			Decimal	Diameter								Metric
23510	-	-	.2362		6.000	6.0	65	13	15.50	14.83	14.15	13.48
23010	-	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	14.78	14.14	13.49	12.85
23020	-	-	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	20.72	19.82	18.92	18.02
23520	-	-	.3150		8.000	8.0	65	19	21.76	20.81	19.87	18.92
23030	-	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	25.81	24.68	23.56	22.44
23530	-	-	.3937		10.000	10.0	70	22	31.41	30.04	28.68	27.31
23040	-	-	.4375	7/16"	11.113	7/16"	2-3/4"	1"	31.50	30.13	28.76	27.39
23540	-	-	.4724		12.000	12.0	75	26	43.40	41.51	39.63	37.74
23050	-	-	.5000	1/2"	12.700	1/2"	3"	1"	41.33	39.53	37.74	35.94
23060	-	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	79.71	76.24	72.78	69.31
23550	-	-	.6299		16.000	16.0	88	32	83.69	80.05	76.41	72.77
23070	-	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	116.87	111.79	106.71	101.63
23560	-	-	.7874		20.000	20.0	100	38	156.03	149.25	142.46	135.68
23080	-	-	1.000	1"	25.400	1"	4"	1-1/2"	174.82	167.22	159.62	152.02
-	23014	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	19.19	18.36	17.52	16.69
-	23024	-	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	26.61	25.45	24.30	23.14
-	23034	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	31.71	30.33	28.95	27.57
-	23044	-	.4375	7/16"	11.113	7/16"	2-3/4"	1"	38.58	36.91	35.23	33.55
-	23054	-	.5000	1/2"	12.700	1/2"	3"	1"	48.40	46.30	44.19	42.09
-	23064	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	90.72	86.78	82.83	78.89
-	23074	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	129.49	123.86	118.23	112.60
-	23084	-	1.000	1"	25.400	1"	4"	1-1/2"	193.79	185.36	176.94	168.51
-	-	23517	.2362		6.000	6.0	65	13	20.57	19.68	18.78	17.89
-	-	23017	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	19.86	19.00	18.13	17.27
-	-	23027	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	28.32	27.09	25.86	24.63
-	-	23527	.3150		8.000	8.0	65	19	29.35	28.07	26.80	25.52
-	-	23037	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	33.42	31.97	30.51	29.06
-	-	23537	.3937		10.000	10.0	70	22	40.08	38.34	36.59	34.85
-	-	23047	.4375	7/16"	11.113	7/16"	2-3/4"	1"	40.17	38.42	36.68	34.93
-	-	23547	.4724		12.000	12.0	75	26	52.05	49.79	47.52	45.26
-	-	23057	.5000	1/2"	12.700	1/2"	3"	1"	49.98	47.81	45.63	43.46
-	-	23067	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	92.22	88.21	84.20	80.19
-	-	23557	.6299		16.000	16.0	88	32	96.21	92.03	87.84	83.66
-	-	23077	.7500	3/4"	19.050	3/4"	4"	1-1/2"	131.64	125.92	120.19	114.47
-	-	23567	.7874		20.000	20.0	100	38	177.85	170.12	162.38	154.65
-	-	23087	1.000	1"	25.400	1"	4"	1-1/2"	196.66	188.11	179.56	171.01

255MA (855MA metric) - 5 Flute

Technical information:
page 229, 231



TOLERANCES

$d1$	+.000" -.002" (+.000 -.050mm)	
$d2$	3mm - 6mm	+.0000" -.0003" (+.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)

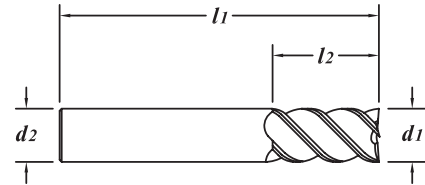
.1181" - .6250"
(3.000mm - 15.875mm)

Balinit® X.CEED Coated

Uncoated - page 121
TiCN Coated - page 123

- Solid submicron grain carbide end mill - center cutting
- High performance milling
- Rigid work holding, machine stability and part integrity are critical!
- Dry or semi-dry machining
- Up to 40% faster than uncoated
- Improved finishes in titanium
- Heavy core, Sharp corners

Recommended for steels, stainless steel and exotics



EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
40047	.1181	3.000	3.0	38	8	13.56	12.97	12.38	11.79	
40057	.1181	3.000	3.0	50	12	16.34	15.63	14.92	14.21	
52087	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	12.88	12.32	11.76	11.20
52097	.1250	1/8"	3.175	1/8"	2"	1/2"	15.53	14.85	14.18	13.50
40087	.1575	4.000	6.0	50	8	21.92	20.97	20.01	19.06	
40097	.1575	4.000	6.0	50	12	21.92	20.97	20.01	19.06	
52107	.1875	3/16"	4.763	3/16"	2"	5/16"	14.72	14.08	13.44	12.80
52127	.1875	3/16"	4.763	3/16"	2"	9/16"	14.72	14.08	13.44	12.80
40107	.1969	5.000	5.0	50	8	17.45	16.69	15.93	15.17	
40127	.1969	5.000	5.0	50	14	17.45	16.69	15.93	15.17	
40207	.2362	6.000	6.0	50	10	18.25	17.46	16.66	15.87	
40227	.2362	6.000	6.0	65	20	20.57	19.68	18.78	17.89	
40247	.2362	6.000	6.0	100	32	34.05	32.57	31.09	29.61	
52207	.2500	1/4"	6.350	1/4"	2"	3/8"	17.51	16.75	15.99	15.23
52227	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	19.86	19.00	18.13	17.27
52247	.2500	1/4"	6.350	1/4"	4"	1-1/4"	32.65	31.23	29.81	28.39
52307	.3125	5/16"	7.938	5/16"	2"	7/16"	24.21	23.16	22.10	21.05
52327	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	28.32	27.09	25.86	24.63
52347	.3125	5/16"	7.938	5/16"	4"	1-1/4"	44.49	42.56	40.62	38.69
40307	.3150	8.000	8.0	50	11	25.20	24.10	23.01	21.91	
40327	.3150	8.000	8.0	65	21	29.35	28.07	26.80	25.52	
40347	.3150	8.000	8.0	100	32	46.32	44.31	42.29	40.28	
52407	.3750	3/8"	9.525	3/8"	2"	1/2"	28.60	27.36	26.11	24.87
52427	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	33.42	31.97	30.51	29.06
52447	.3750	3/8"	9.525	3/8"	3-1/2"	1-1/2"	48.22	46.12	44.03	41.93
40407	.3937	10.000	10.0	50	12	33.10	31.66	30.22	28.78	
40427	.3937	10.000	10.0	70	22	40.08	38.34	36.59	34.85	
40447	.3937	10.000	10.0	88	38	59.19	56.62	54.04	51.47	
52507	.4375	7/16"	11.113	7/16"	2-1/2"	9/16"	40.17	38.42	36.68	34.93
52527	.4375	7/16"	11.113	7/16"	2-3/4"	1"	40.17	38.42	36.68	34.93
52547	.4375	7/16"	11.113	7/16"	4"	2"	64.24	61.45	58.65	55.86
40507	.4724	12.000	12.0	65	16	48.78	46.66	44.54	42.42	
40527	.4724	12.000	12.0	75	32	52.05	49.79	47.52	45.26	
40547	.4724	12.000	12.0	100	50	71.04	67.95	64.86	61.77	
52607	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	46.78	44.75	42.71	40.68
52627	.5000	1/2"	12.700	1/2"	3"	1-1/4"	49.98	47.81	45.63	43.46
52647	.5000	1/2"	12.700	1/2"	4"	2"	67.63	64.69	61.75	58.81
52707	.6250	5/8"	15.875	5/8"	3"	3/4"	82.93	79.32	75.72	72.11
52727	.6250	5/8"	15.875	5/8"	3-1/2"	1-5/8"	92.22	88.21	84.20	80.19
52747	.6250	5/8"	15.875	5/8"	6"	2-1/2"	134.87	129.01	123.14	117.28

255MA (855MA metric) - 5 Flute (continued)

.6299" - 1.000"
(16.000mm - 25.400mm)

HIGH PERFORMANCE
END MILLS

EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
40607	.6299	16.000	16.0	75	20	86.74	82.97	79.20	75.43	
40627	.6299	16.000	16.0	88	41	96.21	92.03	87.84	83.66	
40647	.6299	16.000	16.0	150	63	134.87	129.01	123.14	117.28	
52807	.7500	3/4"	19.050	3/4"	3"	7/8"	116.84	111.76	106.68	101.60
52827	.7500	3/4"	19.050	3/4"	4"	1-5/8"	131.64	125.92	120.19	114.47
52837	.7500	3/4"	19.050	3/4"	5"	2"	176.69	169.00	161.32	153.64
52847	.7500	3/4"	19.050	3/4"	6"	3-1/4"	206.77	197.78	188.79	179.80
40707	.7874		20.000	20.0	75	22	159.44	152.50	145.57	138.64
40727	.7874		20.000	20.0	100	41	177.85	170.12	162.38	154.65
40747	.7874		20.000	20.0	150	82	223.09	213.39	203.69	193.99
40787	.9843		25.000	25.0	100	28	203.10	194.27	185.44	176.61
40827	.9843		25.000	25.0	100	50	203.10	194.27	185.44	176.61
40847	.9843		25.000	25.0	150	82	328.66	314.37	300.08	285.79
52897	1.000	1"	25.400	1"	4"	1-1/8"	196.66	188.11	179.56	171.01
52927	1.000	1"	25.400	1"	4"	2"	196.66	188.11	179.56	171.01
52947	1.000	1"	25.400	1"	6"	3-1/4"	342.90	327.99	313.08	298.17



End Mill Manufacturing

255M (855M metric) - 5 Flute

Technical information:
page 229, 231



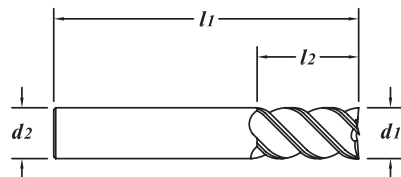
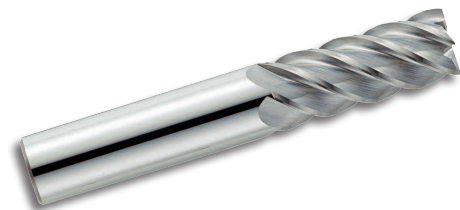
TOLERANCES		
d_1		+0.000" -0.002" (+0.000 -0.050mm)
d_2	3mm - 6mm	+0.0000" -0.0003" (+0.0000 -0.0075mm)
	1/4" - 1"	-0.0001" -0.0004" (-0.0025 -0.0100mm)

.1181" - .6250"
(3.000mm - 15.875mm)

X.CEED Coated - page 119
TiCN Coated - page 123

- Solid submicron grain carbide end mill - center cutting
- High performance milling
- Rigid work holding, machine stability and part integrity are critical!
- Improved finishes in titanium
- Heavy core
- Sharp corners

Recommended for steels, stainless steel and exotics



EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
40040	.1181	3.000	3.0	38	8	11.07	10.59	10.11	9.63	
40050	.1181	3.000	3.0	50	12	13.34	12.76	12.18	11.60	
52080	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	10.40	9.94	9.04	
52090	.1250	1/8"	3.175	1/8"	2"	1/2"	12.52	11.98	10.89	
40080	.1575	4.000	6.0	50	8	18.00	17.22	16.43	15.65	
40090	.1575	4.000	6.0	50	12	18.00	17.22	16.43	15.65	
52100	.1875	3/16"	4.763	3/16"	2"	5/16"	12.25	11.72	10.65	
52120	.1875	3/16"	4.763	3/16"	2"	9/16"	12.25	11.72	10.65	
40100	.1969	5.000	5.0	50	8	13.60	13.01	12.42	11.83	
40120	.1969	5.000	5.0	50	14	13.60	13.01	12.42	11.83	
40200	.2362	6.000	6.0	50	10	14.42	13.79	13.17	12.54	
40220	.2362	6.000	6.0	65	20	15.50	14.83	14.15	13.48	
40240	.2362	6.000	6.0	100	32	28.09	26.87	25.65	24.43	
52200	.2500	1/4"	6.350	1/4"	2"	3/8"	13.67	13.08	12.48	11.89
52220	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	14.78	14.14	13.49	12.85
52240	.2500	1/4"	6.350	1/4"	4"	1-1/4"	26.69	25.53	24.37	23.21
52300	.3125	5/16"	7.938	5/16"	2"	7/16"	18.70	17.89	17.07	16.26
52320	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	20.72	19.82	18.92	18.02
52340	.3125	5/16"	7.938	5/16"	4"	1-1/4"	34.81	33.30	31.78	30.27
40300	.3150	8.000	8.0	50	11	19.71	18.85	18.00	17.14	
40320	.3150	8.000	8.0	65	21	21.76	20.81	19.87	18.92	
40340	.3150	8.000	8.0	100	32	36.66	35.07	33.47	31.88	
52400	.3750	3/8"	9.525	3/8"	2"	1/2"	23.10	22.10	21.09	20.09
52420	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	25.81	24.68	23.56	22.44
52440	.3750	3/8"	9.525	3/8"	3-1/2"	1-1/2"	38.55	36.87	35.20	33.52
40400	.3937	10.000	10.0	50	12	26.88	25.71	24.54	23.37	
40420	.3937	10.000	10.0	70	22	31.41	30.04	28.68	27.31	
40440	.3937	10.000	10.0	88	38	47.99	45.90	43.82	41.73	
52500	.4375	7/16"	11.113	7/16"	2-1/2"	9/16"	31.50	30.13	28.76	27.39
52520	.4375	7/16"	11.113	7/16"	2-3/4"	1"	31.50	30.13	28.76	27.39
52540	.4375	7/16"	11.113	7/16"	4"	2"	53.04	50.73	48.43	46.12
40500	.4724	12.000	12.0	65	16	40.14	38.39	36.65	34.90	
40520	.4724	12.000	12.0	75	32	43.40	41.51	39.63	37.74	
40540	.4724	12.000	12.0	100	50	59.80	57.20	54.60	52.00	
52600	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	38.12	36.47	34.81	33.15
52620	.5000	1/2"	12.700	1/2"	3"	1-1/4"	41.33	39.53	37.74	35.94
52640	.5000	1/2"	12.700	1/2"	4"	2"	56.42	53.97	51.51	49.06
52700	.6250	5/8"	15.875	5/8"	3"	3/4"	72.90	69.73	66.56	63.39
52720	.6250	5/8"	15.875	5/8"	3-1/2"	1-5/8"	79.71	76.24	72.78	69.31
52740	.6250	5/8"	15.875	5/8"	6"	2-1/2"	116.28	111.22	106.17	101.11

255M (855M metric) - 5 Flute (continued)

.6299" - 1.000"
(16.000mm - 25.400mm)

HIGH PERFORMANCE
END MILLS

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
	Decimal	Metric							
40600	.6299	16.000	16.0	75	20	76.72	73.38	70.05	66.71
40620	.6299	16.000	16.0	88	41	83.69	80.05	76.41	72.77
40640	.6299	16.000	16.0	150	63	116.28	111.22	106.17	101.11
52800	.7500	3/4"	19.050	3"	7/8"	104.82	100.27	95.71	91.15
52820	.7500	3/4"	19.050	4"	1-5/8"	116.87	111.79	106.71	101.63
52830	.7500	3/4"	19.050	5"	2"	158.21	151.33	144.45	137.57
52840	.7500	3/4"	19.050	6"	3-1/4"	185.24	177.19	169.13	161.08
40700	.7874	20.000	20.0	75	22	142.17	135.99	129.81	123.63
40720	.7874	20.000	20.0	100	41	156.03	149.25	142.46	135.68
40740	.7874	20.000	20.0	150	82	195.14	186.66	178.17	169.69
40780	.9843	25.000	25.0	100	28	181.26	173.38	165.50	157.62
40820	.9843	25.000	25.0	100	50	181.26	173.38	165.50	157.62
40840	.9843	25.000	25.0	150	82	300.71	287.64	274.56	261.49
52890	1.000	1"	25.400	4"	1-1/8"	174.82	167.22	159.62	152.02
52920	1.000	1"	25.400	4"	2"	174.82	167.22	159.62	152.02
52940	1.000	1"	25.400	6"	3-1/4"	314.94	301.25	287.55	273.86



255MC - 5 Flute

Technical information:
page 229, 231



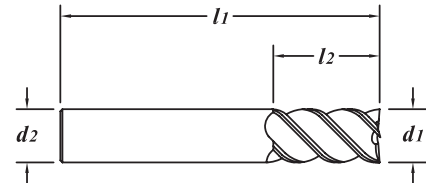
TOLERANCES		
$d1$	+.000" -.002" (+.000 -.050mm)	
$d2$	3mm - 6mm	+.0000" -.0003" (+.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)

TiCN Coated

X.CEED Coated - page 119
Uncoated - page 121

- Solid submicron grain carbide end mill - center cutting
- High performance milling
- Rigid work holding, machine stability and part integrity are critical!
- Improved abrasion resistance and lubricity
- Up to 25% faster than uncoated
- Improved finishes in titanium
- Heavy core
- Sharp corners

Recommended for steels, stainless steel and exotics



EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
52104	.1875	3/16"	4.763	3/16"	2"	5/16"	14.42	13.79	13.17	12.54
52124	.1875	3/16"	4.763	3/16"	2"	9/16"	14.42	13.79	13.17	12.54
52204	.2500	1/4"	6.350	1/4"	2"	3/8"	16.73	16.01	15.28	14.55
52224	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	19.19	18.36	17.52	16.69
52244	.2500	1/4"	6.350	1/4"	4"	1-1/4"	31.45	30.09	28.72	27.35
52304	.3125	5/16"	7.938	5/16"	2"	7/16"	23.47	22.45	21.43	20.41
52324	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	26.61	25.45	24.30	23.14
52344	.3125	5/16"	7.938	5/16"	4"	1-1/4"	42.15	40.32	38.48	36.65
52404	.3750	3/8"	9.525	3/8"	2"	1/2"	27.88	26.66	25.45	24.24
52424	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	31.71	30.33	28.95	27.57
52444	.3750	3/8"	9.525	3/8"	3-1/2"	1-1/2"	45.86	43.87	41.87	39.88
52504	.4375	7/16"	11.113	7/16"	2-1/2"	9/16"	38.58	36.91	35.23	33.55
52524	.4375	7/16"	11.113	7/16"	2-3/4"	1"	38.58	36.91	35.23	33.55
52544	.4375	7/16"	11.113	7/16"	4"	2"	61.87	59.18	56.49	53.80
52604	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	45.20	43.23	41.27	39.30
52624	.5000	1/2"	12.700	1/2"	3"	1-1/4"	48.40	46.30	44.19	42.09
52644	.5000	1/2"	12.700	1/2"	4"	2"	65.26	62.43	59.59	56.75
52704	.6250	5/8"	15.875	5/8"	3"	3/4"	82.40	78.82	75.23	71.65
52724	.6250	5/8"	15.875	5/8"	3-1/2"	1-5/8"	90.72	86.78	82.83	78.89
52744	.6250	5/8"	15.875	5/8"	6"	2-1/2"	131.73	126.01	120.28	114.55
52804	.7500	3/4"	19.050	3/4"	3"	7/8"	116.52	111.45	106.39	101.32
52824	.7500	3/4"	19.050	3/4"	4"	1-5/8"	129.49	123.86	118.23	112.60
52844	.7500	3/4"	19.050	3/4"	6"	3-1/4"	202.88	194.06	185.24	176.42
52894	1.000	1"	25.400	1"	4"	1-1/8"	193.79	185.36	176.94	168.51
52924	1.000	1"	25.400	1"	4"	2"	193.79	185.36	176.94	168.51
52944	1.000	1"	25.400	1"	6"	3-1/4"	339.88	325.11	310.33	295.55

255RA (855RA metric) - 5 Flute

Technical information:
page 229, 231

TOLERANCES

d_1	+.000" -.002" (+.000 -.050mm)	
d_2	3mm - 6mm	+.0000" -.0003" (+.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)
r	+.001" -.001" (+.025 -.025mm)	

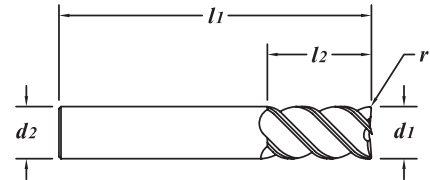
.1181" - .3125"
(3.000mm - 7.938mm)



Corner Radius - *Balinit*® X.CEED Coated

- Solid submicron grain carbide end mill - center cutting
- High performance milling
- Rigid work holding, machine stability and part integrity are critical!
- Dry or semi-dry machining
- Up to 40% faster than uncoated
- Improved finishes in titanium
- Heavy core
- An ideal tool for finishing applications after using the VRX end mill (see page 103)

Recommended for steels, stainless steel and exotics



EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
	Decimal	Metric									
83527	.1181	3.000	3.0	38	8	0.2	14.81	14.17	13.52	12.88	
83537	.1181	3.000	3.0	38	8	0.5	14.81	14.17	13.52	12.88	
83547	.1181	3.000	3.0	50	12	0.2	17.74	16.97	16.20	15.43	
83550	.1181	3.000	3.0	50	12	0.3	17.74	16.97	16.20	15.43	
83557	.1181	3.000	3.0	50	12	0.5	17.74	16.97	16.20	15.43	
83567	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.010"	14.08	13.46	12.85	12.24
83577	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.020"	14.08	13.46	12.85	12.24
83587	.1250	1/8"	3.175	1/8"	2"	1/2"	.010"	17.30	16.54	15.79	15.04
83597	.1250	1/8"	3.175	1/8"	2"	1/2"	.020"	17.30	16.54	15.79	15.04
83600	.1250	1/8"	3.175	1/8"	2"	1/2"	.030"	17.30	16.54	15.79	15.04
83607	.1575	4.000	6.0	50	8	0.3	23.87	22.84	21.80	20.76	
83617	.1575	4.000	6.0	50	8	0.5	23.87	22.84	21.80	20.76	
83627	.1575	4.000	6.0	50	12	0.3	23.87	22.84	21.80	20.76	
83637	.1575	4.000	6.0	50	12	0.5	23.87	22.84	21.80	20.76	
83647	.1875	3/16"	4.763	3/16"	2"	5/16"	.010"	17.69	16.92	16.15	15.38
83657	.1875	3/16"	4.763	3/16"	2"	5/16"	.020"	17.69	16.92	16.15	15.38
83667	.1875	3/16"	4.763	3/16"	2"	9/16"	.010"	17.69	16.92	16.15	15.38
83677	.1875	3/16"	4.763	3/16"	2"	9/16"	.020"	17.69	16.92	16.15	15.38
83680	.1875	3/16"	4.763	3/16"	2"	9/16"	.030"	17.69	16.92	16.15	15.38
83707	.1969	5.000	6.0	65	15	0.3	26.04	24.90	23.77	22.64	
83717	.1969	5.000	6.0	65	15	0.5	26.04	24.90	23.77	22.64	
83767	.2362	6.000	6.0	50	12	0.3	22.46	21.48	20.51	19.53	
83777	.2362	6.000	6.0	50	12	0.5	22.46	21.48	20.51	19.53	
83780	.2362	6.000	6.0	65	19	0.2	25.22	24.12	23.03	21.93	
83787	.2362	6.000	6.0	65	19	0.3	25.22	24.12	23.03	21.93	
83797	.2362	6.000	6.0	65	19	0.5	25.22	24.12	23.03	21.93	
83807	.2362	6.000	6.0	65	19	1.0	25.22	24.12	23.03	21.93	
83827	.2500	1/4"	6.350	1/4"	2"	3/8"	.015"	21.62	20.68	19.74	18.80
83837	.2500	1/4"	6.350	1/4"	2"	3/8"	.030"	21.62	20.68	19.74	18.80
83845	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"	24.30	23.24	22.19	21.13
83847	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	24.30	23.24	22.19	21.13
83857	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	24.30	23.24	22.19	21.13
83877	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.060"	24.30	23.24	22.19	21.13
83927	.3125	5/16"	7.938	5/16"	2"	7/16"	.020"	29.52	28.24	26.95	25.67
83937	.3125	5/16"	7.938	5/16"	2"	7/16"	.030"	29.52	28.24	26.95	25.67
83940	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.010"	32.90	31.47	30.04	28.61
83947	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.020"	32.90	31.47	30.04	28.61
83957	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.030"	32.90	31.47	30.04	28.61
83977	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.060"	32.90	31.47	30.04	28.61

continued →

255RA (855RA metric) - 5 Flute (continued)

.3150" - 1.000"
(8.000mm - 25.400mm)

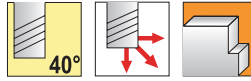
EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
	Decimal	Metric									
83987	.3150	8.000	8.0	50	12	0.5	30.60	29.27	27.94	26.61	
83997	.3150	8.000	8.0	50	12	1.0	30.60	29.27	27.94	26.61	
84000	.3150	8.000	8.0	65	22	0.3	34.13	32.65	31.16	29.68	
84007	.3150	8.000	8.0	65	22	0.5	34.13	32.65	31.16	29.68	
84017	.3150	8.000	8.0	65	22	1.0	34.13	32.65	31.16	29.68	
84027	.3150	8.000	8.0	65	22	1.5	34.13	32.65	31.16	29.68	
84087	.3750	3/8"	9.525	3/8"	2"	1/2"	.020"	34.80	33.29	31.77	30.26
84097	.3750	3/8"	9.525	3/8"	2"	1/2"	.030"	34.80	33.29	31.77	30.26
84100	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.010"	38.27	36.61	34.94	33.28
84107	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.020"	38.27	36.61	34.94	33.28
84117	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	38.27	36.61	34.94	33.28
84137	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.060"	38.27	36.61	34.94	33.28
84167	.3937	10.000	10.0	70	22	0.5	46.26	44.25	42.24	40.23	
84177	.3937	10.000	10.0	70	22	1.0	46.26	44.25	42.24	40.23	
84257	.4724	12.000	12.0	75	32	0.3	67.65	64.71	61.77	58.83	
84267	.4724	12.000	12.0	75	32	0.5	67.65	64.71	61.77	58.83	
84277	.4724	12.000	12.0	75	32	1.0	67.65	64.71	61.77	58.83	
84287	.4724	12.000	12.0	75	32	1.5	67.65	64.71	61.77	58.83	
84307	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.010"	64.92	62.10	59.27	56.45
84317	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.020"	64.92	62.10	59.27	56.45
84327	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	64.92	62.10	59.27	56.45
84337	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"	64.92	62.10	59.27	56.45
84357	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.120"	64.92	62.10	59.27	56.45
84367	.5000	1/2"	12.700	1/2"	4"	2"	.030"	76.90	73.56	70.21	66.87
84377	.5000	1/2"	12.700	1/2"	4"	2"	.060"	76.90	73.56	70.21	66.87
84397	.5000	1/2"	12.700	1/2"	4"	2"	.120"	76.90	73.56	70.21	66.87
84467	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"	103.24	98.75	94.26	89.77
84487	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	103.24	98.75	94.26	89.77
84497	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	103.24	98.75	94.26	89.77
84507	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.120"	103.24	98.75	94.26	89.77
84567	.6299	16.000	16.0	88	32	1.0	107.65	102.97	98.29	93.61	
84577	.6299	16.000	16.0	88	32	2.0	107.65	102.97	98.29	93.61	
84587	.6299	16.000	16.0	150	65	1.0	160.76	153.77	146.78	139.79	
84597	.6299	16.000	16.0	150	65	2.0	160.76	153.77	146.78	139.79	
84667	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"	147.74	141.32	134.89	128.47
84687	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	147.74	141.32	134.89	128.47
84697	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	147.74	141.32	134.89	128.47
84700	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.120"	147.74	141.32	134.89	128.47
84707	.7500	3/4"	19.050	3/4"	5"	2"	.030"	204.56	195.67	186.77	177.88
84717	.7500	3/4"	19.050	3/4"	5"	2"	.060"	204.56	195.67	186.77	177.88
84747	.7500	3/4"	19.050	3/4"	5"	2"	.120"	204.56	195.67	186.77	177.88
84757	.7500	3/4"	19.050	3/4"	5"	2"	.190"	204.56	195.67	186.77	177.88
84767	.7874	20.000	20.0	100	38	1.0	209.07	199.98	190.89	181.80	
84777	.7874	20.000	20.0	100	38	3.0	209.07	199.98	190.89	181.80	
84887	.9843	25.000	25.0	100	38	1.0	239.26	228.86	218.45	208.05	
84897	.9843	25.000	25.0	100	38	3.0	239.26	228.86	218.45	208.05	
84957	1.000	1"	25.400	1"	4"	1-1/2"	.015"	251.68	240.74	229.79	218.85
84967	1.000	1"	25.400	1"	4"	1-1/2"	.030"	251.68	240.74	229.79	218.85
84970	1.000	1"	25.400	1"	4"	1-1/2"	.060"	251.68	240.74	229.79	218.85
84977	1.000	1"	25.400	1"	4"	1-1/2"	.120"	251.68	240.74	229.79	218.85
84980	1.000	1"	25.400	1"	4"	1-1/2"	.190"	251.68	240.74	229.79	218.85
84987	1.000	1"	25.400	1"	5"	2"	.030"	309.50	296.04	282.59	269.13
84990	1.000	1"	25.400	1"	5"	2"	.060"	309.50	296.04	282.59	269.13
84997	1.000	1"	25.400	1"	5"	2"	.120"	309.50	296.04	282.59	269.13
85007	1.000	1"	25.400	1"	5"	2"	.190"	309.50	296.04	282.59	269.13

TOLERANCES

$d1$	+.000" -.002" (+.000 -.050mm)	
$d2$	3mm - 6mm	+.0000" -.0003" (+.0000 -.0075mm)
	1/4" - 1-1/4"	-.0001" -.0004" (-.0025 -.0100mm)

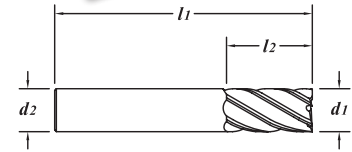
246M (846M metric) - 6 Flute - Uncoated
246MC - 6 Flute - TiCN Coated
246MA (846MA metric) - 6 Flute - Balinit® X.CEED Coated

Technical information: page 229, 231

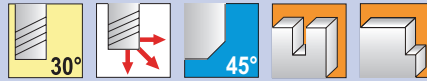


HIGH PERFORMANCE END MILLS

Solid submicron grain carbide end mill - center cutting
 High performance finishing in a variety of steels
 Rigid work holding, machine stability and part integrity are critical!
 Excellent durability



UNCOATED EDP#	TiCN EDP#	X.CEED EDP#	$d1$ †		$d2$	$l1$	$l2$	1-11	12-24	25-49	50-100	
			Decimal	Diameter Metric								
51110	-	-	.1875	3/16"	4.763	3/16"	2"	5/8"	12.25	11.72	11.18	10.65
51510	-	-	.1969		5.000	5.0	50	16	13.60	13.01	12.42	11.83
51520	-	-	.2362		6.000	6.0	65	20	15.50	14.83	14.15	13.48
51150	-	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	14.78	14.14	13.49	12.85
51190	-	-	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	20.72	19.82	18.92	18.02
51530	-	-	.3150		8.000	8.0	65	22	21.76	20.81	19.87	18.92
51230	-	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	25.81	24.68	23.56	22.44
51540	-	-	.3937		10.000	10.0	70	25	31.41	30.04	28.68	27.31
51270	-	-	.4375	7/16"	11.113	7/16"	2-3/4"	1"	31.50	30.13	28.76	27.39
51550	-	-	.4724		12.000	12.0	75	25	43.40	41.51	39.63	37.74
51310	-	-	.5000	1/2"	12.700	1/2"	3"	1"	41.33	39.53	37.74	35.94
51330	-	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	79.71	76.24	72.78	69.31
51560	-	-	.6299		16.000	16.0	88	32	83.69	80.05	76.41	72.77
51350	-	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	116.87	111.79	106.71	101.63
51570	-	-	.7874		20.000	20.0	100	38	156.03	149.25	142.46	135.68
51580	-	-	.9843		25.000	25.0	100	38	181.26	173.38	165.50	157.62
51370	-	-	1.000	1"	25.400	1"	4"	1-1/2"	174.82	167.22	159.62	152.02
51400	-	-	1.250	1-1/4"	31.750	1-1/4"	4-1/2"	2"	510.39	488.20	466.01	443.82
51430	-	-	1.250	1-1/4"	31.750	1-1/4"	6"	3"	668.12	639.07	610.02	580.97
-	51114	-	.1875	3/16"	4.763	3/16"	2"	5/8"	14.42	13.79	13.17	12.54
-	51154	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	19.19	18.36	17.52	16.69
-	51194	-	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	26.61	25.45	24.30	23.14
-	51234	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	31.71	30.33	28.95	27.57
-	51274	-	.4375	7/16"	11.113	7/16"	2-3/4"	1"	38.58	36.91	35.23	33.55
-	51314	-	.5000	1/2"	12.700	1/2"	3"	1"	48.40	46.30	44.19	42.09
-	51334	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	90.72	86.78	82.83	78.89
-	51354	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	129.49	123.86	118.23	112.60
-	51374	-	1.000	1"	25.400	1"	4"	1-1/2"	193.75	185.33	176.90	168.48
-	51404	-	1.250	1-1/4"	31.750	1-1/4"	4-1/2"	2"	540.98	517.46	493.94	470.42
-	51434	-	1.250	1-1/4"	31.750	1-1/4"	6"	3"	702.72	672.17	641.61	611.06
-	-	51117	.1875	3/16"	4.763	3/16"	2"	5/8"	14.72	14.08	13.44	12.80
-	-	51517	.1969		5.000	5.0	50	16	17.45	16.69	15.93	15.17
-	-	51527	.2362		6.000	6.0	65	20	20.57	19.68	18.78	17.89
-	-	51157	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	19.86	19.00	18.13	17.27
-	-	51197	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	28.32	27.09	25.86	24.63
-	-	51537	.3150		8.000	8.0	65	22	29.35	28.07	26.80	25.52
-	-	51237	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	33.42	31.97	30.51	29.06
-	-	51547	.3937		10.000	10.0	70	25	40.08	38.34	36.59	34.85
-	-	51277	.4375	7/16"	11.113	7/16"	2-3/4"	1"	40.17	38.42	36.68	34.93
-	-	51557	.4724		12.000	12.0	75	25	52.05	49.79	47.52	45.26
-	-	51317	.5000	1/2"	12.700	1/2"	3"	1"	49.98	47.81	45.63	43.46
-	-	51337	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	92.22	88.21	84.20	80.19
-	-	51567	.6299		16.000	16.0	88	32	96.21	92.03	87.84	83.66
-	-	51357	.7500	3/4"	19.050	3/4"	4"	1-1/2"	131.64	125.92	120.19	114.47
-	-	51577	.7874		20.000	20.0	100	38	177.85	170.12	162.38	154.65
-	-	51587	.9843		25.000	25.0	100	38	203.10	194.27	185.44	176.61
-	-	51377	1.000	1"	25.400	1"	4"	1-1/2"	196.66	188.11	179.56	171.01
-	-	51407	1.250	1-1/4"	31.750	1-1/4"	4-1/2"	2"	546.19	522.45	498.70	474.95
-	-	51437	1.250	1-1/4"	31.750	1-1/4"	6"	3"	703.92	673.31	642.71	612.10



TOLERANCES

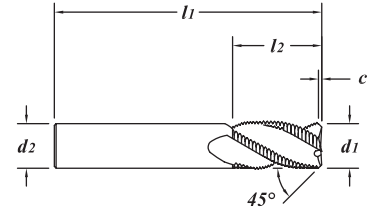
$d1$	+0.00° - .002° (+.000 - .050mm)	
$d2$	3mm - 6mm	+0.000° - .0003° (+.0000 - .0075mm)
	1/4" - 1"	-.0001° - .0004° (-.0025 - .0100mm)

Balinit® X.CEED Coated

Solid submicron grain carbide end mill - center cutting
 State-of-the-art rougher using VRX technology
 Reduces tool pressure for more aggressive machining

Recommended for stainless steel, inconel, pH materials, cold rolled steel, titanium, cast iron and tool steels

Variable flute geometry



EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	c Chamfer Length	1-11	12-24	25-49	50-100	
	Decimal	Metric									
49490	.2362	6.000	6.0	50	12	0.5	34.39	32.89	31.40	29.90	
49500	.2362	6.000	6.0	65	19	0.5	38.08	36.42	34.77	33.11	
49520	.2500	1/4"	6.350	1/4"	2"	3/8"	.020"	33.03	31.59	30.16	28.72
49540	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"	37.67	36.04	34.40	32.76
49550	.2756	7.000	8.0	50	12	0.5	46.78	44.75	42.71	40.68	
49555	.2756	7.000	8.0	65	22	0.5	50.58	48.38	46.18	43.98	
49570	.2812	9/32"	7.142	5/16"	2"	7/16"	.020"	45.94	43.95	41.95	39.95
49575	.2812	9/32"	7.142	5/16"	2-1/2"	13/16"	.020"	49.48	47.33	45.18	43.03
49580	.3125	5/16"	7.938	5/16"	2"	7/16"	.020"	40.14	38.39	36.65	34.90
49600	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.020"	43.26	41.38	39.50	37.62
49610	.3150	8.000	8.0	50	12	0.5	40.99	39.20	37.42	35.64	
49620	.3150	8.000	8.0	65	22	0.5	44.17	42.25	40.33	38.41	
49625	.3438	11/32"	8.733	3/8"	2"	1/2"	.025"	52.11	49.84	47.58	45.31
49630	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	.025"	59.28	56.71	54.13	51.55
49635	.3543	9.000	10.0	50	14	0.5	63.91	61.13	58.35	55.57	
49637	.3543	9.000	10.0	65	22	0.5	69.46	66.44	63.42	60.40	
49640	.3750	3/8"	9.525	3/8"	2"	1/2"	.025"	46.05	44.04	42.04	40.04
49660	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.025"	52.41	50.13	47.85	45.57
49670	.3937	10.000	10.0	50	16	0.5	56.48	54.02	51.57	49.11	
49680	.3937	10.000	10.0	70	22	0.5	61.36	58.70	56.03	53.36	
49690	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.025"	61.66	58.98	56.30	53.62
49700	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.025"	61.66	58.98	56.30	53.62
49710	.4724	12.000	12.0	65	19	0.8	66.22	63.34	60.46	57.58	
49720	.4724	12.000	12.0	75	32	0.8	73.89	70.68	67.46	64.25	
* 49740	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"	63.40	60.64	57.89	55.13
* 49760	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	70.85	67.77	64.69	61.61
* 49765	.5512	14.000	14.0	75	19	0.8	104.81	100.25	95.70	91.14	
* 49770	.5512	14.000	14.0	88	32	0.8	107.73	103.05	98.36	93.68	
* 49780	.6250	5/8"	15.875	5/8"	3"	3/4"	.035"	109.97	105.19	100.41	95.63
* 49800	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.035"	112.88	107.98	103.07	98.16
* 49820	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.035"	118.94	113.77	108.60	103.43
* 49830	.6299	16.000	16.0	75	19	1.0	114.83	109.84	104.84	99.85	
* 49840	.6299	16.000	16.0	88	32	1.0	117.85	112.73	107.60	102.48	
* 49845	.7087	18.000	18.0	75	22	1.0	165.68	158.48	151.27	144.07	
* 49850	.7087	18.000	18.0	100	38	1.0	169.42	162.05	154.69	147.32	
* 49860	.7500	3/4"	19.050	3/4"	3"	7/8"	.040"	158.80	151.90	144.99	138.09
* 49880	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.040"	162.08	155.03	147.99	140.94
* 49890	.7874	20.000	20.0	75	22	1.0	224.47	214.71	204.95	195.19	
* 49900	.7874	20.000	20.0	100	38	1.0	229.38	219.41	209.43	199.46	
* 49905	.8661	22.000	22.0	100	22	1.0	252.13	241.16	230.20	219.24	
* 49915	.9843	25.000	25.0	100	25	1.0	263.06	251.63	240.19	228.75	
* 49920	.9843	25.000	25.0	100	38	1.0	263.06	251.63	240.19	228.75	
* 49925	1.000	1"	25.400	1"	4"	1"	.040"	272.24	260.40	248.57	236.73
* 49930	1.000	1"	25.400	1"	4"	1-1/2"	.040"	272.24	260.40	248.57	236.73
* 49940	1.000	1"	25.400	1"	5"	2"	.040"	335.20	320.63	306.05	291.48

* - Tools with weldon flats

TOLERANCES

d_1	+0.000" - .002" (+.000mm - .050mm)
d_2	-.0001" - .0004" (-.0025 - .0100mm)

Technical information: page 234-235



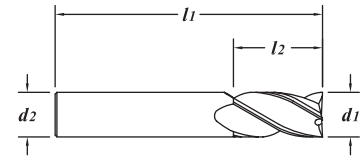
NEW SERIES

V4S - 4 Flute

**HIGH PERFORMANCE
END MILLS**

Variable Helix End Mill - Square End - AlCrN-based Coated

- Solid submicron grain carbide end mill - center cutting
- Recommended for Titanium, Inconel, and Steels (< 40Rc)
- PCT (Polish Carbide Treatment) enhances tool life by 20%
- Minimizes burr on part
- Helix geometry varies over length of flutes
- Variable flute design helps with chip evacuation in slots and pockets
- Variable rake aids in chip formation
- 12mm and larger tools offered with weldon flat
- Smaller diameters can be modified with a flat within 48 hours
- V4 Corner Radius - page 130
- V4 Ball End - page 132
- The combination of an extended flute length with a weldon flat may cause the flute washout to reach inside some end mill holders*



EDP#		d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
(plain)	(weldon)	Decimal	Metric							
50236	-	.2362"	6.000	6.0	65	12	22.64	21.66	20.67	19.69
50237	-	.2362"	6.000	6.0	65	19	22.64	21.66	20.67	19.69
50238	-	.2500"	6.350	1/4"	2-1/2"	3/4"	21.85	20.90	19.95	19.00
50239	-	.3125"	7.937	5/16"	2-1/2"	13/16"	31.15	29.80	28.44	27.09
50240	-	.3150"	8.000	8.0	65	22	32.28	30.88	29.47	28.07
50241	-	.3750"	9.525	3/8"	2-1/2"	1"	36.77	35.17	33.57	31.97
50242	-	.3937"	10.000	10.0	70	22	44.07	42.15	40.24	38.32
50450	50449	.4724"	12.000	12.0	75	26	57.27	54.78	52.29	49.80
50243	50283	.4724"	12.000	12.0	75	32	57.27	54.78	52.29	49.80
50452	50453	.5000"	12.700	1/2"	3"	1"	54.98	52.59	50.20	47.81
50244	50284	.5000"	12.700	1/2"	3"	1-1/4"	54.98	52.59	50.20	47.81
50245	50285	.5000"	12.700	1/2"	4"	2-1/8"	74.39	71.16	67.92	64.69
50246	50286	.6250"	15.875	5/8"	3-1/2"	1-1/4"	101.44	97.03	92.62	88.21
50247	50287	.6299"	16.000	16.0	88	32	105.83	101.23	96.63	92.03
50248	50288	.7500"	19.050	3/4"	4"	1-1/2"	144.80	138.50	132.21	125.91
50249	50289	.7874"	20.000	20.0	100	38	195.64	187.13	178.63	170.12
50250	50290	1.000"	25.400	1"	4"	1-1/2"	216.33	206.92	197.52	188.11

V4R - 4 Flute

Technical information: page 234-235

**NEW
SERIES**



TOLERANCES	
d_1	+0.000" -0.002" (+0.000mm -0.050mm)
d_2	-0.001" -0.004" (-0.025 -0.100mm)
r	+0.001" -0.001" (+0.025 -0.025mm)

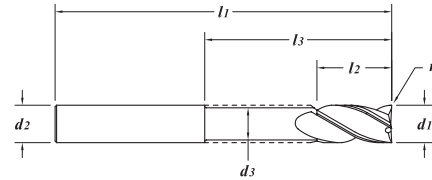
.2362" - .3937"
(6.000mm - 10.000mm)

Variable Helix End Mill - Corner Radius - AlCrN-based Coated

- Solid submicron grain carbide end mill - center cutting
- Recommended for Titanium, Inconel, and Steels (< 40Rc)
- PCT (Polish Carbide Treatment) enhances tool life by 20%
- Minimizes burr on part
- Helix geometry varies over length of flutes
- Variable flute design helps with chip evacuation in slots and pockets
- Variable rake aids in chip formation
- 12mm and larger tools offered with weldon flat
- Smaller diameters can be modified with a flat within 48 hours

V4 Square End - page 129
V4 Ball End - page 132

The combination of an extended flute length with a weldon flat may cause the flute washout to reach inside end mill holders



EDP#	(plain) (weldon)	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	l_3 Reach Length	d_3 Neck Diameter	1-11	12-24	25-49	50-100
		Decimal	Metric										
50199	-	.2362"	6.000	6.0	65	12	0.3	-	-	25.74	24.62	23.50	22.38
50200	-	.2362"	6.000	6.0	65	12	0.5	-	-	25.74	24.62	23.50	22.38
50201	-	.2362"	6.000	6.0	65	12	0.75	-	-	25.74	24.62	23.50	22.38
50202	-	.2362"	6.000	6.0	65	12	1.0	-	-	25.74	24.62	23.50	22.38
50203	-	.2362"	6.000	6.0	65	12	1.5	-	-	25.74	24.62	23.50	22.38
50204	-	.2362"	6.000	6.0	65	19	0.3	-	-	25.74	24.62	23.50	22.38
50205	-	.2362"	6.000	6.0	65	19	0.5	-	-	25.74	24.62	23.50	22.38
50206	-	.2362"	6.000	6.0	65	19	1.0	-	-	25.74	24.62	23.50	22.38
50207	-	.2500"	6.350	1/4"	2-1/2"	3/4"	.010"	-	-	24.75	23.67	22.60	21.52
50208	-	.2500"	6.350	1/4"	2-1/2"	3/4"	.015"	-	-	24.75	23.67	22.60	21.52
50209	-	.2500"	6.350	1/4"	2-1/2"	3/4"	.030"	-	-	24.75	23.67	22.60	21.52
50210	-	.2500"	6.350	1/4"	2-1/2"	3/4"	.060"	-	-	24.75	23.67	22.60	21.52
50211	-	.2500"	6.350	1/4"	4"	3/8"	.015"	1-1/4"	.230"	47.96	45.87	43.79	41.70
50212	-	.3125"	7.938	5/16"	2-1/2"	13/16"	.020"	-	-	33.52	32.07	30.61	29.15
50213	-	.3125"	7.938	5/16"	2-1/2"	13/16"	.030"	-	-	33.52	32.07	30.61	29.15
50214	-	.3150"	8.000	8.0	65	22	0.5	-	-	34.79	33.28	31.76	30.25
50356	-	.3150"	8.000	8.0	65	22	0.75	-	-	34.79	33.28	31.76	30.25
50215	-	.3150"	8.000	8.0	65	22	1.0	-	-	34.79	33.28	31.76	30.25
50357	-	.3150"	8.000	8.0	65	22	1.5	-	-	34.79	33.28	31.76	30.25
50358	-	.3150"	8.000	8.0	65	22	2.0	-	-	34.79	33.28	31.76	30.25
50216	-	.3750"	9.525	3/8"	2-1/2"	1"	.010"	-	-	39.16	37.46	35.75	34.05
50217	-	.3750"	9.525	3/8"	2-1/2"	1"	.020"	-	-	39.16	37.46	35.75	34.05
50218	-	.3750"	9.525	3/8"	2-1/2"	1"	.030"	-	-	39.16	37.46	35.75	34.05
50219	-	.3750"	9.525	3/8"	2-1/2"	1"	.060"	-	-	39.16	37.46	35.75	34.05
50220	-	.3750"	9.525	3/8"	4"	1/2"	.020"	1-7/8"	.350"	69.21	66.20	63.19	60.18
50221	-	.3937"	10.000	10.0	70	22	0.5	-	-	47.28	45.22	43.17	41.11
50359	-	.3937"	10.000	10.0	70	22	0.75	-	-	47.28	45.22	43.17	41.11
50360	-	.3937"	10.000	10.0	70	22	1.0	-	-	47.28	45.22	43.17	41.11
50361	-	.3937"	10.000	10.0	70	22	1.5	-	-	47.28	45.22	43.17	41.11
50362	-	.3937"	10.000	10.0	70	22	2.0	-	-	47.28	45.22	43.17	41.11

EDP#		$d1^{\dagger}$		$d2$	$l1$	$l2$	r	$l3$	$d3$	1-11	12-24	25-49	50-100
(plain)	(weldon)	Decimal	Diameter	Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter				
50363	50369	.4724"	12.000	12.0	75	26	0.3	-	-	69.64	66.62	63.59	60.56
50364	50370	.4724"	12.000	12.0	75	26	0.5	-	-	69.64	66.62	63.59	60.56
50365	50366	.4724"	12.000	12.0	75	26	0.75	-	-	69.64	66.62	63.59	60.56
50367	50371	.4724"	12.000	12.0	75	26	1.0	-	-	69.64	66.62	63.59	60.56
50372	50373	.4724"	12.000	12.0	75	26	1.5	-	-	69.64	66.62	63.59	60.56
50374	50375	.4724"	12.000	12.0	75	26	2.0	-	-	69.64	66.62	63.59	60.56
50222	50270	.4724"	12.000	12.0	75	32	0.5	-	-	69.64	66.62	63.59	60.56
50223	50271	.4724"	12.000	12.0	75	32	1.0	-	-	69.64	66.62	63.59	60.56
50379	50380	.5000"	12.700	1/2"	3"	1"	.010"	-	-	66.80	63.90	60.99	58.09
50381	50382	.5000"	12.700	1/2"	3"	1"	.020"	-	-	66.80	63.90	60.99	58.09
50383	50384	.5000"	12.700	1/2"	3"	1"	.030"	-	-	66.80	63.90	60.99	58.09
50385	50386	.5000"	12.700	1/2"	3"	1"	.060"	-	-	66.80	63.90	60.99	58.09
50224	50272	.5000"	12.700	1/2"	3"	1-1/4"	.010"	-	-	66.80	63.90	60.99	58.09
50225	50273	.5000"	12.700	1/2"	3"	1-1/4"	.020"	-	-	66.80	63.90	60.99	58.09
50226	50274	.5000"	12.700	1/2"	3"	1-1/4"	.030"	-	-	66.80	63.90	60.99	58.09
50227	50275	.5000"	12.700	1/2"	3"	1-1/4"	.060"	-	-	66.80	63.90	60.99	58.09
50228	50276	.5000"	12.700	1/2"	4"	5/8"	.020"	2-1/4"	.470"	90.13	86.21	82.29	78.37
50229	50277	.6250"	15.875	5/8"	3-1/2"	1-1/4"	.020"	-	-	106.35	101.73	97.10	92.48
50230	50278	.6250"	15.875	5/8"	3-1/2"	1-1/4"	.120"	-	-	106.35	101.73	97.10	92.48
50231	50279	.6299"	16.000	16.0	88	32	0.5	-	-	110.99	106.16	101.34	96.51
50409	50410	.6299"	16.000	16.0	88	32	0.75	-	-	110.99	106.16	101.34	96.51
50411	50412	.6299"	16.000	16.0	88	32	1.0	-	-	110.99	106.16	101.34	96.51
50413	50414	.6299"	16.000	16.0	88	32	1.5	-	-	110.99	106.16	101.34	96.51
50415	50416	.6299"	16.000	16.0	88	32	2.0	-	-	110.99	106.16	101.34	96.51
50417	50418	.6299"	16.000	16.0	88	32	3.0	-	-	110.99	106.16	101.34	96.51
50232	50280	.7500"	19.050	3/4"	4"	1-1/2"	.030"	-	-	152.51	145.88	139.25	132.62
50233	50281	1.000"	25.400	1"	4"	1-1/2"	.030"	-	-	260.38	249.06	237.74	226.42
50234	50282	1.000"	25.400	1"	5"	2-1/8"	.030"	-	-	320.38	306.45	292.52	278.59



V4 in action

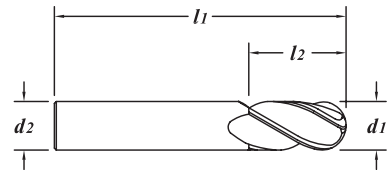
**NEW
SERIES**



TOLERANCES	
d_1	+0.000" -0.002" (+0.000mm -0.050mm)
d_2	-0.001" -0.004" (-0.025 -0.100mm)
ball radius	+0.000" -0.001" (+0.000 -0.025mm)

Variable Helix End Mill - Ball End - AlCrN-based Coated

- Solid submicron grain carbide end mill - center cutting
- Recommended for Titanium, Inconel, and Steels (< 40Rc)**
- PCT (Polish Carbide Treatment) enhances tool life by 20%
- Minimizes burr on part
- Helix geometry varies over length of flutes
- Variable flute design helps with chip evacuation in slots and pockets
- Variable rake aids in chip formation
- 12mm and larger tools offered with weldon flat
- Smaller diameters can be modified with a flat within 48 hours
- V4 Square End - page 129
- V4 Corner Radius - page 130



The combination of an extended flute length with a weldon flat may cause the flute washout to reach inside some end mill holders

EDP#		d_1 †		d_2	l_1	l_2	1-11	12-24	25-49	50-100
		Decimal	Metric							
50252	-	.2362"	6.000	6.0	65	12	25.74	24.62	23.50	22.38
50253	-	.2362"	6.000	6.0	65	19	25.74	24.62	23.50	22.38
50254	-	.2500"	6.350	1/4"	2-1/2"	3/4"	24.75	23.67	22.60	21.52
50255	-	.3125"	7.937	5/16"	2-1/2"	13/16"	33.52	32.07	30.61	29.15
50256	-	.3150"	8.000	8.0	65	22	34.79	33.28	31.76	30.25
50257	-	.3750"	9.525	3/8"	2-1/2"	1"	39.16	37.46	35.75	34.05
50258	-	.3937"	10.000	10.0	70	22	47.28	45.22	43.17	41.11
50470	50469	.4724"	12.000	12.0	75	26	69.64	66.62	63.59	60.56
50259	50291	.4724"	12.000	12.0	75	32	69.64	66.62	63.59	60.56
50472	50473	.5000"	12.700	1/2"	3"	1"	66.80	63.90	60.99	58.09
50260	50292	.5000"	12.700	1/2"	3"	1-1/4"	66.80	63.90	60.99	58.09
50261	50293	.5000"	12.700	1/2"	4"	2-1/8"	78.96	75.53	72.09	68.66
50262	50294	.6250"	15.875	5/8"	3-1/2"	1-1/4"	106.35	101.73	97.10	92.48
50263	50295	.6299"	16.000	16.0	88	32	110.99	106.16	101.34	96.51
50264	50296	.7500"	19.050	3/4"	4"	1-1/2"	152.51	145.88	139.25	132.62
50265	50297	.7874"	20.000	20.0	100	38	215.86	206.47	197.09	187.70
50266	50298	1.000"	25.400	1"	4"	1-1/2"	260.38	249.06	237.74	226.42

TOLERANCES

<i>d1</i>	+0.000" -0.002" (+0.000mm -0.050mm)
<i>d2</i>	-0.0001" -0.0004" (-0.0025 -0.1000mm)
<i>r</i>	+0.001" -0.001" (+0.025 -0.025mm)

Technical information: page 236-237



NEW SERIES

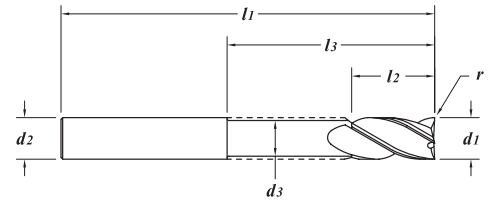
V5 - 5 Flute

.2362" - .3150"
(6.000mm - 8.000mm)

**HIGH PERFORMANCE
END MILLS**

Variable Helix End Mill - AlCrN-based Coated

- Solid submicron grain carbide end mill - center cutting
- Recommended for Titanium, Inconel, and Stainless Steel**
- PCT (Polish Carbide Treatment) enhances tool life by 20%
- Minimizes burr on part
- Helix geometry varies over length of flutes
- Staggered flutes to control harmonics
- Variable flute design helps with chip evacuation in slots and pockets
- Variable rake aids in chip formation
- 12mm and larger tools offered with weldon flat
- Smaller diameters can be modified with a flat within 48 hours
- The combination of an extended flute length with a weldon flat may cause the flute washout to reach inside some end mill holders*



EDP#	Diameter	Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter				
								1-11	12-24	25-49	50-100
50000	.2362"	6.000	50	13	-	-	-	20.99	20.08	19.16	18.25
50001	.2362"	6.000	50	13	0.5	-	-	24.27	23.21	22.16	21.10
50002	.2362"	6.000	65	19	-	-	-	23.66	22.63	21.60	20.57
50003	.2362"	6.000	65	19	0.5	-	-	26.90	25.73	24.56	23.39
50004	.2362"	6.000	65	13	-	20	5.4	31.56	30.18	28.81	27.44
50005	.2362"	6.000	65	13	0.5	20	5.4	34.80	33.29	31.77	30.26
50006	.2362"	6.000	65	13	1.0	20	5.4	34.80	33.29	31.77	30.26
50007	.2500" 1/4"	6.350	2"	3/8"	-	-	-	20.14	19.26	18.39	17.51
50008	.2500" 1/4"	6.350	2"	3/8"	.015"	-	-	23.36	22.34	21.33	20.31
50009	.2500" 1/4"	6.350	2"	3/8"	.030"	-	-	23.36	22.34	21.33	20.31
50011	.2500" 1/4"	6.350	2-1/2"	3/4"	-	-	-	22.84	21.85	20.85	19.86
50012	.2500" 1/4"	6.350	2-1/2"	3/4"	.015"	-	-	25.86	24.74	23.61	22.49
50013	.2500" 1/4"	6.350	2-1/2"	3/4"	.020"	-	-	25.86	24.74	23.61	22.49
50014	.2500" 1/4"	6.350	2-1/2"	3/4"	.030"	-	-	25.86	24.74	23.61	22.49
50015	.2500" 1/4"	6.350	3"	1"	-	-	-	34.88	33.36	31.85	30.33
50016	.2500" 1/4"	6.350	3"	1"	.030"	-	-	38.33	36.66	35.00	33.33
50017	.2500" 1/4"	6.350	4"	1/2"	.015"	1-1/4"	.235"	50.13	47.95	45.77	43.59
50018	.3125" 5/16"	7.938	2-1/2"	13/16"	-	-	-	32.57	31.15	29.74	28.32
50019	.3125" 5/16"	7.938	2-1/2"	13/16"	.015"	-	-	35.06	33.54	32.01	30.49
50021	.3125" 5/16"	7.938	2-1/2"	13/16"	.020"	-	-	35.06	33.54	32.01	30.49
50022	.3125" 5/16"	7.938	2-1/2"	13/16"	.030"	-	-	35.06	33.54	32.01	30.49
50023	.2756"	7.000	65	22	0.2	-	-	41.63	39.82	38.01	36.20
50024	.3150"	8.000	65	22	0.2	-	-	36.37	34.79	33.21	31.63
50025	.3150"	8.000	65	22	0.5	-	-	36.37	34.79	33.21	31.63
50026	.3150"	8.000	75	19	-	26	7.2	56.48	54.02	51.57	49.11
50027	.3150"	8.000	75	19	0.5	26	7.2	61.11	58.45	55.80	53.14
50028	.3150"	8.000	75	19	1.0	26	7.2	61.11	58.45	55.80	53.14

continued →

V5 - 5 Flute (continued)

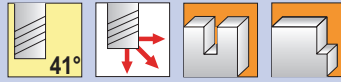
.3750" - .7087"
(9.525mm - 18.000mm)

HIGH PERFORMANCE
END MILLS

EDP#		$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	$l3$ Reach Length	$d3$ Neck Diameter	1-11	12-24	25-49	50-100	
(plain)	(weldon)	Decimal	Metric											
50029	-	.3750"	3/8"	9.525	3/8"	2"	1/2"	-	-	-	32.89	31.46	30.03	28.60
50031	-	.3750"	3/8"	9.525	3/8"	2"	1/2"	.015"	-	-	37.65	36.01	34.38	32.74
50032	-	.3750"	3/8"	9.525	3/8"	2"	1/2"	.020"	-	-	37.65	36.01	34.38	32.74
50033	-	.3750"	3/8"	9.525	3/8"	2"	1/2"	.030"	-	-	37.65	36.01	34.38	32.74
50034	-	.3750"	3/8"	9.525	3/8"	2-1/2"	1"	-	-	-	38.43	36.76	35.09	33.42
50035	-	.3750"	3/8"	9.525	3/8"	2-1/2"	1"	.015"	-	-	40.94	39.16	37.38	35.60
50036	-	.3750"	3/8"	9.525	3/8"	2-1/2"	1"	.020"	-	-	40.94	39.16	37.38	35.60
50037	-	.3750"	3/8"	9.525	3/8"	2-1/2"	1"	.030"	-	-	40.94	39.16	37.38	35.60
50038	-	.3750"	3/8"	9.525	3/8"	2-1/2"	1"	.060"	-	-	40.94	39.16	37.38	35.60
50039	-	.3750"	3/8"	9.525	3/8"	4"	2"	-	-	-	55.45	53.04	50.63	48.22
50041	-	.3750"	3/8"	9.525	3/8"	4"	2"	.030"	-	-	60.64	58.00	55.37	52.73
50042	-	.3750"	3/8"	9.525	3/8"	4"	7/8"	.015"	1-7/8"	.355"	72.36	69.21	66.07	62.92
50043	-	.3937"		10.000	10.0	70	22	-	-	-	46.09	44.09	42.08	40.08
50044	-	.3937"		10.000	10.0	70	22	0.5	-	-	49.44	47.29	45.14	42.99
50045	-	.3937"		10.000	10.0	75	22	-	32	9.0	63.88	61.11	58.33	55.55
50046	-	.3937"		10.000	10.0	75	22	0.5	32	9.0	68.91	65.91	62.92	59.92
50047	-	.3937"		10.000	10.0	75	22	1.0	32	9.0	68.91	65.91	62.92	59.92
50484	50485	.4724"		12.000	12.0	75	25	-	-	-	59.86	57.26	54.65	52.05
50486	50487	.4724"		12.000	12.0	75	25	0.5	-	-	72.81	69.64	66.48	63.31
50048	50299	.4724"		12.000	12.0	75	32	-	-	-	59.86	57.26	54.65	52.05
50049	50300	.4724"		12.000	12.0	75	32	0.5	-	-	72.81	69.64	66.48	63.31
50051	50301	.4724"		12.000	12.0	100	26	-	38	10.8	91.67	87.68	83.70	79.71
50052	50302	.4724"		12.000	12.0	100	26	0.5	38	10.8	96.39	92.20	88.01	83.82
50053	50303	.4724"		12.000	12.0	100	26	1.0	38	10.8	96.39	92.20	88.01	83.82
50054	50304	.5000"	1/2"	12.700	1/2"	2-1/2"	5/8"	-	-	-	53.80	51.46	49.12	46.78
50106	50305	.5000"	1/2"	12.700	1/2"	2-1/2"	5/8"	.010"	-	-	62.57	59.85	57.13	54.41
50055	50306	.5000"	1/2"	12.700	1/2"	2-1/2"	5/8"	.020"	-	-	62.57	59.85	57.13	54.41
50107	50307	.5000"	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"	-	-	62.57	59.85	57.13	54.41
50056	50308	.5000"	1/2"	12.700	1/2"	3"	1"	-	-	-	57.48	54.98	52.48	49.98
50108	50309	.5000"	1/2"	12.700	1/2"	3"	1"	.010"	-	-	69.84	66.80	63.77	60.73
50057	50310	.5000"	1/2"	12.700	1/2"	3"	1"	.020"	-	-	69.84	66.80	63.77	60.73
50109	50311	.5000"	1/2"	12.700	1/2"	3"	1"	.030"	-	-	69.84	66.80	63.77	60.73
50058	50312	.5000"	1/2"	12.700	1/2"	3"	1-1/4"	-	-	-	57.48	54.98	52.48	49.98
50111	50313	.5000"	1/2"	12.700	1/2"	3"	1-1/4"	.010"	-	-	69.84	66.80	63.77	60.73
50059	50314	.5000"	1/2"	12.700	1/2"	3"	1-1/4"	.015"	-	-	69.84	66.80	63.77	60.73
50061	50315	.5000"	1/2"	12.700	1/2"	3"	1-1/4"	.020"	-	-	69.84	66.80	63.77	60.73
50062	50316	.5000"	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	-	69.84	66.80	63.77	60.73
50063	50317	.5000"	1/2"	12.700	1/2"	3"	1-1/4"	.045"	-	-	69.84	66.80	63.77	60.73
50064	50318	.5000"	1/2"	12.700	1/2"	3"	1-1/4"	.060"	-	-	69.84	66.80	63.77	60.73
50065	50319	.5000"	1/2"	12.700	1/2"	3"	1-1/4"	.090"	-	-	69.84	66.80	63.77	60.73
50066	50320	.5000"	1/2"	12.700	1/2"	4"	1-1/4"	.030"	2-1/4"	.475"	94.22	90.12	86.03	81.93
50067	50321	.5000"	1/2"	12.700	1/2"	4"	2-1/8"	-	-	-	77.77	74.39	71.01	67.63
50068	50322	.5000"	1/2"	12.700	1/2"	4"	2-1/8"	.030"	-	-	82.54	78.95	75.36	71.77
50069	50323	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/4"	-	-	-	106.05	101.44	96.83	92.22
50071	50324	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	-	-	111.19	106.36	101.52	96.69
50072	50325	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	-	-	111.19	106.36	101.52	96.69
50073	50326	.6250"	5/8"	15.875	5/8"	4"	1-1/4"	.030"	2-1/4"	.590"	131.03	125.33	119.64	113.94
50074	50327	.6299"		16.000	16.0	88	32	-	-	-	110.64	105.83	101.02	96.21
50075	50328	.6299"		16.000	16.0	88	32	0.5	-	-	116.02	110.98	105.93	100.89
50076	50329	.6299"		16.000	16.0	100	32	-	50	14.4	127.86	122.30	116.74	111.18
50077	50330	.6299"		16.000	16.0	100	32	0.5	50	14.4	133.55	127.74	121.94	116.13
50078	50331	.7087"		18.000	18.0	100	32	0.75	-	-	166.57	159.32	152.08	144.84

EDP#		$d1$ †		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	$l3$ Reach Length	$d3$ Neck Diameter	1-11	12-24	25-49	50-100
(plain)	(weldon)	Decimal	Metric										
50079	50332	.7500"	3/4"	19.050	3"	7/8"	-	-	-	147.99	141.56	135.12	128.69
50081	50333	.7500"	3/4"	19.050	3"	7/8"	.030"	-	-	156.06	149.27	142.49	135.70
50082	50334	.7500"	3/4"	19.050	4"	1-1/2"	-	-	-	151.39	144.80	138.22	131.64
50083	50335	.7500"	3/4"	19.050	4"	1-1/2"	.030"	-	-	159.46	152.53	145.59	138.66
50084	50336	.7500"	3/4"	19.050	4"	1-1/2"	.060"	-	-	159.46	152.53	145.59	138.66
50085	50337	.7500"	3/4"	19.050	4"	1-1/2"	.120"	-	-	159.46	152.53	145.59	138.66
50086	50338	.7500"	3/4"	19.050	5"	2-1/8"	-	-	-	203.19	194.36	185.52	176.69
50087	50339	.7500"	3/4"	19.050	5"	2-1/8"	.030"	-	-	221.18	211.56	201.95	192.33
50088	50340	.7500"	3/4"	19.050	5-1/2"	1-1/2"	.030"	3-1/4"	.705"	274.49	262.56	250.62	238.69
50089	50341	.7500"	3/4"	19.050	6"	3-1/4"	-	-	-	237.79	227.45	217.11	206.77
50091	50342	.7500"	3/4"	19.050	6"	3-1/4"	.030"	-	-	262.73	251.31	239.88	228.46
50092	50343	.7874"		20.000	100	38	-	-	-	204.53	195.64	186.74	177.85
50093	50344	.7874"		20.000	100	38	0.75	-	-	225.68	215.86	206.05	196.24
50094	50345	1.000"	1"	25.400	4"	1-1/4"	-	-	-	226.16	216.33	206.49	196.66
50095	50346	1.000"	1"	25.400	4"	1-1/4"	.030"	-	-	272.23	260.39	248.56	236.72
50096	50347	1.000"	1"	25.400	4"	1-1/4"	.060"	-	-	272.23	260.39	248.56	236.72
-	50348	1.000"	1"	25.400	4"	1-1/2"	-	-	-	226.16	216.33	206.49	196.66
-	50349	1.000"	1"	25.400	4"	1-1/2"	.030"	-	-	272.23	260.39	248.56	236.72
-	50350	1.000"	1"	25.400	4"	1-1/2"	.060"	-	-	272.23	260.39	248.56	236.72
50097	-	1.000"	1"	25.400	4"	1-3/4"	-	-	-	226.16	216.33	206.49	196.66
50098	-	1.000"	1"	25.400	4"	1-3/4"	.030"	-	-	272.23	260.39	248.56	236.72
50099	-	1.000"	1"	25.400	4"	1-3/4"	.060"	-	-	272.23	260.39	248.56	236.72
50101	50351	1.000"	1"	25.400	5-1/2"	1-3/4"	.030"	3-1/4"	.940"	444.16	424.85	405.54	386.23
50102	50352	1.000"	1"	25.400	5-1/2"	1-3/4"	.060"	3-1/4"	.940"	444.16	424.85	405.54	386.23
50103	50353	1.000"	1"	25.400	5-1/2"	1-3/4"	.120"	3-1/4"	.940"	444.16	424.85	405.54	386.23
50104	50354	1.000"	1"	25.400	6"	3-1/4"	-	-	-	394.35	377.20	360.06	342.91
50105	50355	1.000"	1"	25.400	6"	3-1/4"	.030"	-	-	436.84	417.85	398.85	379.86





TOLERANCES	
$d1$	+0.00" -0.02" (+.000 - .050mm)
$d2$	3mm - 6mm +.0000" -0.003" (+.0000 - .0075mm)
	1/4" - 1" -.0001" -0.004" (-.0025 - .0100mm)

Square End - Balinit® X.CEED Coated

Solid submicron grain carbide end mill - center cutting
 State-of-the-art rougher/finisher
 Reduces vibration for more aggressive machining resulting in less cycle times and greater productivity

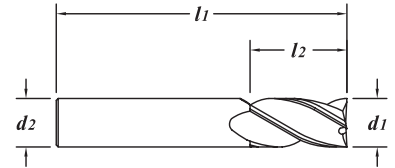
Recommended for stainless steel, inconel, pH materials, titanium and tool steels

Variable flute geometry

VRX Corner Radius - page 137

VRX Ball End - page 141

The combination of an extended flute length with a weldon flat may cause the flute washout to reach inside some end mill holders



EDP#		$d1$ †		$d2$	$l1$	$l2$	1-11	12-24	25-49	50-100	
(plain)	(weldon)	Decimal	Diameter	Shank Diameter	Overall Length	Flute Length					
61877	-	.1181		3.000	3.0	38	8	11.67	11.17	10.66	10.15
61887	-	.1181		3.000	3.0	38	12	11.67	11.17	10.66	10.15
61917	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	11.67	11.17	10.66	10.15
61927	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	11.67	11.17	10.66	10.15
61977	-	.1575		4.000	6.0	50	12	21.92	20.97	20.01	19.06
62007	-	.1875	3/16"	4.763	3/16"	2"	5/16"	14.72	14.08	13.44	12.80
62017	-	.1875	3/16"	4.763	3/16"	2"	9/16"	14.72	14.08	13.44	12.80
62057	-	.1969		5.000	6.0	65	15	23.44	22.42	21.40	20.38
62077	-	.2362		6.000	6.0	50	12	18.25	17.46	16.66	15.87
62087	-	.2362		6.000	6.0	65	19	20.57	19.68	18.78	17.89
62137	-	.2500	1/4"	6.350	1/4"	2"	3/8"	17.51	16.75	15.99	15.23
62147	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	19.86	19.00	18.13	17.27
62207	-	.3125	5/16"	7.938	5/16"	2"	7/16"	24.21	23.16	22.10	21.05
62217	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	28.32	27.09	25.86	24.63
62257	-	.3150		8.000	8.0	50	12	25.20	24.10	23.01	21.91
62267	-	.3150		8.000	8.0	65	22	29.35	28.07	26.80	25.52
62317	-	.3750	3/8"	9.525	3/8"	2"	1/2"	28.60	27.36	26.11	24.87
62327	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	33.42	31.97	30.51	29.06
62397	-	.3937		10.000	10.0	70	22	40.08	38.34	36.59	34.85
62437	-	.4375	7/16"	11.113	7/16"	2-3/4"	7/8"	40.17	38.42	36.68	34.93
62475	-	.4724		12.000	12.0	65	19	48.78	46.66	44.54	42.42
62485	-	.4724		12.000	12.0	75	32	52.05	49.79	47.52	45.26
62525	62527	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	46.78	44.75	42.71	40.68
62535	62537	.5000	1/2"	12.700	1/2"	3"	1-1/4"	49.98	47.81	45.63	43.46
62565	62567	.5000	1/2"	12.700	1/2"	4"	2"	67.63	64.69	61.75	58.81
62625	62627	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	83.11	79.50	75.88	72.27
62655	62657	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	92.22	88.21	84.20	80.19
62675	62677	.6250	5/8"	15.875	5/8"	4"	1-3/4"	98.49	94.20	89.92	85.64
62715	62717	.6299		16.000	16.0	88	32	96.21	92.03	87.84	83.66
62775	62777	.7500	3/4"	19.050	3/4"	4"	1-1/2"	131.64	125.92	120.19	114.47
62785	62787	.7500	3/4"	19.050	3/4"	4"	1-3/4"	131.64	125.92	120.19	114.47
62795	62797	.7500	3/4"	19.050	3/4"	5"	2"	176.69	169.00	161.32	153.64
62805	62807	.7500	3/4"	19.050	3/4"	6"	3"	206.77	197.78	188.79	179.80
62825	62827	.7874		20.000	20.0	100	38	177.85	170.12	162.38	154.65
62855	62857	.9843		25.000	25.0	100	38	203.10	194.27	185.44	176.61
62885	62887	1.000	1"	25.400	1"	4"	1-1/2"	196.66	188.11	179.56	171.01
62895	62897	1.000	1"	25.400	1"	4"	1-3/4"	196.66	188.11	179.56	171.01
62905	62907	1.000	1"	25.400	1"	5"	2"	263.25	251.80	240.36	228.91
62915	62917	1.000	1"	25.400	1"	6"	3"	342.90	327.99	313.08	298.17

TOLERANCES		
d_1	+.000" -.002" (+.000 -.050mm)	
d_2	3mm - 6mm	+.0000" -.0003" (+.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)
r	+.001" -.001" (+.025 -.025mm)	

Technical information: page 233



VRX - 4 Flute

.1181" - .2756"
(3.000mm - 7.000mm)

HIGH PERFORMANCE
END MILLS

Corner Radius - Balinit® X.CEED Coated

Solid submicron grain carbide end mill - center cutting
State-of-the-art rougher/finisher
Reduces vibration for more aggressive machining resulting in less cycle times and greater productivity

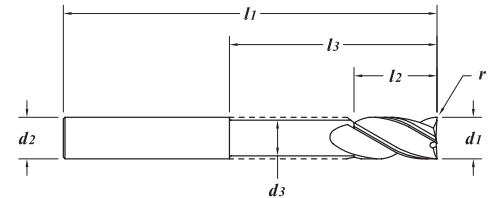
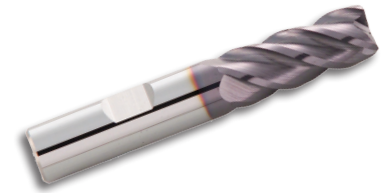
Recommended for stainless steel, inconel, pH materials, titanium and tool steels

Variable flute geometry

VRX Square End - page 136

VRX Ball End - page 141

The combination of an extended flute length with a weldon flat may cause the flute washout to reach inside some end mill holders



EDP#	d_1 †	d_2	l_1	l_2	r	l_3	d_3							
								1-11	12-24	25-49	50-100			
(plain)	(weldon)	Decimal	Diameter	Metric	Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter				
27420	-	.1181	3.000	3.0	38	8	0.2	-	-	-	13.13	12.56	11.99	11.42
27425	-	.1181	3.000	3.0	38	8	0.5	-	-	-	13.13	12.56	11.99	11.42
27430	-	.1181	3.000	3.0	50	12	0.2	-	-	-	13.13	12.56	11.99	11.42
27435	-	.1181	3.000	3.0	50	12	0.5	-	-	-	13.13	12.56	11.99	11.42
27440	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.010"	-	-	13.13	12.56	11.99	11.42
27450	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.010"	-	-	13.13	12.56	11.99	11.42
27455	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.020"	-	-	13.13	12.56	11.99	11.42
27460	-	.1562	5/32"	3.967	3/16"	2"	5/16"	.010"	-	-	18.10	17.31	16.53	15.74
27470	-	.1562	5/32"	3.967	3/16"	2"	1/2"	.010"	-	-	18.10	17.31	16.53	15.74
27480	-	.1575	4.000	6.0	50	8	0.3	-	-	-	22.25	21.29	20.32	19.35
27490	-	.1575	4.000	6.0	50	12	0.3	-	-	-	22.25	21.29	20.32	19.35
27495	-	.1575	4.000	6.0	50	12	0.5	-	-	-	22.25	21.29	20.32	19.35
27500	-	.1875	3/16"	4.763	3/16"	2"	5/16"	.010"	-	-	16.49	15.77	15.06	14.34
27520	-	.1875	3/16"	4.763	3/16"	2"	9/16"	.010"	-	-	16.49	15.77	15.06	14.34
27521	-	.1875	3/16"	4.763	3/16"	2"	9/16"	.020"	-	-	16.49	15.77	15.06	14.34
63100	-	.1875	3/16"	4.763	3/16"	4"	5/16"	.010"	-	-	30.72	29.38	28.05	26.71
27522	-	.1969	5.000	6.0	50	10	0.3	-	-	-	21.80	20.86	19.91	18.96
27524	-	.1969	5.000	6.0	65	15	0.3	-	-	-	24.16	23.11	22.06	21.01
27526	-	.1969	5.000	6.0	65	15	0.5	-	-	-	24.16	23.11	22.06	21.01
27528	-	.1969	5.000	6.0	65	15	1.0	-	-	-	24.16	23.11	22.06	21.01
63110	-	.1969	5.000	6.0	100	10	0.3	-	-	-	46.30	44.29	42.27	40.26
27525	-	.2188	7/32"	5.558	1/4"	2"	3/8"	.015"	-	-	20.98	20.06	19.15	18.24
27530	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	.015"	-	-	23.26	22.25	21.24	20.23
63120	-	.2188	7/32"	5.558	1/4"	4"	3/8"	.015"	-	-	44.71	42.77	40.82	38.88
27535	-	.2362	6.000	6.0	50	12	0.3	-	-	-	21.10	20.19	19.27	18.35
27540	-	.2362	6.000	6.0	65	19	0.3	-	-	-	23.39	22.37	21.36	20.34
27545	-	.2362	6.000	6.0	65	19	0.5	-	-	-	23.39	22.37	21.36	20.34
27547	-	.2362	6.000	6.0	65	19	1.0	-	-	-	23.39	22.37	21.36	20.34
27548	-	.2362	6.000	6.0	65	19	1.5	-	-	-	23.39	22.37	21.36	20.34
63130	-	.2362	6.000	6.0	100	12	0.3	32	5.70	-	45.14	43.18	41.21	39.25
27560	-	.2500	1/4"	6.350	1/4"	2"	3/8"	.015"	-	-	20.31	19.43	18.54	17.66
27570	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"	-	-	22.49	21.52	20.54	19.56
27580	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	-	-	22.49	21.52	20.54	19.56
27581	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	-	-	22.49	21.52	20.54	19.56
27583	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.060"	-	-	22.49	21.52	20.54	19.56
63140	-	.2500	1/4"	6.350	1/4"	4"	3/8"	.015"	1-1/4"	.240"	43.59	41.69	39.80	37.90
27585	-	.2756	7.000	8.0	50	12	0.3	-	-	-	32.94	31.50	30.07	28.64
27590	-	.2756	7.000	8.0	65	22	0.3	-	-	-	36.20	34.63	33.05	31.48

continued →

VRX - 4 Flute (continued)

.2812" - .5000"
(7.142mm - 12.700mm)

HIGH PERFORMANCE
END MILLS

EDP#		d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	l_3 Reach Length	d_3 Neck Diameter	1-11	12-24	25-49	50-100	
(plain)	(weldon)	Decimal	Metric											
27595	-	.2812	9/32"	7.142	5/16"	2"	7/16"	.015"	-	-	31.74	30.36	28.98	27.60
27597	-	.2812	9/32"	7.142	5/16"	2-1/2"	13/16"	.015"	-	-	34.89	33.37	31.86	30.34
63150	-	.2812	9/32"	7.142	5/16"	4"	7/16"	.015"	-	-	60.28	57.66	55.04	52.42
27600	-	.3125	5/16"	7.938	5/16"	2"	7/16"	.020"	-	-	27.74	26.53	25.33	24.12
27610	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.010"	-	-	30.49	29.16	27.84	26.51
27620	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.020"	-	-	30.49	29.16	27.84	26.51
27622	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.030"	-	-	30.49	29.16	27.84	26.51
27624	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.060"	-	-	30.49	29.16	27.84	26.51
63160	-	.3125	5/16"	7.938	5/16"	4"	7/16"	.020"	1-7/8"	.300"	58.78	56.22	53.67	51.11
27630	-	.3150		8.000	8.0	50	12	0.5	-	-	28.76	27.51	26.26	25.01
27635	-	.3150		8.000	8.0	65	22	0.3	-	-	31.63	30.25	28.88	27.50
27640	-	.3150		8.000	8.0	65	22	0.5	-	-	31.63	30.25	28.88	27.50
27642	-	.3150		8.000	8.0	65	22	1.0	-	-	31.63	30.25	28.88	27.50
27643	-	.3150		8.000	8.0	65	22	1.5	-	-	31.63	30.25	28.88	27.50
63170	-	.3150		8.000	8.0	100	12	0.5	47	7.60	60.81	58.17	55.52	52.88
27645	-	.3438	11/32"	8.733	3/8"	2"	1/2"	.020"	-	-	37.04	35.43	33.82	32.21
27650	-	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	.020"	-	-	40.27	38.52	36.77	35.02
63180	-	.3438	11/32"	8.733	3/8"	4"	1/2"	.020"	-	-	64.54	61.73	58.93	56.12
27655	-	.3543		9.000	10.0	50	14	0.5	-	-	44.72	42.78	40.83	38.89
27657	-	.3543		9.000	10.0	65	22	0.5	-	-	48.61	46.50	44.38	42.27
27658	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.010"	-	-	32.74	31.32	29.89	28.47
27660	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.020"	-	-	32.74	31.32	29.89	28.47
27662	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.030"	-	-	32.74	31.32	29.89	28.47
27670	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.010"	-	-	35.60	34.06	32.51	30.96
27680	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.020"	-	-	35.60	34.06	32.51	30.96
27682	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	-	-	35.60	34.06	32.51	30.96
27684	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.060"	-	-	35.60	34.06	32.51	30.96
63190	-	.3750	3/8"	9.525	3/8"	4"	1/2"	.020"	1-7/8"	.360"	62.92	60.18	57.45	54.71
27690	-	.3937		10.000	10.0	50	16	0.5	-	-	39.53	37.81	36.09	34.37
27698	-	.3937		10.000	10.0	70	22	0.3	-	-	42.99	41.12	39.25	37.38
27700	-	.3937		10.000	10.0	70	22	0.5	-	-	42.99	41.12	39.25	37.38
27702	-	.3937		10.000	10.0	70	22	1.0	-	-	42.99	41.12	39.25	37.38
63200	-	.3937		10.000	10.0	100	14	0.5	47	9.50	76.95	73.60	70.26	66.91
27705	-	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.020"	-	-	43.06	41.18	39.31	37.44
27708	-	.4375	7/16"	11.113	7/16"	2-3/4"	7/8"	.010"	-	-	43.06	41.18	39.31	37.44
27710	-	.4375	7/16"	11.113	7/16"	2-3/4"	7/8"	.020"	-	-	43.06	41.18	39.31	37.44
63210	-	.4375	7/16"	11.113	7/16"	6"	1"	.020"	-	-	92.81	88.77	84.74	80.70
27712	-	.4724		12.000	12.0	65	19	0.3	-	-	56.74	54.27	51.81	49.34
27715	-	.4724		12.000	12.0	65	19	0.5	-	-	56.74	54.27	51.81	49.34
27718	-	.4724		12.000	12.0	75	32	0.3	-	-	63.31	60.56	57.80	55.05
27720	-	.4724		12.000	12.0	75	32	0.5	-	-	63.31	60.56	57.80	55.05
27722	-	.4724		12.000	12.0	75	32	1.0	-	-	63.31	60.56	57.80	55.05
27730	-	.4724		12.000	12.0	75	32	1.5	-	-	63.31	60.56	57.80	55.05
27735	-	.4724		12.000	12.0	75	32	2.0	-	-	63.31	60.56	57.80	55.05
63220	-	.4724		12.000	12.0	150	19	0.5	57	11.50	111.68	106.82	101.97	97.11
27739	27738	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.010"	-	-	54.41	52.04	49.68	47.31
27741	27740	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.020"	-	-	54.41	52.04	49.68	47.31
27743	27742	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"	-	-	54.41	52.04	49.68	47.31
27751	27750	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.010"	-	-	60.73	58.09	55.45	52.81
27761	27760	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.020"	-	-	60.73	58.09	55.45	52.81
27763	27762	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	-	60.73	58.09	55.45	52.81
27767	27764	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"	-	-	60.73	58.09	55.45	52.81
27769	27768	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.120"	-	-	60.73	58.09	55.45	52.81
63231	63230	.5000	1/2"	12.700	1/2"	4"	5/8"	.020"	2-1/4"	.480"	81.93	78.36	74.80	71.24
63401	63400	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.010"	-	-	71.77	68.65	65.53	62.41
63411	63410	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.030"	-	-	71.77	68.65	65.53	62.41

VRX - 4 Flute (continued)

.5000" - .7874"
(12.700mm - 20.000mm)

HIGH PERFORMANCE
END MILLS

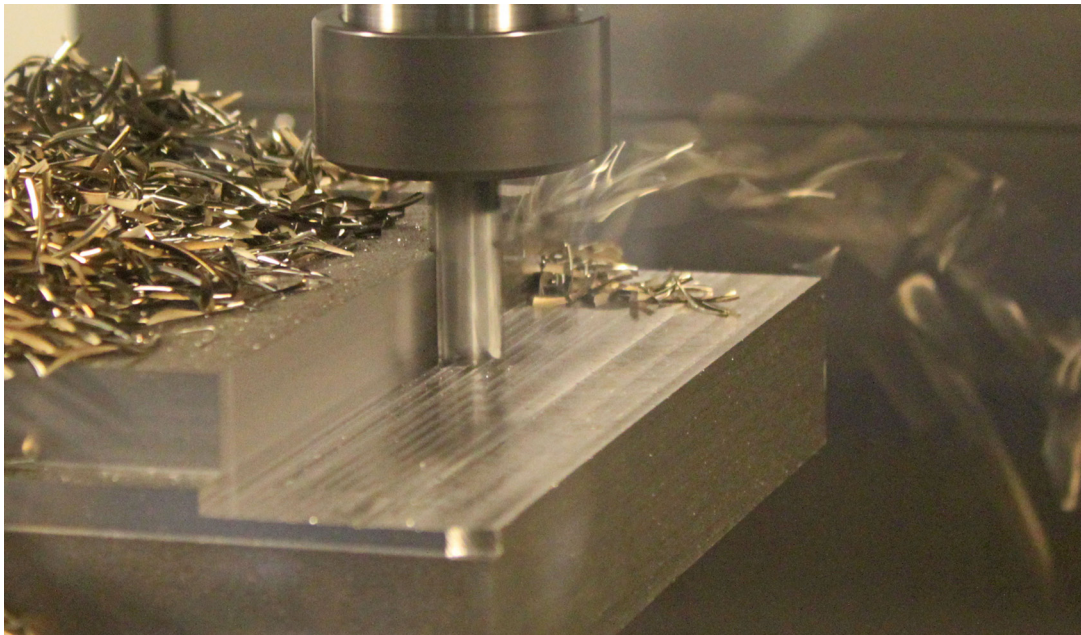
EDP#		d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	l_3 Reach Length	d_3 Neck Diameter	1-11	12-24	25-49	50-100
(plain)	(weldon)	Decimal	1/2"	Metric										
63421	63420	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.060"	-	-	71.77	68.65	65.53	62.41
63431	63430	.5000	1/2"	12.700	1/2"	4"	2"	.010"	-	-	71.77	68.65	65.53	62.41
63441	63440	.5000	1/2"	12.700	1/2"	4"	2"	.030"	-	-	71.77	68.65	65.53	62.41
63451	63450	.5000	1/2"	12.700	1/2"	4"	2"	.060"	-	-	71.77	68.65	65.53	62.41
63241	63240	.5000	1/2"	12.700	1/2"	6"	2"	.020"	-	-	101.50	97.09	92.67	88.26
27766	27765	.5512		14.000	14.0	75	19	0.5	-	-	89.61	85.71	81.82	77.92
27771	27770	.5512		14.000	14.0	88	32	0.5	-	-	92.10	88.10	84.09	80.09
63251	63250	.5512		14.000	14.0	150	19	0.5	57	13.50	148.44	141.99	135.53	129.08
63261	63260	.5512		14.000	14.0	150	50	0.5	-	-	138.25	132.24	126.23	120.22
63461	63460	.6250	5/8"	15.875	5/8"	3"	3/4"	.010"	-	-	94.07	89.98	85.89	81.80
27781	27780	.6250	5/8"	15.875	5/8"	3"	3/4"	.025"	-	-	94.07	89.98	85.89	81.80
27791	27790	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.010"	-	-	96.69	92.49	88.28	84.08
27801	27800	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.025"	-	-	96.69	92.49	88.28	84.08
27803	27802	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	-	-	96.69	92.49	88.28	84.08
27805	27804	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.120"	-	-	96.69	92.49	88.28	84.08
63501	63500	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.010"	-	-	105.10	100.53	95.96	91.39
63511	63510	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.030"	-	-	105.10	100.53	95.96	91.39
63521	63520	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.060"	-	-	105.10	100.53	95.96	91.39
63531	63530	.6250	5/8"	15.875	5/8"	4"	1-3/4"	.010"	-	-	105.10	100.53	95.96	91.39
63541	63540	.6250	5/8"	15.875	5/8"	4"	1-3/4"	.030"	-	-	105.10	100.53	95.96	91.39
63551	63550	.6250	5/8"	15.875	5/8"	4"	1-3/4"	.060"	-	-	105.10	100.53	95.96	91.39
63271	63270	.6250	5/8"	15.875	5/8"	6"	3/4"	.025"	3-1/4"	.600"	154.85	148.12	141.38	134.65
63281	63280	.6250	5/8"	15.875	5/8"	6"	2"	.025"	-	-	144.68	138.39	132.10	125.81
27809	27808	.6299		16.000	16.0	75	19	0.3	-	-	98.20	93.93	89.66	85.39
27811	27810	.6299		16.000	16.0	75	19	0.5	-	-	98.20	93.93	89.66	85.39
27819	27818	.6299		16.000	16.0	88	32	0.3	-	-	100.89	96.50	92.12	87.73
27821	27820	.6299		16.000	16.0	88	32	0.5	-	-	100.89	96.50	92.12	87.73
27823	27822	.6299		16.000	16.0	88	32	1.0	-	-	100.89	96.50	92.12	87.73
27825	27824	.6299		16.000	16.0	88	32	2.0	-	-	100.89	96.50	92.12	87.73
63581	63580	.6299		16.000	16.0	100	38	0.3	-	-	107.28	102.62	97.95	93.29
63291	63290	.6299		16.000	16.0	150	19	0.5	82	15.25	154.85	148.12	141.38	134.65
27831	27830	.7087		18.000	18.0	75	22	0.8	-	-	141.66	135.50	129.34	123.18
27836	27835	.7087		18.000	18.0	100	38	0.8	-	-	144.84	138.55	132.25	125.95
63301	63300	.7087		18.000	18.0	150	25	0.8	82	17.25	225.72	215.91	206.09	196.28
27841	27840	.7500	3/4"	19.050	3/4"	3"	7/8"	.030"	-	-	135.70	129.80	123.90	118.00
27851	27850	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"	-	-	138.66	132.63	126.60	120.57
27861	27860	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	-	-	138.66	132.63	126.60	120.57
27865	27864	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	-	-	138.66	132.63	126.60	120.57
27867	27866	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.120"	-	-	138.66	132.63	126.60	120.57
63601	63600	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.015"	-	-	138.66	132.63	126.60	120.57
27869	27868	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.030"	-	-	138.66	132.63	126.60	120.57
63611	63610	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.060"	-	-	138.66	132.63	126.60	120.57
63621	63620	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.120"	-	-	138.66	132.63	126.60	120.57
63631	63630	.7500	3/4"	19.050	3/4"	5"	2"	.015"	-	-	192.33	183.96	175.60	167.24
63311	63310	.7500	3/4"	19.050	3/4"	5"	2"	.030"	-	-	192.33	183.96	175.60	167.24
63641	63640	.7500	3/4"	19.050	3/4"	5"	2"	.060"	-	-	192.33	183.96	175.60	167.24
63651	63650	.7500	3/4"	19.050	3/4"	6"	3"	.015"	-	-	228.46	218.53	208.59	198.66
63661	63660	.7500	3/4"	19.050	3/4"	6"	3"	.030"	-	-	228.46	218.53	208.59	198.66
63671	63670	.7500	3/4"	19.050	3/4"	6"	3"	.060"	-	-	228.46	218.53	208.59	198.66
63321	63320	.7500	3/4"	19.050	3/4"	6"	1"	.030"	3-1/4"	.730"	238.69	228.32	217.94	207.56
27871	27870	.7874		20.000	20.0	75	22	1.0	-	-	191.91	183.57	175.22	166.88
27879	27878	.7874		20.000	20.0	100	38	0.5	-	-	196.24	187.70	179.17	170.64
27881	27880	.7874		20.000	20.0	100	38	1.0	-	-	196.24	187.70	179.17	170.64
27891	27890	.7874		20.000	20.0	100	38	1.5	-	-	196.24	187.70	179.17	170.64
63331	63330	.7874		20.000	20.0	150	25	1.0	82	19.30	251.39	240.46	229.53	218.60

continued →

VRX - 4 Flute (continued)

.8661" - 1.000"
(22.000mm - 25.400mm)

EDP#		d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	l_3 Reach Length	d_3 Neck Diameter	1-11	12-24	25-49	50-100	
(plain)	(weldon)	Decimal	Metric											
27911	27910	.8661	22.000	22.0	100	38	1.0	-	-	215.57	206.20	196.82	187.45	
63341	63340	.8661	22.000	22.0	150	25	1.0	82	21.50	272.17	260.34	248.50	236.67	
27941	27940	.9843	25.000	25.0	100	38	1.0	-	-	224.91	215.13	205.35	195.57	
27951	27950	.9843	25.000	25.0	100	38	1.5	-	-	224.91	215.13	205.35	195.57	
63351	63350	.9843	25.000	25.0	125	50	1.0	-	-	280.78	268.58	256.37	244.16	
63361	63360	.9843	25.000	25.0	150	32	1.0	82	24.40	376.53	360.16	343.79	327.42	
27959	27958	1.000	1"	25.400	1"	4"	1"	.015"	-	236.72	226.42	216.13	205.84	
27961	27960	1.000	1"	25.400	1"	4"	1"	.035"	-	236.72	226.42	216.13	205.84	
27963	27962	1.000	1"	25.400	1"	4"	1"	.060"	-	236.72	226.42	216.13	205.84	
27965	27964	1.000	1"	25.400	1"	4"	1"	.090"	-	236.72	226.42	216.13	205.84	
27967	27966	1.000	1"	25.400	1"	4"	1-1/2"	.015"	-	236.72	226.42	216.13	205.84	
27971	27970	1.000	1"	25.400	1"	4"	1-1/2"	.035"	-	236.72	226.42	216.13	205.84	
27981	27980	1.000	1"	25.400	1"	4"	1-1/2"	.060"	-	236.72	226.42	216.13	205.84	
27991	27990	1.000	1"	25.400	1"	4"	1-1/2"	.090"	-	236.72	226.42	216.13	205.84	
28001	28000	1.000	1"	25.400	1"	4"	1-3/4"	.015"	-	236.72	226.42	216.13	205.84	
28011	28012	1.000	1"	25.400	1"	4"	1-3/4"	.060"	-	236.72	226.42	216.13	205.84	
28021	28022	1.000	1"	25.400	1"	4"	1-3/4"	.090"	-	236.72	226.42	216.13	205.84	
63369	63368	1.000	1"	25.400	1"	5"	2"	.015"	-	291.25	278.59	265.92	253.26	
63371	63370	1.000	1"	25.400	1"	5"	2"	.035"	-	291.25	278.59	265.92	253.26	
63373	63372	1.000	1"	25.400	1"	5"	2"	.060"	-	291.25	278.59	265.92	253.26	
63375	63374	1.000	1"	25.400	1"	5"	2"	.090"	-	291.25	278.59	265.92	253.26	
63381	63380	1.000	1"	25.400	1"	6"	1-1/4"	.035"	3-1/4"	.980"	393.43	376.32	359.22	342.11

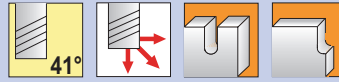


V series in 1018 material

TOLERANCES

d_1	+.000" -.002" (+.000 -.050mm)	
d_2	3mm - 6mm	+.0000" -.0003" (+.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)
Ball radius	+.000" -.001" (+.000 -.025mm)	

Technical information: page 233



VRX - 4 Flute

HIGH PERFORMANCE END MILLS

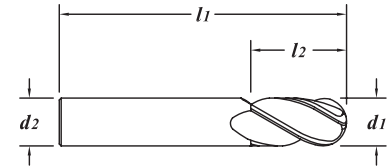
Ball End - Balinit® X.CEED Coated

Solid submicron grain carbide end mill - center cutting
 State-of-the-art rougher/finisher
 Reduces vibration for more aggressive machining resulting in less cycle times and greater productivity

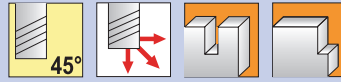
Recommended for stainless steel, inconel, pH materials, titanium and tool steels

Variable flute geometry
 VRX Square End - page 136
 VRX Corner Radius - page 137

The combination of an extended flute length with a weldon flat may cause the flute washout to reach inside some end mill holders



EDP#	d_1 †	d_2	l_1	l_2	1-11	12-24	25-49	50-100			
									Decimal	Metric	Shank Diameter
28470	-	.1575	4.000	6.0	50	8	22.25	21.29	20.32	19.35	
28480	-	.1575	4.000	6.0	50	12	22.25	21.29	20.32	19.35	
28490	-	.1875	3/16"	4.763	3/16"	2"	5/16"	16.49	15.77	15.06	14.34
28500	-	.1875	3/16"	4.763	3/16"	2"	9/16"	16.49	15.77	15.06	14.34
28510	-	.1969	5.000	6.0	50	10	21.80	20.86	19.91	18.96	
28520	-	.1969	5.000	6.0	65	15	24.16	23.11	22.06	21.01	
28530	-	.2362	6.000	6.0	50	12	21.10	20.19	19.27	18.35	
28540	-	.2362	6.000	6.0	65	19	23.39	22.37	21.36	20.34	
28570	-	.2500	1/4"	6.350	1/4"	2"	3/8"	20.31	19.43	18.54	17.66
28580	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	22.49	21.52	20.54	19.56
28610	-	.3125	5/16"	7.938	5/16"	2"	7/16"	27.74	26.53	25.33	24.12
28620	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	30.49	29.16	27.84	26.51
28630	-	.3150	8.000	8.0	50	12	28.76	27.51	26.26	25.01	
28640	-	.3150	8.000	8.0	65	22	31.63	30.25	28.88	27.50	
28670	-	.3750	3/8"	9.525	3/8"	2"	1/2"	32.74	31.32	29.89	28.47
28680	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	35.60	34.06	32.51	30.96
28690	-	.3937	10.000	10.0	50	16	39.53	37.81	36.09	34.37	
28700	-	.3937	10.000	10.0	70	22	42.99	41.12	39.25	37.38	
28705	-	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	43.06	41.18	39.31	37.44
28710	-	.4375	7/16"	11.113	7/16"	2-3/4"	7/8"	43.06	41.18	39.31	37.44
28715	-	.4724	12.000	12.0	65	19	56.74	54.27	51.81	49.34	
28720	-	.4724	12.000	12.0	75	32	63.31	60.56	57.80	55.05	
28751	28750	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	54.41	52.04	49.68	47.31
28761	28760	.5000	1/2"	12.700	1/2"	3"	1-1/4"	60.73	58.09	55.45	52.81
28771	28770	.5000	1/2"	12.700	1/2"	4"	5/8"	71.77	68.65	65.53	62.41
28781	28780	.5512	14.000	14.0	75	19	89.61	85.71	81.82	77.92	
28786	28785	.5512	14.000	14.0	88	32	92.10	88.10	84.09	80.09	
28796	28795	.6250	5/8"	15.875	5/8"	3"	3/4"	94.07	89.98	85.89	81.80
28801	28800	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	96.69	92.49	88.28	84.08
28806	28805	.6250	5/8"	15.875	5/8"	6"	2"	144.68	138.39	132.10	125.81
28811	28810	.6299	16.000	16.0	75	19	98.20	93.93	89.66	85.39	
28821	28820	.6299	16.000	16.0	88	32	100.89	96.50	92.12	87.73	
28831	28830	.7087	18.000	18.0	75	22	141.66	135.50	129.34	123.18	
28836	28835	.7087	18.000	18.0	100	38	144.84	138.55	132.25	125.95	
28841	28840	.7500	3/4"	19.050	3/4"	3"	7/8"	135.70	129.80	123.90	118.00
28861	28860	.7500	3/4"	19.050	3/4"	4"	1-1/2"	138.66	132.63	126.60	120.57
28866	28865	.7500	3/4"	19.050	3/4"	5"	2"	192.33	183.96	175.60	167.24
28871	28870	.7874	20.000	20.0	75	22	191.91	183.57	175.22	166.88	
28881	28880	.7874	20.000	20.0	100	38	196.24	187.70	179.17	170.64	
28901	28900	.9843	25.000	25.0	100	38	224.91	215.13	205.35	195.57	
28911	28910	1.000	1"	25.400	1"	4"	1"	236.72	226.42	216.13	205.84
28916	28915	1.000	1"	25.400	1"	4"	1-1/2"	236.72	226.42	216.13	205.84
28931	28930	1.000	1"	25.400	1"	5"	2"	291.25	278.59	265.92	253.26



TOLERANCES

$d1$	+.000" -.002" (+.000 -.050mm)	
$d2$	3mm - 6mm	+0.000" -.0003" (+.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)

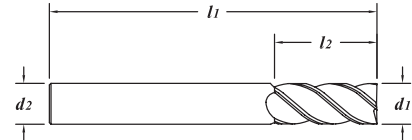
Square End - *Balinit*® X.CEED Coated

Solid submicron grain carbide end mill - center cutting
High performance tool for use in high Rockwell materials

Recommended for hardened die mold, inconel and tool steels above 45 Rc

Corner Radius - page 143

Ball End - page 144



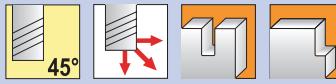
EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	Number of Flutes	1-11	12-24	25-49	50-100
	Decimal	Metric								
21200	.1181	3.000	3.0	38	12	4	14.32	13.70	13.07	12.45
21230	.1250	1/8"	3.175	1/8"	1-1/2"	4	13.60	13.01	12.42	11.83
21260	.1575		4.000	6.0	50	4	23.13	22.12	21.12	20.11
21290	.1875	3/16"	4.763	3/16"	2"	4	17.10	16.36	15.61	14.87
21320	.1969		5.000	6.0	65	4	25.33	24.23	23.13	22.03
21350	.2362		6.000	6.0	65	4	24.56	23.50	22.43	21.36
21380	.2500	1/4"	6.350	1/4"	2-1/2"	4	23.68	22.65	21.62	20.59
21410	.2756		7.000	8.0	65	5	37.10	35.49	33.87	32.26
21440	.3125	5/16"	7.938	5/16"	2-1/2"	5	32.14	30.75	29.35	27.95
21470	.3150		8.000	8.0	65	5	33.79	32.32	30.85	29.38
21500	.3543		9.000	10.0	65	5	49.63	47.48	45.32	43.16
21530	.3750	3/8"	9.525	3/8"	2-1/2"	5	37.26	35.64	34.02	32.40
21560	.3937		10.000	10.0	70	5	44.97	43.01	41.06	39.10
21620	.4724		12.000	12.0	75	5	65.93	63.06	60.20	57.33
21660	.5000	1/2"	12.700	1/2"	3"	5	62.69	59.96	57.24	54.51
21710	.6250	5/8"	15.875	5/8"	3-1/2"	5	99.53	95.21	90.88	86.55
21740	.6299		16.000	16.0	88	5	104.68	100.13	95.58	91.03
21770	.7087		18.000	18.0	100	5	148.98	142.51	136.03	129.55
21800	.7500	3/4"	19.050	3/4"	4"	5	142.57	136.37	130.17	123.97
21830	.7874		20.000	20.0	100	5	201.55	192.79	184.02	175.26
21890	.9843		25.000	25.0	100	5	251.99	241.03	230.08	219.12
21920	1.000	1"	25.400	1"	4"	5	243.64	233.05	222.45	211.86

TOLERANCES

<i>d1</i>	+.000"-.002" (+.000-.050mm)	
<i>d2</i>	3mm - 6mm	+.0000"-.0003" (+.0000-.0075mm)
	1/4" - 1"	-.0001"-.0004" (-.0025-.0100mm)
<i>r</i>	+.001"-.001" (+.025-.025mm)	

Technical information: page 238, 239

545RA



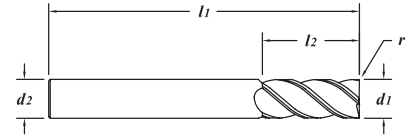
Corner Radius - Balinit® X.CEED Coated

Solid submicron grain carbide end mill - center cutting
High performance tool for use in high Rockwell materials

Recommended for hardened die mold, inconel and tool steels above 45 Rc

Square End - page 142

Ball End - page 144



HIGH PERFORMANCE END MILLS

EDP#	<i>d1</i> † Diameter		<i>d2</i> Shank Diameter	<i>l1</i> Overall Length	<i>l2</i> Flute Length	<i>r</i> Corner Radius	Number of Flutes	1-11	12-24	25-49	50-100	
	Decimal	Metric										
21202	.1181	3.000	3.0	38	12	0.2	4	15.63	14.95	14.27	13.59	
21212	.1181	3.000	3.0	38	12	0.5	4	15.63	14.95	14.27	13.59	
21232	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.010"	4	14.85	14.20	13.56	12.91
21242	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.020"	4	14.85	14.20	13.56	12.91
21262	.1575	4.000	6.0	50	12	0.3	4	25.20	24.10	23.01	21.91	
21292	.1875	3/16"	4.763	3/16"	2"	9/16"	.010"	4	18.66	17.85	17.04	16.23
21302	.1875	3/16"	4.763	3/16"	2"	9/16"	.020"	4	18.66	17.85	17.04	16.23
21322	.1969	5.000	6.0	65	15	0.3	4	27.49	26.29	25.10	23.90	
21342	.2362	6.000	6.0	65	19	0.2	4	26.62	25.47	24.31	23.15	
21352	.2362	6.000	6.0	65	19	0.5	4	26.62	25.47	24.31	23.15	
21372	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"	4	25.65	24.53	23.42	22.30
21382	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	4	25.65	24.53	23.42	22.30
21392	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	4	25.65	24.53	23.42	22.30
21412	.2756	7.000	8.0	65	22	0.5	5	40.23	38.48	36.73	34.98	
21432	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.010"	5	34.73	33.22	31.71	30.20
21442	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.015"	5	34.73	33.22	31.71	30.20
21452	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.030"	5	34.73	33.22	31.71	30.20
21462	.3150	8.000	8.0	65	22	0.2	5	36.56	34.97	33.38	31.79	
21472	.3150	8.000	8.0	65	22	0.5	5	36.56	34.97	33.38	31.79	
21502	.3543	9.000	10.0	65	22	0.5	5	54.03	51.68	49.33	46.98	
21522	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.010"	5	40.41	38.65	36.90	35.14
21532	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.015"	5	40.41	38.65	36.90	35.14
21542	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	5	40.41	38.65	36.90	35.14
21552	.3937	10.000	10.0	70	22	0.2	5	48.83	46.71	44.58	42.46	
21562	.3937	10.000	10.0	70	22	0.5	5	48.83	46.71	44.58	42.46	
21602	.4724	12.000	12.0	75	32	0.2	5	72.13	68.99	65.86	62.72	
21612	.4724	12.000	12.0	75	32	0.5	5	72.13	68.99	65.86	62.72	
21622	.4724	12.000	12.0	75	32	1.0	5	72.13	68.99	65.86	62.72	
21642	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.010"	5	68.52	65.54	62.56	59.58
21652	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.015"	5	68.52	65.54	62.56	59.58
21662	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	5	68.52	65.54	62.56	59.58
21672	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"	5	68.52	65.54	62.56	59.58
21692	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.010"	5	108.97	104.24	99.50	94.76
21702	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"	5	108.97	104.24	99.50	94.76
21712	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	5	108.97	104.24	99.50	94.76
21722	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	5	108.97	104.24	99.50	94.76
21732	.6299	16.000	16.0	88	32	0.5	5	114.71	109.73	104.74	99.75	
21742	.6299	16.000	16.0	88	32	1.0	5	114.71	109.73	104.74	99.75	
21772	.7087	18.000	18.0	100	38	0.5	5	163.71	156.60	149.48	142.36	
21802	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"	5	156.66	149.85	143.04	136.23
21812	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	5	156.66	149.85	143.04	136.23
21822	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	5	156.66	149.85	143.04	136.23
21832	.7874	20.000	20.0	100	38	0.5	5	221.48	211.85	202.22	192.59	
21892	.9843	25.000	25.0	100	38	0.5	5	276.91	264.87	252.83	240.79	
21922	1.000	1"	25.400	1"	4"	1-1/2"	.015"	5	267.74	256.10	244.46	232.82
21932	1.000	1"	25.400	1"	4"	1-1/2"	.030"	5	267.74	256.10	244.46	232.82
21942	1.000	1"	25.400	1"	4"	1-1/2"	.060"	5	267.74	256.10	244.46	232.82



TOLERANCES

d_1	+.000" - .002" (+.000 - .050mm)	
d_2	3mm - 6mm	+.0000" - .0003" (+.0000 - .0075mm)
	1/4" - 1"	-.0001" - .0004" (-.0025 - .0100mm)
Ball radius	+.000" - .001" (+.000 - .025mm)	

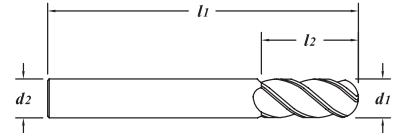
Ball End - *Balinit*® X.CEED Coated

Solid submicron grain carbide end mill - center cutting
High performance tool for use in high Rockwell materials

Recommended for hardened die mold, inconel and tool steels above 45 Rc

Square End - page 142

Corner Radius - page 143

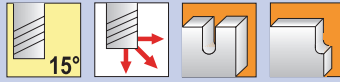


EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	Number of Flutes	1-11	12-24	25-49	50-100
	Decimal	Metric								
21204	.1181	3.000	3.0	38	12	4	15.63	14.95	14.27	13.59
21234	.1250	1/8"	3.175	1/8"	1-1/2"	4	14.85	14.20	13.56	12.91
21264	.1575		4.000	6.0	50	4	25.20	24.10	23.01	21.91
21294	.1875	3/16"	4.763	3/16"	2"	4	18.66	17.85	17.04	16.23
21324	.1969		5.000	6.0	65	4	27.49	26.29	25.10	23.90
21354	.2362		6.000	6.0	65	4	26.62	25.47	24.31	23.15
21384	.2500	1/4"	6.353	1/4"	2-1/2"	4	25.65	24.53	23.42	22.30
21414	.2756		7.000	8.0	65	5	40.23	38.48	36.73	34.98
21444	.3125	5/16"	7.938	5/16"	2-1/2"	5	34.73	33.22	31.71	30.20
21474	.3150		8.000	8.0	65	5	36.56	34.97	33.38	31.79
21504	.3543		9.000	10.0	65	5	54.03	51.68	49.33	46.98
21534	.3750	3/8"	9.525	3/8"	2-1/2"	5	40.41	38.65	36.90	35.14
21564	.3937		10.000	10.0	70	5	48.83	46.71	44.58	42.46
21624	.4724		12.000	12.0	75	5	72.13	68.99	65.86	62.72
21664	.5000	1/2"	12.700	1/2"	3"	5	68.52	65.54	62.56	59.58
21714	.6250	5/8"	15.875	5/8"	3-1/2"	5	108.97	104.24	99.50	94.76
21744	.6299		16.000	16.0	88	5	114.71	109.73	104.74	99.75
21774	.7087		18.000	18.0	100	5	163.71	156.60	149.48	142.36
21804	.7500	3/4"	19.050	3/4"	4"	5	156.66	149.85	143.04	136.23
21834	.7874		20.000	20.0	100	5	221.48	211.85	202.22	192.59
21894	.9843		25.000	25.0	100	5	276.91	264.87	252.83	240.79
21924	1.000	1"	25.400	1"	4"	5	267.74	256.10	244.46	232.82

TOLERANCES

d_1	+0.000" -0.001" (+0.000 -0.025mm)
d_2	-0.0001" -0.0003" (-0.0025 -0.0075mm)
Ball radius	+0.0000" -0.0005" (+0.0000 -0.0127mm)

Technical information:
page 240, 241

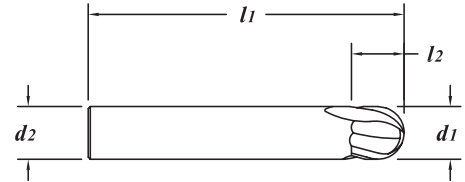


350MX (950MX metric) - 2 Flute

**HIGH PERFORMANCE
END MILLS**

Die Mold Cutters - *Balinit*® X.CEED Coated

Solid submicron grain carbide end mill - center cutting
 High performance machining in the die mold industry
 Rigid work holding, machine stability and part integrity are critical!
 Carbide tested and selected for specific application
 ≤5mm (.1969") diameter have 5° taper to shank
 Recommended for high Rockwell materials
 Can be modified with a neck in 48 hours

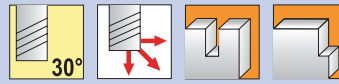


EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
14210	.0312	1/32"	0.792	1/4"	3"	1/32"	55.28	52.88	50.47	48.07
15210	.0394		1.000	6.0	75	1	55.28	52.88	50.47	48.07
15220	.0591		1.501	6.0	75	1.5	55.28	52.88	50.47	48.07
14220	.0625	1/16"	1.588	1/4"	3"	1/16"	55.28	52.88	50.47	48.07
15230	.0787		2.000	6.0	75	2	55.28	52.88	50.47	48.07
14230	.0938	3/32"	2.383	1/4"	3"	3/32"	55.28	52.88	50.47	48.07
15240	.1181		3.000	6.0	75	3	54.02	51.67	49.32	46.97
14240	.1250	1/8"	3.175	1/4"	3"	1/8"	54.02	51.67	49.32	46.97
15250	.1575		4.000	6.0	75	4	53.23	50.92	48.60	46.29
14250	.1875	3/16"	4.763	1/4"	3"	3/16"	53.23	50.92	48.60	46.29
15260	.1969		5.000	6.0	75	5	53.23	50.92	48.60	46.29
15270	.2362		6.000	6.0	75	6	52.12	49.85	47.59	45.32
14260	.2500	1/4"	6.350	1/4"	3"	1/4"	52.12	49.85	47.59	45.32
14270	.3125	5/16"	7.938	5/16"	4"	5/16"	63.83	61.05	58.28	55.50
15280	.3150		8.000	8.0	100	8	63.83	61.05	58.28	55.50
14280	.3750	3/8"	9.525	3/8"	4"	3/8"	70.62	67.55	64.48	61.41
15290	.3937		10.000	10.0	100	10	76.41	73.08	69.76	66.44
15300	.4724		12.000	12.0	100	12	92.54	88.52	84.49	80.47
14290	.5000	1/2"	12.700	1/2"	4"	1/2"	103.05	98.57	94.09	89.61

210D - 4 Flute

Technical information: page 228, 230, 242

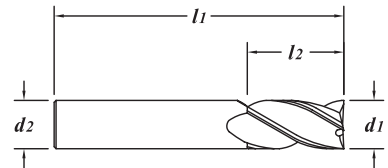
TOLERANCES	
d_1	+0.000" -0.002" (+0.000 -0.050mm)
d_2	-0.0001" -0.0002" (-0.0025 -0.0050mm)



Square End - Diamond Coated

Solid grade C-2 carbide end mill - center cutting
Crystalline diamond coating
Up to 17x tool life than uncoated

Recommended for graphite, fiber-reinforced plastics, carbon fiber and high silicon aluminum



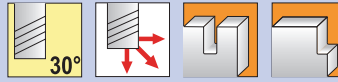
EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
10018	.0312	1/32"	0.792	1/8"	1-1/2"	3/32"	67.08	64.16	61.25	58.33
46018	.0394		1.000	3.0	38	4	70.61	67.54	64.47	61.40
10028	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"	67.08	64.16	61.25	58.33
46028	.0591		1.501	3.0	38	6	70.61	67.54	64.47	61.40
10038	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	64.95	62.13	59.30	56.48
46038	.0787		2.000	3.0	38	8	68.38	65.41	62.43	59.46
10058	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	63.80	61.03	58.25	55.48
46058	.1181		3.000	3.0	38	12	63.46	60.70	57.94	55.18
10078	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	60.27	57.65	55.03	52.41
46078	.1575		4.000	4.0	50	14	101.41	97.00	92.59	88.18
10118	.1875	3/16"	4.763	3/16"	2"	5/8"	96.34	92.15	87.96	83.77
46098	.1969		5.000	5.0	50	16	116.89	111.80	106.72	101.64
46108	.2362		6.000	6.0	65	20	119.21	114.03	108.84	103.66
10158	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	113.24	108.32	103.39	98.47
10198	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	135.48	129.59	123.70	117.81
46128	.3150		8.000	8.0	65	20	159.93	152.98	146.02	139.07
10238	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	151.82	145.22	138.62	132.02
46148	.3937		10.000	10.0	70	25	177.12	169.42	161.72	154.02
46168	.4724		12.000	12.0	75	25	194.18	185.74	177.29	168.85
10318	.5000	1/2"	12.700	1/2"	3"	1"	184.46	176.44	168.42	160.40
13338	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	266.59	255.00	243.41	231.82
46188	.6299		16.000	16.0	88	32	324.61	310.50	296.38	282.27
13358	.7500	3/4"	19.050	3/4"	4"	1-1/2"	504.39	482.46	460.53	438.60
46208	.7874		20.000	20.0	100	38	631.61	604.15	576.69	549.23
46228	.9843		25.000	25.0	100	38	798.55	763.83	729.11	694.39
13378	1.000	1"	25.400	1"	4"	1-1/2"	792.45	758.00	723.54	689.09

TOLERANCES

d_1	+0.000" -0.002" (+.000 -0.050mm)
d_2	-0.0001" -0.0002" (-0.0025 -0.050mm)
r	+0.001" -0.001" (+.025 -0.025mm)

Technical information: page 228, 230, 242

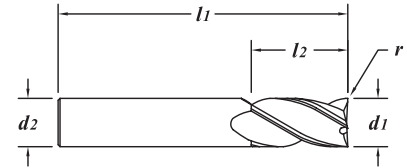
210RD - 4 Flute



Corner Radius - Diamond Coated

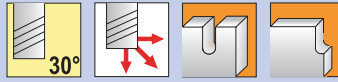
- Solid grade C-2 carbide end mill - center cutting
- Crystalline diamond coating
- Up to 17x tool life than uncoated
- For stronger corners and part radius

Recommended for graphite, fiber-reinforced plastics, carbon fiber and high silicon aluminum



HIGH PERFORMANCE END MILLS

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
	Decimal	Metric									
24108	.1181	3.000	3.0	38	12	0.3	87.92	84.10	80.27	76.45	
24118	.1181	3.000	3.0	38	12	0.5	87.92	84.10	80.27	76.45	
80018	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.015"	83.51	79.88	76.25	72.62
80028	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.020"	83.51	79.88	76.25	72.62
24148	.1575	4.000	4.0	50	14	0.3	127.04	121.52	115.99	110.47	
24158	.1575	4.000	4.0	50	14	0.5	127.04	121.52	115.99	110.47	
80058	.1875	3/16"	4.763	3/16"	2"	5/8"	.015"	120.69	115.45	110.20	104.95
80068	.1875	3/16"	4.763	3/16"	2"	5/8"	.020"	120.69	115.45	110.20	104.95
24178	.2362	6.000	6.0	65	20	0.5	135.56	129.67	123.77	117.88	
24208	.2362	6.000	6.0	65	20	1.5	135.56	129.67	123.77	117.88	
80108	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	128.79	123.19	117.59	111.99
80118	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"	128.79	123.19	117.59	111.99
80128	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	128.79	123.19	117.59	111.99
24228	.3150	8.000	8.0	65	20	0.5	170.00	162.61	155.22	147.83	
24248	.3150	8.000	8.0	65	20	1.0	170.00	162.61	155.22	147.83	
80248	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.020"	161.98	154.94	147.89	140.85
80258	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	161.98	154.94	147.89	140.85
24298	.3937	10.000	10.0	70	25	0.5	188.83	180.62	172.41	164.20	
24318	.3937	10.000	10.0	70	25	1.0	188.83	180.62	172.41	164.20	
24378	.4724	12.000	12.0	75	25	0.5	207.64	198.62	189.59	180.56	
24398	.4724	12.000	12.0	75	25	1.0	207.64	198.62	189.59	180.56	
80328	.5000	1/2"	12.700	1/2"	3"	1"	.030"	197.26	188.68	180.11	171.53
80348	.5000	1/2"	12.700	1/2"	3"	1"	.060"	197.26	188.68	180.11	171.53

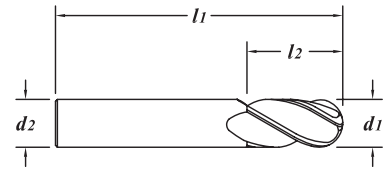


TOLERANCES	
d_1	+0.000" -0.002" (+0.000 -0.050mm)
d_2	-0.001" -0.002" (-0.025 -0.050mm)
Ball radius	+0.000" -0.001" (+0.000 -0.025mm)

Ball End - Diamond Coated

Solid grade C-2 carbide end mill - center cutting
Crystalline diamond coating
Up to 17x tool life than uncoated

Recommended for graphite, fiber-reinforced plastics, carbon fiber and high silicon aluminum



EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Diameter Metric								
15018	.0312	1/32"	0.792	1/8"	1-1/2"	3/32"	90.70	86.76	82.81	78.87
48018	.0394		1.000	3.0	38	4	95.47	91.32	87.17	83.02
15028	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"	90.70	86.76	82.81	78.87
48028	.0591		1.501	3.0	38	6	95.47	91.32	87.17	83.02
15038	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	88.57	84.72	80.87	77.02
48038	.0787		2.000	3.0	38	8	93.22	89.17	85.11	81.06
15058	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	87.03	83.25	79.46	75.68
48058	.1181		3.000	3.0	38	12	87.92	84.10	80.27	76.45
15078	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	83.51	79.88	76.25	72.62
48078	.1575		4.000	4.0	50	14	127.04	121.52	115.99	110.47
15118	.1875	3/16"	4.763	3/16"	2"	5/8"	120.69	115.45	110.20	104.95
48098	.1969		5.000	5.0	50	16	132.74	126.97	121.20	115.43
48108	.2362		6.000	6.0	65	20	135.56	129.67	123.77	117.88
15158	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	128.79	123.19	117.59	111.99
15198	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	145.05	138.74	132.44	126.13
48128	.3150		8.000	8.0	65	20	170.00	162.61	155.22	147.83
15238	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	161.98	154.94	147.89	140.85
48148	.3937		10.000	10.0	70	25	188.83	180.62	172.41	164.20
48168	.4724		12.000	12.0	75	25	207.64	198.62	189.59	180.56
15318	.5000	1/2"	12.700	1/2"	3"	1"	197.26	188.68	180.11	171.53
18338	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	275.06	263.10	251.14	239.18
48188	.6299		16.000	16.0	88	32	333.48	318.98	304.48	289.98
18358	.7500	3/4"	19.050	3/4"	4"	1-1/2"	517.25	494.76	472.27	449.78
48208	.7874		20.000	20.0	100	38	657.79	629.19	600.59	571.99
48228	.9843		25.000	25.0	100	38	849.16	812.24	775.32	738.40
18378	1.000	1"	25.400	1"	4"	1-1/2"	841.25	804.67	768.10	731.52

TOLERANCES

d_1	+0.001" -0.002" (+0.000 -0.050mm)
d_2	-0.0001" -0.0002" (-0.0025 -0.0050mm)

Technical information: page 228, 230, 242

610D - 4 Flute

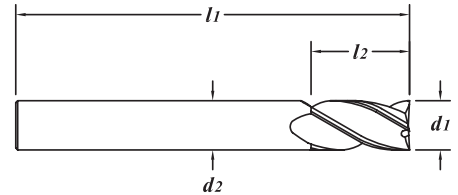


Extra Length - Square End - Diamond Coated

Solid grade C-2 carbide end mill - center cutting
 Crystalline diamond coating
 Up to 17x tool life than uncoated

Recommended for graphite, fiber-reinforced plastics, carbon fiber and high silicon aluminum

Can be modified with a neck in 48 hours

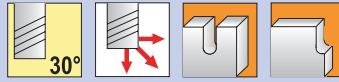


HIGH PERFORMANCE END MILLS

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
94028	.1181	3.000	3.0	75	20	97.23	93.01	88.78	84.55	
38038	.1250	1/8"	3.175	1/8"	3"	1"	92.38	88.36	84.35	80.33
94068	.1575	4.000	4.0	75	25	130.10	124.44	118.79	113.13	
38048	.1875	3/16"	4.763	3/16"	4"	1"	123.59	118.22	112.84	107.47
94108	.2362	6.000	6.0	100	25	144.75	138.46	132.16	125.87	
94128	.2362	6.000	6.0	150	38	165.67	158.47	151.26	144.06	
38058	.2500	1/4"	6.350	1/4"	3"	1"	132.41	126.65	120.90	115.14
38068	.2500	1/4"	6.350	1/4"	4"	1"	137.52	131.54	125.56	119.58
38078	.2500	1/4"	6.350	1/4"	6"	1-1/2"	157.39	150.55	143.70	136.86
38098	.3125	5/16"	7.938	5/16"	4"	1"	161.22	154.21	147.20	140.19
94168	.3150	8.000	8.0	100	25	192.84	184.46	176.07	167.69	
38128	.3750	3/8"	9.525	3/8"	4"	1"	179.53	171.72	163.92	156.11
38138	.3750	3/8"	9.525	3/8"	6"	1-1/2"	198.41	189.78	181.16	172.53
94208	.3937	10.000	10.0	100	25	215.29	205.93	196.57	187.21	
94248	.4724	12.000	12.0	100	25	237.73	227.39	217.06	206.72	
38168	.5000	1/2"	12.700	1/2"	4"	1"	225.86	216.04	206.22	196.40
38178	.5000	1/2"	12.700	1/2"	4"	2"	225.86	216.04	206.22	196.40

710D - 4 Flute

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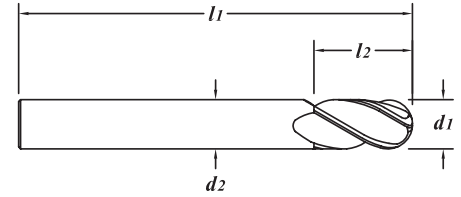
TOLERANCES	
d_1	+0.000" -0.002" (+0.000 -0.050mm)
d_2	-0.0001" -0.0002" (-0.0025 -0.0050mm)
Ball radius	+0.000" -0.001" (+0.000 -0.025mm)

Extra Length - Ball End - Diamond Coated

Solid grade C-2 carbide end mill - center cutting
Crystalline diamond coating
Up to 17x tool life than uncoated

Recommended for graphite, fiber-reinforced plastics, carbon fiber and high silicon aluminum

Can be modified with a neck in 48 hours

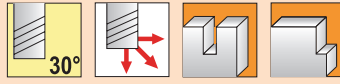


EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
	Decimal	Metric							
99028	.1181	3.000	3.0	75	20	118.76	113.60	108.43	103.27
40038	.1250	1/8"	3.175	1/8"	3"	112.83	107.92	103.02	98.11
99068	.1575	4.000	4.0	75	25	147.76	141.34	134.91	128.49
40048	.1875	3/16"	4.763	3/16"	4"	140.37	134.27	128.16	122.06
99108	.2362	6.000	6.0	100	25	162.40	155.34	148.28	141.22
99128	.2362	6.000	6.0	150	38	180.32	172.48	164.64	156.80
40058	.2500	1/4"	6.350	1/4"	3"	149.19	142.70	136.22	129.73
40068	.2500	1/4"	6.350	1/4"	4"	154.30	147.59	140.88	134.17
40078	.2500	1/4"	6.350	1/4"	6"	171.30	163.86	156.41	148.96
40098	.3125	5/16"	7.938	5/16"	4"	178.00	170.26	162.52	154.78
99168	.3150	8.000	8.0	100	25	207.46	198.44	189.42	180.40
40128	.3750	3/8"	9.525	3/8"	4"	196.32	187.78	179.25	170.71
40138	.3750	3/8"	9.525	3/8"	6"	207.71	198.68	189.65	180.62
99208	.3937	10.000	10.0	100	25	229.92	219.92	209.93	199.93
99248	.4724	12.000	12.0	100	25	252.40	241.43	230.45	219.48
40168	.5000	1/2"	12.700	1/2"	4"	239.78	229.35	218.93	208.50
40178	.5000	1/2"	12.700	1/2"	4"	239.78	229.35	218.93	208.50

TOLERANCES

d_1	$\leq .030"$	$+0.004" - .0004" (+.0100 - .0100mm)$
	$\geq 1/32"$	$+0.000" - .002" (+0.000 - .050mm)$
d_2	3mm - 6mm	$+0.000" - .0003" (-0.0000 - .0075mm)$
	1/4" - 1"	$-0.001" - .0004" (-.0025 - .0100mm)$

Technical information:
page 228, 230



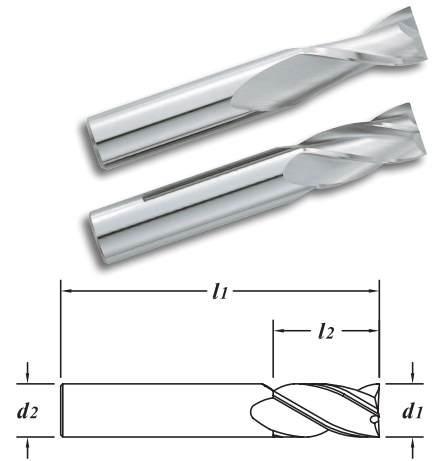
160M (860M metric) - 2 Flute
170M (870M metric) - 4 Flute

.0050" - .0787"
(0.127mm - 2.000mm)

END MILLS

Stub Length

Solid submicron grain carbide end mill - center cutting
Shorter flute length for rigidity
Extremely versatile
TiAlN Coated - page 153



2 Flute EDP#	4 Flute EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Diameter Metric								
01200	-	.0050	.0050"	0.127	1/8"	1-1/2"	.008"	21.28	20.35	19.43	18.50
01210	-	.0060	.0060"	0.152	1/8"	1-1/2"	.009"	21.28	20.35	19.43	18.50
01220	-	.0070	.0070"	0.178	1/8"	1-1/2"	.011"	20.02	19.15	18.28	17.41
01230	-	.0080	.0080"	0.203	1/8"	1-1/2"	.012"	20.02	19.15	18.28	17.41
01240	-	.0090	.0090"	0.229	1/8"	1-1/2"	.014"	18.89	18.07	17.25	16.43
01250	-	.0100	.0100"	0.254	1/8"	1-1/2"	.015"	18.89	18.07	17.25	16.43
01260	-	.0110	.0110"	0.279	1/8"	1-1/2"	.017"	17.49	16.73	15.97	15.21
01270	-	.0120	.0120"	0.305	1/8"	1-1/2"	.018"	17.49	16.73	15.97	15.21
01280	-	.0130	.0130"	0.330	1/8"	1-1/2"	.020"	17.40	16.64	15.89	15.13
01290	-	.0140	.0140"	0.356	1/8"	1-1/2"	.021"	17.40	16.64	15.89	15.13
01300	-	.0150	.0150"	0.381	1/8"	1-1/2"	.023"	17.40	16.64	15.89	15.13
01310	-	.0160	.0160"	0.406	1/8"	1-1/2"	.024"	17.17	16.42	15.68	14.93
01320	-	.0170	.0170"	0.432	1/8"	1-1/2"	.026"	17.17	16.42	15.68	14.93
01330	-	.0180	.0180"	0.457	1/8"	1-1/2"	.027"	16.85	16.12	15.38	14.65
01340	-	.0190	.0190"	0.483	1/8"	1-1/2"	.029"	16.85	16.12	15.38	14.65
01350	-	.0200	.0200"	0.508	1/8"	1-1/2"	.030"	16.85	16.12	15.38	14.65
01360	-	.0210	.0210"	0.533	1/8"	1-1/2"	.032"	16.85	16.12	15.38	14.65
01370	-	.0220	.0220"	0.559	1/8"	1-1/2"	.033"	16.65	15.93	15.20	14.48
01380	-	.0230	.0230"	0.584	1/8"	1-1/2"	.035"	16.65	15.93	15.20	14.48
01390	-	.0240	.0240"	0.610	1/8"	1-1/2"	.036"	16.65	15.93	15.20	14.48
01400	-	.0250	.0250"	0.635	1/8"	1-1/2"	.038"	15.71	15.03	14.34	13.66
01410	-	.0260	.0260"	0.660	1/8"	1-1/2"	.039"	15.71	15.03	14.34	13.66
01420	-	.0270	.0270"	0.686	1/8"	1-1/2"	.041"	14.09	13.48	12.86	12.25
01430	-	.0280	.0280"	0.711	1/8"	1-1/2"	.042"	14.09	13.48	12.86	12.25
01440	-	.0290	.0290"	0.737	1/8"	1-1/2"	.044"	14.09	13.48	12.86	12.25
01450	-	.0300	.0300"	0.762	1/8"	1-1/2"	.045"	14.09	13.48	12.86	12.25
01010	02010	.0312	1/32"	0.792	1/8"	1-1/2"	1/16"	10.25	9.80	9.36	8.91
01510	02510	.0394		1.000	3.0	38	2	10.76	10.30	9.83	9.36
01020	02020	.0469	3/64"	1.191	1/8"	1-1/2"	3/32"	10.25	9.80	9.36	8.91
01520	02520	.0591		1.500	3.0	38	3	10.76	10.30	9.83	9.36
01030	02030	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	8.13	7.78	7.42	7.07
01530	02530	.0787		2.000	3.0	38	4	8.56	8.18	7.81	7.44

continued →

160M (860M metric) - 2 Flute (continued)
170M (870M metric) - 4 Flute (continued)

.0938" - 1.000"
 (2.383mm - 25.400mm)

2 Flute EDP#	4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
01040	02040	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	7.69	7.36	7.02	6.69
01540	02540	.0984		2.500	3.0	38	5	8.10	7.74	7.39	7.04
01550	02550	.1181		3.000	3.0	38	6	7.90	7.56	7.21	6.87
01050	02050	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	7.49	7.16	6.84	6.51
01560	02560	.1378		3.500	4.0	50	7	11.05	10.57	10.09	9.61
01060	02060	.1562	5/32"	3.967	3/16"	2"	5/16"	10.51	10.05	9.60	9.14
01570	02570	.1575		4.000	4.0	50	8	10.45	10.00	9.54	9.09
01580	02580	.1772		4.500	5.0	50	9.5	13.87	13.27	12.66	12.06
01070	02070	.1875	3/16"	4.763	3/16"	2"	3/8"	9.95	9.52	9.08	8.65
01590	02590	.1969		5.000	5.0	50	10	12.94	12.38	11.81	11.25
01080	02080	.2188	7/32"	5.558	1/4"	2"	7/16"	13.19	12.62	12.04	11.47
01600	02600	.2362		6.000	6.0	50	12	13.70	13.10	12.51	11.91
01090	02090	.2500	1/4"	6.350	1/4"	2"	1/2"	13.00	12.43	11.87	11.30
01610	02610	.2756		7.000	7.0	50	12	17.81	17.04	16.26	15.49
01100	02100	.3125	5/16"	7.938	5/16"	2"	1/2"	17.79	17.02	16.24	15.47
01620	02620	.3150		8.000	8.0	50	12	18.70	17.89	17.07	16.26
01630	02630	.3543		9.000	9.0	50	14	23.10	22.10	21.09	20.09
01110	02110	.3750	3/8"	9.525	3/8"	2"	5/8"	21.97	21.01	20.06	19.10
01640	02640	.3937		10.000	10.0	50	16	25.53	24.42	23.31	22.20
01650	02650	.4331		11.000	11.0	65	19	29.83	28.53	27.24	25.94
01120	02120	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	27.16	25.98	24.80	23.62
01660	02660	.4724		12.000	12.0	65	19	38.12	36.47	34.81	33.15
01130	02130	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	36.23	34.65	33.08	31.50
01140	02140	.6250	5/8"	15.875	5/8"	3"	3/4"	69.24	66.23	63.22	60.21
01670	02670	.6299		16.000	16.0	75	19	72.88	69.71	66.54	63.37
01150	02150	.7500	3/4"	19.050	3/4"	3"	1"	99.59	95.26	90.93	86.60
01680	02680	.7874		20.000	20.0	75	25	135.07	129.20	123.32	117.45
-	02690	.9843		25.000	25.0	75	25	153.49	146.82	140.14	133.47
-	02160	1.000	1"	25.400	1"	3"	1"	171.37	163.92	156.47	149.02

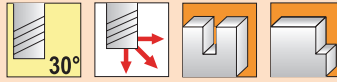


End Mill Manufacturing

TOLERANCES

<i>d1</i>		+.000" -.002" (+.000 -.050mm)	
<i>d2</i>	3mm - 6mm	+.0000" -.0003" (-.0000 -.0075mm)	
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)	

Technical information:
page 228, 230

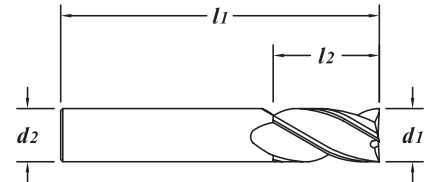


160MA (860MA metric) - 2 Flute
170MA (870MA metric) - 4 Flute

END MILLS

Stub Length - TiALN Coated

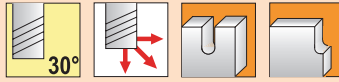
- Solid submicron grain carbide end mill - center cutting
- Shorter flute length for rigidity
- Dry or semi-dry machining
- Up to 40% faster than uncoated
- Extremely versatile
- Uncoated - page 151



2 Flute EDP#	4 Flute EDP#	<i>d1</i> † Diameter		<i>d2</i> Shank Diameter	<i>l1</i> Overall Length	<i>l2</i> Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
01017	02017	.0312	1/32"	0.792	1/8"	1-1/2"	1/16"	12.72	12.17	11.61	11.06
01517	02517	.0394		1.000	3.0	38	2	13.25	12.67	12.10	11.52
01027	02027	.0469	3/64"	1.191	1/8"	1-1/2"	3/32"	12.72	12.17	11.61	11.06
01527	02527	.0591		1.500	3.0	38	3	13.25	12.67	12.10	11.52
01037	02037	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	10.60	10.14	9.68	9.22
01537	02537	.0787		2.000	3.0	38	4	11.03	10.55	10.07	9.59
01047	02047	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	10.17	9.72	9.28	8.84
01547	02547	.0984		2.500	3.0	38	5	10.56	10.10	9.64	9.18
01557	02557	.1181		3.000	3.0	38	6	10.35	9.90	9.45	9.00
01057	02057	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	9.95	9.52	9.08	8.65
01567	02567	.1378		3.500	4.0	50	7	13.51	12.93	12.34	11.75
01067	02067	.1562	5/32"	3.967	3/16"	2"	5/16"	12.97	12.41	11.84	11.28
01577	02577	.1575		4.000	4.0	50	8	12.94	12.38	11.81	11.25
01587	02587	.1772		4.500	5.0	50	9.5	17.72	16.95	16.18	15.41
01077	02077	.1875	3/16"	4.763	3/16"	2"	3/8"	12.42	11.88	11.34	10.80
01597	02597	.1969		5.000	5.0	50	10	16.77	16.04	15.31	14.58
01087	02087	.2188	7/32"	5.558	1/4"	2"	7/16"	17.04	16.30	15.56	14.82
01607	02607	.2362		6.000	6.0	50	12	17.54	16.78	16.01	15.25
01097	02097	.2500	1/4"	6.350	1/4"	2"	1/2"	16.85	16.12	15.38	14.65
01617	02617	.2756		7.000	7.0	50	12	23.30	22.29	21.27	20.26
01107	02107	.3125	5/16"	7.938	5/16"	2"	1/2"	23.28	22.26	21.25	20.24
01627	02627	.3150		8.000	8.0	50	12	24.21	23.16	22.10	21.05
01637	02637	.3543		9.000	9.0	50	14	28.59	27.35	26.10	24.86
01117	02117	.3750	3/8"	9.525	3/8"	2"	5/8"	27.45	26.26	25.06	23.87
01647	02647	.3937		10.000	10.0	50	16	31.75	30.37	28.99	27.61
01657	02657	.4331		11.000	11.0	65	19	38.49	36.82	35.14	33.47
01127	02127	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	35.81	34.25	32.70	31.14
01667	02667	.4724		12.000	12.0	65	19	46.78	44.75	42.71	40.68
01137	02137	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	44.88	42.93	40.98	39.03
01147	02147	.6250	5/8"	15.875	5/8"	3"	3/4"	79.28	75.83	72.39	68.94
01677	02677	.6299		16.000	16.0	75	19	82.89	79.29	75.68	72.08
01157	02157	.7500	3/4"	19.050	3/4"	3"	1"	111.61	106.76	101.90	97.05
01687	02687	.7874		20.000	20.0	75	25	154.00	147.30	140.61	133.91
-	02697	.9843		25.000	25.0	75	25	172.42	164.92	157.43	149.93
-	02167	1.000	1"	25.400	1"	3"	1"	190.31	182.04	173.76	165.49

180M (980M metric) - 2 Flute
190M (990M metric) - 4 Flute

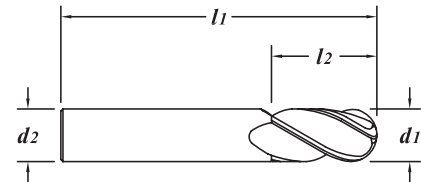
Technical information:
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TOLERANCES		
d_1	$\leq .030"$	$+0.004" -0.004" (+0.100 -0.100mm)$
	$\geq 1/32"$	$+0.000" -0.002" (+0.000 -0.050mm)$
d_2	3mm - 6mm	$+0.000" -0.003" (-0.000 -0.075mm)$
	1/4" - 1"	$-0.001" -0.004" (-0.025 -0.100mm)$
Ball radius	$+0.000" -0.001" (+0.000 -0.025mm)$	

Stub Length - Ball End

Solid submicron grain carbide end mill - center cutting
 Shorter flute length for rigidity
 Extremely versatile
 TiAlN Coated - page 155

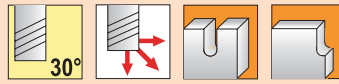


2 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
03250	-	.0100	.0100"	0.254	1/8"	1-1/2"	.015"	21.71	20.77	19.82	18.88
03300	-	.0150	.0150"	0.381	1/8"	1-1/2"	.023"	21.62	20.68	19.74	18.80
03350	-	.0200	.0200"	0.508	1/8"	1-1/2"	.030"	21.05	20.13	19.22	18.30
03400	-	.0250	.0250"	0.635	1/8"	1-1/2"	.038"	20.34	19.46	18.57	17.69
03450	-	.0300	.0300"	0.762	1/8"	1-1/2"	.045"	17.53	16.76	16.00	15.24
03010	04010	.0312	1/32"	0.792	1/8"	1-1/2"	1/16"	13.00	12.43	11.87	11.30
03510	04510	.0394		1.000	3.0	38	2	13.65	13.06	12.46	11.87
03020	04020	.0469	3/64"	1.191	1/8"	1-1/2"	3/32"	13.00	12.43	11.87	11.30
03520	04520	.0591		1.500	3.0	38	3	13.65	13.06	12.46	11.87
03030	04030	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	9.58	9.16	8.75	8.33
03530	04530	.0787		2.000	3.0	38	4	10.07	9.64	9.20	8.76
03040	04040	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	9.05	8.66	8.26	7.87
03540	04540	.0984		2.500	3.0	38	5	9.51	9.10	8.68	8.27
03550	04550	.1181		3.000	3.0	38	6	9.27	8.87	8.46	8.06
03050	04050	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	8.82	8.44	8.05	7.67
03560	04560	.1378		3.500	4.0	50	7	12.98	12.42	11.85	11.29
03060	04060	.1562	5/32"	3.967	3/16"	2"	5/16"	12.34	11.80	11.27	10.73
03570	04570	.1575		4.000	4.0	50	8	12.33	11.79	11.26	10.72
03580	04580	.1772		4.500	5.0	50	9.5	16.30	15.59	14.88	14.17
03070	04070	.1875	3/16"	4.763	3/16"	2"	3/8"	11.71	11.20	10.69	10.18
03590	04590	.1969		5.000	5.0	50	10	15.35	14.69	14.02	13.35
03080	04080	.2188	7/32"	5.558	1/4"	2"	7/16"	15.53	14.85	14.18	13.50
03600	04600	.2362		6.000	6.0	50	12	16.12	15.42	14.72	14.02
03090	04090	.2500	1/4"	6.350	1/4"	2"	1/2"	15.28	14.62	13.95	13.29
03610	04610	.2756		7.000	7.0	50	12	21.09	20.17	19.26	18.34
03100	04100	.3125	5/16"	7.938	5/16"	2"	1/2"	20.91	20.00	19.09	18.18
03620	04620	.3150		8.000	8.0	50	12	22.01	21.05	20.10	19.14
03630	04630	.3543		9.000	9.0	50	14	27.19	26.00	24.82	23.64
03110	04110	.3750	3/8"	9.525	3/8"	2"	5/8"	25.83	24.71	23.58	22.46
03640	04640	.3937		10.000	10.0	50	16	30.04	28.73	27.43	26.12
03650	04650	.4331		11.000	11.0	65	19	34.55	33.04	31.54	30.04
03120	04120	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	31.95	30.56	29.17	27.78
03660	04660	.4724		12.000	12.0	65	19	44.82	42.87	40.92	38.97
03130	04130	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	42.60	40.74	38.89	37.04
03140	04140	.6250	5/8"	15.875	5/8"	3"	3/4"	81.49	77.95	74.40	70.86
03670	04670	.4724		16.000	16.0	75	19	85.77	82.04	78.31	74.58
03150	04150	.7500	3/4"	19.050	3/4"	3"	1"	117.19	112.09	107.00	101.90
03680	04680	.7874		20.000	20.0	75	25	158.90	151.99	145.08	138.17
03690	04690	.9843		25.000	25.0	75	25	180.60	172.74	164.89	157.04

TOLERANCES

d_1	$\leq .030"$	$+0.004" -0.004" (+.0100 -0.100mm)$
	$\geq 1/32"$	$+0.000" -0.002" (+0.000 -0.050mm)$
d_2	3mm - 6mm	$+0.0000" -0.0003" (-0.0000 -0.0075mm)$
	1/4" - 1"	$-0.0001" -0.0004" (-0.0025 -0.100mm)$
Ball radius	$+0.000" -0.001" (+0.000 -0.025mm)$	

Technical information:
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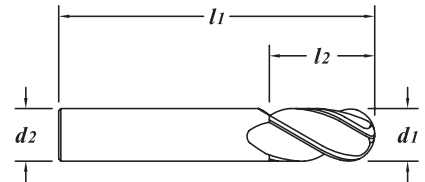


180MA (980MA metric) - 2 Flute
190MA (990MA metric) - 4 Flute

END MILLS

Stub Length - Ball End - TiALN Coated

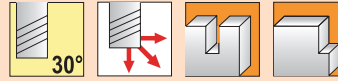
- Solid submicron grain carbide end mill - center cutting
- Shorter flute length for rigidity
- Dry or semi-dry machining
- Up to 40% faster than uncoated
- Extremely versatile
- Uncoated - page 154



2 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
03017	04017	.0312	1/32"	0.792	1/8"	1-1/2"	1/16"	15.48	14.81	14.13	13.46
03517	04517	.0394		1.000	3.0	38	2	16.12	15.42	14.72	14.02
03027	04027	.0469	3/64"	1.191	1/8"	1-1/2"	3/32"	15.48	14.81	14.13	13.46
03527	04527	.0591		1.500	3.0	38	3	16.12	15.42	14.72	14.02
03037	04037	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	12.04	11.52	10.99	10.47
03537	04537	.0787		2.000	3.0	38	4	12.54	11.99	11.45	10.90
03047	04047	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	11.51	11.01	10.51	10.01
03547	04547	.0984		2.500	3.0	38	5	11.98	11.46	10.94	10.42
03557	04557	.1181		3.000	3.0	38	6	11.73	11.22	10.71	10.20
03057	04057	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	11.28	10.79	10.30	9.81
03567	04567	.1378		3.500	4.0	50	7	15.46	14.78	14.11	13.44
03067	04067	.1562	5/32"	3.967	3/16"	2"	5/16"	14.80	14.16	13.51	12.87
03577	04577	.1575		4.000	4.0	50	8	14.79	14.15	13.50	12.86
03587	04587	.1772		4.500	5.0	50	9.5	20.14	19.26	18.39	17.51
03077	04077	.1875	3/16"	4.763	3/16"	2"	3/8"	14.17	13.55	12.94	12.32
03597	04597	.1969		5.000	5.0	50	10	19.19	18.36	17.52	16.69
03087	04087	.2188	7/32"	5.558	1/4"	2"	7/16"	19.38	18.54	17.69	16.85
03607	04607	.2362		6.000	6.0	50	12	19.95	19.09	18.22	17.35
03097	04097	.2500	1/4"	6.350	1/4"	2"	1/2"	19.15	18.32	17.48	16.65
03617	04617	.2756		7.000	7.0	50	12	26.59	25.43	24.28	23.12
03107	04107	.3125	5/16"	7.938	5/16"	2"	1/2"	26.39	25.25	24.10	22.95
03627	04627	.3150		8.000	8.0	50	12	27.50	26.30	25.11	23.91
03637	04637	.3543		9.000	9.0	50	14	32.68	31.26	29.84	28.42
03117	04117	.3750	3/8"	9.525	3/8"	2"	5/8"	31.31	29.95	28.59	27.23
03647	04647	.3937		10.000	10.0	50	16	36.26	34.68	33.11	31.53
03657	04657	.4331		11.000	11.0	65	19	43.21	41.33	39.45	37.57
03127	04127	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	40.61	38.84	37.08	35.31
03667	04667	.4724		12.000	12.0	65	19	53.49	51.16	48.84	46.51
03137	04137	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	51.24	49.02	46.79	44.56
03147	04147	.6250	5/8"	15.875	5/8"	3"	3/4"	91.52	87.54	83.56	79.58
03677	04677	.6299		16.000	16.0	75	19	95.82	91.65	87.49	83.32
03157	04157	.7500	3/4"	19.050	3/4"	3"	1"	129.21	123.60	117.98	112.36
03687	04687	.7874		20.000	20.0	75	25	177.82	170.09	162.36	154.63
-	04697	.9843		25.000	25.0	75	25	199.51	190.84	182.16	173.49

165M (865M metric) - 2 Flute
175M (875M metric) - 4 Flute

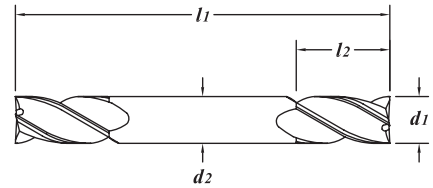
Technical information:
 page 228, 230



TOLERANCES		
d_1	+.000" - .002" (+.000 - .050mm)	
d_2	3mm - 6mm	+.0000" - .0003" (-.0000 - .0075mm)
	1/4" - 1/2"	-.0001" - .0004" (-.0025 - .0100mm)

Stub Length - Double End

Solid submicron grain carbide end mill - center cutting
 Shorter flute length for rigidity
 Extremely versatile
 TiAlN Coated - page 157

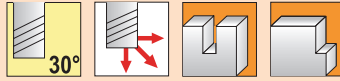


2 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
05010	06010	.0312	1/32"	0.792	1/8"	1-1/2"	1/16"	18.42	17.62	16.82	16.02
05510	06510	.0394		1.000	3.0	38	2	19.39	18.55	17.70	16.86
05020	06020	.0469	3/64"	1.191	1/8"	1-1/2"	3/32"	18.42	17.62	16.82	16.02
05520	06520	.0591		1.500	3.0	38	3	19.39	18.55	17.70	16.86
05030	06030	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	18.42	17.62	16.82	16.02
05530	06530	.0787		2.000	3.0	38	4	19.39	18.55	17.70	16.86
05040	06040	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	18.42	17.62	16.82	16.02
05540	06540	.0984		2.500	3.0	38	5	19.39	18.55	17.70	16.86
05550	06550	.1181		3.000	3.0	38	6	12.02	11.50	10.97	10.45
05050	06050	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	11.41	10.91	10.42	9.92
05560	06560	.1378		3.500	4.0	50	7	21.36	20.43	19.50	18.57
-	06060	.1562	5/32"	3.967	3/16"	2"	5/16"	20.27	19.39	18.51	17.63
05570	06570	.1575		4.000	4.0	50	8	17.42	16.67	15.91	15.15
05580	06580	.1772		4.500	5.0	65	9.5	24.89	23.80	22.72	21.64
05070	06070	.1875	3/16"	4.763	3/16"	2"	3/8"	16.55	15.83	15.11	14.39
05590	06590	.1969		5.000	5.0	65	10	21.99	21.03	20.08	19.12
05080	06080	.2188	7/32"	5.558	1/4"	2-1/2"	1/2"	23.64	22.62	21.59	20.56
05600	06600	.2362		6.000	6.0	65	12	22.67	21.68	20.70	19.71
05090	06090	.2500	1/4"	6.350	1/4"	2-1/2"	1/2"	21.53	20.59	19.66	18.72
05610	06610	.2756		7.000	7.0	65	12	27.31	26.13	24.94	23.75
05100	06100	.3125	5/16"	7.938	5/16"	2-1/2"	1/2"	26.80	25.63	24.47	23.30
05620	06620	.3150		8.000	8.0	65	12	28.20	26.97	25.75	24.52
05630	06630	.3543		9.000	9.0	75	14	31.42	30.05	28.69	27.32
05110	06110	.3750	3/8"	9.525	3/8"	2-1/2"	1/2"	28.50	27.26	26.02	24.78
05640	06640	.3937		10.000	10.0	75	14	41.23	39.44	37.64	35.85
05650	06650	.4331		11.000	11.0	75	14	44.01	42.10	40.18	38.27
05120	06120	.4375	7/16"	11.113	7/16"	2-3/4"	9/16"	40.80	39.03	37.25	35.48
05660	06660	.4724		12.000	12.0	75	16	50.97	48.75	46.54	44.32
05130	06130	.5000	1/2"	12.700	1/2"	3"	5/8"	48.43	46.32	44.22	42.11
05670	06670	.6299		16.000	16.0	100	19	100.60	96.23	91.85	87.48
05680	06680	.7874		20.000	20.0	100	25	211.75	202.54	193.34	184.13

TOLERANCES

$d1$	+.000" - .002" (+.000 - .050mm)	
$d2$	3mm - 6mm	+.0000" - .0003" (+.0000 - .0075mm)
	1/4" - 1/2"	-.0001" - .0004" (-.0025 - .0100mm)

Technical information:
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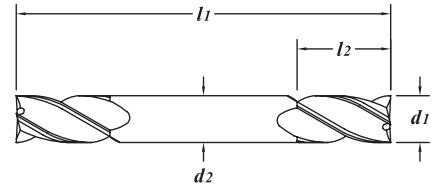


165MA (865MA metric) - 2 Flute
175MA (875MA metric) - 4 Flute

END MILLS

Stub Length - Double End - TiALN Coated

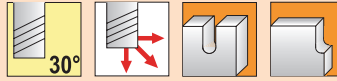
- Solid submicron grain carbide end mill - center cutting
- Shorter flute length for rigidity
- Dry or semi-dry machining
- Up to 40% faster than uncoated
- Extremely versatile
- Uncoated - page 156



2 Flute EDP#	4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
05017	06017	.0312	1/32"	0.792	1/8"	1-1/2"	1/16"	22.11	21.15	20.19	19.23
05517	06517	.0394		1.000	3.0	38	2	23.09	22.09	21.08	20.08
05027	06027	.0469	3/64"	1.191	1/8"	1-1/2"	3/32"	22.11	21.15	20.19	19.23
05527	06527	.0591		1.500	3.0	38	3	23.09	22.09	21.08	20.08
05037	06037	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	22.11	21.15	20.19	19.23
05537	06537	.0787		2.000	3.0	38	4	23.09	22.09	21.08	20.08
05047	06047	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	22.11	21.15	20.19	19.23
05547	06547	.0984		2.500	3.0	38	5	23.09	22.09	21.08	20.08
05557	06557	.1181		3.000	3.0	38	6	15.72	15.04	14.35	13.67
05057	06057	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	15.11	14.45	13.80	13.14
05567	06567	.1378		3.500	4.0	50	7	25.06	23.97	22.88	21.79
05067	06067	.1562	5/32"	3.967	3/16"	2"	5/16"	23.98	22.94	21.89	20.85
05577	06577	.1575		4.000	4.0	50	8	21.10	20.19	19.27	18.35
05587	06587	.1772		4.500	5.0	65	9.5	32.52	31.11	29.69	28.28
05077	06077	.1875	3/16"	4.763	3/16"	2"	3/8"	20.25	19.37	18.49	17.61
05597	06597	.1969		5.000	5.0	65	10	29.61	28.33	27.04	25.75
05087	06087	.2188	7/32"	5.558	1/4"	2-1/2"	1/2"	31.28	29.92	28.56	27.20
05607	06607	.2362		6.000	6.0	65	12	30.29	28.97	27.66	26.34
05097	06097	.2500	1/4"	6.350	1/4"	2-1/2"	1/2"	29.15	27.89	26.62	25.35
05617	06617	.2756		7.000	7.0	65	12	38.73	37.05	35.36	33.68
05107	06107	.3125	5/16"	7.938	5/16"	2-1/2"	1/2"	38.20	36.54	34.88	33.22
05627	06627	.3150		8.000	8.0	65	12	39.62	37.90	36.17	34.45
05637	06637	.3543		9.000	9.0	75	14	42.85	40.99	39.12	37.26
05117	06117	.3750	3/8"	9.525	3/8"	2-1/2"	1/2"	39.93	38.19	36.46	34.72
05647	06647	.3937		10.000	10.0	75	14	54.21	51.85	49.50	47.14
05657	06657	.4331		11.000	11.0	75	14	57.02	54.54	52.06	49.58
05127	06127	.4375	7/16"	11.113	7/16"	2-3/4"	9/16"	53.77	51.44	49.10	46.76
05667	06667	.4724		12.000	12.0	75	16	63.97	61.19	58.41	55.63
05137	06137	.5000	1/2"	12.700	1/2"	3"	5/8"	61.42	58.75	56.08	53.41
05147	06147	.6250	5/8"	15.875	5/8"	4"	3/4"	114.34	109.37	104.40	99.43
05157	-	.7500	3/4"	19.050	3/4"	4"	1"	153.77	147.08	140.40	133.71
05687	-	.7874		20.000	20.0	100	25	244.49	233.86	223.23	212.60

185M (985M metric) - 2 Flute
195M (995M metric) - 4 Flute

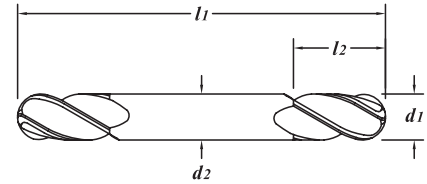
Technical information:
 page 228, 230



TOLERANCES		
d_1	$\leq .030"$	$+0.004" -0.004" (+0.100 -0.100mm)$
	$\geq 1/32"$	$+0.000" -0.002" (+0.000 -0.050mm)$
d_2	3mm - 6mm	$+0.000" -0.003" (-0.000 -0.075mm)$
	1/4" - 1/2"	$-0.001" -0.004" (-0.025 -0.100mm)$
Ball radius	$+0.000" -0.001" (+0.000 -0.025mm)$	

Stub Length - Double End - Ball End

Solid submicron grain carbide end mill - center cutting
 Shorter flute length for rigidity
 Extremely versatile
 TiAlN Coated - page 159

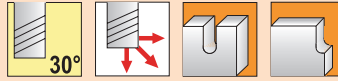


2 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
07010	08010	.0312	1/32"	0.792	1/8"	1-1/2"	1/16"	21.63	20.69	19.75	18.81
07510	08510	.0394		1.000	3.0	38	2	22.77	21.78	20.79	19.80
07020	08020	.0469	3/64"	1.191	1/8"	1-1/2"	3/32"	21.63	20.69	19.75	18.81
07520	08520	.0591		1.500	3.0	38	3	22.77	21.78	20.79	19.80
07030	08030	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	21.63	20.69	19.75	18.81
07530	08530	.0787		2.000	3.0	38	4	22.77	21.78	20.79	19.80
07040	08040	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	21.63	20.69	19.75	18.81
07540	08540	.0984		2.500	3.0	38	5	22.77	21.78	20.79	19.80
07550	08550	.1181		3.000	3.0	38	6	14.13	13.52	12.90	12.29
07050	08050	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	13.42	12.84	12.25	11.67
07560	08560	.1378		3.500	4.0	50	7	25.09	24.00	22.91	21.82
07060	08060	.1562	5/32"	3.967	3/16"	2"	5/16"	23.83	22.79	21.76	20.72
07570	08570	.1575		4.000	4.0	50	8	20.50	19.61	18.72	17.83
07580	08580	.1772		4.500	5.0	65	9.5	29.28	28.01	26.73	25.46
07070	08070	.1875	3/16"	4.763	3/16"	2"	3/8"	19.48	18.63	17.79	16.94
07590	08590	.1969		5.000	5.0	65	10	25.99	24.86	23.73	22.60
07080	08080	.2188	7/32"	5.558	1/4"	2-1/2"	1/2"	27.83	26.62	25.41	24.20
07600	08600	.2362		6.000	6.0	65	12	26.68	25.52	24.36	23.20
07090	08090	.2500	1/4"	6.350	1/4"	2-1/2"	1/2"	25.33	24.23	23.13	22.03
07610	08610	.2756		7.000	7.0	65	12	32.30	30.90	29.49	28.09
07100	08100	.3125	5/16"	7.938	5/16"	2-1/2"	1/2"	31.53	30.16	28.79	27.42
07620	08620	.3150		8.000	8.0	65	12	33.21	31.77	30.32	28.88
07630	08630	.3543		9.000	9.0	75	14	36.71	35.11	33.52	31.92
07110	08110	.3750	3/8"	9.525	3/8"	2-1/2"	1/2"	33.53	32.08	30.62	29.16
07640	08640	.3937		10.000	10.0	75	14	48.82	46.70	44.57	42.45
-	08650	.4331		11.000	11.0	75	14	51.60	49.36	47.11	44.87
07120	08120	.4375	7/16"	11.113	7/16"	2-3/4"	9/16"	47.99	45.90	43.82	41.73
07660	08660	.4724		12.000	12.0	75	16	59.98	57.38	54.77	52.16
07130	08130	.5000	1/2"	12.700	1/2"	3"	5/8"	56.98	54.51	52.03	49.55
-	08140	.6250	5/8"	15.875	5/8"	4"	3/4"	112.41	107.53	102.64	97.75
07670	08670	.6299		16.000	16.0	100	19	118.32	113.18	108.03	102.89
07150	-	.7500	3/4"	19.050	3/4"	4"	1"	154.82	148.09	141.36	134.63
-	08680	.7874		20.000	20.0	100	25	249.15	238.32	227.48	216.65

TOLERANCES

d_1	$\leq .030"$	$+0.004" -0.004" (+0.100 -0.100mm)$
	$\geq 1/32"$	$+0.000" -0.002" (+0.000 -0.050mm)$
d_2	3mm - 6mm	$+0.000" -0.003" (-0.000 -0.075mm)$
	1/4" - 1/2"	$-0.001" -0.004" (-0.025 -0.100mm)$
Ball radius	$+0.000" -0.001" (+0.000 -0.025mm)$	

Technical information:
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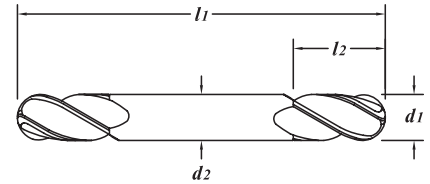


185MA (985MA metric) - 2 Flute
195MA (995MA metric) - 4 Flute

END MILLS

Stub Length - Double End - Ball End - TiALN Coated

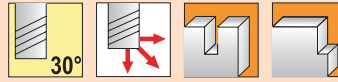
- Solid submicron grain carbide end mill - center cutting
- Shorter flute length for rigidity
- Dry or semi-dry machining
- Up to 40% faster than uncoated
- Extremely versatile
- Uncoated - page 158



2 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
07017	08017	.0312	1/32"	0.792	1/8"	1-1/2"	1/16"	25.33	24.23	23.13	22.03
07517	08517	.0394		1.000	3.0	38	2	26.47	25.32	24.17	23.02
07027	08027	.0469	3/64"	1.191	1/8"	1-1/2"	3/32"	25.33	24.23	23.13	22.03
07527	08527	.0591		1.500	3.0	38	3	26.47	25.32	24.17	23.02
07037	08037	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	25.33	24.23	23.13	22.03
07537	08537	.0787		2.000	3.0	38	4	26.47	25.32	24.17	23.02
07047	08047	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	25.33	24.23	23.13	22.03
07547	08547	.0984		2.500	3.0	38	5	26.47	25.32	24.17	23.02
07557	08557	.1181		3.000	3.0	38	6	17.84	17.06	16.29	15.51
07057	08057	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	17.12	16.38	15.63	14.89
07567	08567	.1378		3.500	4.0	50	7	28.80	27.54	26.29	25.04
07067	08067	.1562	5/32"	3.967	3/16"	2"	5/16"	27.53	26.33	25.14	23.94
07577	08577	.1575		4.000	4.0	50	8	24.21	23.16	22.10	21.05
07587	08587	.1772		4.500	5.0	65	9.5	36.90	35.30	33.69	32.09
07077	08077	.1875	3/16"	4.763	3/16"	2"	3/8"	23.17	22.17	21.16	20.15
07597	08597	.1969		5.000	5.0	65	10	33.61	32.15	30.69	29.23
07087	08087	.2188	7/32"	5.558	1/4"	2-1/2"	1/2"	35.44	33.90	32.36	30.82
07607	08607	.2362		6.000	6.0	65	12	34.29	32.80	31.31	29.82
07097	08097	.2500	1/4"	6.350	1/4"	2-1/2"	1/2"	32.97	31.54	30.10	28.67
07617	08617	.2756		7.000	7.0	65	12	43.73	41.83	39.93	38.03
07107	08107	.3125	5/16"	7.938	5/16"	2-1/2"	1/2"	42.94	41.07	39.21	37.34
07627	08627	.3150		8.000	8.0	65	12	44.62	42.68	40.74	38.80
07637	08637	.3543		9.000	9.0	75	14	48.13	46.04	43.94	41.85
07117	08117	.3750	3/8"	9.525	3/8"	2-1/2"	1/2"	44.95	43.00	41.04	39.09
07647	08647	.3937		10.000	10.0	75	14	61.80	59.11	56.43	53.74
07657	08657	.4331		11.000	11.0	75	14	64.61	61.80	58.99	56.18
07127	08127	.4375	7/16"	11.113	7/16"	2-3/4"	9/16"	60.97	58.32	55.67	53.02
07667	08667	.4724		12.000	12.0	75	16	72.98	69.81	66.63	63.46
07137	08137	.5000	1/2"	12.700	1/2"	3"	5/8"	69.99	66.95	63.90	60.86
-	08677	.6299		16.000	16.0	100	19	137.10	131.14	125.18	119.22
07157	-	.7500	3/4"	19.050	3/4"	4"	1"	177.01	169.31	161.62	153.92
-	08687	.7874		20.000	20.0	100	25	281.88	269.62	257.37	245.11

220M (820M metric) - 2 Flute
223M (823M metric) - 3 Flute
230M (830M metric) - 4 Flute
 .0050" - .0984"
 (0.127mm - 2.500mm)

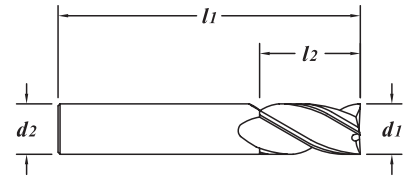
Technical information:
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TOLERANCES		
d_1	$\leq .030"$	$+0.0004" - .0004" (+0.0100 - .0100mm)$
	$\geq 1/32"$	$+0.000" - .002" (+0.000 - .050mm)$
d_2	3mm - 6mm	$+0.0000" - .0003" (-0.0000 - .0075mm)$
	1/4" - 1-1/4"	$-0.0001" - .0004" (-.0025 - .0100mm)$

Standard Length

Solid submicron grain carbide end mill - center cutting
 Extremely versatile
 TiN Coated - page 162
 TiCN Coated - page 163
 TiAlN Coated - page 164



2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Diameter								
11500	-	-	.0050	.0050"	0.127	1/8"	1-1/2"	.015"	21.28	20.35	19.43	18.50
11510	-	-	.0060	.0060"	0.152	1/8"	1-1/2"	.018"	21.28	20.35	19.43	18.50
11520	-	-	.0070	.0070"	0.178	1/8"	1-1/2"	.021"	20.02	19.15	18.28	17.41
11530	-	-	.0080	.0080"	0.203	1/8"	1-1/2"	.024"	20.02	19.15	18.28	17.41
11540	-	-	.0090	.0090"	0.229	1/8"	1-1/2"	.027"	18.89	18.07	17.25	16.43
11550	-	13550	.0100	.0100"	0.254	1/8"	1-1/2"	.030"	18.89	18.07	17.25	16.43
11560	-	-	.0110	.0110"	0.279	1/8"	1-1/2"	.033"	17.49	16.73	15.97	15.21
11570	-	-	.0120	.0120"	0.305	1/8"	1-1/2"	.036"	17.49	16.73	15.97	15.21
11580	-	-	.0130	.0130"	0.330	1/8"	1-1/2"	.039"	17.40	16.64	15.89	15.13
11590	-	-	.0140	.0140"	0.356	1/8"	1-1/2"	.042"	17.40	16.64	15.89	15.13
11600	-	13600	.0150	.0150"	0.381	1/8"	1-1/2"	.045"	17.40	16.64	15.89	15.13
11610	-	-	.0160	.0160"	0.406	1/8"	1-1/2"	.048"	17.17	16.42	15.68	14.93
11620	-	-	.0170	.0170"	0.432	1/8"	1-1/2"	.051"	17.17	16.42	15.68	14.93
11630	-	-	.0180	.0180"	0.457	1/8"	1-1/2"	.054"	16.85	16.12	15.38	14.65
11640	-	-	.0190	.0190"	0.483	1/8"	1-1/2"	.057"	16.85	16.12	15.38	14.65
11650	-	13650	.0200	.0200"	0.508	1/8"	1-1/2"	.060"	16.85	16.12	15.38	14.65
11660	-	-	.0210	.0210"	0.533	1/8"	1-1/2"	.063"	16.85	16.12	15.38	14.65
11670	-	-	.0220	.0220"	0.559	1/8"	1-1/2"	.066"	16.65	15.93	15.20	14.48
11680	-	-	.0230	.0230"	0.584	1/8"	1-1/2"	.069"	16.65	15.93	15.20	14.48
11690	-	-	.0240	.0240"	0.610	1/8"	1-1/2"	.072"	16.65	15.93	15.20	14.48
11700	-	13700	.0250	.0250"	0.635	1/8"	1-1/2"	.075"	15.71	15.03	14.34	13.66
11710	-	-	.0260	.0260"	0.660	1/8"	1-1/2"	.078"	15.71	15.03	14.34	13.66
11720	-	-	.0270	.0270"	0.686	1/8"	1-1/2"	.081"	14.09	13.48	12.86	12.25
11730	-	-	.0280	.0280"	0.711	1/8"	1-1/2"	.084"	14.09	13.48	12.86	12.25
11740	-	-	.0290	.0290"	0.737	1/8"	1-1/2"	.087"	14.09	13.48	12.86	12.25
11750	-	13750	.0300	.0300"	0.762	1/8"	1-1/2"	.090"	14.09	13.48	12.86	12.25
11010	12010	13010	.0312	1/32"	0.792	1/8"	1-1/2"	3/32"	10.25	9.80	9.36	8.91
45010	37010	46010	.0394		1.000	3.0	38	4	10.76	10.30	9.83	9.36
11020	12020	13020	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"	10.25	9.80	9.36	8.91
45020	37020	46020	.0591		1.500	3.0	38	6	10.76	10.30	9.83	9.36
11030	12030	13030	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	9.51	9.10	8.68	8.27
11040	12040	13040	.0781	5/64"	1.984	1/8"	1-1/2"	1/4"	9.51	9.10	8.68	8.27
45030	37030	46030	.0787		2.000	3.0	38	8	9.98	9.55	9.11	8.68
11050	12050	13050	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	8.99	8.60	8.21	7.82
45040	37040	46040	.0984		2.500	3.0	38	12	9.44	9.03	8.62	8.21

220M (820M metric) - 2 Flute (continued)
223M (823M metric) - 3 Flute (continued)
230M (830M metric) - 4 Flute (continued)

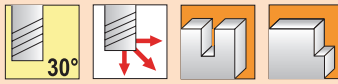
.1094" - 1.250"
 (2.779mm - 31.750mm)

END MILLS

2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
11060	12060	13060	.1094	7/64"	2.779	1/8"	1-1/2"	3/8"	8.99	8.60	8.21	7.82
45050	37050	46050	.1181		3.000	3.0	38	12	8.72	8.34	7.96	7.58
11070	12070	13070	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	8.30	7.94	7.58	7.22
45060	37060	46060	.1378		3.500	4.0	50	12	12.90	12.34	11.78	11.22
11080	12080	13080	.1406	9/64"	3.571	3/16"	2"	9/16"	12.27	11.74	11.20	10.67
11090	12090	13090	.1562	5/32"	3.967	3/16"	2"	9/16"	12.27	11.74	11.20	10.67
45070	37070	46070	.1575		4.000	4.0	50	14	12.24	11.70	11.17	10.64
11100	12100	13100	.1719	11/64"	4.366	3/16"	2"	9/16"	12.27	11.74	11.20	10.67
45080	37080	46080	.1772		4.500	5.0	50	14	14.97	14.32	13.67	13.02
11110	12110	13110	.1875	3/16"	4.763	3/16"	2"	5/8"	11.64	11.13	10.63	10.12
45090	37090	46090	.1969		5.000	5.0	65	16	14.28	13.66	13.04	12.42
11120	12120	13120	.2031	13/64"	5.159	1/4"	2-1/2"	5/8"	15.42	14.75	14.08	13.41
11130	12130	13130	.2188	7/32"	5.558	1/4"	2-1/2"	5/8"	15.42	14.75	14.08	13.41
11140	12140	13140	.2344	15/64"	5.954	1/4"	2-1/2"	3/4"	15.42	14.75	14.08	13.41
45100	37100	46100	.2362		6.000	6.0	65	19	14.73	14.09	13.45	12.81
11150	12150	13150	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	14.03	13.42	12.81	12.20
11160	12160	13160	.2656	17/64"	6.746	5/16"	2-1/2"	7/8"	24.61	23.54	22.47	21.40
45110	37110	46110	.2756		7.000	7.0	65	22	20.24	19.36	18.48	17.60
11170	12170	13170	.2812	9/32"	7.142	5/16"	2-1/2"	7/8"	24.61	23.54	22.47	21.40
11180	12180	13180	.2969	19/64"	7.541	5/16"	2-1/2"	7/8"	24.61	23.54	22.47	21.40
11190	12190	13190	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	19.68	18.82	17.97	17.11
45120	37120	46120	.3150		8.000	8.0	65	22	20.67	19.77	18.87	17.97
11200	12200	13200	.3281	21/64"	8.334	3/8"	2-1/2"	7/8"	29.15	27.89	26.62	25.35
11210	12210	13210	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	29.15	27.89	26.62	25.35
45130	37130	46130	.3543		9.000	9.0	65	22	25.74	24.62	23.50	22.38
11220	12220	13220	.3594	23/64"	9.129	3/8"	2-1/2"	7/8"	29.15	27.89	26.62	25.35
11230	12230	13230	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	24.52	23.45	22.39	21.32
11240	12240	13240	.3906	25/64"	9.921	7/16"	2-3/4"	7/8"	34.86	33.34	31.83	30.31
45140	37140	46140	.3937		10.000	10.0	70	25	29.83	28.53	27.24	25.94
11250	12250	13250	.4062	13/32"	10.317	7/16"	2-3/4"	7/8"	34.86	33.34	31.83	30.31
11260	12260	13260	.4219	27/64"	10.716	7/16"	2-3/4"	7/8"	34.86	33.34	31.83	30.31
45150	37150	46150	.4331		11.000	11.0	75	25	31.41	30.04	28.68	27.31
11270	12270	13270	.4375	7/16"	11.113	7/16"	2-3/4"	1"	29.91	28.61	27.31	26.01
11280	12280	13280	.4531	29/64"	11.509	1/2"	3"	1"	46.95	44.91	42.87	40.83
11290	12290	13290	.4688	15/32"	11.908	1/2"	3"	1"	46.95	44.91	42.87	40.83
45160	37160	46160	.4724		12.000	12.0	75	25	41.24	39.45	37.65	35.86
11300	12300	13300	.4844	31/64"	12.304	1/2"	3"	1"	46.95	44.91	42.87	40.83
11310	12310	13310	.5000	1/2"	12.700	1/2"	3"	1"	39.26	37.55	35.85	34.14
45170	37170	46170	.5512		14.000	14.0	88	32	70.41	67.35	64.29	61.23
11320	12320	13320	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	67.07	64.15	61.24	58.32
11330	12330	13330	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	75.72	72.42	69.13	65.84
45180	37180	46180	.6299		16.000	16.0	88	38	79.51	76.05	72.60	69.14
11340	12340	13340	.6875	11/16"	17.463	3/4"	4"	1-1/2"	126.10	120.62	115.13	109.65
45190	37190	46190	.7087		18.000	18.0	100	38	116.58	111.51	106.44	101.37
11350	12350	13350	.7500	3/4"	19.050	3/4"	4"	1-1/2"	111.01	106.18	101.36	96.53
45200	37200	46200	.7874		20.000	20.0	100	38	148.22	141.78	135.33	128.89
45210	37210	46210	.8661		22.000	22.0	100	38	164.70	157.54	150.38	143.22
11360	12360	13360	.8750	7/8"	22.225	7/8"	4"	1-1/2"	159.76	152.81	145.87	138.92
45220	37220	46220	.9843		25.000	25.0	100	38	172.20	164.71	157.23	149.74
11370	12370	13370	1.000	1"	25.400	1"	4"	1-1/2"	166.08	158.86	151.64	144.42
-	-	13390	1.250	1-1/4"	31.750	1-1/4"	4-1/2"	2"	484.89	463.80	442.72	421.64

220MT - 2 Flute
230MT - 4 Flute

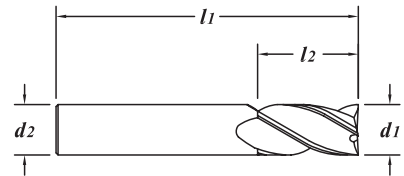
Technical information: page 228, 230



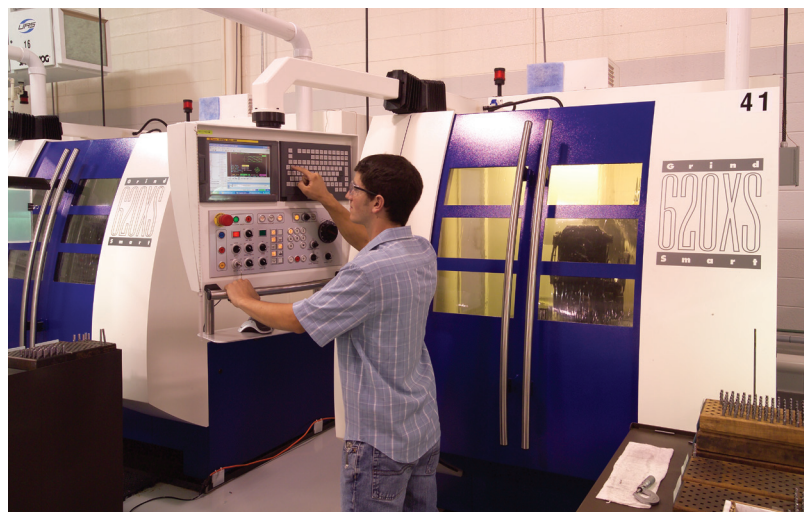
TOLERANCES			
d_1		+.000" -.002" (+.000 -.050mm)	
d_2	3mm - 6mm	+.0000" -.0003" (-.0000 -.0075mm)	
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)	

Standard Length - TiN Coated

- Solid submicron grain carbide end mill - center cutting
- Improved lubricity - 10% faster than uncoated
- Extremely versatile
- Uncoated - page 160
- TiCN Coated - page 163
- TiALN Coated - page 164



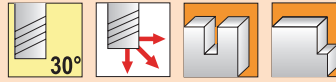
2 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
11073	13073	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	9.76	9.34	8.91	8.49
11113	13113	.1875	3/16"	4.763	3/16"	2"	5/8"	13.08	12.51	11.94	11.37
11153	13153	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	16.96	16.23	15.49	14.75
11193	13193	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	23.62	22.59	21.57	20.54
11233	13233	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	28.46	27.23	25.99	24.75
11273	13273	.4375	7/16"	11.113	7/16"	2-3/4"	1"	34.68	33.18	31.67	30.16
11313	13313	.5000	1/2"	12.700	1/2"	3"	1"	44.05	42.13	40.22	38.30
11333	13333	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	83.06	79.45	75.84	72.23
11353	13353	.7500	3/4"	19.050	3/4"	4"	1-1/2"	119.43	114.24	109.04	103.85
11373	13373	1.000	1"	25.400	1"	4"	1-1/2"	180.77	172.91	165.05	157.19



TOLERANCES

<i>d1</i>	+.000" -.002" (+.000 -.050mm)	
<i>d2</i>	3mm - 6mm	+.0000" -.0003" (+.0000 -.0075mm)
	1/4" - 1-1/4"	-.0001" -.0004" (-.0025 -.0100mm)

Technical information:
page 228, 230

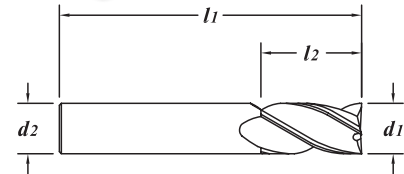


220MC - 2 Flute
223MC - 3 Flute
230MC - 4 Flute

END MILLS

Standard Length - TiCN Coated

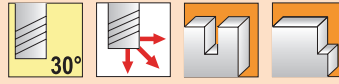
- Solid submicron grain carbide end mill - center cutting
- Improved abrasion resistance and lubricity
- Up to 25% faster than uncoated
- Extremely versatile
- Uncoated - page 160
- TiN Coated - page 162
- TiALN Coated - page 164



2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	<i>d1</i> † Diameter		<i>d2</i> Shank Diameter	<i>l1</i> Overall Length	<i>l2</i> Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
11014	12014	13014	.0312	1/32"	0.792	1/8"	1-1/2"	3/32"	12.43	11.89	11.35	10.81
11024	12024	13024	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"	12.43	11.89	11.35	10.81
11034	12034	13034	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	11.70	11.19	10.68	10.17
11044	12044	13044	.0781	5/64"	1.984	1/8"	1-1/2"	1/4"	11.70	11.19	10.68	10.17
11054	12054	13054	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	11.17	10.68	10.20	9.71
11064	12064	13064	.1094	7/64"	2.779	1/8"	1-1/2"	3/8"	11.17	10.68	10.20	9.71
11074	12074	13074	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	10.48	10.02	9.57	9.11
11084	12084	13084	.1406	9/64"	3.571	3/16"	2"	9/16"	14.44	13.82	13.19	12.56
11094	12094	13094	.1562	5/32"	3.967	3/16"	2"	9/16"	14.44	13.82	13.19	12.56
11104	12104	13104	.1719	11/64"	4.366	3/16"	2"	9/16"	14.44	13.82	13.19	12.56
11114	12114	13114	.1875	3/16"	4.763	3/16"	2"	5/8"	13.81	13.21	12.61	12.01
11124	12124	13124	.2031	13/64"	5.159	1/4"	2-1/2"	5/8"	19.84	18.98	18.11	17.25
11134	12134	13134	.2188	7/32"	5.558	1/4"	2-1/2"	5/8"	19.84	18.98	18.11	17.25
11144	12144	13144	.2344	15/64"	5.954	1/4"	2-1/2"	3/4"	19.84	18.98	18.11	17.25
11154	12154	13154	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	18.45	17.64	16.84	16.04
11164	12164	13164	.2656	17/64"	6.746	5/16"	2-1/2"	7/8"	30.51	29.18	27.86	26.53
11174	12174	13174	.2812	9/32"	7.142	5/16"	2-1/2"	7/8"	30.51	29.18	27.86	26.53
11184	12184	13184	.2969	19/64"	7.541	5/16"	2-1/2"	7/8"	30.51	29.18	27.86	26.53
11194	12194	13194	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	25.58	24.46	23.35	22.24
11204	12204	13204	.3281	21/64"	8.334	3/8"	2-1/2"	7/8"	35.05	33.53	32.00	30.48
11214	12214	13214	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	35.05	33.53	32.00	30.48
11224	12224	13224	.3594	23/64"	9.129	3/8"	2-1/2"	7/8"	35.05	33.53	32.00	30.48
11234	12234	13234	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	30.41	29.08	27.76	26.44
11244	12244	13244	.3906	25/64"	9.921	7/16"	2-1/2"	7/8"	41.94	40.12	38.29	36.47
11254	12254	13254	.4062	13/32"	10.317	7/16"	2-1/2"	7/8"	41.94	40.12	38.29	36.47
11264	12264	13264	.4219	27/64"	10.716	7/16"	2-1/2"	7/8"	41.94	40.12	38.29	36.47
11274	12274	13274	.4375	7/16"	11.113	7/16"	2-3/4"	1"	37.01	35.40	33.79	32.18
11284	12284	13284	.4531	29/64"	11.509	1/2"	3"	1"	54.03	51.68	49.33	46.98
11294	12294	13294	.4688	15/32"	11.908	1/2"	3"	1"	54.03	51.68	49.33	46.98
11304	12304	13304	.4844	31/64"	12.304	1/2"	3"	1"	54.03	51.68	49.33	46.98
11314	12314	13314	.5000	1/2"	12.700	1/2"	3"	1"	46.36	44.34	42.33	40.31
11324	12324	13324	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	78.10	74.70	71.31	67.91
11334	12334	13334	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	86.74	82.97	79.20	75.43
11344	12344	13344	.6875	11/16"	17.463	3/4"	4"	1-1/2"	138.69	132.66	126.63	120.60
11354	12354	13354	.7500	3/4"	19.050	3/4"	4"	1-1/2"	123.63	118.25	112.88	107.50
11364	12364	13364	.8750	7/8"	22.225	7/8"	4"	1-1/2"	178.70	170.93	163.16	155.39
11374	12374	13374	1.000	1"	25.400	1"	4"	1-1/2"	185.02	176.98	168.93	160.89
-	-	13394	1.250	1-1/4"	31.750	1-1/4"	4-1/2"	2"	515.50	493.09	470.67	448.26

220MA (820MA metric) - 2 Flute
223MA (823MA metric) - 3 Flute
230MA (830MA metric) - 4 Flute
 .0312" - .3594"
 (0.792mm - 9.129mm)

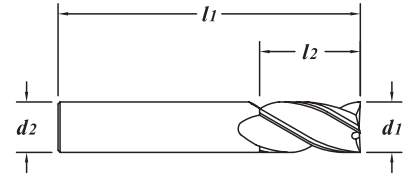
Technical information:
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TOLERANCES		
d_1	+0.00" -0.02" (+0.00 -0.50mm)	
d_2	3mm - 6mm	+0.000" -0.003" (-0.000 -0.075mm)
	1/4" - 1-1/4"	-0.001" -0.004" (-0.025 -0.100mm)

Standard Length - TiAlN Coated

- Solid submicron grain carbide end mill - center cutting
- Dry or semi-dry machining
- Up to 40% faster than uncoated
- Extremely versatile
- Uncoated - page 160
- TiN Coated - page 162
- TiCN Coated - page 163



2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
11017	12017	13017	.0312	1/32"	0.792	1/8"	1-1/2"	3/32"	12.72	12.17	11.61	11.06
45017	37017	46017	.0394		1.000	3.0	38	4	13.23	12.65	12.08	11.50
11027	12027	13027	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"	12.72	12.17	11.61	11.06
45027	37027	46027	.0591		1.500	3.0	38	6	13.23	12.65	12.08	11.50
11037	12037	13037	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	11.98	11.46	10.94	10.42
11047	12047	13047	.0781	5/64"	1.984	1/8"	1-1/2"	1/4"	11.98	11.46	10.94	10.42
45037	37037	46037	.0787		2.000	3.0	38	8	12.44	11.90	11.36	10.82
11057	12057	13057	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	11.45	10.96	10.46	9.96
45047	37047	46047	.0984		2.500	3.0	38	12	11.91	11.40	10.88	10.36
11067	12067	13067	.1094	7/64"	2.779	1/8"	1-1/2"	3/8"	11.45	10.96	10.46	9.96
45057	37057	46057	.1181		3.000	3.0	38	12	11.19	10.70	10.22	9.73
11077	12077	13077	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	10.76	10.30	9.83	9.36
45067	37067	46067	.1378		3.500	4.0	50	12	15.36	14.70	14.03	13.36
11087	12087	13087	.1406	9/64"	3.571	3/16"	2"	9/16"	14.73	14.09	13.45	12.81
11097	12097	13097	.1562	5/32"	3.967	3/16"	2"	9/16"	14.73	14.09	13.45	12.81
45077	37077	46077	.1575		4.000	4.0	50	14	14.70	14.06	13.42	12.78
11107	12107	13107	.1719	11/64"	4.366	3/16"	2"	9/16"	14.73	14.09	13.45	12.81
45087	37087	46087	.1772		4.500	5.0	50	14	18.81	18.00	17.18	16.36
11117	12117	13117	.1875	3/16"	4.763	3/16"	2"	5/8"	14.10	13.49	12.87	12.26
45097	37097	46097	.1969		5.000	5.0	65	16	19.37	18.52	17.68	16.84
11127	12127	13127	.2031	13/64"	5.159	1/4"	2-1/2"	5/8"	20.53	19.64	18.74	17.85
11137	12137	13137	.2188	7/32"	5.558	1/4"	2-1/2"	5/8"	20.53	19.64	18.74	17.85
11147	12147	13147	.2344	15/64"	5.954	1/4"	2-1/2"	3/4"	20.53	19.64	18.74	17.85
45107	37107	46107	.2362		6.000	6.0	65	19	19.83	18.96	18.10	17.24
11157	12157	13157	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	19.12	18.29	17.46	16.63
11167	12167	13167	.2656	17/64"	6.746	5/16"	2-1/2"	7/8"	32.23	30.83	29.43	28.03
45117	37117	46117	.2756		7.000	7.0	65	22	27.84	26.63	25.42	24.21
11177	12177	13177	.2812	9/32"	7.142	5/16"	2-1/2"	7/8"	32.23	30.83	29.43	28.03
11187	12187	13187	.2969	19/64"	7.541	5/16"	2-1/2"	7/8"	32.23	30.83	29.43	28.03
11197	12197	13197	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	27.30	26.11	24.93	23.74
45127	37127	46127	.3150		8.000	8.0	65	22	28.29	27.06	25.83	24.60
11207	12207	13207	.3281	21/64"	8.334	3/8"	2-1/2"	7/8"	36.77	35.17	33.57	31.97
11217	12217	13217	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	36.77	35.17	33.57	31.97
45137	37137	46137	.3543		9.000	9.0	65	22	33.35	31.90	30.45	29.00
11227	12227	13227	.3594	23/64"	9.129	3/8"	2-1/2"	7/8"	36.77	35.17	33.57	31.97

220MA (820MA metric) - 2 Flute (continued)
223MA (823MA metric) - 3 Flute (continued)
230MA (830MA metric) - 4 Flute (continued)

.3750" - 1.250"
 (9.525mm - 31.750mm)

END MILLS

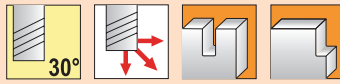
2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
11237	12237	13237	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	32.12	30.72	29.33	27.93
11247	12247	13247	.3906	25/64"	9.921	7/16"	2-3/4"	7/8"	43.53	41.64	39.74	37.85
45147	37147	46147	.3937		10.000	10.0	70	25	38.49	36.82	35.14	33.47
11257	12257	13257	.4062	13/32"	10.317	7/16"	2-3/4"	7/8"	43.53	41.64	39.74	37.85
11267	12267	13267	.4219	27/64"	10.716	7/16"	2-3/4"	7/8"	43.53	41.64	39.74	37.85
45157	37157	46157	.4331		11.000	11.0	75	25	40.08	38.34	36.59	34.85
11277	12277	13277	.4375	7/16"	11.113	7/16"	2-3/4"	1"	38.58	36.91	35.23	33.55
11287	12287	13287	.4531	29/64"	11.509	1/2"	3"	1"	55.61	53.20	50.78	48.36
11297	12297	13297	.4688	15/32"	11.908	1/2"	3"	1"	55.61	53.20	50.78	48.36
45167	37167	46167	.4724		12.000	12.0	75	25	49.89	47.72	45.55	43.38
11307	12307	13307	.4844	31/64"	12.304	1/2"	3"	1"	55.61	53.20	50.78	48.36
11317	12317	13317	.5000	1/2"	12.700	1/2"	3"	1"	47.93	45.85	43.76	41.68
45177	37177	46177	.5512		14.000	14.0	88	32	82.93	79.32	75.72	72.11
11327	12327	13327	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	79.58	76.12	72.66	69.20
11337	12337	13337	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	88.25	84.41	80.58	76.74
45187	37187	46187	.6299		16.000	16.0	88	38	92.05	88.04	84.04	80.04
11347	12347	13347	.6875	11/16"	17.463	3/4"	4"	1-1/2"	140.88	134.75	128.63	122.50
45197	37197	46197	.7087		18.000	18.0	100	38	131.35	125.64	119.93	114.22
11357	12357	13357	.7500	3/4"	19.050	3/4"	4"	1-1/2"	125.80	120.33	114.86	109.39
45207	37207	46207	.7874		20.000	20.0	100	38	170.06	162.67	155.27	147.88
45217	37217	46217	.8661		22.000	22.0	100	38	186.53	178.42	170.31	162.20
11367	12367	13367	.8750	7/8"	22.225	7/8"	4"	1-1/2"	181.59	173.69	165.80	157.90
45227	37227	46227	.9843		25.000	25.0	100	38	194.03	185.59	177.16	168.72
11377	12377	13377	1.000	1"	25.400	1"	4"	1-1/2"	187.90	179.73	171.56	163.39
-	-	13397	1.250	1-1/4"	31.750	1-1/4"	4-1/2"	2"	516.51	494.05	471.60	449.14



End Mill Manufacturing

220R - 2 Flute
230R - 4 Flute

Technical information: page 228, 230



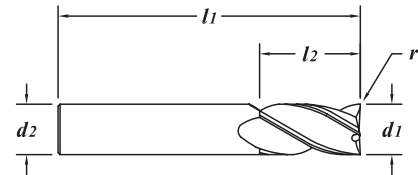
TOLERANCES

d_1	+.000" -.002" (+.000 -.050mm)	
d_2	3mm - 6mm	+.0000" -.0003" (-.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)
r	+.001" -.001" (+.025 -.025mm)	

.0625" - .5000"
(1.588mm - 12.700mm)

Standard Length - Corner Radius

Solid submicron grain carbide end mill - center cutting
For stronger corners and part radius
Extremely versatile
TiAlN Coated - page 168



2 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
		Decimal	Metric									
79580	80580	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	.010"	12.27	11.74	11.20	10.67
79590	80590	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	.015"	12.27	11.74	11.20	10.67
79600	80600	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.010"	11.73	11.22	10.71	10.20
79610	80610	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.015"	11.73	11.22	10.71	10.20
79620	80620	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.020"	11.73	11.22	10.71	10.20
79000	80000	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.010"	10.65	10.19	9.72	9.26
79010	80010	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.015"	10.65	10.19	9.72	9.26
79020	80020	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.020"	10.65	10.19	9.72	9.26
79030	80030	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.030"	10.65	10.19	9.72	9.26
79040	80040	.1875	3/16"	4.763	3/16"	2"	5/8"	.010"	14.03	13.42	12.81	12.20
79050	80050	.1875	3/16"	4.763	3/16"	2"	5/8"	.015"	14.03	13.42	12.81	12.20
79060	80060	.1875	3/16"	4.763	3/16"	2"	5/8"	.020"	14.03	13.42	12.81	12.20
79070	80070	.1875	3/16"	4.763	3/16"	2"	5/8"	.030"	14.03	13.42	12.81	12.20
-	80090	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"	17.42	16.67	15.91	15.15
79100	80100	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	17.42	16.67	15.91	15.15
79110	80110	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"	17.42	16.67	15.91	15.15
79120	80120	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	17.42	16.67	15.91	15.15
79130	80130	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.045"	17.42	16.67	15.91	15.15
79140	80140	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.060"	17.42	16.67	15.91	15.15
79160	80160	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.015"	22.85	21.86	20.86	19.87
79170	80170	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.020"	22.85	21.86	20.86	19.87
79180	80180	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.030"	22.85	21.86	20.86	19.87
79190	80190	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.045"	22.85	21.86	20.86	19.87
79200	80200	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.060"	22.85	21.86	20.86	19.87
-	80220	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.010"	27.96	26.74	25.53	24.31
79230	80230	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.015"	27.96	26.74	25.53	24.31
79240	80240	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.020"	27.96	26.74	25.53	24.31
79250	80250	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	27.96	26.74	25.53	24.31
79260	80260	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.045"	27.96	26.74	25.53	24.31
79270	80270	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.060"	27.96	26.74	25.53	24.31
-	80290	.5000	1/2"	12.700	1/2"	3"	1"	.010"	52.05	49.79	47.52	45.26
79300	80300	.5000	1/2"	12.700	1/2"	3"	1"	.015"	52.05	49.79	47.52	45.26
79310	80310	.5000	1/2"	12.700	1/2"	3"	1"	.020"	52.05	49.79	47.52	45.26
79320	80320	.5000	1/2"	12.700	1/2"	3"	1"	.030"	52.05	49.79	47.52	45.26
79330	80330	.5000	1/2"	12.700	1/2"	3"	1"	.045"	52.05	49.79	47.52	45.26
79340	80340	.5000	1/2"	12.700	1/2"	3"	1"	.060"	52.05	49.79	47.52	45.26
79350	80350	.5000	1/2"	12.700	1/2"	3"	1"	.090"	52.05	49.79	47.52	45.26
79360	80360	.5000	1/2"	12.700	1/2"	3"	1"	.125"	52.05	49.79	47.52	45.26

220R - 2 Flute (continued)
230R - 4 Flute (continued)

.6250" - 1.000"
 (15.875mm - 25.400mm)

END MILLS

2 Flute EDP#	4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
		Decimal	Metric									
79370	80370	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"	84.18	80.52	76.86	73.20
79380	80380	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.020"	84.18	80.52	76.86	73.20
79390	80390	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	84.18	80.52	76.86	73.20
79400	80400	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.045"	84.18	80.52	76.86	73.20
79410	80410	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	84.18	80.52	76.86	73.20
79420	80420	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.090"	84.18	80.52	76.86	73.20
79440	80440	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"	123.88	118.49	113.11	107.72
79450	80450	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.020"	123.88	118.49	113.11	107.72
79460	80460	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	123.88	118.49	113.11	107.72
79470	80470	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.045"	123.88	118.49	113.11	107.72
79480	80480	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	123.88	118.49	113.11	107.72
79490	80490	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.090"	123.88	118.49	113.11	107.72
79500	80500	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.125"	123.88	118.49	113.11	107.72
79630	80630	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.250"	123.88	118.49	113.11	107.72
79510	80510	1.000	1"	25.400	1"	4"	1-1/2"	.015"	214.88	205.54	196.19	186.85
79520	80520	1.000	1"	25.400	1"	4"	1-1/2"	.020"	214.88	205.54	196.19	186.85
79530	80530	1.000	1"	25.400	1"	4"	1-1/2"	.030"	214.88	205.54	196.19	186.85
79540	80540	1.000	1"	25.400	1"	4"	1-1/2"	.045"	214.88	205.54	196.19	186.85
79550	80550	1.000	1"	25.400	1"	4"	1-1/2"	.060"	214.88	205.54	196.19	186.85
79560	80560	1.000	1"	25.400	1"	4"	1-1/2"	.090"	214.88	205.54	196.19	186.85
79570	80570	1.000	1"	25.400	1"	4"	1-1/2"	.125"	214.88	205.54	196.19	186.85
79640	80640	1.000	1"	25.400	1"	4"	1-1/2"	.250"	214.88	205.54	196.19	186.85



220RA - 2 Flute
230RA (830RA metric) - 4 Flute

Technical information:
 page 228, 230



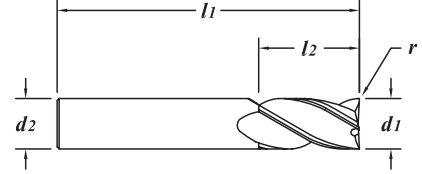
TOLERANCES

$d1$		+0.00" -0.002" (+0.000 -0.050mm)
$d2$	3mm - 6mm	+0.0000" -0.0003" (-0.0000 -0.0075mm)
	1/4" - 1"	-0.0001" -0.0004" (-0.0025 -0.0100mm)
r		+0.001" -0.001" (+0.025 -0.025mm)

.0625" - .3125"
 (1.588mm - 7.938mm)

Standard Length - Corner Radius - TiAlN Coated

- Solid submicron grain carbide end mill - center cutting
- Dry or semi-dry machining
- Up to 40% faster than uncoated
- For stronger corners and part radius
- Extremely versatile
- Uncoated - page 166



2 Flute EDP#	4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
		Decimal	Metric									
79587	80587	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	.010"	14.73	14.09	13.45	12.81
79597	80597	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	.015"	14.73	14.09	13.45	12.81
79607	80607	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.010"	14.19	13.57	12.96	12.34
79617	80617	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.015"	14.19	13.57	12.96	12.34
79627	80627	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.020"	14.19	13.57	12.96	12.34
-	24077	.1181		3.000	3.0	38	12	0.2	13.13	12.56	11.99	11.42
-	24087	.1181		3.000	3.0	38	12	0.5	13.13	12.56	11.99	11.42
79007	80007	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.010"	13.11	12.54	11.97	11.40
79017	80017	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.015"	13.11	12.54	11.97	11.40
79027	80027	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.020"	13.11	12.54	11.97	11.40
79037	80037	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.030"	13.11	12.54	11.97	11.40
-	24097	.1575		4.000	4.0	50	14	0.3	17.19	16.45	15.70	14.95
-	24107	.1575		4.000	4.0	50	14	0.5	17.19	16.45	15.70	14.95
79047	80047	.1875	3/16"	4.763	3/16"	2"	5/8"	.010"	16.49	15.77	15.06	14.34
79057	80057	.1875	3/16"	4.763	3/16"	2"	5/8"	.015"	16.49	15.77	15.06	14.34
79067	80067	.1875	3/16"	4.763	3/16"	2"	5/8"	.020"	16.49	15.77	15.06	14.34
79077	80077	.1875	3/16"	4.763	3/16"	2"	5/8"	.030"	16.49	15.77	15.06	14.34
-	24117	.1969		5.000	5.0	50	16	0.3	22.94	21.95	20.95	19.95
-	24127	.1969		5.000	5.0	65	16	0.5	22.94	21.95	20.95	19.95
-	24177	.2362		6.000	6.0	65	19	0.5	23.39	22.37	21.36	20.34
-	24187	.2362		6.000	6.0	65	19	0.8	23.39	22.37	21.36	20.34
-	24197	.2362		6.000	6.0	65	19	1.0	23.39	22.37	21.36	20.34
-	24207	.2362		6.000	6.0	65	19	1.5	23.39	22.37	21.36	20.34
-	24217	.2362		6.000	6.0	65	19	2.0	23.39	22.37	21.36	20.34
-	80097	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"	22.49	21.52	20.54	19.56
79107	80107	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	22.49	21.52	20.54	19.56
79117	80117	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"	22.49	21.52	20.54	19.56
79127	80127	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	22.49	21.52	20.54	19.56
79137	80137	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.045"	22.49	21.52	20.54	19.56
79147	80147	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.060"	22.49	21.52	20.54	19.56
79167	80167	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.015"	30.49	29.16	27.84	26.51
79177	80177	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.020"	30.49	29.16	27.84	26.51
79187	80187	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.030"	30.49	29.16	27.84	26.51
79197	80197	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.045"	30.49	29.16	27.84	26.51
79207	80207	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.060"	30.49	29.16	27.84	26.51

220RA - 2 Flute (continued)
230RA (830RA metric) - 4 Flute (continued)

.3150" - .6299"
 (8.000mm - 16.000mm)

END MILLS

2 Flute EDP#	4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	1-11	12-24	25-49	50-100		
		Decimal	Metric										
-	24227	.3150	8.000	8.0	65	22	0.5	31.63	30.25	28.88	27.50		
-	24237	.3150	8.000	8.0	65	22	0.8	31.63	30.25	28.88	27.50		
-	24247	.3150	8.000	8.0	65	22	1.0	31.63	30.25	28.88	27.50		
-	24257	.3150	8.000	8.0	65	22	1.5	31.63	30.25	28.88	27.50		
-	24267	.3150	8.000	8.0	65	22	2.0	31.63	30.25	28.88	27.50		
-	24277	.3150	8.000	8.0	65	22	2.5	31.63	30.25	28.88	27.50		
-	24287	.3150	8.000	8.0	65	22	3.0	31.63	30.25	28.88	27.50		
-	80227	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.010"	35.60	34.06	32.51	30.96	
79237	80237	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.015"	35.60	34.06	32.51	30.96	
79247	80247	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.020"	35.60	34.06	32.51	30.96	
79257	80257	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	35.60	34.06	32.51	30.96	
79267	80267	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.045"	35.60	34.06	32.51	30.96	
79277	80277	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.060"	35.60	34.06	32.51	30.96	
-	24297	.3937		10.000	10.0	70	25	0.5	42.99	41.12	39.25	37.38	
-	24307	.3937		10.000	10.0	70	25	0.8	42.99	41.12	39.25	37.38	
-	24317	.3937		10.000	10.0	70	25	1.0	42.99	41.12	39.25	37.38	
-	24327	.3937		10.000	10.0	70	25	1.5	42.99	41.12	39.25	37.38	
-	24337	.3937		10.000	10.0	70	25	2.0	42.99	41.12	39.25	37.38	
-	24347	.3937		10.000	10.0	70	25	2.5	42.99	41.12	39.25	37.38	
-	24357	.3937		10.000	10.0	70	25	3.0	42.99	41.12	39.25	37.38	
-	24367	.3937		10.000	10.0	70	25	3.2	42.99	41.12	39.25	37.38	
NEW	-	80279	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.010"	43.06	41.19	39.32	37.44
NEW	-	80281	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.015"	43.06	41.19	39.32	37.44
NEW	-	80283	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.020"	43.06	41.19	39.32	37.44
NEW	-	80285	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.030"	43.06	41.19	39.32	37.44
NEW	-	80287	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.045"	43.06	41.19	39.32	37.44
NEW	-	80289	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.060"	43.06	41.19	39.32	37.44
NEW	-	80291	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.090"	43.06	41.19	39.32	37.44
NEW	-	80293	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.125"	43.06	41.19	39.32	37.44
-	24377	.4724		12.000	12.0	75	25	0.5	63.31	60.56	57.80	55.05	
-	24387	.4724		12.000	12.0	75	25	0.8	63.31	60.56	57.80	55.05	
-	24397	.4724		12.000	12.0	75	25	1.0	63.31	60.56	57.80	55.05	
-	24407	.4724		12.000	12.0	75	25	1.5	63.31	60.56	57.80	55.05	
-	24417	.4724		12.000	12.0	75	25	2.0	63.31	60.56	57.80	55.05	
-	24427	.4724		12.000	12.0	75	25	2.5	63.31	60.56	57.80	55.05	
-	24437	.4724		12.000	12.0	75	25	3.0	63.31	60.56	57.80	55.05	
-	24447	.4724		12.000	12.0	75	25	3.2	63.31	60.56	57.80	55.05	
-	80297	.5000	1/2"	12.700	1/2"	3"	1"	.010"	60.73	58.09	55.45	52.81	
79307	80307	.5000	1/2"	12.700	1/2"	3"	1"	.015"	60.73	58.09	55.45	52.81	
79317	80317	.5000	1/2"	12.700	1/2"	3"	1"	.020"	60.73	58.09	55.45	52.81	
79327	80327	.5000	1/2"	12.700	1/2"	3"	1"	.030"	60.73	58.09	55.45	52.81	
79337	80337	.5000	1/2"	12.700	1/2"	3"	1"	.045"	60.73	58.09	55.45	52.81	
79347	80347	.5000	1/2"	12.700	1/2"	3"	1"	.060"	60.73	58.09	55.45	52.81	
79357	80357	.5000	1/2"	12.700	1/2"	3"	1"	.090"	60.73	58.09	55.45	52.81	
79367	80367	.5000	1/2"	12.700	1/2"	3"	1"	.125"	60.73	58.09	55.45	52.81	
79377	80377	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"	96.69	92.49	88.28	84.08	
79387	80387	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.020"	96.69	92.49	88.28	84.08	
79397	80397	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	96.69	92.49	88.28	84.08	
79407	80407	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.045"	96.69	92.49	88.28	84.08	
79417	80417	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	96.69	92.49	88.28	84.08	
79427	80427	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.090"	96.69	92.49	88.28	84.08	
-	24457	.6299		16.000	16.0	88	38	0.5	100.89	96.50	92.12	87.73	
-	24467	.6299		16.000	16.0	88	38	1.0	100.89	96.50	92.12	87.73	
-	24477	.6299		16.000	16.0	88	38	2.0	100.89	96.50	92.12	87.73	
-	24487	.6299		16.000	16.0	88	38	2.5	100.89	96.50	92.12	87.73	
-	24497	.6299		16.000	16.0	88	38	3.0	100.89	96.50	92.12	87.73	
-	24507	.6299		16.000	16.0	88	38	4.0	100.89	96.50	92.12	87.73	
-	24517	.6299		16.000	16.0	88	38	5.0	100.89	96.50	92.12	87.73	

continued →

220RA - 2 Flute (continued)
230RA (830RA metric) - 4 Flute (continued)

.7500" - 1.000"
 (19.050mm - 25.400mm)

2 Flute EDP#	4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
		Decimal	Metric									
79447	80447	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"	138.66	132.63	126.60	120.57
79457	80457	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.020"	138.66	132.63	126.60	120.57
79467	80467	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	138.66	132.63	126.60	120.57
79477	80477	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.045"	138.66	132.63	126.60	120.57
79487	80487	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	138.66	132.63	126.60	120.57
79497	80497	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.090"	138.66	132.63	126.60	120.57
79507	80507	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.125"	138.66	132.63	126.60	120.57
79637	80637	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.250"	138.66	132.63	126.60	120.57
-	24527	.7874		20.000	20.0	100	38	0.5	196.24	187.70	179.17	170.64
-	24537	.7874		20.000	20.0	100	38	1.0	196.24	187.70	179.17	170.64
-	24547	.7874		20.000	20.0	100	38	2.0	196.24	187.70	179.17	170.64
-	24557	.7874		20.000	20.0	100	38	3.0	196.24	187.70	179.17	170.64
-	24567	.7874		20.000	20.0	100	38	5.0	196.24	187.70	179.17	170.64
79517	80517	1.000	1"	25.400	1"	4"	1-1/2"	.015"	236.72	226.42	216.13	205.84
79527	80527	1.000	1"	25.400	1"	4"	1-1/2"	.020"	236.72	226.42	216.13	205.84
79537	80537	1.000	1"	25.400	1"	4"	1-1/2"	.030"	236.72	226.42	216.13	205.84
79547	80547	1.000	1"	25.400	1"	4"	1-1/2"	.045"	236.72	226.42	216.13	205.84
79557	80557	1.000	1"	25.400	1"	4"	1-1/2"	.060"	236.72	226.42	216.13	205.84
79567	80567	1.000	1"	25.400	1"	4"	1-1/2"	.090"	236.72	226.42	216.13	205.84
79577	80577	1.000	1"	25.400	1"	4"	1-1/2"	.125"	236.72	226.42	216.13	205.84
79647	80647	1.000	1"	25.400	1"	4"	1-1/2"	.250"	236.72	226.42	216.13	205.84

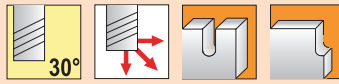


End Mill Manufacturing

TOLERANCES

d_1	$\leq .030"$	$+0.0004" -0.0004" (+0.0100 -0.0100mm)$
	$\geq 1/32"$	$+0.000" -0.002" (+0.000 -0.050mm)$
d_2	3mm - 6mm	$+0.0000" -0.0003" (-0.0000 -0.0075mm)$
	1/4" - 1"	$-0.0001" -0.0004" (-0.0025 -0.0100mm)$
Ball radius		$+0.000" -0.001" (+0.000 -0.025mm)$

Technical information:
page 228, 230

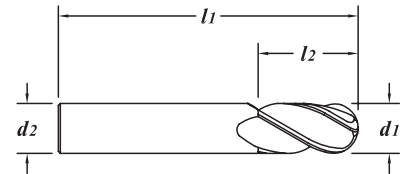


320M (920M metric) - 2 Flute
323M (923M metric) - 3 Flute
330M (930M metric) - 4 Flute
 .0100" - .2656"
 (0.254mm - 6.746mm)

END MILLS

Standard Length - Ball End

Solid submicron grain carbide end mill - center cutting
 Extremely versatile
 TiN Coated - page 173
 TiCN Coated - page 174
 TiAlN Coated - page 175



2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
16550	-	-	.0100	.0100"	0.254	1/8"	1-1/2"	.030"	21.71	20.77	19.82	18.88
16600	-	-	.0150	.0150"	0.381	1/8"	1-1/2"	.045"	21.62	20.68	19.74	18.80
16650	-	-	.0200	.0200"	0.508	1/8"	1-1/2"	.060"	21.05	20.13	19.22	18.30
16700	-	-	.0250	.0250"	0.635	1/8"	1-1/2"	.075"	20.34	19.46	18.57	17.69
16750	-	-	.0300	.0300"	0.762	1/8"	1-1/2"	.090"	17.53	16.76	16.00	15.24
16010	17010	18010	.0312	1/32"	0.792	1/8"	1-1/2"	3/32"	13.00	12.43	11.87	11.30
47010	38010	48010	.0394		1.000	3.0	38	4	13.65	13.06	12.46	11.87
16020	17020	18020	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"	13.00	12.43	11.87	11.30
47020	38020	48020	.0591		1.500	3.0	38	6	13.65	13.06	12.46	11.87
16030	17030	18030	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	12.27	11.74	11.20	10.67
16040	17040	18040	.0781	5/64"	1.984	1/8"	1-1/2"	1/4"	12.27	11.74	11.20	10.67
47030	38030	48030	.0787		2.000	3.0	38	8	12.87	12.31	11.75	11.19
16050	17050	18050	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	11.73	11.22	10.71	10.20
47040	38040	48040	.0984		2.500	3.0	38	12	12.33	11.79	11.26	10.72
16060	17060	18060	.1094	7/64"	2.779	1/8"	1-1/2"	3/8"	11.73	11.22	10.71	10.20
47050	38050	48050	.1181		3.000	3.0	38	12	11.19	10.70	10.22	9.73
16070	17070	18070	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	10.65	10.19	9.72	9.26
47060	38060	48060	.1378		3.500	4.0	50	12	16.43	15.72	15.00	14.29
16080	17080	18080	.1406	9/64"	3.571	3/16"	2"	9/16"	15.62	14.94	14.26	13.58
16090	17090	18090	.1562	5/32"	3.967	3/16"	2"	9/16"	15.62	14.94	14.26	13.58
47070	38070	48070	.1575		4.000	4.0	50	14	14.73	14.09	13.45	12.81
16100	17100	18100	.1719	11/64"	4.366	3/16"	2"	9/16"	15.62	14.94	14.26	13.58
47080	38080	48080	.1772		4.500	5.0	50	14	18.54	17.73	16.93	16.12
16110	17110	18110	.1875	3/16"	4.763	3/16"	2"	5/8"	14.03	13.42	12.81	12.20
47090	38090	48090	.1969		5.000	5.0	65	16	17.86	17.08	16.31	15.53
16120	17120	18120	.2031	13/64"	5.159	1/4"	2-1/2"	5/8"	18.17	17.38	16.59	15.80
16130	17130	18130	.2188	7/32"	5.558	1/4"	2-1/2"	5/8"	18.17	17.38	16.59	15.80
16140	17140	18140	.2344	15/64"	5.954	1/4"	2-1/2"	3/4"	18.17	17.38	16.59	15.80
47100	38100	48100	.2362		6.000	6.0	65	19	18.31	17.51	16.72	15.92
16150	17150	18150	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	17.42	16.67	15.91	15.15
16160	17160	18160	.2656	17/64"	6.746	5/16"	2-1/2"	7/8"	27.27	26.08	24.90	23.71

continued →

320M (920M metric) - 2 Flute (continued)

323M (923M metric) - 3 Flute (continued)

330M (930M metric) - 4 Flute (continued)

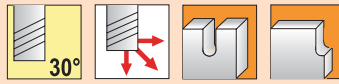
.2756" - 1.000"
(7.00mm - 25.40mm)

2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
47110	38110	48110	.2756	7.000	7.0	65	22	23.51	22.48	21.46	20.44	
16170	17170	18170	.2812	9/32"	7.142	5/16"	2-1/2"	7/8"	27.27	26.08	24.90	23.71
16180	17180	18180	.2969	19/64"	7.541	5/16"	2-1/2"	7/8"	27.27	26.08	24.90	23.71
16190	17190	18190	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	22.85	21.86	20.86	19.87
47120	38120	48120	.3150		8.000	8.0	65	22	24.04	22.99	21.95	20.90
16200	17200	18200	.3281	21/64"	8.334	3/8"	2-1/2"	7/8"	32.65	31.23	29.81	28.39
16210	17210	18210	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	32.65	31.23	29.81	28.39
47130	38130	48130	.3543		9.000	9.0	65	22	29.37	28.09	26.82	25.54
16220	17220	18220	.3594	23/64"	9.129	3/8"	2-1/2"	7/8"	32.65	31.23	29.81	28.39
16230	17230	18230	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	27.96	26.74	25.53	24.31
16240	17240	18240	.3906	25/64"	9.921	7/16"	2-3/4"	7/8"	40.17	38.42	36.68	34.93
47140	38140	48140	.3937		10.000	10.0	70	25	34.33	32.84	31.34	29.85
16250	17250	18250	.4062	13/32"	10.317	7/16"	2-3/4"	7/8"	40.17	38.42	36.68	34.93
16260	17260	18260	.4219	27/64"	10.716	7/16"	2-3/4"	7/8"	40.17	38.42	36.68	34.93
47150	38150	48150	.4331		11.000	11.0	75	25	36.13	34.56	32.99	31.42
16270	17270	18270	.4375	7/16"	11.113	7/16"	2-3/4"	1"	34.41	32.91	31.42	29.92
16280	17280	18280	.4531	29/64"	11.509	1/2"	3"	1"	57.55	55.04	52.54	50.04
16290	17290	18290	.4688	15/32"	11.908	1/2"	3"	1"	57.55	55.04	52.54	50.04
47160	38160	48160	.4724		12.000	12.0	75	25	54.66	52.28	49.91	47.53
16300	17300	18300	.4844	31/64"	12.304	1/2"	3"	1"	57.55	55.04	52.54	50.04
16310	17310	18310	.5000	1/2"	12.700	1/2"	3"	1"	52.05	49.79	47.52	45.26
47170	38170	48170	.5512		14.000	14.0	88	32	79.58	76.12	72.66	69.20
16320	17320	18320	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	75.80	72.50	69.21	65.91
16330	17330	18330	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	84.18	80.52	76.86	73.20
47180	38180	48180	.6299		16.000	16.0	88	38	88.37	84.52	80.68	76.84
16340	17340	18340	.6875	11/16"	17.463	3/4"	4"	1-1/2"	140.13	134.04	127.94	121.85
47190	38190	48190	.7087		18.000	18.0	100	38	130.05	124.40	118.74	113.09
16350	17350	18350	.7500	3/4"	19.050	3/4"	4"	1-1/2"	123.88	118.49	113.11	107.72
47200	38200	48200	.7874		20.000	20.0	100	38	174.40	166.82	159.23	151.65
47210	38210	48210	.8661		22.000	22.0	100	38	193.73	185.31	176.88	168.46
16360	17360	18360	.8750	7/8"	22.225	7/8"	4"	1-1/2"	198.46	189.83	181.20	172.57
47220	38220	48220	.9843		25.000	25.0	100	38	203.08	194.25	185.42	176.59
16370	17370	18370	1.000	1"	25.400	1"	4"	1-1/2"	214.88	205.54	196.19	186.85

TOLERANCES

<i>d1</i>	+.000" -.002" (+.000 -.050mm)	
<i>d2</i>	1/8" - 3/16"	+.0000" -.0003" (-.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)
Ball radius	+.000" -.001" (+.000 -.025mm)	

Technical information: page 228, 230

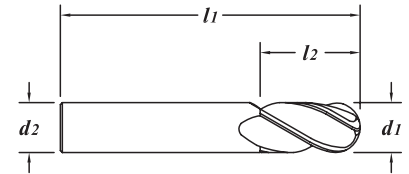


320MT - 2 Flute
330MT - 4 Flute

END MILLS

Standard Length - Ball End - TiN Coated

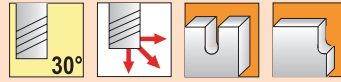
- Solid submicron grain carbide end mill - center cutting
- Improved lubricity - 10% faster than uncoated
- Extremely versatile
- Uncoated - page 171
- TiCN Coated - page 174
- TiALN Coated - page 175



2 Flute EDP#	4 Flute EDP#	<i>d1</i> †		<i>d2</i> Shank Diameter	<i>l1</i> Overall Length	<i>l2</i> Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
16073	18073	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	12.09	11.56	11.04	10.51
16113	18113	.1875	3/16"	4.763	3/16"	2"	5/8"	15.49	14.82	14.14	13.47
16153	18153	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	20.36	19.47	18.59	17.70
16193	18193	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	26.80	25.63	24.47	23.30
16233	18233	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	31.91	30.53	29.14	27.75
16273	18273	.4375	7/16"	11.113	7/16"	2-3/4"	1"	39.18	37.48	35.77	34.07
16313	18313	.5000	1/2"	12.700	1/2"	3"	1"	56.83	54.36	51.89	49.42
16333	18333	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	91.52	87.54	83.56	79.58
16353	18353	.7500	3/4"	19.050	3/4"	4"	1-1/2"	132.27	126.52	120.77	115.02
16373	18373	1.000	1"	25.400	1"	4"	1-1/2"	229.57	219.59	209.61	199.63

320MC - 2 Flute
323MC - 3 Flute
330MC - 4 Flute

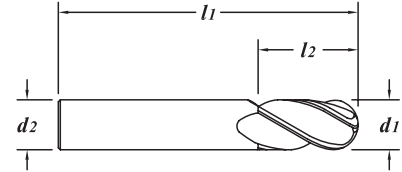
Technical information:
 page 228, 230



TOLERANCES	
d_1	+0.000" -0.002" (+0.000 -0.050mm)
d_2	1/8" - 3/16" +0.0000" -0.0003" (-0.0000 -0.0075mm)
	1/4" - 1" -0.0001" -0.0004" (-0.0025 -0.0100mm)
Ball radius	+0.000" -0.001" (+0.000 -0.025mm)

Standard Length - Ball End - TiCN Coated

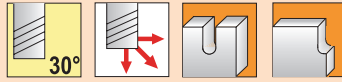
- Solid submicron grain carbide end mill - center cutting
- Improved abrasion resistance and lubricity
- Up to 25% faster than uncoated
- Extremely versatile
- Uncoated - page 171
- TiN Coated - page 173
- TiAlN Coated - page 175



2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
16014	17014	18014	.0312	1/32"	0.792	1/8"	1-1/2"	3/32"	15.17	14.51	13.85	13.19
16024	17024	18024	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"	15.17	14.51	13.85	13.19
16034	17034	18034	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	14.44	13.82	13.19	12.56
16044	17044	18044	.0781	5/64"	1.984	1/8"	1-1/2"	1/4"	14.44	13.82	13.19	12.56
16054	17054	18054	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	13.90	13.30	12.69	12.09
16064	17064	18064	.1094	7/64"	2.779	1/8"	1-1/2"	3/8"	13.90	13.30	12.69	12.09
16074	17074	18074	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	12.81	12.25	11.70	11.14
16084	17084	18084	.1406	9/64"	3.571	3/16"	2"	9/16"	17.81	17.04	16.26	15.49
16094	17094	18094	.1562	5/32"	3.967	3/16"	2"	9/16"	17.81	17.04	16.26	15.49
16104	17104	18104	.1719	11/64"	4.366	3/16"	2"	9/16"	17.81	17.04	16.26	15.49
16114	17114	18114	.1875	3/16"	4.763	3/16"	2"	5/8"	16.20	15.50	14.79	14.09
16124	17124	18124	.2031	13/64"	5.159	1/4"	2-1/2"	5/8"	22.57	21.59	20.61	19.63
16134	17134	18134	.2188	7/32"	5.558	1/4"	2-1/2"	5/8"	22.57	21.59	20.61	19.63
16144	17144	18144	.2344	15/64"	5.954	1/4"	2-1/2"	3/4"	22.57	21.59	20.61	19.63
16154	17154	18154	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	21.83	20.88	19.93	18.98
16164	17164	18164	.2656	17/64"	6.746	5/16"	2-1/2"	7/8"	33.17	31.72	30.28	28.84
16174	17174	18174	.2812	9/32"	7.142	5/16"	2-1/2"	7/8"	33.17	31.72	30.28	28.84
16184	17184	18184	.2969	19/64"	7.541	5/16"	2-1/2"	7/8"	33.17	31.72	30.28	28.84
16194	17194	18194	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	28.77	27.52	26.27	25.02
16204	17204	18204	.3281	21/64"	8.334	3/8"	2-1/2"	7/8"	38.55	36.87	35.20	33.52
16214	17214	18214	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	38.55	36.87	35.20	33.52
16224	17224	18224	.3594	23/64"	9.129	3/8"	2-1/2"	7/8"	38.55	36.87	35.20	33.52
16234	17234	18234	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	33.86	32.38	30.91	29.44
16244	17244	18244	.3906	25/64"	9.921	7/16"	2-3/4"	7/8"	47.23	45.18	43.12	41.07
16254	17254	18254	.4062	13/32"	10.317	7/16"	2-3/4"	7/8"	47.23	45.18	43.12	41.07
16264	17264	18264	.4219	27/64"	10.716	7/16"	2-3/4"	7/8"	47.23	45.18	43.12	41.07
16274	17274	18274	.4375	7/16"	11.113	7/16"	2-3/4"	1"	41.49	39.69	37.88	36.08
16284	17284	18284	.4531	29/64"	11.509	1/2"	3"	1"	64.63	61.82	59.01	56.20
16294	17294	18294	.4688	15/32"	11.908	1/2"	3"	1"	64.63	61.82	59.01	56.20
16304	17304	18304	.4844	31/64"	12.304	1/2"	3"	1"	64.63	61.82	59.01	56.20
16314	17314	18314	.5000	1/2"	12.700	1/2"	3"	1"	59.14	56.57	54.00	51.43
16324	17324	18324	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	86.81	83.04	79.26	75.49
16334	17334	18334	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	95.21	91.07	86.93	82.79
16344	17344	18344	.6875	11/16"	17.463	3/4"	4"	1-1/2"	152.72	146.08	139.44	132.80
16354	17354	18354	.7500	3/4"	19.050	3/4"	4"	1-1/2"	136.48	130.55	124.61	118.68
16364	17364	18364	.8750	7/8"	22.225	7/8"	4"	1-1/2"	217.40	207.94	198.49	189.04
16374	17374	18374	1.000	1"	25.400	1"	4"	1-1/2"	233.82	223.65	213.49	203.32

TOLERANCES		
d_1	+.000" -.002" (+.000 -.050mm)	
d_2	3mm - 6mm	+.0000" -.0003" (-.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)
Ball radius	+.000" -.001" (+.000 -.025mm)	

Technical information:
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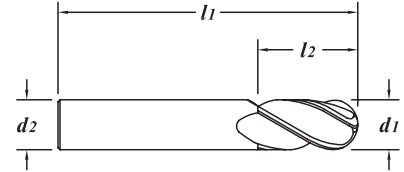


320MA (920MA metric) - 2 Flute
323MA (923MA metric) - 3 Flute
330MA (930MA metric) - 4 Flute
 .0312" - .3150"
 (0.792mm - 8.000mm)

END MILLS

Standard Length - Ball End - TiALN Coated

- Solid submicron grain carbide end mill - center cutting
- Dry or semi-dry machining
- Up to 40% faster than uncoated
- Extremely versatile
- Uncoated - page 171
- TiN Coated - page 173
- TiCN Coated - page 174



2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
16017	17017	18017	.0312	1/32"	0.792	1/8"	1-1/2"	3/32"	15.46	14.78	14.11	13.44
47017	38017	48017	.0394		1.000	3.0	38	4	16.11	15.41	14.71	14.01
16027	17027	18027	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"	15.46	14.78	14.11	13.44
47027	38027	48027	.0591		1.500	3.0	38	6	16.11	15.41	14.71	14.01
16037	17037	18037	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	14.73	14.09	13.45	12.81
16047	17047	18047	.0781	5/64"	1.984	1/8"	1-1/2"	1/4"	14.73	14.09	13.45	12.81
47037	38037	48037	.0787		2.000	3.0	38	8	15.34	14.67	14.01	13.34
16057	17057	18057	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	14.19	13.57	12.96	12.34
47047	38047	48047	.0984		2.500	3.0	38	12	14.79	14.15	13.50	12.86
16067	17067	18067	.1094	7/64"	2.779	1/8"	1-1/2"	3/8"	14.19	13.57	12.96	12.34
47057	38057	48057	.1181		3.000	3.0	38	12	13.65	13.06	12.46	11.87
16077	17077	18077	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	13.11	12.54	11.97	11.40
47067	38067	48067	.1378		3.500	4.0	50	12	18.88	18.06	17.24	16.42
16087	17087	18087	.1406	9/64"	3.571	3/16"	2"	9/16"	18.10	17.31	16.53	15.74
16097	17097	18097	.1562	5/32"	3.967	3/16"	2"	9/16"	18.10	17.31	16.53	15.74
47077	38077	48077	.1575		4.000	4.0	50	14	17.19	16.45	15.70	14.95
16107	17107	18107	.1719	11/64"	4.366	3/16"	2"	9/16"	18.10	17.31	16.53	15.74
47087	38087	48087	.1772		4.500	5.0	50	14	22.39	21.42	20.44	19.47
16117	17117	18117	.1875	3/16"	4.763	3/16"	2"	5/8"	16.49	15.77	15.06	14.34
47097	38097	48097	.1969		5.000	5.0	65	16	22.94	21.95	20.95	19.95
16127	17127	18127	.2031	13/64"	5.159	1/4"	2-1/2"	5/8"	23.26	22.25	21.24	20.23
16137	17137	18137	.2188	7/32"	5.558	1/4"	2-1/2"	5/8"	23.26	22.25	21.24	20.23
16147	17147	18147	.2344	15/64"	5.954	1/4"	2-1/2"	3/4"	23.26	22.25	21.24	20.23
47107	38107	48107	.2362		6.000	6.0	65	19	23.39	22.37	21.36	20.34
16157	17157	18157	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	22.49	21.52	20.54	19.56
16167	17167	18167	.2656	17/64"	6.746	5/16"	2-1/2"	7/8"	34.89	33.37	31.86	30.34
47117	38117	48117	.2756		7.000	7.0	65	22	31.10	29.74	28.39	27.04
16177	17177	18177	.2812	9/32"	7.142	5/16"	2-1/2"	7/8"	34.89	33.37	31.86	30.34
16187	17187	18187	.2969	19/64"	7.541	5/16"	2-1/2"	7/8"	34.89	33.37	31.86	30.34
16197	17197	18197	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	30.49	29.16	27.84	26.51
47127	38127	48127	.3150		8.000	8.0	65	22	31.63	30.25	28.88	27.50

continued →

320MA (920MA metric) - 2 Flute (continued)

323MA (923MA metric) - 3 Flute (continued)

330MA (930MA metric) - 4 Flute (continued)

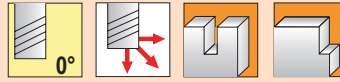
.3281" - 1.000"
(8.334mm - 25.400mm)

2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
16207	17207	18207	.3281	21/64"	8.334	3/8"	2-1/2"	7/8"	40.27	38.52	36.77	35.02
16217	17217	18217	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	40.27	38.52	36.77	35.02
47137	38137	48137	.3543		9.000	9.0	65	22	36.97	35.37	33.76	32.15
16227	17227	18227	.3594	23/64"	9.129	3/8"	2-1/2"	7/8"	40.27	38.52	36.77	35.02
16237	17237	18237	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	35.60	34.06	32.51	30.96
16247	17247	18247	.3906	25/64"	9.921	7/16"	2-3/4"	7/8"	48.82	46.70	44.57	42.45
47147	38147	48147	.3937		10.000	10.0	70	25	42.99	41.12	39.25	37.38
16257	17257	18257	.4062	13/32"	10.317	7/16"	2-3/4"	7/8"	48.82	46.70	44.57	42.45
16267	17267	18267	.4219	27/64"	10.716	7/16"	2-3/4"	7/8"	48.82	46.70	44.57	42.45
47157	38157	48157	.4331		11.000	11.0	75	25	44.78	42.83	40.89	38.94
16277	17277	18277	.4375	7/16"	11.113	7/16"	2-3/4"	1"	43.06	41.18	39.31	37.44
16287	17287	18287	.4531	29/64"	11.509	1/2"	3"	1"	66.22	63.34	60.46	57.58
16297	17297	18297	.4688	15/32"	11.908	1/2"	3"	1"	66.22	63.34	60.46	57.58
47167	38167	48167	.4724		12.000	12.0	75	25	63.31	60.56	57.80	55.05
16307	17307	18307	.4844	31/64"	12.304	1/2"	3"	1"	66.22	63.34	60.46	57.58
16317	17317	18317	.5000	1/2"	12.700	1/2"	3"	1"	60.73	58.09	55.45	52.81
47177	38177	48177	.5512		14.000	14.0	88	32	92.10	88.10	84.09	80.09
16327	17327	18327	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	88.31	84.47	80.63	76.79
16337	17337	18337	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	96.69	92.49	88.28	84.08
47187	38187	48187	.6299		16.000	16.0	88	38	100.89	96.50	92.12	87.73
16347	17347	18347	.6875	11/16"	17.463	3/4"	4"	1-1/2"	154.89	148.16	141.42	134.69
47197	38197	48197	.7087		18.000	18.0	100	38	144.84	138.55	132.25	125.95
16357	17357	18357	.7500	3/4"	19.050	3/4"	4"	1-1/2"	138.66	132.63	126.60	120.57
47207	38207	48207	.7874		20.000	20.0	100	38	196.24	187.70	179.17	170.64
47217	38217	48217	.8661		22.000	22.0	100	38	215.57	206.20	196.82	187.45
16367	17367	18367	.8750	7/8"	22.225	7/8"	4"	1-1/2"	220.29	210.72	201.14	191.56
47227	38227	48227	.9843		25.000	25.0	100	38	224.91	215.13	205.35	195.57
16377	17377	18377	1.000	1"	25.400	1"	4"	1-1/2"	236.72	226.42	216.13	205.84

TOLERANCES

d_1	+.000" -.002" (+.000 -.050mm)	
d_2	1/8" - 3/16"	+.0000" -.0003" (-.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)
Ball radius	+.000" -.001" (+.000 -.025mm)	

Technical information:
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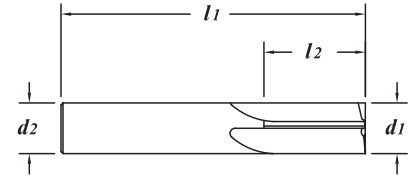


222M - 2 Flute - Square End
234M - 4 Flute - Square End
322M - 2 Flute - Ball End
334M - 4 Flute - Ball End

END MILLS

Standard Length - Straight Flute

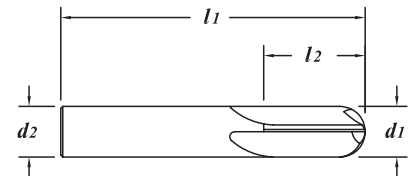
Solid submicron grain carbide end mill - center cutting
 For cutting high Rc materials
 Helps to hold perpendicularity



222M EDP#	234M EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Diameter								Metric
81070	82070	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	9.22	8.82	8.42	8.02
81110	82110	.1875	3/16"	4.763	3/16"	2"	5/8"	12.94	12.38	11.81	11.25
81150	82150	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	15.59	14.92	14.24	13.56
81190	82190	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	21.86	20.91	19.96	19.01
81230	82230	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	27.24	26.06	24.87	23.69
81270	82270	.4375	7/16"	11.113	7/16"	2-3/4"	1"	33.24	31.79	30.35	28.90
81310	82310	.5000	1/2"	12.700	1/2"	3"	1"	43.59	41.69	39.80	37.90
81330	82330	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	84.13	80.48	76.82	73.16
81350	82350	.7500	3/4"	19.050	3/4"	4"	1-1/2"	123.35	117.99	112.62	107.26
81370	82370	1.000	1"	25.400	1"	4"	1-1/2"	202.95	194.13	185.30	176.48

Standard Length - Straight Flute - Ball End

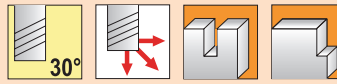
Solid submicron grain carbide end mill - center cutting
 For cutting high Rc materials
 Helps to hold perpendicularity



322M EDP#	334M EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Diameter								Metric
83070	84070	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	11.81	11.30	10.78	10.27
83110	84110	.1875	3/16"	4.763	3/16"	2"	5/8"	15.59	14.92	14.24	13.56
83150	84150	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	19.33	18.49	17.65	16.81
83190	84190	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	25.39	24.29	23.18	22.08
83230	84230	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	31.06	29.71	28.36	27.01
83270	84270	.4375	7/16"	11.113	7/16"	2-3/4"	1"	38.25	36.59	34.92	33.26
83310	84310	.5000	1/2"	12.700	1/2"	3"	1"	57.85	55.33	52.82	50.30
83330	84330	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	93.54	89.47	85.41	81.34
83350	84350	.7500	3/4"	19.050	3/4"	4"	1-1/2"	137.64	131.66	125.67	119.69
83370	84370	1.000	1"	25.400	1"	4"	1-1/2"	238.74	228.36	217.98	207.60

273M - 3 Flute - Square end
373M - 3 Flute - Ball end

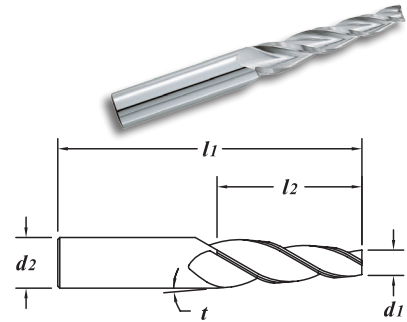
Technical information:
 page 228, 230



TOLERANCES	
$d1$	+0.003" -0.000" (+0.075 -0.000mm)
$d2$	-0.0001" -0.0004" (-0.0025 -0.0100mm)
r	+0.003" -0.000" (+0.075 -0.000mm)

Standard Length - Tapered

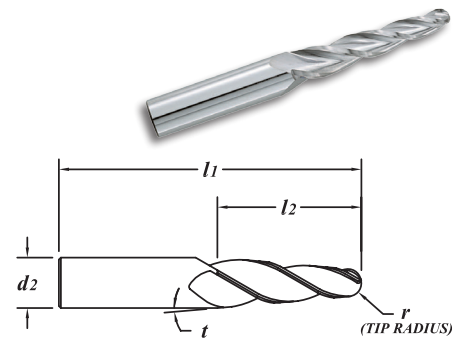
Solid submicron grain carbide end mill - center cutting
 Excellent for holding draft angles in mold and die applications



273M EDP#	$d2$ Shank Diameter	t Taper Per Side	$d1$ † Tip Diameter		$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric							
49010	1/4"	1°	.1250	1/8"	3.175	3"	1-1/2"	30.23	28.92	27.60	26.29
49020	1/4"	1° 30'	.1250	1/8"	3.175	3"	1-1/2"	30.23	28.92	27.60	26.29
49030	1/4"	2°	.1250	1/8"	3.175	3"	1"	30.23	28.92	27.60	26.29
49040	1/4"	3°	.1250	1/8"	3.175	3"	1"	30.23	28.92	27.60	26.29
49050	1/4"	5°	.1250	1/8"	3.175	3"	3/4"	30.23	28.92	27.60	26.29
49060	1/4"	7°	.1250	1/8"	3.175	3"	1/2"	30.23	28.92	27.60	26.29
49070	3/8"	1°	.1875	3/16"	4.763	3-1/2"	1-3/4"	45.40	43.43	41.45	39.48
49080	3/8"	1° 30'	.1875	3/16"	4.763	3-1/2"	1-3/4"	45.40	43.43	41.45	39.48
49090	3/8"	2°	.1875	3/16"	4.763	3-1/2"	1-3/4"	45.40	43.43	41.45	39.48
49100	3/8"	3°	.1562	5/32"	3.967	3-1/2"	1-3/4"	45.40	43.43	41.45	39.48
49110	3/8"	5°	.1250	1/8"	3.175	3-1/2"	1-1/2"	45.40	43.43	41.45	39.48
49120	3/8"	7°	.1562	5/32"	3.967	3-1/2"	3/4"	45.40	43.43	41.45	39.48
49130	1/2"	3°	.2500	1/4"	6.350	4"	2"	62.54	59.82	57.10	54.38
49140	1/2"	5°	.2500	1/4"	6.350	4"	1-1/4"	62.54	59.82	57.10	54.38
49150	1/2"	7°	.1875	3/16"	4.763	4"	1-1/4"	62.54	59.82	57.10	54.38

Standard Length - Tapered - Ball End

Solid submicron grain carbide end mill - center cutting
 Excellent for holding draft angles in mold and die applications

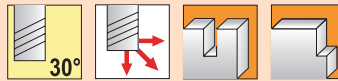


373M EDP#	$d2$ Shank Diameter	t Taper Per Side	r † Tip Radius		$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric							
50010	1/4"	1°	.0620	.062"	1.575	3"	1-1/2"	33.53	32.08	30.62	29.16
50020	1/4"	1° 30'	.0620	.062"	1.575	3"	1-1/2"	33.53	32.08	30.62	29.16
50030	1/4"	2°	.0620	.062"	1.575	3"	1"	33.53	32.08	30.62	29.16
50040	1/4"	3°	.0620	.062"	1.575	3"	1"	33.53	32.08	30.62	29.16
50050	1/4"	5°	.0620	.062"	1.575	3"	3/4"	33.53	32.08	30.62	29.16
50060	1/4"	7°	.0620	.062"	1.575	3"	1/2"	33.53	32.08	30.62	29.16
50070	3/8"	1°	.0930	.093"	2.362	3-1/2"	1-3/4"	50.42	48.22	46.03	43.84
50080	3/8"	1° 30'	.0930	.093"	2.362	3-1/2"	1-3/4"	50.42	48.22	46.03	43.84
50090	3/8"	2°	.0930	.093"	2.362	3-1/2"	1-3/4"	50.42	48.22	46.03	43.84
50100	3/8"	3°	.0780	.078"	1.981	3-1/2"	1-3/4"	50.42	48.22	46.03	43.84
50110	3/8"	5°	.0620	.062"	1.575	3-1/2"	1-1/2"	50.42	48.22	46.03	43.84
50120	3/8"	7°	.0780	.078"	1.981	3-1/2"	3/4"	50.42	48.22	46.03	43.84
50130	1/2"	3°	.1250	.125"	3.175	4"	2"	71.88	68.75	65.63	62.50
50140	1/2"	5°	.1250	.125"	3.175	4"	1-1/4"	71.88	68.75	65.63	62.50
50150	1/2"	7°	.0930	.093"	2.362	4"	1-1/4"	71.88	68.75	65.63	62.50

TOLERANCES

d_1	+.001" -.000" (+.025 -.000mm)	
d_2	1/8" - 3/16"	+.0000" -.0003" (-.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)
Ball radius	+.000" -.001" (+.000 -.025mm)	

Technical information:
page 228, 230

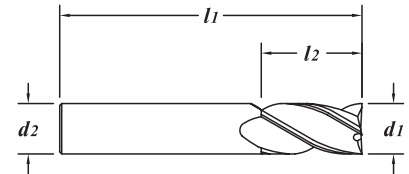


280M - 2 Flute - Square End
290M - 4 Flute - Square End
380M - 2 Flute - Ball End
390M - 4 Flute - Ball End

END MILLS

Standard Length - N/C Tolerance

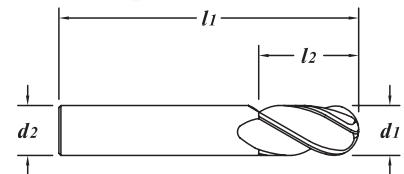
Solid submicron grain carbide end mill - center cutting
 Excellent for keyways
 Tight tolerance for precision machining
 For use when matching tools are necessary



280M EDP#	290M EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Diameter								Metric
25010	26010	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	13.50	12.91	12.33	11.74
25020	26020	.0938	3/32"	2.383	1/8"	1-1/2"	5/16"	12.79	12.23	11.68	11.12
25030	26030	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	12.42	11.88	11.34	10.80
25040	26040	.1875	3/16"	4.763	3/16"	2"	9/16"	16.51	15.80	15.08	14.36
25050	26050	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	18.99	18.16	17.34	16.51
25060	26060	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	27.19	26.00	24.82	23.64
* 25070	* 26070	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	34.89	33.37	31.86	30.34
* 25080	* 26080	.4375	7/16"	11.113	7/16"	2-3/4"	1"	42.57	40.72	38.87	37.02
* 25090	* 26090	.5000	1/2"	12.700	1/2"	3"	1"	55.89	53.46	51.03	48.60
* 25100	* 26100	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	99.49	95.16	90.84	86.51
* 25110	* 26110	.7500	3/4"	19.050	3/4"	4"	1-1/2"	148.79	142.32	135.85	129.38
* 25120	* 26120	1.000	1"	25.400	1"	4"	1-1/2"	252.68	241.69	230.71	219.72

Standard Length - N/C Tolerance - Ball End

Solid submicron grain carbide end mill - center cutting
 Excellent for keyways
 Tight tolerance for precision machining
 For use when matching tools are necessary
 Radius tolerance +.0005" -.0000" (+.0127mm -.0000mm)

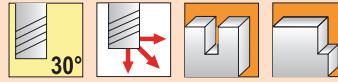


380M EDP#	390M EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Diameter								Metric
27010	28010	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	15.54	14.86	14.19	13.51
27020	28020	.0938	3/32"	2.383	1/8"	1-1/2"	5/16"	14.73	14.09	13.45	12.81
27030	28030	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	14.28	13.66	13.04	12.42
27040	28040	.1875	3/16"	4.763	3/16"	2"	9/16"	18.99	18.16	17.34	16.51
27050	28050	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	21.86	20.91	19.96	19.01
27060	28060	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	31.25	29.89	28.53	27.17
* 27070	* 28070	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	40.14	38.39	36.65	34.90
* 27080	* 28080	.4375	7/16"	11.113	7/16"	2-3/4"	1"	48.93	46.81	44.68	42.55
* 27090	* 28090	.5000	1/2"	12.700	1/2"	3"	1"	64.29	61.49	58.70	55.90
* 27100	* 28100	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	114.45	109.47	104.50	99.52
* 27110	* 28110	.7500	3/4"	19.050	3/4"	4"	1-1/2"	171.11	163.67	156.23	148.79
* 27120	* 28120	1.000	1"	25.400	1"	4"	1-1/2"	290.58	277.95	265.31	252.68

* - Tools with weldon flats

425M - 2 Flute
 435M - 4 Flute
 425MA - 2 Flute
 435MA - 4 Flute

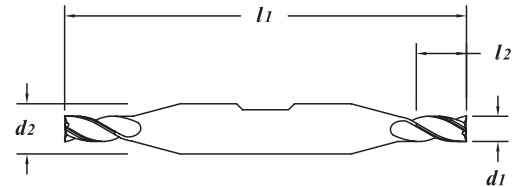
Technical information:
 page 228, 230



TOLERANCES	
d_1	+0.00" -0.002" (+0.00 -0.050mm)
d_2	-0.001" -0.004" (-0.025 -0.100mm)

Standard Length - Double End - 3/8" Shank

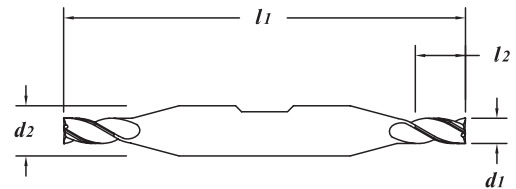
Solid submicron grain carbide end mill - center cutting
 Common 3/8" diameter shank **with weldon flat**
 For strength and adaptability when converting from high speed steel



425M EDP#	435M EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
33010	34010	.1250	1/8"	3.175	3/8"	3"	3/8"	36.13	34.56	32.99	31.42
33020	34020	.1562	5/32"	3.967	3/8"	3"	7/16"	36.13	34.56	32.99	31.42
33030	34030	.1875	3/16"	4.763	3/8"	3"	1/2"	36.13	34.56	32.99	31.42
33040	34040	.2188	7/32"	5.558	3/8"	3"	9/16"	36.13	34.56	32.99	31.42
33050	34050	.2500	1/4"	6.350	3/8"	3"	5/8"	36.13	34.56	32.99	31.42
33060	34060	.2812	9/32"	7.142	3/8"	4"	11/16"	41.52	39.71	37.91	36.10
33070	34070	.3125	5/16"	7.938	3/8"	4"	3/4"	41.52	39.71	37.91	36.10
33080	34080	.3438	11/32"	8.733	3/8"	4"	3/4"	41.52	39.71	37.91	36.10
33090	34090	.3750	3/8"	9.525	3/8"	4"	3/4"	41.52	39.71	37.91	36.10

Standard Length - Double End - 3/8" Shank - TiAlN Coated

Solid submicron grain carbide end mill - center cutting
 Common 3/8" diameter shank **with weldon flat**
 For strength and adaptability when converting from high speed steel
 Dry or semi-dry machining
 Up to 40% faster than uncoated



425MA EDP#	435MA EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
33017	34017	.1250	1/8"	3.175	3/8"	3"	3/8"	47.55	45.49	43.42	41.35
33027	34027	.1562	5/32"	3.967	3/8"	3"	7/16"	47.55	45.49	43.42	41.35
33037	34037	.1875	3/16"	4.763	3/8"	3"	1/2"	47.55	45.49	43.42	41.35
33047	34047	.2188	7/32"	5.558	3/8"	3"	9/16"	47.55	45.49	43.42	41.35
33057	34057	.2500	1/4"	6.350	3/8"	3"	5/8"	47.55	45.49	43.42	41.35
33067	34067	.2812	9/32"	7.142	3/8"	4"	11/16"	56.01	53.57	51.14	48.70
33077	34077	.3125	5/16"	7.938	3/8"	4"	3/4"	56.01	53.57	51.14	48.70
33087	34087	.3438	11/32"	8.733	3/8"	4"	3/4"	56.01	53.57	51.14	48.70
33097	34097	.3750	3/8"	9.525	3/8"	4"	3/4"	56.01	53.57	51.14	48.70

TOLERANCES

d_1	+0.000" -0.002" (+0.000 -0.050mm)
d_2	-0.0001" -0.0004" (-0.0025 -0.1000mm)
Ball radius	+0.000" -0.001" (+0.000 -0.025mm)

Technical information:
page 228, 230

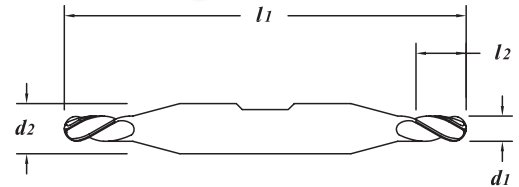


525M - 2 Flute
535M - 4 Flute
525MA - 2 Flute
535MA - 4 Flute

END MILLS

Standard Length - Double End - 3/8" Shank - Ball End

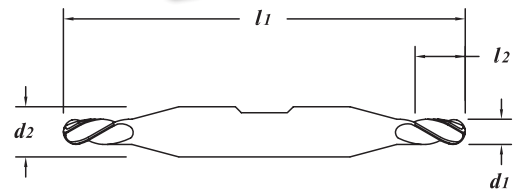
Solid submicron grain carbide end mill - center cutting
 Common 3/8" diameter shank **with weldon flat**
 For strength and adaptability when converting from high speed steel



525M EDP#	535M EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Diameter								Metric
35010	36010	.1250	1/8"	3.175	3/8"	3"	3/8"	42.50	40.66	38.81	36.96
35020	36020	.1562	5/32"	3.967	3/8"	3"	7/16"	42.50	40.66	38.81	36.96
35030	36030	.1875	3/16"	4.763	3/8"	3"	1/2"	42.50	40.66	38.81	36.96
35040	36040	.2188	7/32"	5.558	3/8"	3"	9/16"	42.50	40.66	38.81	36.96
35050	36050	.2500	1/4"	6.350	3/8"	3"	5/8"	42.50	40.66	38.81	36.96
35060	36060	.2812	9/32"	7.142	3/8"	4"	11/16"	48.83	46.71	44.58	42.46
35070	36070	.3125	5/16"	7.938	3/8"	4"	3/4"	48.83	46.71	44.58	42.46
35080	36080	.3438	11/32"	8.733	3/8"	4"	3/4"	48.83	46.71	44.58	42.46
35090	36090	.3750	3/8"	9.525	3/8"	4"	3/4"	48.83	46.71	44.58	42.46

Standard Length - Double End - 3/8" Shank - Ball End - TiALN Coated

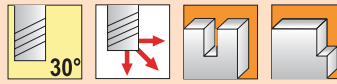
Solid submicron grain carbide end mill - center cutting
 Common 3/8" diameter shank **with weldon flat**
 For strength and adaptability when converting from high speed steel
 Dry or semi-dry machining
 Up to 40% faster than uncoated



525MA EDP#	535MA EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Diameter								Metric
35017	36017	.1250	1/8"	3.175	3/8"	3"	3/8"	53.92	51.58	49.23	46.89
35027	36027	.1562	5/32"	3.967	3/8"	3"	7/16"	53.92	51.58	49.23	46.89
35037	36037	.1875	3/16"	4.763	3/8"	3"	1/2"	53.92	51.58	49.23	46.89
35047	36047	.2188	7/32"	5.558	3/8"	3"	9/16"	53.92	51.58	49.23	46.89
35057	36057	.2500	1/4"	6.350	3/8"	3"	5/8"	53.92	51.58	49.23	46.89
35067	36067	.2812	9/32"	7.142	3/8"	4"	11/16"	63.33	60.58	57.82	55.07
35077	36077	.3125	5/16"	7.938	3/8"	4"	3/4"	63.33	60.58	57.82	55.07
35087	36087	.3438	11/32"	8.733	3/8"	4"	3/4"	63.33	60.58	57.82	55.07
35097	36097	.3750	3/8"	9.525	3/8"	4"	3/4"	63.33	60.58	57.82	55.07

420M (440M metric) - 2 Flute
430M (450M metric) - 4 Flute

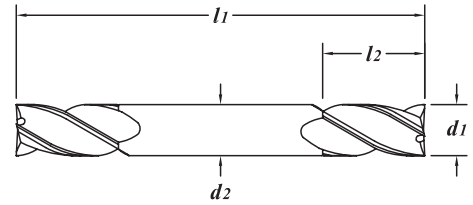
Technical information:
 page 228, 230



TOLERANCES		
$d1$		+0.000° -0.002° (+0.000 -0.050mm)
$d2$	3mm - 6mm	+0.0000° -0.0003° (-0.0000 -0.0075mm)
	1/4" - 1/2"	-0.0001° -0.0004° (-0.0025 -0.0100mm)

Standard Length - Double End

Solid submicron grain carbide end mill - center cutting
 Extremely versatile
 TiAlN Coated - page 183

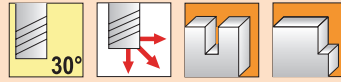


2 Flute EDP#	4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
29010	30010	.0312	1/32"	0.792	1/8"	2"	3/32"	21.87	20.92	19.97	19.02
29510	30510	.0394		1.000	3.0	50	4	23.02	22.02	21.02	20.02
29020	30020	.0469	3/64"	1.191	1/8"	2"	1/8"	21.87	20.92	19.97	19.02
29520	30520	.0591		1.500	3.0	50	5	23.02	22.02	21.02	20.02
29030	30030	.0625	1/16"	1.588	1/8"	2"	3/16"	21.87	20.92	19.97	19.02
29530	30530	.0787		2.000	3.0	50	6	23.02	22.02	21.02	20.02
29040	30040	.0938	3/32"	2.383	1/8"	2"	1/4"	21.87	20.92	19.97	19.02
29540	30540	.0984		2.500	3.0	50	7	23.02	22.02	21.02	20.02
29550	30550	.1181		3.000	3.0	50	8	16.63	15.91	15.18	14.46
29050	30050	.1250	1/8"	3.175	1/8"	2"	3/8"	15.80	15.11	14.43	13.74
29560	30560	.1378		3.500	4.0	65	9.5	23.77	22.74	21.70	20.67
29060	30060	.1562	5/32"	3.967	3/16"	2-1/2"	7/16"	22.59	21.60	20.62	19.64
29570	30570	.1575		4.000	4.0	65	10	19.90	19.03	18.17	17.30
29580	30580	.1772		4.500	5.0	65	12	26.47	25.32	24.17	23.02
29070	30070	.1875	3/16"	4.763	3/16"	2-1/2"	1/2"	18.89	18.07	17.25	16.43
29590	30590	.1969		5.000	5.0	65	12	23.08	22.08	21.07	20.07
29080	30080	.2188	7/32"	5.558	1/4"	2-1/2"	9/16"	25.15	24.06	22.96	21.87
29600	30600	.2362		6.000	6.0	65	16	24.10	23.06	22.01	20.96
29090	30090	.2500	1/4"	6.350	1/4"	2-1/2"	5/8"	22.91	21.91	20.92	19.92
29610	30610	.2756		7.000	7.0	88	19	30.30	28.99	27.67	26.35
29100	30100	.3125	5/16"	7.938	5/16"	3-1/2"	3/4"	29.91	28.61	27.31	26.01
-	30620	.3150		8.000	8.0	88	19	31.49	30.12	28.75	27.38
29630	30630	.3543		9.000	9.0	88	19	40.66	38.90	37.13	35.36
29110	30110	.3750	3/8"	9.525	3/8"	3-1/2"	3/4"	38.63	36.95	35.27	33.59
29640	30640	.3937		10.000	10.0	88	19	54.05	51.70	49.35	47.00
-	30650	.4331		11.000	11.0	100	22	57.78	55.26	52.75	50.24
29120	30120	.4375	7/16"	11.113	7/16"	4"	7/8"	54.90	52.51	50.13	47.74
29660	30660	.4724		12.000	12.0	100	25	64.95	62.13	59.30	56.48
29130	30130	.5000	1/2"	12.700	1/2"	4"	1"	61.69	59.00	56.32	53.64
29140	30140	.5625	9/16"	14.288	9/16"	6"	1-1/4"	117.36	112.26	107.15	102.05
29670	-	.6299		16.000	16.0	150	32	158.73	151.83	144.93	138.03
-	30680	.7874		20.000	20.0	150	38	298.59	285.60	272.62	259.64
29170	30170	.8750	7/8"	22.225	7/8"	6"	1-1/2"	341.00	326.17	311.35	296.52
29180	30180	1.000	1"	25.400	1"	6"	1-1/2"	372.47	356.28	340.08	323.89

TOLERANCES

$d1$		+0.000" - .002" (+.000 - .050mm)
$d2$	3mm - 6mm	+0.0000" - .0003" (-.0000 - .0075mm)
	1/4" - 1/2"	-.0001" - .0004" (-.0025 - .0100mm)

Technical information:
page 228, 230

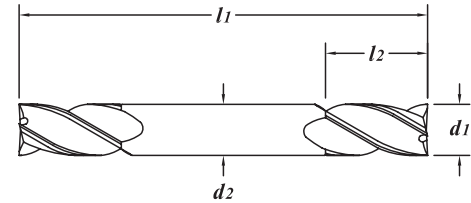


420MA (440MA metric) - 2 Flute
430MA (450MA metric) - 4 Flute

END MILLS

Standard Length - Double End - TiALN Coated

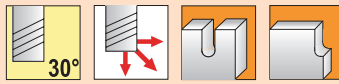
- Solid submicron grain carbide end mill - center cutting
- Dry or semi-dry machining
- Up to 40% faster than uncoated
- Extremely versatile
- Uncoated - page 182



2 Flute EDP#	4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
29017	30017	.0312	1/32"	0.792	1/8"	2"	3/32"	25.58	24.46	23.35	22.24
29517	30517	.0394		1.000	3.0	50	4	26.74	25.58	24.41	23.25
29027	30027	.0469	3/64"	1.191	1/8"	2"	1/8"	25.58	24.46	23.35	22.24
-	30527	.0591		1.500	3.0	50	5	26.74	25.58	24.41	23.25
29037	30037	.0625	1/16"	1.588	1/8"	2"	3/16"	25.58	24.46	23.35	22.24
29537	30537	.0787		2.000	3.0	50	6	26.74	25.58	24.41	23.25
29047	30047	.0938	3/32"	2.383	1/8"	2"	1/4"	25.58	24.46	23.35	22.24
-	30547	.0984		2.500	3.0	50	7	26.74	25.58	24.41	23.25
29557	30557	.1181		3.000	3.0	50	8	20.33	19.45	18.56	17.68
29057	30057	.1250	1/8"	3.175	1/8"	2"	3/8"	19.50	18.66	17.81	16.96
29567	30567	.1378		3.500	4.0	65	9.5	29.53	28.25	26.96	25.68
29067	30067	.1562	5/32"	3.967	3/16"	2-1/2"	7/16"	28.34	27.10	25.87	24.64
29577	30577	.1575		4.000	4.0	65	10	25.65	24.53	23.42	22.30
-	30587	.1772		4.500	5.0	65	12	34.10	32.62	31.13	29.65
29077	30077	.1875	3/16"	4.763	3/16"	2-1/2"	1/2"	24.67	23.60	22.52	21.45
29597	30597	.1969		5.000	5.0	65	12	30.69	29.36	28.02	26.69
29087	30087	.2188	7/32"	5.558	1/4"	2-1/2"	9/16"	32.78	31.35	29.93	28.50
29607	30607	.2362		6.000	6.0	65	16	31.73	30.35	28.97	27.59
29097	30097	.2500	1/4"	6.350	1/4"	2-1/2"	5/8"	30.56	29.23	27.90	26.57
-	30617	.2756		7.000	7.0	88	19	44.80	42.86	40.91	38.96
29107	30107	.3125	5/16"	7.938	5/16"	3-1/2"	3/4"	44.41	42.48	40.55	38.62
-	30627	.3150		8.000	8.0	88	19	45.99	43.99	41.99	39.99
-	30637	.3543		9.000	9.0	88	19	55.17	52.77	50.37	47.97
29117	30117	.3750	3/8"	9.525	3/8"	3-1/2"	3/4"	53.15	50.84	48.53	46.22
29647	30647	.3937		10.000	10.0	88	19	70.86	67.78	64.70	61.62
-	30657	.4331		11.000	11.0	100	22	74.59	71.35	68.10	64.86
29127	30127	.4375	7/16"	11.113	7/16"	4"	7/8"	71.70	68.59	65.47	62.35
-	30667	.4724		12.000	12.0	100	25	81.75	78.20	74.64	71.09
29137	30137	.5000	1/2"	12.700	1/2"	4"	1"	78.49	75.08	71.66	68.25
29157	-	.6250	5/8"	15.875	5/8"	6"	1-1/4"	178.72	170.95	163.18	155.41
-	30677	.6299		16.000	16.0	150	32	186.66	178.54	170.43	162.31
29167	30167	.7500	3/4"	19.050	3/4"	6"	1-1/2"	240.73	230.26	219.80	209.33
-	30177	.8750	7/8"	22.225	7/8"	6"	1-1/2"	382.92	366.27	349.62	332.97

520M (540M metric) - 2 Flute
530M (550M metric) - 4 Flute

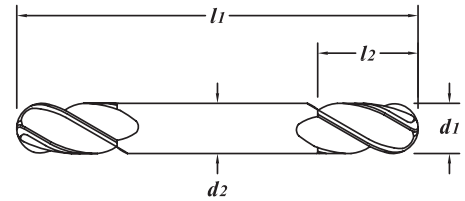
Technical information:
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TOLERANCES		
d_1	+0.000" -0.002" (+0.000 -0.050mm)	
d_2	1/8" - 3/16"	+0.0000" -0.0003" (-0.0000 -0.0075mm)
	1/4" - 1/2"	-0.0001" -0.0004" (-0.0025 -0.0100mm)
Ball radius	+0.000" -0.001" (+0.000 -0.025mm)	

Standard Length - Double End - Ball End

Solid submicron grain carbide end mill - center cutting
 Extremely versatile
 TiAlN Coated - page 185

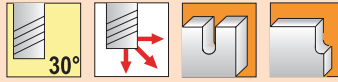


2 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
31010	32010	.0312	1/32"	0.792	1/8"	2"	3/32"	25.16	24.07	22.97	21.88
31510	32510	.0394		1.000	3.0	50	4	26.47	25.32	24.17	23.02
31020	32020	.0469	3/64"	1.191	1/8"	2"	1/8"	25.16	24.07	22.97	21.88
31520	32520	.0591		1.500	3.0	50	5	26.47	25.32	24.17	23.02
-	32030	.0625	1/16"	1.588	1/8"	2"	3/16"	25.16	24.07	22.97	21.88
31530	-	.0787		2.000	3.0	50	6	26.47	25.32	24.17	23.02
31040	32040	.0938	3/32"	2.383	1/8"	2"	1/4"	25.16	24.07	22.97	21.88
31540	32540	.0984		2.500	3.0	50	7	26.47	25.32	24.17	23.02
31550	32550	.1181		3.000	3.0	50	8	19.12	18.29	17.46	16.63
31050	32050	.1250	1/8"	3.175	1/8"	2"	3/8"	18.16	17.37	16.58	15.79
31560	32560	.1378		3.500	4.0	65	9.5	27.35	26.16	24.97	23.78
31060	32060	.1562	5/32"	3.967	3/16"	2-1/2"	7/16"	25.98	24.85	23.72	22.59
31570	32570	.1575		4.000	4.0	65	10	23.41	22.40	21.38	20.36
31580	32580	.1772		4.500	5.0	65	12	30.48	29.15	27.83	26.50
31070	32070	.1875	3/16"	4.763	3/16"	2-1/2"	1/2"	22.24	21.27	20.31	19.34
31590	32590	.1969		5.000	5.0	65	12	26.75	25.59	24.42	23.26
31080	32080	.2188	7/32"	5.558	1/4"	2-1/2"	9/16"	28.92	27.67	26.41	25.15
-	32600	.2362		6.000	6.0	65	16	27.80	26.59	25.38	24.17
31090	32090	.2500	1/4"	6.350	1/4"	2-1/2"	5/8"	26.39	25.25	24.10	22.95
31610	32610	.2756		7.000	7.0	88	19	35.05	33.53	32.00	30.48
31100	32100	.3125	5/16"	7.938	5/16"	3-1/2"	3/4"	34.40	32.90	31.41	29.91
31620	32620	.3150		8.000	8.0	88	19	36.23	34.65	33.08	31.50
31630	32630	.3543		9.000	9.0	88	19	46.81	44.77	42.74	40.70
31110	32110	.3750	3/8"	9.525	3/8"	3-1/2"	3/4"	44.46	42.53	40.59	38.66
31640	32640	.3937		10.000	10.0	88	19	62.72	59.99	57.27	54.54
31650	-	.4331		11.000	11.0	100	22	66.45	63.56	60.67	57.78
31120	32120	.4375	7/16"	11.113	7/16"	4"	7/8"	63.14	60.39	57.65	54.90
31660	32660	.4724		12.000	12.0	100	25	74.67	71.42	68.18	64.93
31130	32130	.5000	1/2"	12.700	1/2"	4"	1"	70.94	67.86	64.77	61.69
-	32140	.5625	9/16"	14.288	9/16"	6"	1-1/4"	135.01	129.14	123.27	117.40
31150	-	.6250	5/8"	15.875	5/8"	6"	1-1/4"	173.40	165.86	158.32	150.78
31160	-	.7500	3/4"	19.050	3/4"	6"	1-1/2"	239.75	229.33	218.90	208.48
31170	32170	.8750	7/8"	22.225	7/8"	6"	1-1/2"	391.89	374.85	357.81	340.77
-	32690	.9843		25.000	25.0	150	38	450.88	431.28	411.67	392.07
31180	32180	1.000	1"	25.400	1"	6"	1-1/2"	428.34	409.72	391.09	372.47

TOLERANCES

d_1	+.000" -.002" (+.000 -.050mm)	
d_2	1/8" - 3/16"	+.0000" -.0003" (-.0000 -.0075mm)
	1/4" - 1/2"	-.0001" -.0004" (-.0025 -.0100mm)
Ball radius	+.000" -.001" (+.000 -.025mm)	

Technical information:
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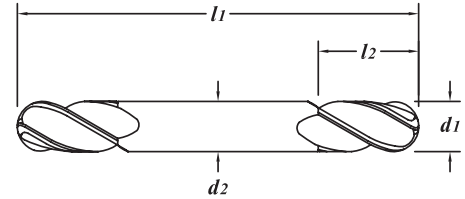


520MA (540MA metric) - 2 Flute
530MA (550MA metric) - 4 Flute

END MILLS

Standard Length - Double End - Ball End - TiAlN Coated

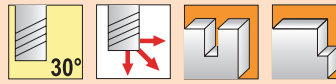
- Solid submicron grain carbide end mill - center cutting
- Dry or semi-dry machining
- Up to 40% faster than uncoated
- Extremely versatile
- Uncoated - page 184



2 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
31017	32017	.0312	1/32"	0.792	1/8"	2"	3/32"	28.87	27.61	26.36	25.10
31517	-	.0394		1.000	3.0	50	4	26.47	25.32	24.17	23.02
31027	32027	.0469	3/64"	1.191	1/8"	2"	1/8"	28.87	27.61	26.36	25.10
31527	-	.0591		1.500	3.0	50	5	26.47	25.32	24.17	23.02
31037	32037	.0625	1/16"	1.588	1/8"	2"	3/16"	28.87	27.61	26.36	25.10
31537	-	.0787		2.000	3.0	50	6	26.47	25.32	24.17	23.02
31047	32047	.0938	3/32"	2.383	1/8"	2"	1/4"	28.87	27.61	26.36	25.10
31547	32547	.0984		2.500	3.0	50	7	30.18	28.86	27.55	26.24
31557	-	.1181		3.000	3.0	50	8	22.82	21.82	20.83	19.84
31057	32057	.1250	1/8"	3.175	1/8"	2"	3/8"	21.86	20.91	19.96	19.01
-	32567	.1378		3.500	4.0	65	9.5	33.10	31.66	30.22	28.78
31067	32067	.1562	5/32"	3.967	3/16"	2-1/2"	7/16"	31.73	30.35	28.97	27.59
31577	32577	.1575		4.000	4.0	65	10	29.18	27.91	26.64	25.37
31077	32077	.1875	3/16"	4.763	3/16"	2-1/2"	1/2"	28.00	26.79	25.57	24.35
31597	-	.1969		5.000	5.0	65	12	34.37	32.88	31.38	29.89
31087	32087	.2188	7/32"	5.558	1/4"	2-1/2"	9/16"	36.56	34.97	33.38	31.79
31607	-	.2362		6.000	6.0	65	16	35.42	33.88	32.34	30.80
31097	32097	.2500	1/4"	6.350	1/4"	2-1/2"	5/8"	34.03	32.55	31.07	29.59
31107	32107	.3125	5/16"	7.938	5/16"	3-1/2"	3/4"	48.91	46.78	44.66	42.53
31627	32627	.3150		8.000	8.0	88	19	50.73	48.52	46.32	44.11
31117	32117	.3750	3/8"	9.525	3/8"	3-1/2"	3/4"	58.96	56.40	53.83	51.27
-	32647	.3937		10.000	10.0	88	19	79.53	76.08	72.62	69.16
31127	32127	.4375	7/16"	11.113	7/16"	4"	7/8"	79.94	76.46	72.99	69.51
31667	-	.4724		12.000	12.0	100	25	91.49	87.52	83.54	79.56
31137	32137	.5000	1/2"	12.700	1/2"	4"	1"	87.75	83.93	80.12	76.30
31157	32157	.6250	5/8"	15.875	5/8"	6"	1-1/4"	201.30	192.54	183.79	175.04
31167	32167	.7500	3/4"	19.050	3/4"	6"	1-1/2"	272.06	260.23	248.40	236.57
-	32687	.7874		20.000	20.0	150	38	387.31	370.47	353.63	336.79
-	32187	1.000	1"	25.400	1"	6"	1-1/2"	470.28	449.83	429.39	408.94

620M (640M metric) - 2 Flute
623M (643M metric) - 3 Flute
630M (650M metric) - 4 Flute
 .1181" - .3150"
 (3.000mm - 8.000mm)

Technical information:
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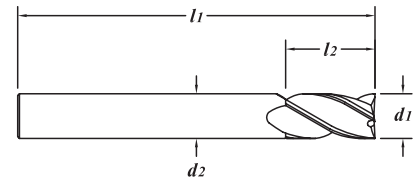


TOLERANCES

$d1$	+0.000" -0.002" (+0.000 -0.050mm)
$d2$	3mm - 6mm +0.0000" -0.0033" (-0.0000 -0.075mm)
	1/4" - 1-1/4" -0.0001" -0.0044" (-0.0025 -0.100mm)

Extra Length

- Solid submicron grain carbide end mill - center cutting
- Extended reach
- Can be modified with a neck within 48 hours
- Extremely versatile
- TiCN Coated - page 188
- TiALN Coated - page 189



2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100
			Decimal	Metric							
92010	93010	94010	.1181	3.000	3.0	50	16	11.64	11.13	10.63	10.12
92020	93020	94020	.1181	3.000	3.0	75	20	19.78	18.92	18.06	17.20
92030	93030	94030	.1181	3.000	3.0	75	25	19.78	18.92	18.06	17.20
41010	54510	42010	.1250	1/8"	3.175	1/8"	2"	12.18	11.65	11.12	10.59
41020	54520	42020	.1250	1/8"	3.175	1/8"	3"	18.79	17.97	17.16	16.34
41030	54530	42030	.1250	1/8"	3.175	1/8"	3"	18.79	17.97	17.16	16.34
92040	93040	94040	.1575	4.000	4.0	50	16	12.24	11.70	11.17	10.64
92050	93050	94050	.1575	4.000	4.0	75	20	20.24	19.36	18.48	17.60
92060	93060	94060	.1575	4.000	4.0	75	25	20.24	19.36	18.48	17.60
41040	54540	42040	.1875	3/16"	4.763	3/16"	3"	20.73	19.83	18.93	18.03
41050	54550	42050	.1875	3/16"	4.763	3/16"	3"	20.73	19.83	18.93	18.03
41060	54560	42060	.1875	3/16"	4.763	3/16"	4"	22.90	21.90	20.91	19.91
92070	93070	94070	.1969	5.000	5.0	50	16	14.38	13.75	13.13	12.50
92080	93080	94080	.1969	5.000	5.0	75	20	21.83	20.88	19.93	18.98
92090	93090	94090	.1969	5.000	5.0	75	25	21.83	20.88	19.93	18.98
92100	93100	94100	.2362	6.000	6.0	75	25	25.30	24.20	23.10	22.00
92110	93110	94110	.2362	6.000	6.0	100	25	26.69	25.53	24.37	23.21
92120	93120	94120	.2362	6.000	6.0	100	32	26.69	25.53	24.37	23.21
92130	93130	94130	.2362	6.000	6.0	150	38	36.11	34.54	32.97	31.40
41070	54570	42070	.2500	1/4"	6.350	1/4"	3"	24.01	22.97	21.92	20.88
41080	54580	42080	.2500	1/4"	6.350	1/4"	4"	25.36	24.26	23.15	22.05
41090	54590	42090	.2500	1/4"	6.350	1/4"	4"	25.36	24.26	23.15	22.05
41100	54600	42100	.2500	1/4"	6.350	1/4"	6"	34.29	32.80	31.31	29.82
41110	54610	42110	.3125	5/16"	7.938	5/16"	3"	29.64	28.35	27.06	25.77
41120	54620	42120	.3125	5/16"	7.938	5/16"	4"	33.09	31.65	30.21	28.77
41130	54630	42130	.3125	5/16"	7.938	5/16"	4"	33.09	31.65	30.21	28.77
41140	54640	42140	.3125	5/16"	7.938	5/16"	6"	49.07	46.94	44.80	42.67
92140	93140	94140	.3150	8.000	8.0	75	25	31.21	29.85	28.50	27.14
92150	93150	94150	.3150	8.000	8.0	100	25	34.81	33.30	31.78	30.27
92160	93160	94160	.3150	8.000	8.0	100	41	34.81	33.30	31.78	30.27
92170	93170	94170	.3150	8.000	8.0	150	50	50.31	48.13	45.94	43.75

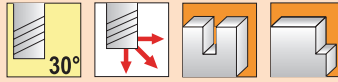
620M (640M metric) - 2 Flute (continued)
623M (643M metric) - 3 Flute (continued)
630M (650M metric) - 4 Flute (continued)

.3750" - 1.250"
 (9.525mm - 31.750mm)

2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
41150	54650	42150	.3750	3/8"	9.525	3/8"	3"	1"	33.34	31.89	30.44	28.99
41160	54660	42160	.3750	3/8"	9.525	3/8"	4"	1"	36.60	35.01	33.42	31.83
41170	54670	42170	.3750	3/8"	9.525	3/8"	4"	2"	36.60	35.01	33.42	31.83
41180	54680	42180	.3750	3/8"	9.525	3/8"	6"	1-1/2"	53.35	51.03	48.71	46.39
41190	54690	42190	.3750	3/8"	9.525	3/8"	6"	3"	53.35	51.03	48.71	46.39
92180	93180	94180	.3937		10.000	10.0	75	25	36.20	34.63	33.05	31.48
92190	93190	94190	.3937		10.000	10.0	100	25	46.67	44.64	42.61	40.58
92200	93200	94200	.3937		10.000	10.0	100	50	46.67	44.64	42.61	40.58
92210	93210	94210	.3937		10.000	10.0	150	38	61.39	58.72	56.05	53.38
92220	93220	94220	.3937		10.000	10.0	150	75	61.39	58.72	56.05	53.38
41200	54700	42200	.4375	7/16"	11.113	7/16"	4"	1"	50.39	48.20	46.01	43.82
41210	54710	42210	.4375	7/16"	11.113	7/16"	4"	2"	50.39	48.20	46.01	43.82
41220	54720	42220	.4375	7/16"	11.113	7/16"	6"	1-1/2"	66.99	64.08	61.16	58.25
41230	54730	42230	.4375	7/16"	11.113	7/16"	6"	3"	66.99	64.08	61.16	58.25
92230	93230	94230	.4724		12.000	12.0	100	25	56.83	54.36	51.89	49.42
92240	93240	94240	.4724		12.000	12.0	100	50	56.83	54.36	51.89	49.42
92250	93250	94250	.4724		12.000	12.0	150	50	77.50	74.13	70.76	67.39
92260	93260	94260	.4724		12.000	12.0	150	75	77.50	74.13	70.76	67.39
41240	54740	42240	.5000	1/2"	12.700	1/2"	4"	1"	53.60	51.27	48.94	46.61
41250	54750	42250	.5000	1/2"	12.700	1/2"	4"	2"	53.60	51.27	48.94	46.61
41260	54760	42260	.5000	1/2"	12.700	1/2"	6"	1-1/2"	77.50	74.13	70.76	67.39
41270	54770	42270	.5000	1/2"	12.700	1/2"	6"	3"	77.50	74.13	70.76	67.39
92270	93270	94270	.5512		14.000	14.0	100	25	78.03	74.64	71.24	67.85
92280	93280	94280	.5512		14.000	14.0	100	50	78.03	74.64	71.24	67.85
92290	93290	94290	.5512		14.000	14.0	150	50	101.73	97.31	92.88	88.46
92300	93300	94300	.5512		14.000	14.0	150	75	101.73	97.31	92.88	88.46
41280	54780	42280	.5625	9/16"	14.288	9/16"	6"	2"	101.74	97.32	92.89	88.47
41290	54790	42290	.5625	9/16"	14.288	9/16"	6"	3"	101.74	97.32	92.89	88.47
41300	54800	42300	.6250	5/8"	15.875	5/8"	6"	2"	110.47	105.67	100.86	96.06
41310	54810	42310	.6250	5/8"	15.875	5/8"	6"	3"	110.47	105.67	100.86	96.06
92310	93310	94310	.6299		16.000	16.0	150	50	110.47	105.67	100.86	96.06
92320	93320	94320	.6299		16.000	16.0	150	75	110.47	105.67	100.86	96.06
92330	93330	94330	.7087		18.000	18.0	150	50	166.08	158.86	151.64	144.42
92340	93340	94340	.7087		18.000	18.0	150	75	166.08	158.86	151.64	144.42
41320	54820	42320	.7500	3/4"	19.050	3/4"	6"	2"	175.97	168.32	160.67	153.02
41330	54830	42330	.7500	3/4"	19.050	3/4"	6"	3"	175.97	168.32	160.67	153.02
92350	93350	94350	.7874		20.000	20.0	150	50	185.38	177.32	169.26	161.20
92360	93360	94360	.7874		20.000	20.0	150	75	185.38	177.32	169.26	161.20
92370	93370	94370	.9843		25.000	25.0	150	50	285.66	273.24	260.82	248.40
92380	93380	94380	.9843		25.000	25.0	150	75	285.66	273.24	260.82	248.40
41340	54840	42340	1.000	1"	25.400	1"	6"	2"	299.16	286.15	273.15	260.14
41350	54850	42350	1.000	1"	25.400	1"	6"	3"	299.16	286.15	273.15	260.14
-	-	42360	1.000	1"	25.400	1"	6"	4"	314.90	301.21	287.52	273.83
-	-	42390	1.250	1-1/4"	31.750	1-1/4"	6"	3"	634.71	607.11	579.52	551.92

620MC - 2 Flute
623MC - 3 Flute
630MC - 4 Flute

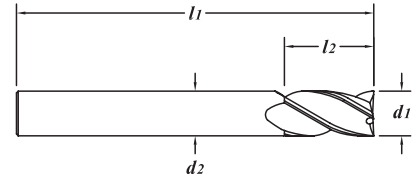
Technical information:
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TOLERANCES		
d_1	+0.000" -0.002" (+0.000 -0.050mm)	
d_2	1/8" - 3/16"	+0.0000" -0.0033" (-0.0000 -0.075mm)
	1/4" - 1-1/4"	-0.0001" -0.0004" (-0.0025 -0.100mm)

Extra Length - TiCN Coated

- Solid submicron grain carbide end mill - center cutting
- Extended reach
- Improved abrasion resistance and lubricity
- Up to 25% faster than uncoated
- Can be modified with a neck within 48 hours
- Extremely versatile
- Uncoated - page 186
- TiAlN Coated - page 189

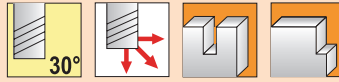


2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
41014	54514	42014	.1250	1/8"	3.175	1/8"	2"	5/8"	14.35	13.73	13.10	12.48
41024	54524	42024	.1250	1/8"	3.175	1/8"	3"	3/4"	21.44	20.50	19.57	18.64
41034	54534	42034	.1250	1/8"	3.175	1/8"	3"	1"	21.44	20.50	19.57	18.64
41044	54544	42044	.1875	3/16"	4.763	3/16"	3"	1"	23.79	22.76	21.72	20.69
41054	54554	42054	.1875	3/16"	4.763	3/16"	3"	1-1/8"	23.79	22.76	21.72	20.69
41064	54564	42064	.1875	3/16"	4.763	3/16"	4"	1"	26.43	25.28	24.13	22.98
41074	54574	42074	.2500	1/4"	6.350	1/4"	3"	1"	28.44	27.20	25.97	24.73
41084	54584	42084	.2500	1/4"	6.350	1/4"	4"	1"	30.13	28.82	27.51	26.20
41094	54594	42094	.2500	1/4"	6.350	1/4"	4"	1-1/2"	30.13	28.82	27.51	26.20
41104	54604	42104	.2500	1/4"	6.350	1/4"	6"	1-1/2"	42.56	40.71	38.86	37.01
41114	54614	42114	.3125	5/16"	7.938	5/16"	3"	1"	35.54	33.99	32.45	30.90
41124	54624	42124	.3125	5/16"	7.938	5/16"	4"	1"	40.39	38.63	36.88	35.12
41134	54634	42134	.3125	5/16"	7.938	5/16"	4"	1-5/8"	40.39	38.63	36.88	35.12
41144	54644	42144	.3125	5/16"	7.938	5/16"	6"	1-1/2"	58.95	56.39	53.82	51.26
41154	54654	42154	.3750	3/8"	9.525	3/8"	3"	1"	39.24	37.53	35.83	34.12
41164	54664	42164	.3750	3/8"	9.525	3/8"	4"	1"	43.96	42.05	40.14	38.23
41174	54674	42174	.3750	3/8"	9.525	3/8"	4"	2"	43.96	42.05	40.14	38.23
41184	54684	42184	.3750	3/8"	9.525	3/8"	6"	1-1/2"	63.25	60.50	57.75	55.00
41194	54694	42194	.3750	3/8"	9.523	3/8"	6"	3"	63.25	60.50	57.75	55.00
41204	54704	42204	.4375	7/16"	11.113	7/16"	4"	1"	59.23	56.65	54.08	51.50
41214	54714	42214	.4375	7/16"	11.113	7/16"	4"	2"	59.23	56.65	54.08	51.50
41224	54724	42224	.4375	7/16"	11.113	7/16"	6"	1-1/2"	79.51	76.05	72.60	69.14
41234	54734	42234	.4375	7/16"	11.113	7/16"	6"	3"	79.51	76.05	72.60	69.14
41244	54744	42244	.5000	1/2"	12.700	1/2"	4"	1"	62.43	59.72	57.00	54.29
41254	54754	42254	.5000	1/2"	12.700	1/2"	4"	2"	62.43	59.72	57.00	54.29
41264	54764	42264	.5000	1/2"	12.700	1/2"	6"	1-1/2"	90.02	86.11	82.19	78.28
41274	54774	42274	.5000	1/2"	12.700	1/2"	6"	3"	90.02	86.11	82.19	78.28
41284	54784	42284	.5625	9/16"	14.288	9/16"	6"	2"	117.19	112.09	107.00	101.90
41294	54794	42294	.5625	9/16"	14.288	9/16"	6"	3"	117.19	112.09	107.00	101.90
41304	54804	42304	.6250	5/8"	15.875	5/8"	6"	2"	125.91	120.44	114.96	109.49
41314	54814	42314	.6250	5/8"	15.875	5/8"	6"	3"	125.91	120.44	114.96	109.49
41324	54824	42324	.7500	3/4"	19.050	3/4"	6"	2"	193.61	185.20	176.78	168.36
41334	54834	42334	.7500	3/4"	19.050	3/4"	6"	3"	193.61	185.20	176.78	168.36
41344	54844	42344	1.000	1"	25.400	1"	6"	2"	324.15	310.06	295.96	281.87
41354	54854	42354	1.000	1"	25.400	1"	6"	3"	324.15	310.06	295.96	281.87
-	-	42364	1.000	1"	25.400	1"	6"	4"	339.87	325.09	310.32	295.54
-	-	42394	1.250	1-1/4"	31.750	1-1/4"	6"	3"	669.32	640.22	611.12	582.02

TOLERANCES

d_1	$+0.000'' - .002'' (+.000 - .050\text{mm})$
d_2	$3\text{mm} - 6\text{mm} \quad +.0000'' - .0003'' (-.0000 - .0075\text{mm})$ $1/4'' - 1-1/4'' \quad -.0001'' - .0004'' (-.0025 - .0100\text{mm})$

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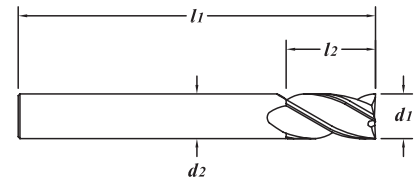


620MA (640MA metric) - 2 Flute
623MA (643MA metric) - 3 Flute
630MA (650MA metric) - 4 Flute
 .1181" - .3150"
 (3.000mm - 8.000mm)

END MILLS

Extra Length - TiALN Coated

- Solid submicron grain carbide end mill - center cutting
- Extended reach
- Dry or semi-dry machining
- Up to 40% faster than uncoated
- Can be modified with a neck within 48 hours
- Extremely versatile
- Uncoated - page 186
- TiCN Coated - page 188



2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
92017	93017	94017	.1181	3.000	3.0	50	16	13.59	13.00	12.41	11.82	
92027	93027	94027	.1181	3.000	3.0	75	20	22.24	21.27	20.31	19.34	
92037	93037	94037	.1181	3.000	3.0	75	25	22.24	21.27	20.31	19.34	
41017	54517	42017	.1250	1/8"	3.175	1/8"	2"	5/8"	14.65	14.01	13.38	12.74
41027	54527	42027	.1250	1/8"	3.175	1/8"	3"	3/4"	21.80	20.86	19.91	18.96
41037	54537	42037	.1250	1/8"	3.175	1/8"	3"	1"	21.80	20.86	19.91	18.96
92047	93047	94047	.1575	4.000	4.0	50	16	14.70	14.06	13.42	12.78	
92057	93057	94057	.1575	4.000	4.0	75	20	24.06	23.01	21.97	20.92	
92067	93067	94067	.1575	4.000	4.0	75	25	24.06	23.01	21.97	20.92	
41047	54547	42047	.1875	3/16"	4.763	3/16"	3"	1"	24.58	23.51	22.44	21.37
41057	54557	42057	.1875	3/16"	4.763	3/16"	3"	1-1/8"	24.58	23.51	22.44	21.37
41067	54567	42067	.1875	3/16"	4.763	3/16"	4"	1"	27.38	26.19	25.00	23.81
92077	93077	94077	.1969	5.000	5.0	50	16	18.22	17.42	16.63	15.84	
92087	93087	94087	.1969	5.000	5.0	75	20	26.90	25.73	24.56	23.39	
92097	93097	94097	.1969	5.000	5.0	75	25	26.90	25.73	24.56	23.39	
92107	93107	94107	.2362	6.000	6.0	75	25	30.36	29.04	27.72	26.40	
92117	93117	94117	.2362	6.000	6.0	100	25	32.65	31.23	29.81	28.39	
92127	93127	94127	.2362	6.000	6.0	100	32	32.65	31.23	29.81	28.39	
92137	93137	94137	.2362	6.000	6.0	150	38	44.51	42.57	40.64	38.70	
41077	54577	42077	.2500	1/4"	6.350	1/4"	3"	1"	29.11	27.84	26.58	25.31
41087	54587	42087	.2500	1/4"	6.350	1/4"	4"	1"	31.31	29.95	28.59	27.23
41097	54597	42097	.2500	1/4"	6.350	1/4"	4"	1-1/2"	31.31	29.95	28.59	27.23
41107	54607	42107	.2500	1/4"	6.350	1/4"	6"	1-1/2"	42.70	40.84	38.99	37.13
41117	54617	42117	.3125	5/16"	7.938	5/16"	3"	1"	37.26	35.64	34.02	32.40
41127	54627	42127	.3125	5/16"	7.938	5/16"	4"	1"	42.75	40.89	39.03	37.17
41137	54637	42137	.3125	5/16"	7.938	5/16"	4"	1-5/8"	42.75	40.89	39.03	37.17
41147	54647	42147	.3125	5/16"	7.938	5/16"	6"	1-1/2"	62.31	59.60	56.89	54.18
92147	93147	94147	.3150	8.000	8.0	75	25	38.80	37.11	35.43	33.74	
92157	93157	94157	.3150	8.000	8.0	100	25	44.49	42.56	40.62	38.69	
92167	93167	94167	.3150	8.000	8.0	100	41	44.49	42.56	40.62	38.69	
92177	93177	94177	.3150	8.000	8.0	150	50	63.57	60.81	58.04	55.28	

continued →

620MA (640MA metric) - 2 Flute (continued)
623MA (643MA metric) - 3 Flute (continued)
630MA (650MA metric) - 4 Flute (continued)
 .3750" - 1.250"
 (9.525mm - 31.750mm)

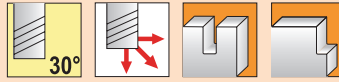
2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
41157	54657	42157	.3750	3/8"	9.525	3/8"	3"	1"	40.97	39.19	37.41	35.63
41167	54667	42167	.3750	3/8"	9.525	3/8"	4"	1"	46.30	44.29	42.27	40.26
41177	54677	42177	.3750	3/8"	9.525	3/8"	4"	2"	46.30	44.29	42.27	40.26
41187	54687	42187	.3750	3/8"	9.525	3/8"	6"	1-1/2"	66.60	63.70	60.81	57.91
41197	54697	42197	.3750	3/8"	9.525	3/8"	6"	3"	66.60	63.70	60.81	57.91
92187	93187	94187	.3937		10.000	10.0	75	25	44.85	42.90	40.95	39.00
92197	93197	94197	.3937		10.000	10.0	100	25	57.87	55.35	52.84	50.32
92207	93207	94207	.3937		10.000	10.0	100	50	57.87	55.35	52.84	50.32
92217	93217	94217	.3937		10.000	10.0	150	38	77.14	73.79	70.43	67.08
92227	93227	94227	.3937		10.000	10.0	150	75	77.14	73.79	70.43	67.08
41207	54707	42207	.4375	7/16"	11.113	7/16"	4"	1"	61.59	58.92	56.24	53.56
41217	54717	42217	.4375	7/16"	11.113	7/16"	4"	2"	61.59	58.92	56.24	53.56
41227	54727	42227	.4375	7/16"	11.113	7/16"	6"	1-1/2"	82.75	79.16	75.56	71.96
41237	54737	42237	.4375	7/16"	11.113	7/16"	6"	3"	82.75	79.16	75.56	71.96
92237	93237	94237	.4724		12.000	12.0	100	25	68.03	65.08	62.12	59.16
92247	93247	94247	.4724		12.000	12.0	100	50	68.03	65.08	62.12	59.16
92257	93257	94257	.4724		12.000	12.0	150	50	93.25	89.20	85.14	81.09
92267	93267	94267	.4724		12.000	12.0	150	75	93.25	89.20	85.14	81.09
41247	54747	42247	.5000	1/2"	12.700	1/2"	4"	1"	64.80	61.99	59.17	56.35
41257	54757	42257	.5000	1/2"	12.700	1/2"	4"	2"	64.80	61.99	59.17	56.35
41267	54767	42267	.5000	1/2"	12.700	1/2"	6"	1-1/2"	93.25	89.20	85.14	81.09
41277	54777	42277	.5000	1/2"	12.700	1/2"	6"	3"	93.25	89.20	85.14	81.09
92277	93277	94277	.5512		14.000	14.0	100	25	90.54	86.60	82.67	78.73
92287	93287	94287	.5512		14.000	14.0	100	50	90.54	86.60	82.67	78.73
92297	93297	94297	.5512		14.000	14.0	150	50	120.32	115.09	109.86	104.63
92307	93307	94307	.5512		14.000	14.0	150	75	120.32	115.09	109.86	104.63
41287	54787	42287	.5625	9/16"	14.288	9/16"	6"	2"	120.32	115.09	109.86	104.63
41297	54797	42297	.5625	9/16"	14.288	9/16"	6"	3"	120.32	115.09	109.86	104.63
41307	54807	42307	.6250	5/8"	15.875	5/8"	6"	2"	129.06	123.45	117.84	112.23
41317	54817	42317	.6250	5/8"	15.875	5/8"	6"	3"	129.06	123.45	117.84	112.23
92317	93317	94317	.6299		16.000	16.0	150	50	129.06	123.45	117.84	112.23
92327	93327	94327	.6299		16.000	16.0	150	75	129.06	123.45	117.84	112.23
92337	93337	94337	.7087		18.000	18.0	150	50	187.61	179.45	171.30	163.14
92347	93347	94347	.7087		18.000	18.0	150	75	187.61	179.45	171.30	163.14
41327	54827	42327	.7500	3/4"	19.050	3/4"	6"	2"	197.50	188.91	180.33	171.74
41337	54837	42337	.7500	3/4"	19.050	3/4"	6"	3"	197.50	188.91	180.33	171.74
92357	93357	94357	.7874		20.000	20.0	150	50	213.34	204.06	194.79	185.51
92367	93367	94367	.7874		20.000	20.0	150	75	213.34	204.06	194.79	185.51
92377	93377	94377	.9843		25.000	25.0	150	50	313.61	299.97	286.34	272.70
92387	93387	94387	.9843		25.000	25.0	150	75	313.61	299.97	286.34	272.70
41347	54847	42347	1.000	1"	25.400	1"	6"	2"	327.11	312.88	298.66	284.44
41357	54857	42357	1.000	1"	25.400	1"	6"	3"	327.11	312.88	298.66	284.44
-	-	42367	1.000	1"	25.400	1"	6"	4"	342.85	327.94	313.04	298.13
-	-	42397	1.250	1-1/4"	31.750	1-1/4"	6"	3"	670.53	641.38	612.22	583.07

TOLERANCES

$d1$	+.000" -.002" (+.000 -.050mm)	
$d2$	1/8" - 3/16"	+.0000" -.0003" (-.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)
r	+.001" -.001" (+.025 -.025mm)	

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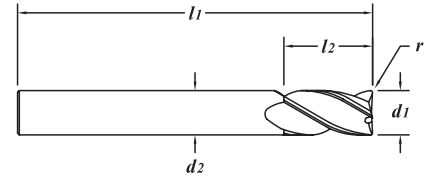
630R - 4 Flute



.1250" - .3125"
(3.175mm - 7.938mm)

Extra Length - Corner Radius

- Solid submicron grain carbide end mill - center cutting
- Extended reach
- For stronger corners and part radius
- Can be modified with a neck within 48 hours
- Extremely versatile
- TiALN Coated - page 194



EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
	Decimal	Metric									
20100	.1250	1/8"	3.175	1/8"	3"	1"	.010"	22.11	21.15	20.19	19.23
20110	.1250	1/8"	3.175	1/8"	3"	1"	.015"	22.11	21.15	20.19	19.23
20120	.1250	1/8"	3.175	1/8"	3"	1"	.020"	22.11	21.15	20.19	19.23
20130	.1250	1/8"	3.175	1/8"	3"	1"	.030"	22.11	21.15	20.19	19.23
20140	.1250	1/8"	3.175	1/8"	3"	1"	.045"	22.11	21.15	20.19	19.23
20150	.1875	3/16"	4.763	3/16"	3"	1"	.010"	24.39	23.33	22.27	21.21
20160	.1875	3/16"	4.763	3/16"	3"	1"	.015"	24.39	23.33	22.27	21.21
20170	.1875	3/16"	4.763	3/16"	3"	1"	.020"	24.39	23.33	22.27	21.21
20180	.1875	3/16"	4.763	3/16"	3"	1"	.030"	24.39	23.33	22.27	21.21
20190	.1875	3/16"	4.763	3/16"	3"	1"	.045"	24.39	23.33	22.27	21.21
20200	.1875	3/16"	4.763	3/16"	3"	1"	.060"	24.39	23.33	22.27	21.21
20210	.1875	3/16"	4.763	3/16"	4"	1"	.010"	26.25	25.11	23.97	22.83
20220	.1875	3/16"	4.763	3/16"	4"	1"	.015"	26.25	25.11	23.97	22.83
20230	.1875	3/16"	4.763	3/16"	4"	1"	.020"	26.25	25.11	23.97	22.83
20240	.1875	3/16"	4.763	3/16"	4"	1"	.030"	26.25	25.11	23.97	22.83
20250	.1875	3/16"	4.763	3/16"	4"	1"	.045"	26.25	25.11	23.97	22.83
20260	.1875	3/16"	4.763	3/16"	4"	1"	.060"	26.25	25.11	23.97	22.83
20270	.2500	1/4"	6.350	1/4"	3"	1"	.010"	28.23	27.01	25.78	24.55
20280	.2500	1/4"	6.350	1/4"	3"	1"	.020"	28.23	27.01	25.78	24.55
20290	.2500	1/4"	6.350	1/4"	3"	1"	.030"	28.23	27.01	25.78	24.55
20300	.2500	1/4"	6.350	1/4"	3"	1"	.045"	28.23	27.01	25.78	24.55
20310	.2500	1/4"	6.350	1/4"	3"	1"	.060"	28.23	27.01	25.78	24.55
20320	.2500	1/4"	6.350	1/4"	4"	1"	.010"	29.70	28.41	27.12	25.83
20330	.2500	1/4"	6.350	1/4"	4"	1"	.020"	29.70	28.41	27.12	25.83
20340	.2500	1/4"	6.350	1/4"	4"	1"	.030"	29.70	28.41	27.12	25.83
20350	.2500	1/4"	6.350	1/4"	4"	1"	.045"	29.70	28.41	27.12	25.83
20360	.2500	1/4"	6.350	1/4"	4"	1"	.060"	29.70	28.41	27.12	25.83
20370	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.010"	38.62	36.94	35.26	33.58
20380	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.020"	38.62	36.94	35.26	33.58
20390	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.030"	38.62	36.94	35.26	33.58
20400	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.045"	38.62	36.94	35.26	33.58
20410	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.060"	38.62	36.94	35.26	33.58
20420	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.010"	38.92	37.22	35.53	33.84
20430	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.020"	38.92	37.22	35.53	33.84
20440	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.030"	38.92	37.22	35.53	33.84
20450	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.045"	38.92	37.22	35.53	33.84
20460	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.060"	38.92	37.22	35.53	33.84
20470	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.090"	38.92	37.22	35.53	33.84
20480	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.125"	38.92	37.22	35.53	33.84

continued →

630R - 4 Flute (continued)

.3750" - .7500"
(9.525mm - 19.050mm)

END MILLS

EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
	Decimal	Metric									
20490	.3750	3/8"	9.525	3/8"	4"	1"	.010"	43.06	41.18	39.31	37.44
20500	.3750	3/8"	9.525	3/8"	4"	1"	.020"	43.06	41.18	39.31	37.44
20510	.3750	3/8"	9.525	3/8"	4"	1"	.030"	43.06	41.18	39.31	37.44
20520	.3750	3/8"	9.525	3/8"	4"	1"	.045"	43.06	41.18	39.31	37.44
20530	.3750	3/8"	9.525	3/8"	4"	1"	.060"	43.06	41.18	39.31	37.44
20540	.3750	3/8"	9.525	3/8"	4"	1"	.090"	43.06	41.18	39.31	37.44
20550	.3750	3/8"	9.525	3/8"	4"	1"	.125"	43.06	41.18	39.31	37.44
20560	.3750	3/8"	9.525	3/8"	4"	2"	.010"	43.06	41.18	39.31	37.44
20570	.3750	3/8"	9.525	3/8"	4"	2"	.020"	43.06	41.18	39.31	37.44
20580	.3750	3/8"	9.525	3/8"	4"	2"	.030"	43.06	41.18	39.31	37.44
20590	.3750	3/8"	9.525	3/8"	4"	2"	.045"	43.06	41.18	39.31	37.44
20600	.3750	3/8"	9.525	3/8"	4"	2"	.060"	43.06	41.18	39.31	37.44
20610	.3750	3/8"	9.525	3/8"	4"	2"	.090"	43.06	41.18	39.31	37.44
20620	.3750	3/8"	9.525	3/8"	4"	2"	.125"	43.06	41.18	39.31	37.44
20630	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.010"	59.13	56.56	53.99	51.42
20640	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.020"	59.13	56.56	53.99	51.42
20650	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.030"	59.13	56.56	53.99	51.42
20660	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.045"	59.13	56.56	53.99	51.42
20670	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.060"	59.13	56.56	53.99	51.42
20680	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.090"	59.13	56.56	53.99	51.42
20690	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.125"	59.13	56.56	53.99	51.42
20700	.5000	1/2"	12.700	1/2"	4"	1"	.015"	60.55	57.92	55.28	52.65
20710	.5000	1/2"	12.700	1/2"	4"	1"	.020"	60.55	57.92	55.28	52.65
20720	.5000	1/2"	12.700	1/2"	4"	1"	.030"	60.55	57.92	55.28	52.65
20730	.5000	1/2"	12.700	1/2"	4"	1"	.045"	60.55	57.92	55.28	52.65
20740	.5000	1/2"	12.700	1/2"	4"	1"	.060"	60.55	57.92	55.28	52.65
20750	.5000	1/2"	12.700	1/2"	4"	1"	.090"	60.55	57.92	55.28	52.65
20760	.5000	1/2"	12.700	1/2"	4"	1"	.125"	60.55	57.92	55.28	52.65
20770	.5000	1/2"	12.700	1/2"	4"	2"	.015"	60.55	57.92	55.28	52.65
20780	.5000	1/2"	12.700	1/2"	4"	2"	.020"	60.55	57.92	55.28	52.65
20790	.5000	1/2"	12.700	1/2"	4"	2"	.030"	60.55	57.92	55.28	52.65
20800	.5000	1/2"	12.700	1/2"	4"	2"	.045"	60.55	57.92	55.28	52.65
20810	.5000	1/2"	12.700	1/2"	4"	2"	.060"	60.55	57.92	55.28	52.65
20820	.5000	1/2"	12.700	1/2"	4"	2"	.090"	60.55	57.92	55.28	52.65
20830	.5000	1/2"	12.700	1/2"	4"	2"	.125"	60.55	57.92	55.28	52.65
20840	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.015"	85.76	82.03	78.30	74.57
20850	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.020"	85.76	82.03	78.30	74.57
20860	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.030"	85.76	82.03	78.30	74.57
20870	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.045"	85.76	82.03	78.30	74.57
20880	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.060"	85.76	82.03	78.30	74.57
20890	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.090"	85.76	82.03	78.30	74.57
20900	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.125"	85.76	82.03	78.30	74.57
20910	.6250	5/8"	15.875	5/8"	6"	2"	.010"	126.10	120.62	115.13	109.65
20920	.6250	5/8"	15.875	5/8"	6"	2"	.015"	126.10	120.62	115.13	109.65
20930	.6250	5/8"	15.875	5/8"	6"	2"	.020"	126.10	120.62	115.13	109.65
20940	.6250	5/8"	15.875	5/8"	6"	2"	.030"	126.10	120.62	115.13	109.65
20950	.6250	5/8"	15.875	5/8"	6"	2"	.045"	126.10	120.62	115.13	109.65
20960	.6250	5/8"	15.875	5/8"	6"	2"	.060"	126.10	120.62	115.13	109.65
20970	.6250	5/8"	15.875	5/8"	6"	2"	.090"	126.10	120.62	115.13	109.65
20980	.6250	5/8"	15.875	5/8"	6"	2"	.125"	126.10	120.62	115.13	109.65
20990	.7500	3/4"	19.050	3/4"	6"	3"	.015"	206.93	197.93	188.94	179.94
21000	.7500	3/4"	19.050	3/4"	6"	3"	.020"	206.93	197.93	188.94	179.94
21010	.7500	3/4"	19.050	3/4"	6"	3"	.030"	206.93	197.93	188.94	179.94
21020	.7500	3/4"	19.050	3/4"	6"	3"	.045"	206.93	197.93	188.94	179.94
21030	.7500	3/4"	19.050	3/4"	6"	3"	.060"	206.93	197.93	188.94	179.94
21040	.7500	3/4"	19.050	3/4"	6"	3"	.090"	206.93	197.93	188.94	179.94
21050	.7500	3/4"	19.050	3/4"	6"	3"	.125"	206.93	197.93	188.94	179.94
21140	.7500	3/4"	19.050	3/4"	6"	3"	.250"	206.93	197.93	188.94	179.94

1.000"
(25.400mm)

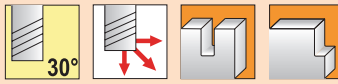
EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
	Decimal	Metric									
21060	1.000	1"	25.400	1"	6"	3"	.015"	351.89	336.59	321.29	305.99
21070	1.000	1"	25.400	1"	6"	3"	.020"	351.89	336.59	321.29	305.99
21080	1.000	1"	25.400	1"	6"	3"	.030"	351.89	336.59	321.29	305.99
21090	1.000	1"	25.400	1"	6"	3"	.045"	351.89	336.59	321.29	305.99
21100	1.000	1"	25.400	1"	6"	3"	.060"	351.89	336.59	321.29	305.99
21110	1.000	1"	25.400	1"	6"	3"	.090"	351.89	336.59	321.29	305.99
21120	1.000	1"	25.400	1"	6"	3"	.125"	351.89	336.59	321.29	305.99
21130	1.000	1"	25.400	1"	6"	3"	.250"	351.89	336.59	321.29	305.99



End Mill Manufacturing

630RA - 4 Flute

Technical information: page 228, 230

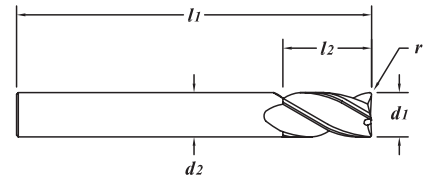


.1250" - .3125"
(3.175mm - 7.938mm)

TOLERANCES	
$d1$	+0.000" - .002" (+.000 - .050mm)
$d2$	1/8" - 3/16" +.0000" - .0003" (-.0000 - .0075mm) 1/4" - 1" -.0001" - .0004" (-.0025 - .0100mm)
r	+0.001" - .001" (+.025 - .025mm)

Extra Length - Corner Radius - TiAlN Coated

- Solid submicron grain carbide end mill - center cutting
- Extended reach
- For stronger corners and part radius
- Dry or semi-dry machining
- Up to 40% faster than uncoated
- Can be modified with a neck within 48 hours
- Extremely versatile
- Uncoated - page 191



EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
	Decimal	Metric									
20107	.1250	1/8"	3.175	1/8"	3"	1"	.010"	25.13	24.04	22.94	21.85
20117	.1250	1/8"	3.175	1/8"	3"	1"	.015"	25.13	24.04	22.94	21.85
20127	.1250	1/8"	3.175	1/8"	3"	1"	.020"	25.13	24.04	22.94	21.85
20137	.1250	1/8"	3.175	1/8"	3"	1"	.030"	25.13	24.04	22.94	21.85
20147	.1250	1/8"	3.175	1/8"	3"	1"	.045"	25.13	24.04	22.94	21.85
20157	.1875	3/16"	4.763	3/16"	3"	1"	.010"	28.22	26.99	25.77	24.54
20167	.1875	3/16"	4.763	3/16"	3"	1"	.015"	28.22	26.99	25.77	24.54
20177	.1875	3/16"	4.763	3/16"	3"	1"	.020"	28.22	26.99	25.77	24.54
20187	.1875	3/16"	4.763	3/16"	3"	1"	.030"	28.22	26.99	25.77	24.54
20197	.1875	3/16"	4.763	3/16"	3"	1"	.045"	28.22	26.99	25.77	24.54
20207	.1875	3/16"	4.763	3/16"	3"	1"	.060"	28.22	26.99	25.77	24.54
20217	.1875	3/16"	4.763	3/16"	4"	1"	.010"	30.72	29.38	28.05	26.71
20227	.1875	3/16"	4.763	3/16"	4"	1"	.015"	30.72	29.38	28.05	26.71
20237	.1875	3/16"	4.763	3/16"	4"	1"	.020"	30.72	29.38	28.05	26.71
20247	.1875	3/16"	4.763	3/16"	4"	1"	.030"	30.72	29.38	28.05	26.71
20257	.1875	3/16"	4.763	3/16"	4"	1"	.045"	30.72	29.38	28.05	26.71
20267	.1875	3/16"	4.763	3/16"	4"	1"	.060"	30.72	29.38	28.05	26.71
20277	.2500	1/4"	6.350	1/4"	3"	1"	.010"	33.33	31.88	30.43	28.98
20287	.2500	1/4"	6.350	1/4"	3"	1"	.020"	33.33	31.88	30.43	28.98
20297	.2500	1/4"	6.350	1/4"	3"	1"	.030"	33.33	31.88	30.43	28.98
20307	.2500	1/4"	6.350	1/4"	3"	1"	.045"	33.33	31.88	30.43	28.98
20317	.2500	1/4"	6.350	1/4"	3"	1"	.060"	33.33	31.88	30.43	28.98
20327	.2500	1/4"	6.350	1/4"	4"	1"	.010"	35.68	34.13	32.58	31.03
20337	.2500	1/4"	6.350	1/4"	4"	1"	.020"	35.68	34.13	32.58	31.03
20347	.2500	1/4"	6.350	1/4"	4"	1"	.030"	35.68	34.13	32.58	31.03
20357	.2500	1/4"	6.350	1/4"	4"	1"	.045"	35.68	34.13	32.58	31.03
20367	.2500	1/4"	6.350	1/4"	4"	1"	.060"	35.68	34.13	32.58	31.03
20377	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.010"	47.02	44.98	42.93	40.89
20387	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.020"	47.02	44.98	42.93	40.89
20397	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.030"	47.02	44.98	42.93	40.89
20407	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.045"	47.02	44.98	42.93	40.89
20417	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.060"	47.02	44.98	42.93	40.89
20427	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.010"	48.60	46.49	44.37	42.26
20437	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.020"	48.60	46.49	44.37	42.26
20447	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.030"	48.60	46.49	44.37	42.26
20457	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.045"	48.60	46.49	44.37	42.26
20467	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.060"	48.60	46.49	44.37	42.26
20477	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.090"	48.60	46.49	44.37	42.26
20487	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.125"	48.60	46.49	44.37	42.26

630RA - 4 Flute (continued)

.3750" - .6250"
(9.525mm - 15.875mm)

END MILLS

EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
	Decimal	Metric									
20497	.3750	3/8"	9.525	3/8"	4"	1"	.010"	52.73	50.44	48.14	45.85
20507	.3750	3/8"	9.525	3/8"	4"	1"	.020"	52.73	50.44	48.14	45.85
20517	.3750	3/8"	9.525	3/8"	4"	1"	.030"	52.73	50.44	48.14	45.85
20527	.3750	3/8"	9.525	3/8"	4"	1"	.045"	52.73	50.44	48.14	45.85
20537	.3750	3/8"	9.525	3/8"	4"	1"	.060"	52.73	50.44	48.14	45.85
20547	.3750	3/8"	9.525	3/8"	4"	1"	.090"	52.73	50.44	48.14	45.85
20557	.3750	3/8"	9.525	3/8"	4"	1"	.125"	52.73	50.44	48.14	45.85
20567	.3750	3/8"	9.525	3/8"	4"	2"	.010"	52.73	50.44	48.14	45.85
20577	.3750	3/8"	9.525	3/8"	4"	2"	.020"	52.73	50.44	48.14	45.85
20587	.3750	3/8"	9.525	3/8"	4"	2"	.030"	52.73	50.44	48.14	45.85
20597	.3750	3/8"	9.525	3/8"	4"	2"	.045"	52.73	50.44	48.14	45.85
20607	.3750	3/8"	9.525	3/8"	4"	2"	.060"	52.73	50.44	48.14	45.85
20617	.3750	3/8"	9.525	3/8"	4"	2"	.090"	52.73	50.44	48.14	45.85
20627	.3750	3/8"	9.525	3/8"	4"	2"	.125"	52.73	50.44	48.14	45.85
20637	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.010"	73.00	69.83	66.65	63.48
20647	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.020"	73.00	69.83	66.65	63.48
20657	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.030"	73.00	69.83	66.65	63.48
20667	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.045"	73.00	69.83	66.65	63.48
20677	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.060"	73.00	69.83	66.65	63.48
20687	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.090"	73.00	69.83	66.65	63.48
20697	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.125"	73.00	69.83	66.65	63.48
NEW 21157	.4375	7/16"	11.113	7/16"	4"	1"	.010"	70.51	67.44	64.38	61.31
NEW 21167	.4375	7/16"	11.113	7/16"	4"	1"	.015"	70.51	67.44	64.38	61.31
NEW 21177	.4375	7/16"	11.113	7/16"	4"	1"	.020"	70.51	67.44	64.38	61.31
NEW 21187	.4375	7/16"	11.113	7/16"	4"	1"	.030"	70.51	67.44	64.38	61.31
NEW 21197	.4375	7/16"	11.113	7/16"	4"	1"	.045"	70.51	67.44	64.38	61.31
NEW 21207	.4375	7/16"	11.113	7/16"	4"	1"	.060"	70.51	67.44	64.38	61.31
NEW 21217	.4375	7/16"	11.113	7/16"	4"	1"	.090"	70.51	67.44	64.38	61.31
NEW 21227	.4375	7/16"	11.113	7/16"	4"	1"	.125"	70.51	67.44	64.38	61.31
20707	.5000	1/2"	12.700	1/2"	4"	1"	.015"	71.77	68.65	65.53	62.41
20717	.5000	1/2"	12.700	1/2"	4"	1"	.020"	71.77	68.65	65.53	62.41
20727	.5000	1/2"	12.700	1/2"	4"	1"	.030"	71.77	68.65	65.53	62.41
20737	.5000	1/2"	12.700	1/2"	4"	1"	.045"	71.77	68.65	65.53	62.41
20747	.5000	1/2"	12.700	1/2"	4"	1"	.060"	71.77	68.65	65.53	62.41
20757	.5000	1/2"	12.700	1/2"	4"	1"	.090"	71.77	68.65	65.53	62.41
20767	.5000	1/2"	12.700	1/2"	4"	1"	.125"	71.77	68.65	65.53	62.41
20777	.5000	1/2"	12.700	1/2"	4"	2"	.015"	71.77	68.65	65.53	62.41
20787	.5000	1/2"	12.700	1/2"	4"	2"	.020"	71.77	68.65	65.53	62.41
20797	.5000	1/2"	12.700	1/2"	4"	2"	.030"	71.77	68.65	65.53	62.41
20807	.5000	1/2"	12.700	1/2"	4"	2"	.045"	71.77	68.65	65.53	62.41
20817	.5000	1/2"	12.700	1/2"	4"	2"	.060"	71.77	68.65	65.53	62.41
20827	.5000	1/2"	12.700	1/2"	4"	2"	.090"	71.77	68.65	65.53	62.41
20837	.5000	1/2"	12.700	1/2"	4"	2"	.125"	71.77	68.65	65.53	62.41
20847	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.015"	101.50	97.09	92.67	88.26
20857	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.020"	101.50	97.09	92.67	88.26
20867	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.030"	101.50	97.09	92.67	88.26
20877	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.045"	101.50	97.09	92.67	88.26
20887	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.060"	101.50	97.09	92.67	88.26
20897	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.090"	101.50	97.09	92.67	88.26
20907	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.125"	101.50	97.09	92.67	88.26
20917	.6250	5/8"	15.875	5/8"	6"	2"	.010"	144.68	138.39	132.10	125.81
20927	.6250	5/8"	15.875	5/8"	6"	2"	.015"	144.68	138.39	132.10	125.81
20937	.6250	5/8"	15.875	5/8"	6"	2"	.020"	144.68	138.39	132.10	125.81
20947	.6250	5/8"	15.875	5/8"	6"	2"	.030"	144.68	138.39	132.10	125.81
20957	.6250	5/8"	15.875	5/8"	6"	2"	.045"	144.68	138.39	132.10	125.81
20967	.6250	5/8"	15.875	5/8"	6"	2"	.060"	144.68	138.39	132.10	125.81
20977	.6250	5/8"	15.875	5/8"	6"	2"	.090"	144.68	138.39	132.10	125.81
20987	.6250	5/8"	15.875	5/8"	6"	2"	.125"	144.68	138.39	132.10	125.81

continued →

630RA - 4 Flute (continued)

.7500" - 1.000"
(19.050mm - 25.400mm)

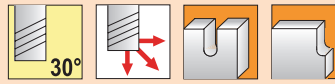
EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
	Decimal	Metric									
20997	.7500	3/4"	19.050	3/4"	6"	3"	.015"	228.46	218.53	208.59	198.66
21007	.7500	3/4"	19.050	3/4"	6"	3"	.020"	228.46	218.53	208.59	198.66
21017	.7500	3/4"	19.050	3/4"	6"	3"	.030"	228.46	218.53	208.59	198.66
21027	.7500	3/4"	19.050	3/4"	6"	3"	.045"	228.46	218.53	208.59	198.66
21037	.7500	3/4"	19.050	3/4"	6"	3"	.060"	228.46	218.53	208.59	198.66
21047	.7500	3/4"	19.050	3/4"	6"	3"	.090"	228.46	218.53	208.59	198.66
21057	.7500	3/4"	19.050	3/4"	6"	3"	.125"	228.46	218.53	208.59	198.66
21147	.7500	3/4"	19.050	3/4"	6"	3"	.250"	228.46	218.53	208.59	198.66
21067	1.000	1"	25.400	1"	6"	3"	.015"	379.86	363.34	346.83	330.31
21077	1.000	1"	25.400	1"	6"	3"	.020"	379.86	363.34	346.83	330.31
21087	1.000	1"	25.400	1"	6"	3"	.030"	379.86	363.34	346.83	330.31
21097	1.000	1"	25.400	1"	6"	3"	.045"	379.86	363.34	346.83	330.31
21107	1.000	1"	25.400	1"	6"	3"	.060"	379.86	363.34	346.83	330.31
21117	1.000	1"	25.400	1"	6"	3"	.090"	379.86	363.34	346.83	330.31
21127	1.000	1"	25.400	1"	6"	3"	.125"	379.86	363.34	346.83	330.31
21137	1.000	1"	25.400	1"	6"	3"	.250"	379.86	363.34	346.83	330.31



TOLERANCES

d_1		+0.000" -0.002" (+0.000 -0.050mm)
d_2	3mm - 6mm	+0.0000" -0.0003" (-0.0000 -0.0075mm)
	1/4" - 1"	-0.0001" -0.0004" (-0.0025 -0.0100mm)
Ball radius		+0.000" -0.001" (+0.000 -0.025mm)

Technical information:
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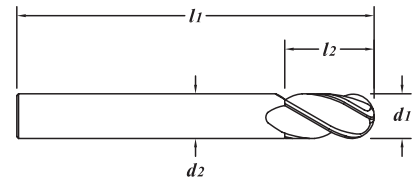


720M (740M metric) - 2 Flute
723M (743M metric) - 3 Flute
730M (750M metric) - 4 Flute
 .1181" - .3150"
 (3.000mm - 8.000mm)

END MILLS

Extra Length - Ball End

- Solid submicron grain carbide end mill - center cutting
- Extended reach
- Can be modified with a neck within 48 hours
- Extremely versatile
- TiCN Coated - page 199
- TiAlN Coated - page 200



2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
97010	98010	99010	.1181	3.000	3.0	50	16	14.13	13.52	12.90	12.29	
97020	98020	99020	.1181	3.000	3.0	75	20	23.28	22.26	21.25	20.24	
97030	98030	99030	.1181	3.000	3.0	75	25	23.28	22.26	21.25	20.24	
43010	55510	44010	.1250	1/8"	3.175	1/8"	2"	5/8"	14.34	13.72	13.09	12.47
43020	55520	44020	.1250	1/8"	3.175	1/8"	3"	3/4"	22.11	21.15	20.19	19.23
43030	55530	44030	.1250	1/8"	3.175	1/8"	3"	1"	22.11	21.15	20.19	19.23
97040	98040	99040	.1575	4.000	4.0	50	16	14.73	14.09	13.45	12.81	
97050	98050	99050	.1575	4.000	4.0	75	20	23.77	22.74	21.70	20.67	
97060	98060	99060	.1575	4.000	4.0	75	25	23.77	22.74	21.70	20.67	
43040	55540	44040	.1875	3/16"	4.763	3/16"	3"	1"	24.39	23.33	22.27	21.21
43050	55550	44050	.1875	3/16"	4.763	3/16"	3"	1-1/8"	24.39	23.33	22.27	21.21
43060	55560	44060	.1875	3/16"	4.763	3/16"	4"	1"	26.25	25.11	23.97	22.83
97070	98070	99070	.1969	5.000	5.0	50	16	17.04	16.30	15.56	14.82	
97080	98080	99080	.1969	5.000	5.0	75	20	25.67	24.55	23.44	22.32	
97090	98090	99090	.1969	5.000	5.0	75	25	25.67	24.55	23.44	22.32	
97100	98100	99100	.2362	6.000	6.0	75	25	29.72	28.42	27.13	25.84	
97110	98110	99110	.2362	6.000	6.0	100	25	31.28	29.92	28.56	27.20	
97120	98120	99120	.2362	6.000	6.0	100	32	31.28	29.92	28.56	27.20	
97130	98130	99130	.2362	6.000	6.0	150	38	40.65	38.89	37.12	35.35	
43070	55570	44070	.2500	1/4"	6.350	1/4"	3"	1"	28.23	27.01	25.78	24.55
43080	55580	44080	.2500	1/4"	6.350	1/4"	4"	1"	29.70	28.41	27.12	25.83
43090	55590	44090	.2500	1/4"	6.350	1/4"	4"	1-1/2"	29.70	28.41	27.12	25.83
43100	55600	44100	.2500	1/4"	6.350	1/4"	6"	1-1/2"	38.62	36.94	35.26	33.58
43110	55610	44110	.3125	5/16"	7.938	5/16"	3"	1"	34.88	33.36	31.85	30.33
43120	55620	44120	.3125	5/16"	7.938	5/16"	4"	1"	38.92	37.22	35.53	33.84
43130	55630	44130	.3125	5/16"	7.938	5/16"	4"	1-5/8"	38.92	37.22	35.53	33.84
43140	55640	44140	.3125	5/16"	7.938	5/16"	6"	1-1/2"	57.74	55.23	52.72	50.21
97140	98140	99140	.3150	8.000	8.0	75	25	36.71	35.11	33.52	31.92	
97150	98150	99150	.3150	8.000	8.0	100	25	40.97	39.19	37.41	35.63	
97160	98160	99160	.3150	8.000	8.0	100	41	40.97	39.19	37.41	35.63	
97170	98170	99170	.3150	8.000	8.0	150	50	59.25	56.67	54.10	51.52	

continued →

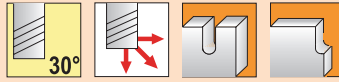
720M (740M metric) - 2 Flute (continued)
723M (743M metric) - 3 Flute (continued)
730M (750M metric) - 4 Flute (continued)
 .3750" - 1.000"
 (9.525mm - 25.400mm)

2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	$d1$ †		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Diameter Metric								
43150	55650	44150	.3750	3/8"	9.525	3/8"	3"	1"	39.24	37.53	35.83	34.12
43160	55660	44160	.3750	3/8"	9.525	3/8"	4"	1"	43.06	41.18	39.31	37.44
43170	55670	44170	.3750	3/8"	9.525	3/8"	4"	2"	43.06	41.18	39.31	37.44
43180	55680	44180	.3750	3/8"	9.525	3/8"	6"	1-1/2"	59.77	57.17	54.57	51.97
43190	55690	44190	.3750	3/8"	9.525	3/8"	6"	3"	59.77	57.17	54.57	51.97
97180	98180	99180	.3937		10.000	10.0	75	25	42.40	40.56	38.71	36.87
97190	98190	99190	.3937		10.000	10.0	100	25	55.57	53.15	50.74	48.32
97200	98200	99200	.3937		10.000	10.0	100	50	55.57	53.15	50.74	48.32
97210	98210	99210	.3937		10.000	10.0	150	38	71.48	68.38	65.27	62.16
97220	98220	99220	.3937		10.000	10.0	150	75	71.48	68.38	65.27	62.16
43200	55700	44200	.4375	7/16"	11.113	7/16"	4"	1"	59.27	56.69	54.12	51.54
43210	55710	44210	.4375	7/16"	11.113	7/16"	4"	2"	59.27	56.69	54.12	51.54
43220	55720	44220	.4375	7/16"	11.113	7/16"	6"	1-1/2"	77.05	73.70	70.35	67.00
43230	55730	44230	.4375	7/16"	11.113	7/16"	6"	3"	77.05	73.70	70.35	67.00
97230	98230	99230	.4724		12.000	12.0	100	25	63.80	61.03	58.25	55.48
97240	98240	99240	.4724		12.000	12.0	100	50	63.80	61.03	58.25	55.48
97250	98250	99250	.4724		12.000	12.0	150	50	85.73	82.01	78.28	74.55
97260	98260	99260	.4724		12.000	12.0	150	75	85.73	82.01	78.28	74.55
43240	55740	44240	.5000	1/2"	12.700	1/2"	4"	1"	60.55	57.92	55.28	52.65
43250	55750	44250	.5000	1/2"	12.700	1/2"	4"	2"	60.55	57.92	55.28	52.65
43260	55760	44260	.5000	1/2"	12.700	1/2"	6"	1-1/2"	85.76	82.03	78.30	74.57
43270	55770	44270	.5000	1/2"	12.700	1/2"	6"	3"	85.76	82.03	78.30	74.57
97270	98270	99270	.5512		14.000	14.0	100	25	88.16	84.33	80.49	76.66
97280	98280	99280	.5512		14.000	14.0	100	50	88.16	84.33	80.49	76.66
97290	98290	99290	.5512		14.000	14.0	150	50	119.67	114.47	109.26	104.06
97300	98300	99300	.5512		14.000	14.0	150	75	119.67	114.47	109.26	104.06
43280	55780	44280	.5625	9/16"	14.288	9/16"	6"	2"	119.66	114.46	109.25	104.05
43290	55790	44290	.5625	9/16"	14.288	9/16"	6"	3"	119.66	114.46	109.25	104.05
43300	55800	44300	.6250	5/8"	15.875	5/8"	6"	2"	126.10	120.62	115.13	109.65
43310	55810	44310	.6250	5/8"	15.875	5/8"	6"	3"	126.10	120.62	115.13	109.65
97310	98310	99310	.6299		16.000	16.0	150	50	126.09	120.60	115.12	109.64
97320	98320	99320	.6299		16.000	16.0	150	75	126.09	120.60	115.12	109.64
97330	98330	99330	.7087		18.000	18.0	150	50	193.96	185.53	177.09	168.66
97340	98340	99340	.7087		18.000	18.0	150	75	193.96	185.53	177.09	168.66
43320	55820	44320	.7500	3/4"	19.050	3/4"	6"	2"	206.93	197.93	188.94	179.94
43330	55830	44330	.7500	3/4"	19.050	3/4"	6"	3"	206.93	197.93	188.94	179.94
97350	98350	99350	.7874		20.000	20.0	150	50	213.26	203.98	194.71	185.44
97360	98360	99360	.7874		20.000	20.0	150	75	213.26	203.98	194.71	185.44
97370	98370	99370	.9843		25.000	25.0	150	50	338.39	323.68	308.96	294.25
97380	98380	99380	.9843		25.000	25.0	150	75	338.39	323.68	308.96	294.25
43340	55840	44340	1.000	1"	25.400	1"	6"	2"	351.89	336.59	321.29	305.99
43350	55850	44350	1.000	1"	25.400	1"	6"	3"	351.89	336.59	321.29	305.99

TOLERANCES

<i>d1</i>	+.000" -.002" (+.000 -.050mm)	
<i>d2</i>	1/8" - 3/16"	+.0000" -.0003" (-.0000 -.0075mm)
	1/4" - 1"	-.0001" -.0004" (-.0025 -.0100mm)
Ball radius	+.000" -.001" (+.000 -.025mm)	

Technical information:
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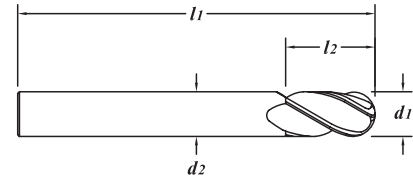


720MC - 2 Flute
723MC - 3 Flute
730MC - 4 Flute

END MILLS

Extra Length - Ball End - TiCN Coated

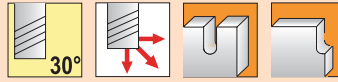
- Solid submicron grain carbide end mill - center cutting
- Extended reach
- Improved abrasion resistance and lubricity
- Up to 25% faster than uncoated
- Can be modified with a neck within 48 hours
- Extremely versatile
- Uncoated - page 197
- TiALN Coated - page 200



2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	<i>d1</i> † Diameter		<i>d2</i> Shank Diameter	<i>l1</i> Overall Length	<i>l2</i> Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
43014	55514	44014	.1250	1/8"	3.175	1/8"	2"	5/8"	16.49	15.77	15.06	14.34
43024	55524	44024	.1250	1/8"	3.175	1/8"	3"	3/4"	24.77	23.69	22.62	21.54
43034	55534	44034	.1250	1/8"	3.175	1/8"	3"	1"	24.77	23.69	22.62	21.54
43044	55544	44044	.1875	3/16"	4.763	3/16"	3"	1"	27.43	26.24	25.04	23.85
43054	55554	44054	.1875	3/16"	4.763	3/16"	3"	1-1/8"	27.43	26.24	25.04	23.85
43064	55564	44064	.1875	3/16"	4.763	3/16"	4"	1"	29.79	28.49	27.20	25.90
43074	55574	44074	.2500	1/4"	6.350	1/4"	3"	1"	32.65	31.23	29.81	28.39
43084	55584	44084	.2500	1/4"	6.350	1/4"	4"	1"	34.48	32.98	31.48	29.98
43094	55594	44094	.2500	1/4"	6.350	1/4"	4"	1-1/2"	34.48	32.98	31.48	29.98
43104	55604	44104	.2500	1/4"	6.350	1/4"	6"	1-1/2"	46.85	44.81	42.78	40.74
43114	55614	44114	.3125	5/16"	7.938	5/16"	3"	1"	40.80	39.03	37.25	35.48
43124	55624	44124	.3125	5/16"	7.938	5/16"	4"	1"	46.26	44.25	42.24	40.23
43134	55634	44134	.3125	5/16"	7.938	5/16"	4"	1-5/8"	46.26	44.25	42.24	40.23
43144	55644	44144	.3125	5/16"	7.938	5/16"	6"	1-1/2"	67.63	64.69	61.75	58.81
43154	55654	44154	.3750	3/8"	9.525	3/8"	3"	1"	45.14	43.18	41.21	39.25
43164	55664	44164	.3750	3/8"	9.525	3/8"	4"	1"	50.40	48.21	46.02	43.83
43174	55674	44174	.3750	3/8"	9.525	3/8"	4"	2"	50.40	48.21	46.02	43.83
43184	55684	44184	.3750	3/8"	9.525	3/8"	6"	1-1/2"	69.67	66.64	63.61	60.58
43194	55694	44194	.3750	3/8"	9.525	3/8"	6"	3"	69.67	66.64	63.61	60.58
43204	55704	44204	.4375	7/16"	11.113	7/16"	4"	1"	68.13	65.16	62.20	59.24
43214	55714	44214	.4375	7/16"	11.113	7/16"	4"	2"	68.13	65.16	62.20	59.24
43224	55724	44224	.4375	7/16"	11.113	7/16"	6"	1-1/2"	89.56	85.67	81.77	77.88
43234	55734	44234	.4375	7/16"	11.113	7/16"	6"	3"	89.56	85.67	81.77	77.88
43244	55744	44244	.5000	1/2"	12.700	1/2"	4"	1"	69.39	66.37	63.36	60.34
43254	55754	44254	.5000	1/2"	12.700	1/2"	4"	2"	69.39	66.37	63.36	60.34
43264	55764	44264	.5000	1/2"	12.700	1/2"	6"	1-1/2"	98.28	94.01	89.73	85.46
43274	55774	44274	.5000	1/2"	12.700	1/2"	6"	3"	98.28	94.01	89.73	85.46
43284	55784	44284	.5625	9/16"	14.288	9/16"	6"	2"	135.13	129.25	123.38	117.50
43294	55794	44294	.5625	9/16"	14.288	9/16"	6"	3"	135.13	129.25	123.38	117.50
43304	55804	44304	.6250	5/8"	15.875	5/8"	6"	2"	141.54	135.39	129.23	123.08
43314	55814	44314	.6250	5/8"	15.875	5/8"	6"	3"	141.54	135.39	129.23	123.08
43324	55824	44324	.7500	3/4"	19.050	3/4"	6"	2"	224.58	214.82	205.05	195.29
43334	55834	44334	.7500	3/4"	19.050	3/4"	6"	3"	224.58	214.82	205.05	195.29
43344	55844	44344	1.000	1"	25.400	1"	6"	2"	376.88	360.49	344.11	327.72
43354	55854	44354	1.000	1"	25.400	1"	6"	3"	376.88	360.49	344.11	327.72

720MA (740MA metric) - 2 Flute
723MA (743MA metric) - 3 Flute
730MA (750MA metric) - 4 Flute
 .1181" - .3150"
 (3.000mm - 8.000mm)

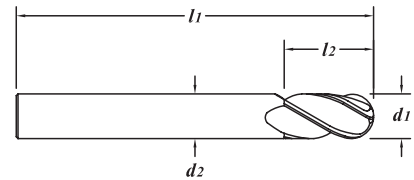
Technical information:
 page 228, 230



TOLERANCES	
d_1	+0.00" - .002" (+0.00 - .050mm)
d_2	3mm - 6mm +.0000" - .0003" (-.0000 - .0075mm)
	1/4" - 1" -.0001" - .0004" (-.0025 - .0100mm)
Ball radius	+0.00" - .001" (+0.00 - .025mm)

Extra Length - Ball End - TiALN Coated

- Solid submicron grain carbide end mill - center cutting
- Extended reach
- Dry or semi-dry machining
- Up to 40% faster than uncoated
- Can be modified with a neck within 48 hours
- Extremely versatile
- Uncoated - page 197
- TiCN Coated - page 199



2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
97017	98017	99017	.1181	3.000	3.0	50	16	16.10	15.40	14.70	14.00	
97027	98027	99027	.1181	3.000	3.0	75	20	25.74	24.62	23.50	22.38	
97037	98037	99037	.1181	3.000	3.0	75	25	25.74	24.62	23.50	22.38	
43017	55517	44017	.1250	1/8"	3.175	1/8"	2"	5/8"	16.78	16.05	15.32	14.59
43027	55527	44027	.1250	1/8"	3.175	1/8"	3"	3/4"	25.13	24.04	22.94	21.85
43037	55537	44037	.1250	1/8"	3.175	1/8"	3"	1"	25.13	24.04	22.94	21.85
97047	98047	99047	.1575	4.000	4.0	50	16	17.19	16.45	15.70	14.95	
97057	98057	99057	.1575	4.000	4.0	75	20	27.61	26.41	25.21	24.01	
97067	98067	99067	.1575	4.000	4.0	75	25	27.61	26.41	25.21	24.01	
43047	55547	44047	.1875	3/16"	4.763	3/16"	3"	1"	28.22	26.99	25.77	24.54
43057	55557	44057	.1875	3/16"	4.763	3/16"	3"	1-1/8"	28.22	26.99	25.77	24.54
43067	55567	44067	.1875	3/16"	4.763	3/16"	4"	1"	30.72	29.38	28.05	26.71
97077	98077	99077	.1969	5.000	5.0	50	16	20.88	19.98	19.07	18.16	
97087	98087	99087	.1969	5.000	5.0	75	20	30.75	29.41	28.08	26.74	
97097	98097	99097	.1969	5.000	5.0	75	25	30.75	29.41	28.08	26.74	
97107	98107	99107	.2362	6.000	6.0	75	25	34.80	33.29	31.77	30.26	
97117	98117	99117	.2362	6.000	6.0	100	25	37.23	35.61	33.99	32.37	
97127	98127	99127	.2362	6.000	6.0	100	32	37.23	35.61	33.99	32.37	
97137	98137	99137	.2362	6.000	6.0	150	38	49.05	46.92	44.78	42.65	
43077	55577	44077	.2500	1/4"	6.350	1/4"	3"	1"	33.33	31.88	30.43	28.98
43087	55587	44087	.2500	1/4"	6.350	1/4"	4"	1"	35.68	34.13	32.58	31.03
43097	55597	44097	.2500	1/4"	6.350	1/4"	4"	1-1/2"	35.68	34.13	32.58	31.03
43107	55607	44107	.2500	1/4"	6.350	1/4"	6"	1-1/2"	47.02	44.98	42.93	40.89
43117	55617	44117	.3125	5/16"	7.938	5/16"	3"	1"	42.50	40.66	38.81	36.96
43127	55627	44127	.3125	5/16"	7.938	5/16"	4"	1"	48.60	46.49	44.37	42.26
43137	55637	44137	.3125	5/16"	7.938	5/16"	4"	1-5/8"	48.60	46.49	44.37	42.26
43147	55647	44147	.3125	5/16"	7.938	5/16"	6"	1-1/2"	70.97	67.88	64.80	61.71
97147	98147	99147	.3150	8.000	8.0	75	25	44.31	42.38	40.46	38.53	
97157	98157	99157	.3150	8.000	8.0	100	25	50.62	48.42	46.22	44.02	
97167	98167	99167	.3150	8.000	8.0	100	41	50.62	48.42	46.22	44.02	
97177	98177	99177	.3150	8.000	8.0	150	50	72.48	69.33	66.18	63.03	

720MA (740MA metric) - 2 Flute (continued)
723MA (743MA metric) - 3 Flute (continued)
730MA (750MA metric) - 4 Flute (continued)

.3750" - 1.000"
 (9.525mm - 25.400mm)

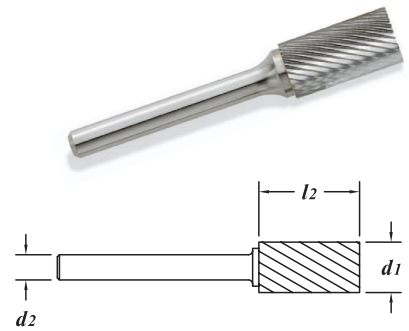
END MILLS

2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
43157	55657	44157	.3750	3/8"	9.525	3/8"	3"	1"	46.85	44.81	42.78	40.74
43167	55667	44167	.3750	3/8"	9.525	3/8"	4"	1"	52.73	50.44	48.14	45.85
43177	55677	44177	.3750	3/8"	9.525	3/8"	4"	2"	52.73	50.44	48.14	45.85
43187	55687	44187	.3750	3/8"	9.525	3/8"	6"	1-1/2"	73.00	69.83	66.65	63.48
43197	55697	44197	.3750	3/8"	9.525	3/8"	6"	3"	73.00	69.83	66.65	63.48
97187	98187	99187	.3937		10.000	10.0	76	25	51.07	48.85	46.63	44.41
97197	98197	99197	.3937		10.000	10.0	100	25	66.76	63.86	60.95	58.05
97207	98207	99207	.3937		10.000	10.0	100	50	66.76	63.86	60.95	58.05
97217	98217	99217	.3937		10.000	10.0	150	38	87.22	83.42	79.63	75.84
97227	98227	99227	.3937		10.000	10.0	150	75	87.22	83.42	79.63	75.84
43207	55707	44207	.4375	7/16"	11.113	7/16"	4"	1"	70.51	67.44	64.38	61.31
43217	55717	44217	.4375	7/16"	11.113	7/16"	4"	2"	70.51	67.44	64.38	61.31
43227	55727	44227	.4375	7/16"	11.113	7/16"	6"	1-1/2"	92.81	88.77	84.74	80.70
43237	55737	44237	.4375	7/16"	11.113	7/16"	6"	3"	92.81	88.77	84.74	80.70
97237	98237	99237	.4724		12.000	12.0	100	25	74.99	71.73	68.47	65.21
97247	98247	99247	.4724		12.000	12.0	100	50	74.99	71.73	68.47	65.21
97257	98257	99257	.4724		12.000	12.0	150	50	101.50	97.09	92.67	88.26
97267	98267	99267	.4724		12.000	12.0	150	75	101.50	97.09	92.67	88.26
43247	55747	44247	.5000	1/2"	12.700	1/2"	4"	1"	71.77	68.65	65.53	62.41
43257	55757	44257	.5000	1/2"	12.700	1/2"	4"	2"	71.77	68.65	65.53	62.41
43267	55767	44267	.5000	1/2"	12.700	1/2"	6"	1-1/2"	101.50	97.09	92.67	88.26
43277	55777	44277	.5000	1/2"	12.700	1/2"	6"	3"	101.50	97.09	92.67	88.26
97277	98277	99277	.5512		14.000	14.0	100	25	100.69	96.32	91.94	87.56
97287	98287	99287	.5512		14.000	14.0	100	50	100.69	96.32	91.94	87.56
97297	98297	99297	.5512		14.000	14.0	150	50	138.25	132.24	126.23	120.22
97307	98307	99307	.5512		14.000	14.0	150	75	138.25	132.24	126.23	120.22
43287	55787	44287	.5625	9/16"	14.288	9/16"	6"	2"	138.25	132.24	126.23	120.22
43297	55797	44297	.5625	9/16"	14.288	9/16"	6"	3"	138.25	132.24	126.23	120.22
43307	55807	44307	.6250	5/8"	15.875	5/8"	6"	2"	144.68	138.39	132.10	125.81
43317	55817	44317	.6250	5/8"	15.875	5/8"	6"	3"	144.68	138.39	132.10	125.81
97317	98317	99317	.6299		16.000	16.0	150	50	144.68	138.39	132.10	125.81
97327	98327	99327	.6299		16.000	16.0	150	75	144.68	138.39	132.10	125.81
97337	98337	99337	.7087		18.000	18.0	150	50	215.50	206.13	196.76	187.39
97347	98347	99347	.7087		18.000	18.0	150	75	215.50	206.13	196.76	187.39
43327	55827	44327	.7500	3/4"	19.050	3/4"	6"	2"	228.46	218.53	208.59	198.66
43337	55837	44337	.7500	3/4"	19.050	3/4"	6"	3"	228.46	218.53	208.59	198.66
97357	98357	99357	.7874		20.000	20.0	150	50	241.24	230.75	220.26	209.77
97367	98367	99367	.7874		20.000	20.0	150	75	241.24	230.75	220.26	209.77
97377	98377	99377	.9843		25.000	25.0	150	50	366.33	350.41	334.48	318.55
97387	98387	99387	.9843		25.000	25.0	150	75	366.33	350.41	334.48	318.55
43347	55847	44347	1.000	1"	25.400	1"	6"	2"	379.86	363.34	346.83	330.31
43357	55857	44357	1.000	1"	25.400	1"	6"	3"	379.86	363.34	346.83	330.31

SA (1/4" Steel Shank)

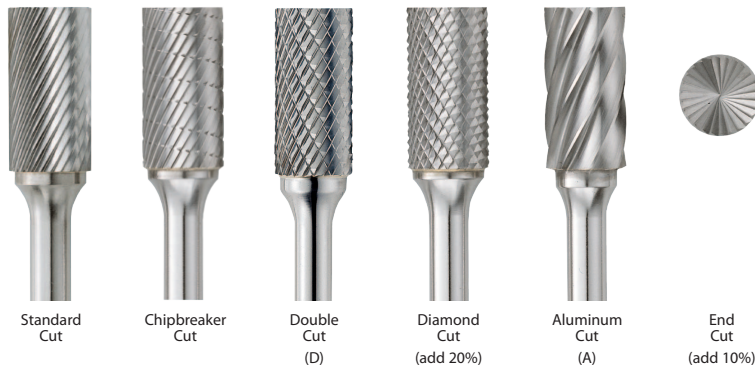
Carbide Rotary Files - Cylindrical Shape

Submicron Grain Carbide
 A - Aluminum Cut
 D - Double Cut
 * - Solid Carbide



EDP#	TOOL #	$d1$ † Diameter		$d2$ Shank Diameter	$l2$ Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
60010	* SA-14	.1875	3/16"	4.763	1/4"	5/8"	9.10	8.70	8.31	7.91
60012	* SA-14D	.1875	3/16"	4.763	1/4"	5/8"	9.10	8.70	8.31	7.91
60020	* SA-1	.2500	1/4"	6.350	1/4"	5/8"	8.10	7.74	7.39	7.04
60021	* SA-1A	.2500	1/4"	6.350	1/4"	5/8"	10.17	9.72	9.28	8.84
60022	* SA-1D	.2500	1/4"	6.350	1/4"	5/8"	8.10	7.74	7.39	7.04
60030	SA-2	.3125	5/16"	7.938	1/4"	3/4"	11.32	10.82	10.33	9.84
60032	SA-2D	.3125	5/16"	7.938	1/4"	3/4"	11.32	10.82	10.33	9.84
60040	SA-3	.3750	3/8"	9.525	1/4"	3/4"	12.19	11.66	11.13	10.60
60041	SA-3A	.3750	3/8"	9.525	1/4"	3/4"	16.41	15.70	14.98	14.27
60042	SA-3D	.3750	3/8"	9.525	1/4"	3/4"	12.19	11.66	11.13	10.60
60050	SA-4	.4375	7/16"	11.113	1/4"	1"	16.84	16.10	15.37	14.64
60052	SA-4D	.4375	7/16"	11.113	1/4"	1"	16.84	16.10	15.37	14.64
60060	SA-5	.5000	1/2"	12.700	1/4"	1"	17.96	17.18	16.40	15.62
60061	SA-5A	.5000	1/2"	12.700	1/4"	1"	23.28	22.26	21.25	20.24
60062	SA-5D	.5000	1/2"	12.700	1/4"	1"	17.96	17.18	16.40	15.62
60070	SA-6	.6250	5/8"	15.875	1/4"	1"	21.76	20.81	19.87	18.92
60071	SA-6A	.6250	5/8"	15.875	1/4"	1"	36.47	34.88	33.30	31.71
60072	SA-6D	.6250	5/8"	15.875	1/4"	1"	21.76	20.81	19.87	18.92
60080	SA-7	.7500	3/4"	19.050	1/4"	1"	34.44	32.95	31.45	29.95
60081	SA-7A	.7500	3/4"	19.050	1/4"	1"	41.32	39.52	37.73	35.93
60082	SA-7D	.7500	3/4"	19.050	1/4"	1"	34.44	32.95	31.45	29.95
60090	SA-9	1.000	1"	25.400	1/4"	1"	46.99	44.95	42.90	40.86
60091	SA-9A	1.000	1"	25.400	1/4"	1"	56.35	53.90	51.45	49.00
60092	SA-9D	1.000	1"	25.400	1/4"	1"	46.99	44.95	42.90	40.86

Basic Rotary File Cut Styles Available



Double Cut and Aluminum Cut rotary files are in stock where indicated by (D) and (A) in the catalog tables.

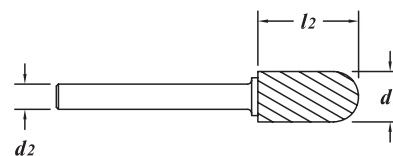
Carbide Rotary Files - Cylindrical-Radius Shape

Submicron Grain Carbide

A - Aluminum Cut

D - Double Cut

* - Solid Carbide

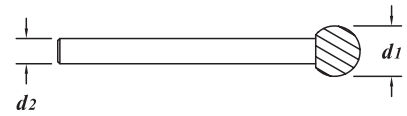


EDP#	TOOL #	$d1$ †		$d2$ Shank Diameter	$l2$ Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Diameter							
61010	* SC-14	.1875	3/16"	4.763	1/4"	5/8"	10.29	9.85	9.40	8.95
61012	* SC-14D	.1875	3/16"	4.763	1/4"	5/8"	10.29	9.85	9.40	8.95
61020	* SC-1	.2500	1/4"	6.350	1/4"	5/8"	9.69	9.27	8.85	8.43
61021	* SC-1A	.2500	1/4"	6.350	1/4"	5/8"	12.79	12.23	11.68	11.12
61022	* SC-1D	.2500	1/4"	6.350	1/4"	5/8"	9.69	9.27	8.85	8.43
61030	SC-2	.3125	5/16"	7.938	1/4"	3/4"	11.32	10.82	10.33	9.84
61032	SC-2D	.3125	5/16"	7.938	1/4"	3/4"	11.32	10.82	10.33	9.84
61040	SC-3	.3750	3/8"	9.525	1/4"	3/4"	13.21	12.64	12.06	11.49
61041	SC-3A	.3750	3/8"	9.525	1/4"	3/4"	22.89	21.89	20.90	19.90
61042	SC-3D	.3750	3/8"	9.525	1/4"	3/4"	13.21	12.64	12.06	11.49
61050	SC-4	.4375	7/16"	11.113	1/4"	1"	19.10	18.27	17.44	16.61
61052	SC-4D	.4375	7/16"	11.113	1/4"	1"	19.10	18.27	17.44	16.61
61060	SC-5	.5000	1/2"	12.700	1/4"	1"	19.80	18.94	18.08	17.22
61061	SC-5A	.5000	1/2"	12.700	1/4"	1"	30.10	28.79	27.48	26.17
61062	SC-5D	.5000	1/2"	12.700	1/4"	1"	19.80	18.94	18.08	17.22
61070	SC-6	.6250	5/8"	15.875	1/4"	1"	26.44	25.29	24.14	22.99
61071	SC-6A	.6250	5/8"	15.875	1/4"	1"	41.23	39.44	37.64	35.85
61072	SC-6D	.6250	5/8"	15.875	1/4"	1"	26.44	25.29	24.14	22.99
61080	SC-7	.7500	3/4"	19.050	1/4"	1"	38.92	37.22	35.53	33.84
61081	SC-7A	.7500	3/4"	19.050	1/4"	1"	57.24	54.75	52.26	49.77
61082	SC-7D	.7500	3/4"	19.050	1/4"	1"	38.92	37.22	35.53	33.84

SD (1/4" Steel Shank)

Carbide Rotary Files - Ball Shape

Submicron Grain Carbide
 A - Aluminum Cut
 D - Double Cut
 * - Solid Carbide



EDP#	TOOL #	$d1$ †		$d2$ Shank Diameter	$l2$ Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Diameter							
62010	* SD-14	.1875	3/16"	4.763	1/4"	-	10.29	9.85	9.40	8.95
62012	* SD-14D	.1875	3/16"	4.763	1/4"	-	10.29	9.85	9.40	8.95
62020	* SD-1	.2500	1/4"	6.350	1/4"	-	10.29	9.85	9.40	8.95
62021	* SD-1A	.2500	1/4"	6.350	1/4"	-	16.32	15.61	14.90	14.19
62022	* SD-1D	.2500	1/4"	6.350	1/4"	-	10.29	9.85	9.40	8.95
62030	SD-2	.3125	5/16"	7.938	1/4"	-	9.69	9.27	8.85	8.43
62032	SD-2D	.3125	5/16"	7.938	1/4"	-	9.69	9.27	8.85	8.43
62040	SD-3	.3750	3/8"	9.525	1/4"	-	10.51	10.05	9.60	9.14
62041	SD-3A	.3750	3/8"	9.525	1/4"	-	17.01	16.27	15.53	14.79
62042	SD-3D	.3750	3/8"	9.525	1/4"	-	10.51	10.05	9.60	9.14
62050	SD-4	.4375	7/16"	11.113	1/4"	-	15.27	14.61	13.94	13.28
62052	SD-4D	.4375	7/16"	11.113	1/4"	-	15.27	14.61	13.94	13.28
62060	SD-5	.5000	1/2"	12.700	1/4"	-	15.76	15.07	14.39	13.70
62061	SD-5A	.5000	1/2"	12.700	1/4"	-	21.07	20.15	19.24	18.32
62062	SD-5D	.5000	1/2"	12.700	1/4"	-	15.76	15.07	14.39	13.70
62070	SD-6	.6250	5/8"	15.875	1/4"	-	17.62	16.85	16.09	15.32
62071	SD-6A	.6250	5/8"	15.875	1/4"	-	36.47	34.88	33.30	31.71
62072	SD-6D	.6250	5/8"	15.875	1/4"	-	17.62	16.85	16.09	15.32
62080	SD-7	.7500	3/4"	19.050	1/4"	-	25.09	24.00	22.91	21.82
62082	SD-7D	.7500	3/4"	19.050	1/4"	-	25.09	24.00	22.91	21.82
62090	SD-9	1.000	1"	25.400	1/4"	-	46.54	44.52	42.49	40.47
62092	SD-9D	1.000	1"	25.400	1/4"	-	46.54	44.52	42.49	40.47

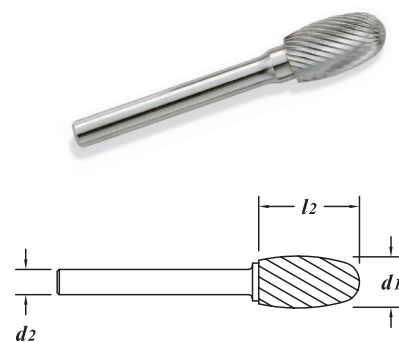
Carbide Rotary Files - Egg Shape

Submicron Grain Carbide

A - Aluminum Cut

D - Double Cut

* - Solid Carbide

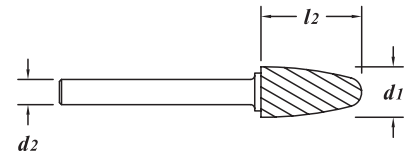


EDP#	TOOL #	$d1$ †		$d2$ Shank Diameter	$l2$ Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Diameter							Metric
63010	* SE-1	.2500	1/4"	6.350	1/4"	3/8"	10.58	10.12	9.66	9.20
63012	* SE-1D	.2500	1/4"	6.350	1/4"	3/8"	10.58	10.12	9.66	9.20
63020	SE-3	.3750	3/8"	9.525	1/4"	5/8"	14.70	14.06	13.42	12.78
63021	SE-3A	.3750	3/8"	9.525	1/4"	5/8"	21.30	20.37	19.45	18.52
63022	SE-3D	.3750	3/8"	9.525	1/4"	5/8"	14.70	14.06	13.42	12.78
63030	SE-5	.5000	1/2"	12.700	1/4"	7/8"	18.80	17.99	17.17	16.35
63031	SE-5A	.5000	1/2"	12.700	1/4"	7/8"	30.58	29.25	27.92	26.59
63032	SE-5D	.5000	1/2"	12.700	1/4"	7/8"	18.80	17.99	17.17	16.35
63040	SE-6	.6250	5/8"	15.875	1/4"	1"	27.62	26.42	25.22	24.02
63041	SE-6A	.6250	5/8"	15.875	1/4"	1"	45.38	43.41	41.43	39.46
63042	SE-6D	.6250	5/8"	15.875	1/4"	1"	27.62	26.42	25.22	24.02
63050	SE-7	.7500	3/4"	19.050	1/4"	1"	38.07	36.41	34.76	33.10
63052	SE-7D	.7500	3/4"	19.050	1/4"	1"	38.07	36.41	34.76	33.10

SF (1/4" Steel Shank)

Carbide Rotary Files - Tree-Radius Shape

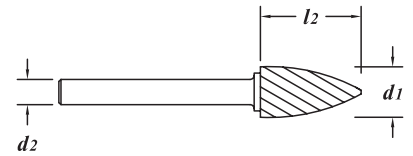
Submicron Grain Carbide
 A - Aluminum Cut
 D - Double Cut
 * - Solid Carbide



EDP#	TOOL #	$d1$ †		$d2$ Shank Diameter	$l2$ Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Diameter							
64010	* SF-1	.2500	1/4"	6.350	1/4"	5/8"	10.58	10.12	9.66	9.20
64011	* SF-1A	.2500	1/4"	6.350	1/4"	5/8"	16.32	15.61	14.90	14.19
64012	* SF-1D	.2500	1/4"	6.350	1/4"	5/8"	10.58	10.12	9.66	9.20
64020	SF-3	.3750	3/8"	9.525	1/4"	3/4"	12.75	12.20	11.64	11.09
64021	SF-3A	.3750	3/8"	9.525	1/4"	3/4"	20.57	19.68	18.78	17.89
64022	SF-3D	.3750	3/8"	9.525	1/4"	3/4"	12.75	12.20	11.64	11.09
64030	SF-5	.5000	1/2"	12.700	1/4"	1"	19.10	18.27	17.44	16.61
64031	SF-5A	.5000	1/2"	12.700	1/4"	1"	29.11	27.84	26.58	25.31
64032	SF-5D	.5000	1/2"	12.700	1/4"	1"	19.10	18.27	17.44	16.61
64040	SF-6	.6250	5/8"	15.875	1/4"	1"	26.44	25.29	24.14	22.99
64041	SF-6A	.6250	5/8"	15.875	1/4"	1"	40.47	38.71	36.95	35.19
64042	SF-6D	.6250	5/8"	15.875	1/4"	1"	26.44	25.29	24.14	22.99
64050	SF-14	.7500	3/4"	19.050	1/4"	1-1/4"	40.73	38.96	37.19	35.42
64052	SF-14D	.7500	3/4"	19.050	1/4"	1-1/4"	40.73	38.96	37.19	35.42

Carbide Rotary Files - Tree-Pointed Shape

Submicron Grain Carbide
 D - Double Cut
 * - Solid Carbide

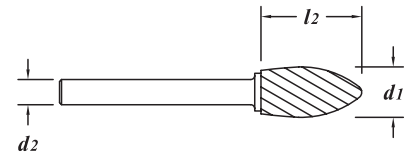


EDP#	TOOL #	d_1 †		d_2 Shank Diameter	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Diameter							Metric
65010	* SG-1	.2500	1/4"	6.350	1/4"	5/8"	10.58	10.12	9.66	9.20
65012	* SG-1D	.2500	1/4"	6.350	1/4"	5/8"	10.58	10.12	9.66	9.20
65020	SG-3	.3750	3/8"	9.525	1/4"	3/4"	13.60	13.01	12.42	11.83
65022	SG-3D	.3750	3/8"	9.525	1/4"	3/4"	13.60	13.01	12.42	11.83
65030	SG-13	.5000	1/2"	12.700	1/4"	3/4"	18.22	17.42	16.63	15.84
65032	SG-13D	.5000	1/2"	12.700	1/4"	3/4"	18.22	17.42	16.63	15.84
65040	SG-5	.5000	1/2"	12.700	1/4"	1"	18.84	18.02	17.20	16.38
65042	SG-5D	.5000	1/2"	12.700	1/4"	1"	18.84	18.02	17.20	16.38
65050	SG-6	.6250	5/8"	15.875	1/4"	1"	26.44	25.29	24.14	22.99
65052	SG-6D	.6250	5/8"	15.875	1/4"	1"	26.44	25.29	24.14	22.99
65060	SG-7	.7500	3/4"	19.050	1/4"	1"	34.97	33.45	31.93	30.41
65062	SG-7D	.7500	3/4"	19.050	1/4"	1"	34.97	33.45	31.93	30.41

SH (1/4" Steel Shank)

Carbide Rotary Files - Flame Shape

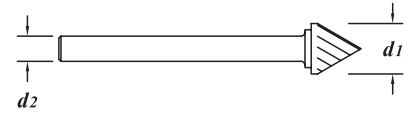
Submicron Grain Carbide
D - Double Cut



EDP#	TOOL #	$d1$ † Diameter		$d2$ Shank Diameter	$l2$ Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
66010	SH-2	.3125	5/16"	7.938	1/4"	3/4"	12.94	12.38	11.81	11.25
66012	SH-2D	.3125	5/16"	7.938	1/4"	3/4"	12.94	12.38	11.81	11.25
66020	SH-5	.5000	1/2"	12.700	1/4"	1-1/4"	26.44	25.29	24.14	22.99
66022	SH-5D	.5000	1/2"	12.700	1/4"	1-1/4"	26.44	25.29	24.14	22.99
66030	SH-6	.6250	5/8"	15.875	1/4"	1-7/16"	34.66	33.15	31.65	30.14
66032	SH-6D	.6250	5/8"	15.875	1/4"	1-7/16"	34.66	33.15	31.65	30.14
66040	SH-7	.7500	3/4"	19.050	1/4"	1-5/8"	42.60	40.74	38.89	37.04
66042	SH-7D	.7500	3/4"	19.050	1/4"	1-5/8"	42.60	40.74	38.89	37.04

Carbide Rotary Files - Taper Shape (60° Included Angle)

Submicron Grain Carbide
 D - Double Cut
 ** - Solid Carbide/Double End

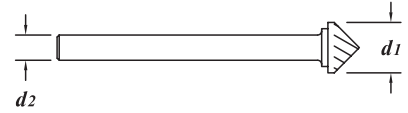


EDP#	TOOL #	$d1$ † Diameter		$d2$ Shank Diameter	1-11	12-24	25-49	50-100	
		Decimal	Metric						
67010	** SJ-1	.2500	1/4"	6.350	1/4"	13.31	12.73	12.15	11.57
67012	** SJ-1D	.2500	1/4"	6.350	1/4"	13.31	12.73	12.15	11.57
67020	SJ-3	.3750	3/8"	9.525	1/4"	11.17	10.68	10.20	9.71
67022	SJ-3D	.3750	3/8"	9.525	1/4"	11.17	10.68	10.20	9.71
67030	SJ-5	.5000	1/2"	12.700	1/4"	13.78	13.18	12.58	11.98
67032	SJ-5D	.5000	1/2"	12.700	1/4"	13.78	13.18	12.58	11.98
67040	SJ-6	.6250	5/8"	15.875	1/4"	18.35	17.56	16.76	15.96
67042	SJ-6D	.6250	5/8"	15.875	1/4"	18.35	17.56	16.76	15.96
67050	SJ-7	.7500	3/4"	19.050	1/4"	24.08	23.03	21.99	20.94
67052	SJ-7D	.7500	3/4"	19.050	1/4"	24.08	23.03	21.99	20.94
67060	SJ-8	.8750	7/8"	22.225	1/4"	36.44	34.86	33.27	31.69
67062	SJ-8D	.8750	7/8"	22.225	1/4"	36.44	34.86	33.27	31.69
67070	SJ-9	1.000	1"	25.400	1/4"	38.63	36.95	35.27	33.59
67072	SJ-9D	1.000	1"	25.400	1/4"	38.63	36.95	35.27	33.59

SK (1/4" Steel Shank)

Carbide Rotary Files - Taper Shape (90° Included Angle)

Submicron Grain Carbide
 D - Double Cut
 ** - Solid Carbide/Double End



EDP#	TOOL #	$d1$ † Diameter		$d2$ Shank Diameter	1-11	12-24	25-49	50-100	
		Decimal	Metric						
68010	** SK-1	.2500	1/4"	6.350	1/4"	13.31	12.73	12.15	11.57
68012	** SK-1D	.2500	1/4"	6.350	1/4"	13.31	12.73	12.15	11.57
68020	SK-3	.3750	3/8"	9.525	1/4"	11.17	10.68	10.20	9.71
68022	SK-3D	.3750	3/8"	9.525	1/4"	11.17	10.68	10.20	9.71
68030	SK-5	.5000	1/2"	12.700	1/4"	13.78	13.18	12.58	11.98
68032	SK-5D	.5000	1/2"	12.700	1/4"	13.78	13.18	12.58	11.98
68040	SK-6	.6250	5/8"	15.875	1/4"	18.35	17.56	16.76	15.96
68042	SK-6D	.6250	5/8"	15.875	1/4"	18.35	17.56	16.76	15.96
68050	SK-7	.7500	3/4"	19.050	1/4"	24.08	23.03	21.99	20.94
68052	SK-7D	.7500	3/4"	19.050	1/4"	24.08	23.03	21.99	20.94
68060	SK-8	.8750	7/8"	22.225	1/4"	36.44	34.86	33.27	31.69
68062	SK-8D	.8750	7/8"	22.225	1/4"	36.44	34.86	33.27	31.69
68070	SK-9	1.000	1"	25.400	1/4"	38.63	36.95	35.27	33.59
68072	SK-9D	1.000	1"	25.400	1/4"	38.63	36.95	35.27	33.59

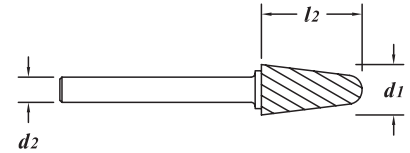
Carbide Rotary Files - Cone-Radius Shape (14° included angle)

Submicron Grain Carbide

A - Aluminum Cut

D - Double Cut

* - Solid Carbide

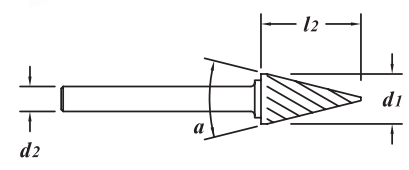


EDP#	TOOL #	$d1$ †		Metric	$d2$ Shank Diameter	$l2$ Flute Length	1-11	12-24	25-49	50-100
		Decimal	Diameter							
69010	* SL-1	.2500	1/4"	6.350	1/4"	5/8"	10.58	10.12	9.66	9.20
69012	* SL-1D	.2500	1/4"	6.350	1/4"	5/8"	10.58	10.12	9.66	9.20
69020	SL-2	.3125	5/16"	7.938	1/4"	7/8"	12.64	12.09	11.54	10.99
69022	SL-2D	.3125	5/16"	7.938	1/4"	7/8"	12.64	12.09	11.54	10.99
69030	SL-3	.3750	3/8"	9.525	1/4"	1-1/16"	14.98	14.33	13.68	13.03
69031	SL-3A	.3750	3/8"	9.525	1/4"	1-1/16"	24.97	23.88	22.80	21.71
69032	SL-3D	.3750	3/8"	9.525	1/4"	1-1/16"	14.98	14.33	13.68	13.03
69040	SL-4	.5000	1/2"	12.700	1/4"	1-1/8"	18.22	17.42	16.63	15.84
69041	SL-4A	.5000	1/2"	12.700	1/4"	1-1/8"	30.94	29.59	28.25	26.90
69042	SL-4D	.5000	1/2"	12.700	1/4"	1-1/8"	18.22	17.42	16.63	15.84
69050	SL-5	.6250	5/8"	15.875	1/4"	1-3/16"	35.85	34.29	32.73	31.17
69051	SL-5A	.6250	5/8"	15.875	1/4"	1-3/16"	48.82	46.70	44.57	42.45
69052	SL-5D	.6250	5/8"	15.875	1/4"	1-3/16"	35.85	34.29	32.73	31.17
69060	SL-7	.7500	3/4"	19.050	1/4"	1-1/2"	47.31	45.25	43.20	41.14
69062	SL-7D	.7500	3/4"	19.050	1/4"	1-1/2"	47.31	45.25	43.20	41.14

SM (1/4" Steel Shank)

Carbide Rotary Files - Cone Flat Shape *(no radius)*

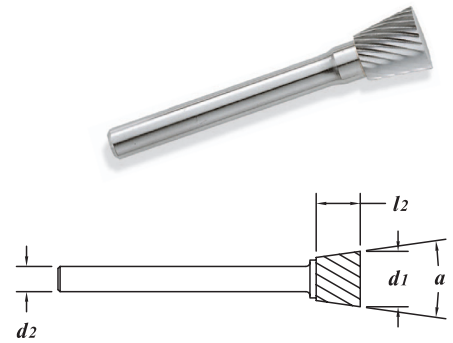
Submicron Grain Carbide
 D - Double Cut
 * - Solid Carbide



EDP#	TOOL #	d_1 † Diameter		d_2 Shank Diameter	a Included Angle	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
70010	* SM-1	.2500	1/4"	6.350	1/4"	22°	1/2"	10.58	10.12	9.66	9.20
70012	* SM-1D	.2500	1/4"	6.350	1/4"	22°	1/2"	10.58	10.12	9.66	9.20
70020	SM-4	.3750	3/8"	9.525	1/4"	28°	5/8"	14.98	14.33	13.68	13.03
70022	SM-4D	.3750	3/8"	9.525	1/4"	28°	5/8"	14.98	14.33	13.68	13.03
70030	SM-5	.5000	1/2"	12.700	1/4"	28°	7/8"	18.80	17.99	17.17	16.35
70032	SM-5D	.5000	1/2"	12.700	1/4"	28°	7/8"	18.80	17.99	17.17	16.35
70040	SM-6	.6250	5/8"	15.875	1/4"	31°	1"	24.98	23.89	22.81	21.72
70042	SM-6D	.6250	5/8"	15.875	1/4"	31°	1"	24.98	23.89	22.81	21.72

Carbide Rotary Files - Inverted Cone Shape

Submicron Grain Carbide
 D - Double Cut
 * - Solid Carbide

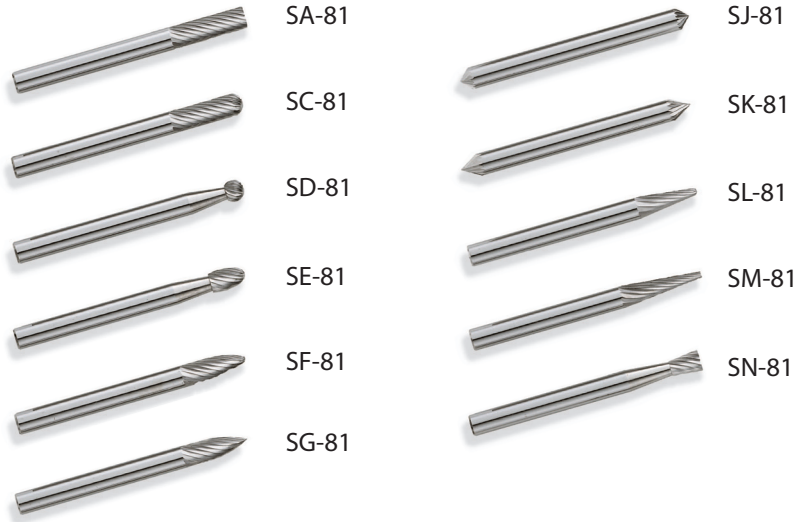


EDP#	TOOL #	$d1$ † Diameter		$d2$ Shank Diameter	a Included Angle	$l2$ Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
71010	* SN-1	.2500	1/4"	6.350	1/4"	10°	5/16"	10.58	10.12	9.66	9.20
71012	* SN-1D	.2500	1/4"	6.350	1/4"	10°	5/16"	10.58	10.12	9.66	9.20
71020	SN-2	.3750	3/8"	9.525	1/4"	13°	3/8"	13.21	12.64	12.06	11.49
71022	SN-2D	.3750	3/8"	9.525	1/4"	13°	3/8"	13.21	12.64	12.06	11.49
71030	SN-3	.5000	1/2"	12.700	1/4"	16°	1/2"	18.22	17.42	16.63	15.84
71032	SN-3D	.5000	1/2"	12.700	1/4"	16°	1/2"	18.22	17.42	16.63	15.84
71040	SN-5	.6250	5/8"	15.875	1/4"	19°	5/8"	24.98	23.89	22.81	21.72
71042	SN-5D	.6250	5/8"	15.875	1/4"	19°	5/8"	24.98	23.89	22.81	21.72

3/16" Diameter (3/16" Shank)

Solid Carbide Rotary Files

Submicron Grain Carbide
D - Double Cut



EDP#	TOOL #	$d1$ † Diameter		$l1$ Overall Length	a Included Angle	$l2$ Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
72010	SA-81	.1875	3/16"	4.763	2"	-	5/8"	11.58	11.08	10.57	10.07
72012	SA-81D	.1875	3/16"	4.763	2"	-	5/8"	11.58	11.08	10.57	10.07
72020	SC-81	.1875	3/16"	4.763	2"	-	5/8"	11.58	11.08	10.57	10.07
72022	SC-81D	.1875	3/16"	4.763	2"	-	5/8"	11.58	11.08	10.57	10.07
72030	SD-81	.1875	3/16"	4.763	2"	-	-	11.58	11.08	10.57	10.07
72032	SD-81D	.1875	3/16"	4.763	2"	-	-	11.58	11.08	10.57	10.07
72040	SE-81	.1875	3/16"	4.763	2"	-	9/32"	11.58	11.08	10.57	10.07
72042	SE-81D	.1875	3/16"	4.763	2"	-	9/32"	11.58	11.08	10.57	10.07
72050	SF-81	.1875	3/16"	4.763	2"	-	1/2"	11.58	11.08	10.57	10.07
72052	SF-81D	.1875	3/16"	4.763	2"	-	1/2"	11.58	11.08	10.57	10.07
72060	SG-81	.1875	3/16"	4.763	2"	-	1/2"	11.58	11.08	10.57	10.07
72062	SG-81D	.1875	3/16"	4.763	2"	-	1/2"	11.58	11.08	10.57	10.07
72070	SJ-81	.1875	3/16"	4.763	2"	60°	-	11.58	11.08	10.57	10.07
72072	SJ-81D	.1875	3/16"	4.763	2"	60°	-	11.58	11.08	10.57	10.07
72080	SK-81	.1875	3/16"	4.763	2"	90°	-	11.58	11.08	10.57	10.07
72082	SK-81D	.1875	3/16"	4.763	2"	90°	-	11.58	11.08	10.57	10.07
72090	SL-81	.1875	3/16"	4.763	2"	14°	1/2"	11.58	11.08	10.57	10.07
72092	SL-81D	.1875	3/16"	4.763	2"	14°	1/2"	11.58	11.08	10.57	10.07
72100	SM-81	.1875	3/16"	4.763	2"	12°	5/8"	11.58	11.08	10.57	10.07
72102	SM-81D	.1875	3/16"	4.763	2"	12°	5/8"	11.58	11.08	10.57	10.07
72110	SN-81	.1875	3/16"	4.763	2"	10°	1/4"	11.58	11.08	10.57	10.07
72112	SN-81D	.1875	3/16"	4.763	2"	10°	1/4"	11.58	11.08	10.57	10.07

Carbide Rotary Files

Submicron Grain Carbide
D - Double Cut



EDP#	TOOL #	d_1 † Diameter		a Included Angle	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
73010	SA-51	.2500	1/4"	6.350	-	1/2"	11.05	10.57	10.09	9.61
73012	SA-51D	.2500	1/4"	6.350	-	1/2"	11.05	10.57	10.09	9.61
73020	SB-51	.2500	1/4"	6.350	-	3/16"	11.05	10.57	10.09	9.61
73022	SB-51D	.2500	1/4"	6.350	-	3/16"	11.05	10.57	10.09	9.61
73030	SC-51	.2500	1/4"	6.350	-	1/2"	11.05	10.57	10.09	9.61
73032	SC-51D	.2500	1/4"	6.350	-	1/2"	11.05	10.57	10.09	9.61
73040	SD-51	.2500	1/4"	6.350	-	-	11.05	10.57	10.09	9.61
73042	SD-51D	.2500	1/4"	6.350	-	-	11.05	10.57	10.09	9.61
73050	SE-51	.2500	1/4"	6.350	-	3/8"	11.05	10.57	10.09	9.61
73052	SE-51D	.2500	1/4"	6.350	-	3/8"	11.05	10.57	10.09	9.61
73060	SF-51	.2500	1/4"	6.350	-	1/2"	11.05	10.57	10.09	9.61
73062	SF-51D	.2500	1/4"	6.350	-	1/2"	11.05	10.57	10.09	9.61
73070	SG-51	.2500	1/4"	6.350	-	1/2"	11.05	10.57	10.09	9.61
73072	SG-51D	.2500	1/4"	6.350	-	1/2"	11.05	10.57	10.09	9.61
73080	SM-51	.2500	1/4"	6.350	22°	1/2"	11.05	10.57	10.09	9.61
73082	SM-51D	.2500	1/4"	6.350	22°	1/2"	11.05	10.57	10.09	9.61
73090	SN-51	.2500	1/4"	6.350	10°	1/4"	11.05	10.57	10.09	9.61
73092	SN-51D	.2500	1/4"	6.350	10°	1/4"	11.05	10.57	10.09	9.61

1/8" Diameter (1/8" Shank)

ROTARY FILES

Solid Carbide Rotary Files

Submicron Grain Carbide
D - Double Cut



EDP#	TOOL #	$d1$ † Diameter		$l1$ Overall Length	a Included Angle	$l2$ Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
74010	SA-41	.0625	1/16"	1.588	1-1/2"	-	1/4"	6.54	6.26	5.97	5.69
74012	SA-41D	.0625	1/16"	1.588	1-1/2"	-	1/4"	6.54	6.26	5.97	5.69
74020	SA-42	.0938	3/32"	2.383	1-1/2"	-	7/16"	6.54	6.26	5.97	5.69
74022	SA-42D	.0938	3/32"	2.383	1-1/2"	-	7/16"	6.54	6.26	5.97	5.69
74030	SA-43	.1250	1/8"	3.175	1-1/2"	-	9/16"	6.54	6.26	5.97	5.69
74032	SA-43D	.1250	1/8"	3.175	1-1/2"	-	9/16"	6.54	6.26	5.97	5.69
74040	SC-41	.0938	3/32"	2.383	1-1/2"	-	7/16"	6.54	6.26	5.97	5.69
74042	SC-41D	.0938	3/32"	2.383	1-1/2"	-	7/16"	6.54	6.26	5.97	5.69
74050	SC-42	.1250	1/8"	3.175	1-1/2"	-	9/16"	6.54	6.26	5.97	5.69
74052	SC-42D	.1250	1/8"	3.175	1-1/2"	-	9/16"	6.54	6.26	5.97	5.69
74060	SD-41	.0938	3/32"	2.383	1-1/2"	-	-	6.54	6.26	5.97	5.69
74062	SD-41D	.0938	3/32"	2.383	1-1/2"	-	-	6.54	6.26	5.97	5.69
74070	SD-42	.1250	1/8"	3.175	1-1/2"	-	-	6.54	6.26	5.97	5.69
74072	SD-42D	.1250	1/8"	3.175	1-1/2"	-	-	6.54	6.26	5.97	5.69
74080	SE-41	.1250	1/8"	3.175	1-1/2"	-	7/32"	6.54	6.26	5.97	5.69
74082	SE-41D	.1250	1/8"	3.175	1-1/2"	-	7/32"	6.54	6.26	5.97	5.69
74090	SF-42	.1250	1/8"	3.175	1-1/2"	-	1/2"	6.54	6.26	5.97	5.69
74092	SF-42D	.1250	1/8"	3.175	1-1/2"	-	1/2"	6.54	6.26	5.97	5.69
74100	SG-43	.1250	1/8"	3.175	1-1/2"	-	3/8"	6.54	6.26	5.97	5.69
74102	SG-43D	.1250	1/8"	3.175	1-1/2"	-	3/8"	6.54	6.26	5.97	5.69
74110	SH-41	.1250	1/8"	3.175	1-1/2"	-	1/4"	6.54	6.26	5.97	5.69
74112	SH-41D	.1250	1/8"	3.175	1-1/2"	-	1/4"	6.54	6.26	5.97	5.69
74120	SJ-42	.1250	1/8"	3.175	1-1/2"	60°	-	6.54	6.26	5.97	5.69
74122	SJ-42D	.1250	1/8"	3.175	1-1/2"	60°	-	6.54	6.26	5.97	5.69
74130	SK-42	.1250	1/8"	3.175	1-1/2"	90°	-	6.54	6.26	5.97	5.69
74132	SK-42D	.1250	1/8"	3.175	1-1/2"	90°	-	6.54	6.26	5.97	5.69
74140	SL-41	.1250	1/8"	3.175	1-1/2"	8°	3/8"	6.54	6.26	5.97	5.69
74142	SL-41D	.1250	1/8"	3.175	1-1/2"	8°	3/8"	6.54	6.26	5.97	5.69
74150	SL-42	.1250	1/8"	3.175	1-1/2"	8°	1/2"	6.54	6.26	5.97	5.69
74152	SL-42D	.1250	1/8"	3.175	1-1/2"	8°	1/2"	6.54	6.26	5.97	5.69
74160	SM-41	.1250	1/8"	3.175	1-1/2"	12°	3/8"	6.54	6.26	5.97	5.69
74162	SM-41D	.1250	1/8"	3.175	1-1/2"	12°	3/8"	6.54	6.26	5.97	5.69
74170	SM-43	.1250	1/8"	3.175	1-1/2"	7°	5/8"	6.54	6.26	5.97	5.69
74172	SM-43D	.1250	1/8"	3.175	1-1/2"	7°	5/8"	6.54	6.26	5.97	5.69
74180	SN-42	.1250	1/8"	3.175	1-1/2"	10°	3/16"	6.54	6.26	5.97	5.69
74182	SN-42D	.1250	1/8"	3.175	1-1/2"	10°	3/16"	6.54	6.26	5.97	5.69



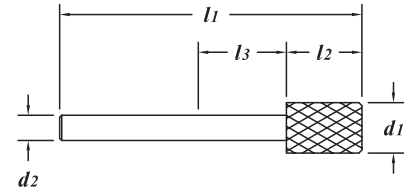
Solid Carbide Grinding Burrs

Submicron Grain Carbide

Standard 45° lead chamfer

Head diameter tolerance $+0.002'' -0.002''$ ($+0.051\text{mm} -0.051\text{mm}$)

* - Carbide shank brazed to carbide head



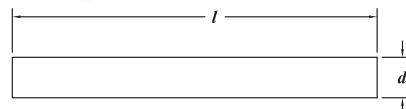
EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	$l3$ Neck Length	1-11	12-24	25-49	50-100	
	Decimal	Metric									
76010	.0480	1.219	1/8"	1-1/2"	1/8"	1/2"	15.61	14.93	14.25	13.57	
75010	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	3/8"	15.61	14.93	14.25	13.57
76020	.0790	2.007	1/8"	1-1/2"	1/8"	1/2"	15.61	14.93	14.25	13.57	
75020	.0938	3/32"	2.383	1/8"	1-1/2"	5/32"	3/8"	15.61	14.93	14.25	13.57
76030	.1100	2.794	1/8"	1-1/2"	5/32"	5/8"	15.61	14.93	14.25	13.57	
75030	.1250	1/8"	3.175	1/8"	1-1/2"	3/16"	5/8"	14.82	14.18	13.53	12.89
76040	.1410	3.581	3/16"	2"	3/16"	3/4"	21.97	21.01	20.06	19.10	
75040	.1562	5/32"	3.967	3/16"	2"	1/4"	3/4"	21.97	21.01	20.06	19.10
76050	.1720	4.369	3/16"	2"	7/32"	3/4"	21.97	21.01	20.06	19.10	
75050	.1875	3/16"	4.763	3/16"	2"	1/4"	3/4"	19.78	18.92	18.06	17.20
76060	.2030	5.156	1/4"	2"	1/4"	3/4"	22.67	21.68	20.70	19.71	
75060	.2188	7/32"	5.558	1/4"	2"	1/4"	3/4"	22.67	21.68	20.70	19.71
76070	.2350	5.969	1/4"	2"	5/16"	3/4"	22.67	21.68	20.70	19.71	
75070	.2500	1/4"	6.350	1/4"	2"	5/16"	3/4"	20.57	19.68	18.78	17.89
76080	* .3000	7.620	1/4"	2-1/2"	3/8"	-	33.22	31.78	30.33	28.89	
75080	.3125	* 5/16"	7.938	1/4"	2-1/2"	3/8"	-	33.22	31.78	30.33	28.89
76090	* .3600	9.144	1/4"	2-1/2"	1/2"	-	35.44	33.90	32.36	30.82	
75090	.3750	* 3/8"	9.525	1/4"	2-1/2"	1/2"	-	35.44	33.90	32.36	30.82
76100	* .4230	10.744	1/4"	2-1/2"	1/2"	-	38.58	36.91	35.23	33.55	
75100	.4375	* 7/16"	11.113	1/4"	2-1/2"	1/2"	-	38.58	36.91	35.23	33.55
76110	* .4850	12.319	1/4"	2-1/2"	1/2"	-	39.73	38.01	36.28	34.55	

TOLERANCES

d	3mm - 6mm	+0.000" - .0003" (+.0000 - .0075mm)
	1/4" - 1"	-.0001" - .0004" (-.0025 - .0100mm)

Centerless Ground

Solid Carbide Submicron Grain



EDP#	d [†] Diameter		l Overall Length	1-11	12-24	25-49	50-100
	Decimal	Metric					
95010	.1181	3.000	38	2.70	2.59	2.47	2.35
53010	.1250	3.175	1-1/2"	2.60	2.49	2.37	2.26
53020	.1250	3.175	2"	4.53	4.33	4.14	3.94
53030	.1250	3.175	3"	5.08	4.86	4.64	4.42
53040	.1250	3.175	4"	8.68	8.31	7.93	7.55
53050	.1250	3.175	6"	13.65	13.06	12.46	11.87
53060	.1250	3.175	12"	30.69	29.36	28.02	26.69
95070	.1575	4.000	50	6.66	6.37	6.08	5.79
53070	.1875	4.763	2"	5.74	5.49	5.24	4.99
53080	.1875	4.763	2-1/2"	8.07	7.72	7.37	7.02
53090	.1875	4.763	3"	11.28	10.79	10.30	9.81
53100	.1875	4.763	4"	13.74	13.15	12.55	11.95
53110	.1875	4.763	6"	20.52	19.62	18.73	17.84
53120	.1875	4.763	12"	34.99	33.47	31.95	30.43
95130	.1969	5.000	65	8.61	8.24	7.86	7.49
95190	.2362	6.000	65	9.23	8.83	8.43	8.03
53130	.2500	6.350	2"	7.60	7.27	6.94	6.61
53140	.2500	6.350	2-1/2"	8.80	8.42	8.03	7.65
53150	.2500	6.350	3"	13.83	13.23	12.63	12.03
53160	.2500	6.350	4"	21.86	20.91	19.96	19.01
53170	.2500	6.350	6"	29.33	28.05	26.78	25.50
53180	.2500	6.350	12"	55.72	53.30	50.87	48.45
53190	.3125	7.938	2-1/2"	14.19	13.57	12.96	12.34
53200	.3125	7.938	3"	23.22	22.21	21.20	20.19
53210	.3125	7.938	4"	26.52	25.37	24.21	23.06
53220	.3125	7.938	6"	43.22	41.34	39.46	37.58
53230	.3125	7.938	12"	72.92	69.75	66.58	63.41
95250	.3150	8.000	65	14.19	13.57	12.96	12.34
53240	.3750	9.525	2-1/2"	19.11	18.28	17.45	16.62
53250	.3750	9.525	3"	25.67	24.55	23.44	22.32
53260	.3750	9.525	3-1/2"	27.38	26.19	25.00	23.81
53270	.3750	9.525	4"	30.05	28.74	27.44	26.13
53280	.3750	9.525	6"	51.09	48.87	46.65	44.43
53290	.3750	9.525	12"	84.76	81.07	77.39	73.70
95320	.3937	10.000	70	20.98	20.06	19.15	18.24
53300	.4375	11.113	2-1/2"	23.39	22.37	21.36	20.34
53310	.4375	11.113	3"	30.64	29.30	27.97	26.64
53320	.4375	11.113	4"	42.14	40.30	38.47	36.64
53330	.4375	11.113	6"	61.12	58.47	55.81	53.15
53340	.4375	11.113	12"	125.86	120.38	114.91	109.44
95380	.4724	12.000	75	33.40	31.94	30.49	29.04
53350	.5000	12.700	3"	31.30	29.94	28.58	27.22
53360	.5000	12.700	4"	43.17	41.29	39.42	37.54
53370	.5000	12.700	6"	72.77	69.61	66.44	63.28
53380	.5000	12.700	12"	161.81	154.77	147.74	140.70
53390	.6250	15.875	3-1/2"	60.48	57.85	55.22	52.59
53400	.6250	15.875	4"	83.97	80.32	76.67	73.02
53410	.6250	15.875	6"	132.87	127.09	121.32	115.54
53420	.6250	15.875	12"	282.53	270.25	257.96	245.68
95440	.6299	16.000	88	60.48	57.85	55.22	52.59
53430	.7500	19.050	4"	89.76	85.86	81.95	78.05
53440	.7500	19.050	6"	177.03	169.33	161.64	153.94
53450	.7500	19.050	12"	338.72	323.99	309.27	294.54
95490	.7874	20.000	100	112.98	108.06	103.15	98.24
95530	.9843	25.000	100	140.98	134.85	128.72	122.59
53460	1.000	25.400	4"	137.51	131.53	125.55	119.57
53470	1.000	25.400	6"	307.30	293.94	280.58	267.22
53480	1.000	25.400	12"	541.48	517.94	494.39	470.85

TOLERANCES

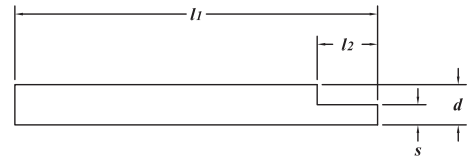
<i>d</i>	1/8" - 3/16"	+0.000" - .0003" (-.0000 - .0075mm)
	1/4" - 1/2"	-.0001" - .0004" (-.0025 - .0100mm)
<i>s</i>	+.001" - .000" (+.025 - .000mm) from centerline	

2220M

BLANKS

Centerless Ground Engraving - Split Single End

Solid Carbide Submicron Grain
 For use in engraving or single flute milling
 Ready to be finished - blank is non-cutting



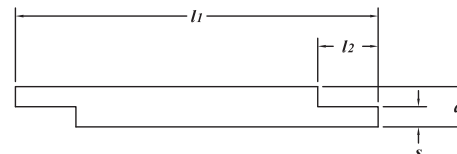
EDP#	<i>d</i> † Diameter		<i>l</i> ₁ Overall Length	<i>l</i> ₂ Split Length	<i>s</i> Split Depth	1-11	12-24	25-49	50-100	
	Decimal	Metric								
54010	.1250	1/8"	3.175	1-1/2"	3/8"	1/16"	4.75	4.54	4.34	4.13
54020	.1250	1/8"	3.175	2"	3/8"	1/16"	6.69	6.40	6.11	5.82
54030	.1250	1/8"	3.175	3"	3/8"	1/16"	7.48	7.15	6.83	6.50
54040	.1250	1/8"	3.175	4"	3/8"	1/16"	10.88	10.41	9.93	9.46
54050	.1250	1/8"	3.175	6"	3/8"	1/16"	15.86	15.17	14.48	13.79
54060	.1875	3/16"	4.763	2"	1/2"	3/32"	9.07	8.68	8.28	7.89
54070	.1875	3/16"	4.763	2-1/2"	1/2"	3/32"	11.41	10.91	10.42	9.92
54080	.1875	3/16"	4.763	3"	1/2"	3/32"	14.63	13.99	13.36	12.72
54090	.1875	3/16"	4.763	4"	1/2"	3/32"	17.08	16.34	15.59	14.85
54100	.1875	3/16"	4.763	6"	1/2"	3/32"	23.83	22.79	21.76	20.72
54110	.2500	1/4"	6.350	2"	1/2"	1/8"	12.77	12.21	11.66	11.10
54120	.2500	1/4"	6.350	2-1/2"	1/2"	1/8"	13.95	13.34	12.74	12.13
54130	.2500	1/4"	6.350	3"	1/2"	1/8"	19.02	18.19	17.37	16.54
54140	.2500	1/4"	6.350	4"	1/2"	1/8"	27.05	25.87	24.70	23.52
54150	.2500	1/4"	6.350	6"	1/2"	1/8"	34.52	33.02	31.52	30.02
54160	.3125	5/16"	7.938	2-1/2"	1/2"	5/32"	19.69	18.83	17.98	17.12
54170	.3125	5/16"	7.938	3"	1/2"	5/32"	28.74	27.49	26.24	24.99
54180	.3125	5/16"	7.938	4"	1/2"	5/32"	32.02	30.62	29.23	27.84
54190	.3125	5/16"	7.938	6"	1/2"	5/32"	48.73	46.61	44.49	42.37
54200	.3750	3/8"	9.525	2-1/2"	1/2"	3/16"	26.66	25.50	24.34	23.18
54210	.3750	3/8"	9.525	3"	1/2"	3/16"	33.15	31.71	30.27	28.83
54220	.3750	3/8"	9.525	4"	1/2"	3/16"	37.57	35.94	34.30	32.67
54230	.3750	3/8"	9.525	6"	1/2"	3/16"	58.64	56.09	53.54	50.99
54240	.4375	7/16"	11.113	2-1/2"	5/8"	7/32"	31.72	30.34	28.96	27.58
54250	.4375	7/16"	11.113	3"	5/8"	7/32"	38.95	37.26	35.56	33.87
54260	.4375	7/16"	11.113	4"	5/8"	7/32"	50.49	48.29	46.10	43.90
54270	.4375	7/16"	11.113	6"	5/8"	7/32"	69.44	66.42	63.40	60.38
54280	.5000	1/2"	12.700	3"	5/8"	1/4"	42.45	40.60	38.76	36.91
54290	.5000	1/2"	12.700	4"	5/8"	1/4"	54.34	51.98	49.61	47.25
54300	.5000	1/2"	12.700	6"	5/8"	1/4"	83.93	80.28	76.63	72.98

TOLERANCES

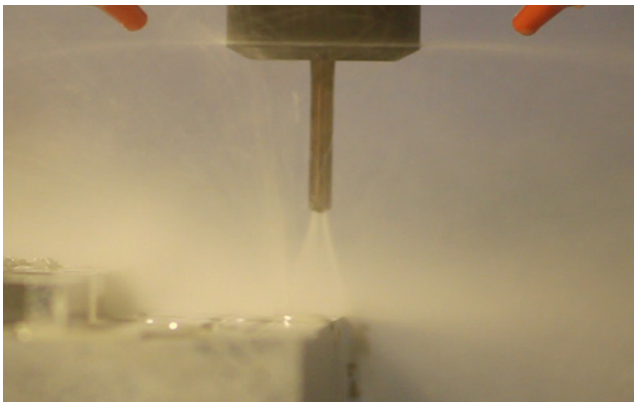
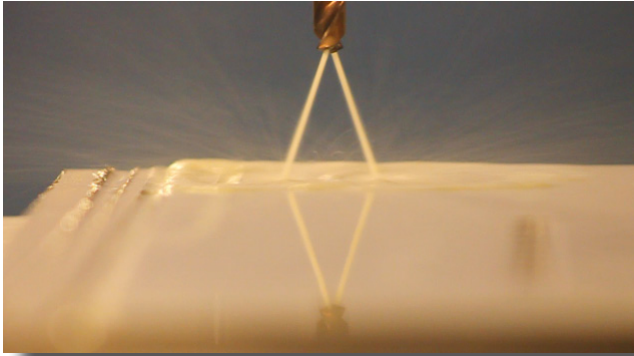
<i>d</i>	1/8" - 3/16"	+0.000" - .0003" (-.0000 - .0075mm)
	1/4" - 1/2"	-.0001" - .0004" (-.0025 - .0100mm)
<i>s</i>	+.001" - .000" (+.025 - .000mm) from centerline	

Centerless Ground Engraving - Split Double End

Solid Carbide Submicron Grain
 For use in engraving or single flute milling
 Ready to be finished - blank is non-cutting



EDP#	<i>d</i> † Diameter		<i>l</i> ₁ Overall Length	<i>l</i> ₂ Split Length	<i>s</i> Split Depth	1-11	12-24	25-49	50-100	
	Decimal	Metric								
55010	.1250	1/8"	3.175	1-1/2"	3/8"	1/16"	6.96	6.66	6.35	6.05
55020	.1250	1/8"	3.175	2"	3/8"	1/16"	8.87	8.48	8.10	7.71
55030	.1250	1/8"	3.175	3"	3/8"	1/16"	9.64	9.22	8.80	8.38
55040	.1250	1/8"	3.175	4"	3/8"	1/16"	13.06	12.50	11.93	11.36
55050	.1250	1/8"	3.175	6"	3/8"	1/16"	17.96	17.18	16.40	15.62
55060	.1875	3/16"	4.763	2"	1/2"	3/32"	12.42	11.88	11.34	10.80
55070	.1875	3/16"	4.763	2-1/2"	1/2"	3/32"	14.72	14.08	13.44	12.80
55080	.1875	3/16"	4.763	3"	1/2"	3/32"	17.92	17.14	16.36	15.58
55090	.1875	3/16"	4.763	4"	1/2"	3/32"	20.42	19.54	18.65	17.76
55100	.1875	3/16"	4.763	6"	1/2"	3/32"	27.17	25.99	24.81	23.63
55110	.2500	1/4"	6.350	2"	1/2"	1/8"	17.92	17.14	16.36	15.58
55120	.2500	1/4"	6.350	2-1/2"	1/2"	1/8"	19.11	18.28	17.45	16.62
55130	.2500	1/4"	6.350	3"	1/2"	1/8"	24.17	23.12	22.07	21.02
55140	.2500	1/4"	6.350	4"	1/2"	1/8"	32.18	30.78	29.38	27.98
55150	.2500	1/4"	6.350	6"	1/2"	1/8"	39.68	37.95	36.23	34.50
55160	.3125	5/16"	7.938	2-1/2"	1/2"	5/32"	25.21	24.11	23.02	21.92
55170	.3125	5/16"	7.938	3"	1/2"	5/32"	34.22	32.74	31.25	29.76
55180	.3125	5/16"	7.938	4"	1/2"	5/32"	37.54	35.90	34.27	32.64
55190	.3125	5/16"	7.938	6"	1/2"	5/32"	54.19	51.83	49.48	47.12
55200	.3750	3/8"	9.525	2-1/2"	1/2"	3/16"	34.13	32.65	31.16	29.68
55210	.3750	3/8"	9.525	3"	1/2"	3/16"	40.66	38.90	37.13	35.36
55220	.3750	3/8"	9.525	4"	1/2"	3/16"	45.05	43.09	41.13	39.17
55230	.3750	3/8"	9.525	6"	1/2"	3/16"	66.11	63.24	60.36	57.49
55240	.4375	7/16"	11.113	2-1/2"	5/8"	7/32"	40.05	38.31	36.57	34.83
55250	.4375	7/16"	11.113	3"	5/8"	7/32"	47.32	45.27	43.21	41.15
55260	.4375	7/16"	11.113	4"	5/8"	7/32"	58.81	56.25	53.70	51.14
55270	.4375	7/16"	11.113	6"	5/8"	7/32"	77.77	74.39	71.01	67.63
55280	.5000	1/2"	12.700	3"	5/8"	1/4"	53.64	51.30	48.97	46.64
55290	.5000	1/2"	12.700	4"	5/8"	1/4"	65.47	62.62	59.78	56.93
55300	.5000	1/2"	12.700	6"	5/8"	1/4"	95.11	90.97	86.84	82.70



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Troubleshooting for End Mills

PROBLEM	SUGGESTIONS
Chipping	Check part rigidity
	Verify speeds and feeds
	Confirm concentricity of end mill in holder
	Decrease ramp angle or slow down approach
	Check coolant flow and location
Breakage	Decrease feed rate
	Decrease axial depth
	Use shorter tool or stub holder
	Resharpen earlier
Chattering	Too light of a cut
	Leave more stock for finish pass
	Decrease axial depth
	Adjust speeds and feeds
Part finish	Confirm concentricity of end mill in holder
	Decrease feed rate
	Use different style of end mill
	Check coolant flow and location
	Check part rigidity
Burr	Change end mill sooner / too much wear
	Verify speeds and feeds
	Increase spindle speed
	Decrease feed rate
	Use different style of end mill
Excessive noise	Check part rigidity
	Verify speeds and feeds
	Too light of a cut
	Confirm concentricity of end mill in holder
Tool life	Work material harder than expected
	Verify speeds and feeds
	Recutting chips
	Too light of a cut
	Use different style of end mill
Wear	Speed too fast
	Too light of a feed
	Confirm concentricity of end mill in holder
	Verify speeds and feeds
Chip welding	Verify speeds and feeds
	Check coolant flow and location
	Use different style of end mill
	Check coolant flow and location
Chip packing	Decrease axial depth
	Adjust speeds and feeds
	Use different style of end mill
	Check coolant flow and location
Wall not straight	Decrease feed rate
	Decrease axial depth
	Use shorter tool or stub holder
	Use different style of end mill

Troubleshooting for Drills

PROBLEM	SUGGESTIONS
Chipping on point	Reduce feed rate
	Check part rigidity
	Constant feed rate
	Verify speeds and feeds
	Minimum drill overhang
Chipping on O.D.	Reduce number of peck cycles
	Reduce feed rate
	Confirm concentricity of drill in holder
	Check coolant flow and location
	Check part rigidity
Breakage	Reduce feed rate
	Check your program - is 'R' clearing the part
	Check coolant flow and location
	Check part rigidity
Heavy wear on corners	Increase feed rate
	Check coolant flow and location
	Confirm concentricity of drill in holder
	Check part rigidity
Long, stringy chips	Increase feed rate
	Increase hone relief
	Constant feed rate
	Increase number of peck cycles
Excessive noise	Check drill
	Check part rigidity
	Check for proper speeds and feeds
Tool life	Lower speeds and feeds
	Check coolant flow and location
	Confirm concentricity of drill in holder
	Confirm coolant concentration
Hole too small	Increase feed rate
	Confirm coolant concentration
	Confirm drill diameter
Hole too large	Reduce feed rate
	Slow feed rate to start hole
	Increase RPMs
	Spot hole
Chip welding	Increase RPMs by 20%
	Confirm coolant concentration
	Check coolant flow and location
Chip packing	Add a peck cycle to clear chips
	Increase RPMs
	Reduce feed rate
	Check coolant flow and location

Troubleshooting for Reamers

PROBLEM	SUGGESTIONS
Hole diameter too large	Check part rigidity
	Verify speeds and feeds
	Confirm concentricity of reamer in holder
	Confirm diameter of reamer
Hole diameter too small	Check coolant flow and location
	Leave more stock before reaming
	Reamer worn
	Check coolant flow and concentration
Hole not straight	Resharpen earlier
	Hole was not drilled properly
	Leave more stock before reaming
	Confirm concentricity of reamer in holder
Part finish	Check part rigidity
	Reamer worn
	Verify speeds and feeds
	Confirm concentricity of reamer in holder
	Check coolant flow and location
Tool life	Check part rigidity
	Work material harder than expected
	Verify speeds and feeds
	Not evacuating chips properly
Wear	Too light of a cut
	Speed too fast
	Too light of a feed
	Confirm concentricity of reamer in holder
Not evacuating	Check coolant flow, location, and concentration
	Verify speeds and feeds
	Reamer worn

$$SFM = \frac{\pi \times \text{Dia.} \times \text{RPM}}{12}$$

$$CPT = \frac{IPM}{\text{RPM} \times \text{Number of teeth}}$$

$$\text{RPM} = \frac{\text{SFM} \times 3.82}{\text{Dia.}}$$

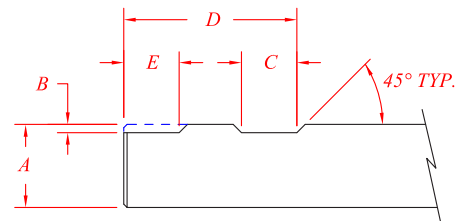
$$IPM = \text{RPM} \times \text{Number of teeth} \times \text{CPT}$$

Chip Thinning theory:

$$\left(\frac{\text{Radius of tool dia.}}{\text{Radial engagement}} \right)^2 = a$$

$$a \times \text{CPT} = \text{Actual CPT}$$

STANDARD WELDON SHANK DIMENSIONS					
Diameter (A)	B	C	D	E	
3/8"	.3750"	.050"-.065"	.280"-.282"	.921"	-
7/16"	.4375"	.050"-.065"	.312"-.314"	.991"	-
1/2"	.5000"	.060"-.075"	.330"-.332"	1.055"	-
9/16"	.5625"	.065"-.080"	.400"-.402"	1.154"	-
5/8"	.6250"	.065"-.080"	.400"-.402"	1.154"	-
3/4"	.7500"	.075"-.090"	.455"-.457"	1.242"	-
7/8"	.8750"	.065"-.080"	.455"-.457"	1.242"	.500"
1"	1.0000"	.075"-.090"	.515"-.517"	1.398"	.500"
1-1/4"	1.2500"	.094"-.109"	.515"-.517"	1.398"	.500"



h6 TOLERANCE FOR SHRINK FIT HOLDERS <i>(as taken from the Machinery's Handbook)</i>		
SHANK DIAMETER		TOLERANCE
Decimal	Nominal	
≤ .1181"	≤ 3mm	-.00000" / -.00024"
> .1181" - .2362"	> 3mm - 6mm	-.00000" / -.00032"
> .2362" - .3937"	> 6mm - 10mm	-.00000" / -.00035"
> .3937" - .7087"	> 10mm - 18mm	-.00000" / -.00043"
> .7087" - 1.1811"	> 18mm - 30mm	-.00000" / -.00050"
> 1.1811"	> 30mm	-.00000" / -.00050"

For additional help:

Check out the MC-20 machinist calculator or, if you have a smartphone, search for the feedrate calculator from the App Store.

Tool Coatings



TiN
(Titanium Nitride)

General purpose coating - low heat resistance. Good lubricity.



TiCN
(Titanium Carbonitride)

Good abrasion resistance. Recommended for aluminum, brass and bronze applications. Low heat resistance - good lubricity.



TiALN - Balinit® FUTURA
(Titanium Aluminum Nitride)

Multi-layer coating with good thermal stability for increased speeds and feeds. For semi-dry to dry cutting of most steels, high-nickel alloys, stainless steel and cast iron. Excellent heat resistance, good lubricity. For materials that are 40Rc and under.



Balinit® X.CEED

A single-layer coating whose hardness, oxidation resistance and thermal stability were optimized for material hardness above 52 HRC and high-speed machining of materials that are difficult to work (titanium alloys, Inconel). Competes with ALTiN.



ALUMASTAR®
(Titanium Diboride - TiB₂)

A thin film coating with a low affinity for aluminum, ideal for machining aluminum alloys. The resistance to adhesion of aluminum allows higher speeds or feeds. Coating thickness is intentionally kept lower in order to maintain a sharp edge.



CRYSTALLINE DIAMOND
(CVD)

Improved productivity in composites and non-ferrous metals. Excellent choice for cutting graphite, fiberglass, and silicon-based aluminum. Can be added to a special for milling or drilling applications.



Balinit® AlCrN-based

Aluminum Chromium-based coatings have excellent wear resistance, thermal shock stability, and hot hardness. Well suited for Titanium, Inconel, and carbon fiber.



Balinit® HARDLUBE

Multi-layer coating with thermal stability and lubricating properties needed for the drilling of steels, high-nickel alloys, stainless steel, cast iron, aluminum, brass, and bronze. Excellent heat resistance, great lubricity.



Balinit® HELICA

G6 Generation coating. Greater abrasion resistance, extra shear strength, lower adhesion tendency, maximum toughness and a very smooth surface achieve a quantum leap in drilling performance. This coating is particularly advantageous for carbide drills. Helica is part of the AlCrN-based coatings.

SFM (M/Min.) / RPM Conversion Charts

Fractional

SFM	DIAMETER														
	.0625"	.0938"	.1250"	.1562"	.1875"	.2188"	.2500"	.3125"	.3750"	.4375"	.5000"	.6250"	.7500"	.8750"	1.000"
	1/16"	3/32"	1/8"	5/32"	3/16"	7/32"	1/4"	5/16"	3/8"	7/16"	1/2"	5/8"	3/4"	7/8"	1"
	RPM														
50	3050	2040	1530	1220	1020	875	765	610	510	440	380	310	250	220	190
75	4580	3060	2290	1830	1530	1310	1150	920	760	570	570	460	380	330	285
100	6100	4080	3050	2450	2040	1750	1530	1220	1020	760	760	610	510	440	385
125	7630	5100	3820	3050	2550	2180	1920	1530	1270	950	950	770	630	550	475
150	9150	6120	4570	3670	3060	2620	2290	1830	1530	1140	1140	920	760	660	575
175	10,680	7140	5350	4270	3570	3060	2680	2140	1780	1330	1330	1080	880	770	665
200	12,200	8150	6100	4900	4070	3500	3100	2450	2000	1500	1500	1200	1000	875	750
300	18,500	12,200	9200	7300	6100	5250	4600	3700	3100	2300	2300	1800	1500	1300	1100
400	24,500	16,300	12,200	9800	8150	7000	6100	4900	4100	3050	3050	2450	2050	1750	1525
500	30,500	20,400	15,300	12,200	10,200	8700	7600	6100	5100	3800	3800	3100	2500	2200	1900
750	45,800	36,700	22,900	18,300	15,300	13,100	11,500	9200	7600	5700	5700	4600	3800	3770	2850
1000	-	40,800	30,600	24,500	20,400	17,500	15,300	12,200	10,200	7650	7650	6100	5100	4400	3800
1500	-	-	40,800	36,700	30,600	26,200	22,900	18,300	15,300	11,300	11,300	9200	7600	6500	5700
2000	-	-	-	49,000	40,800	35,000	30,600	24,400	20,400	15,300	15,300	12,200	10,200	8700	7600
3000	-	-	-	-	-	52,500	45,900	36,600	30,600	22,900	22,900	18,300	15,300	13,100	11,400
4000	-	-	-	-	-	-	-	48,800	40,800	30,600	30,600	24,400	20,400	17,500	15,200
5000	-	-	-	-	-	-	-	-	51,000	38,200	38,200	30,600	25,500	21,800	19,000

Metric

M/Min.	DIAMETER														
	.0394"	.0787"	.1181"	.1575"	.1969"	.2362"	.3150"	.3937"	.4724"	.5512"	.6299"	.7087"	.7874"	.8661"	.9843"
	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0
	RPM														
15	4800	2400	1600	1200	960	800	600	480	400	340	300	265	240	220	190
22	7000	3500	2300	1750	1400	1170	875	700	585	500	440	390	350	320	280
30	10,000	4800	3200	2400	1900	1590	1200	955	800	685	600	530	480	440	380
38	12,100	6000	4000	3025	2420	2020	1515	1210	1000	870	760	670	600	550	485
45	14,300	7200	4800	3600	2870	2390	1790	1430	1200	1020	900	800	710	650	575
53	16,880	8440	5630	4220	3375	2815	2110	1690	1400	1200	1055	940	845	770	675
60	19,110	9550	6370	4780	3825	3185	2390	1910	1590	1365	1200	1060	955	870	765
90	28,770	14,350	9550	7165	5735	4780	3585	2870	2390	2050	1790	1590	1430	1300	1150
120	38,220	19,100	12,750	9550	7645	6370	4780	3820	3185	2730	2490	2120	1910	1740	1530
150	47,770	23,885	15,925	11,950	9550	7965	5970	4780	3980	3410	2990	2650	2390	2170	1900
230	-	36,625	24,400	18,315	14,650	12,210	9150	7325	6100	5230	4580	4070	3660	3330	2930
300	-	47,770	31,850	23,885	19,110	15,925	11,950	9550	7960	6825	5970	5300	4780	4340	3820
450	-	-	47,770	35,830	28,660	23,885	17,915	14,330	11,950	10,240	8960	7960	7170	6510	5730
600	-	-	-	47,770	38,220	31,850	23,885	19,100	15,920	13,650	12,000	10,600	9550	8685	7600
900	-	-	-	-	-	47,770	35,830	28,660	23,885	20,475	17,900	15,900	14,330	13,030	11,500
1200	-	-	-	-	-	-	47,770	38,210	31,850	27,300	23,885	21,230	19,100	17,370	15,300
1500	-	-	-	-	-	-	-	47,770	39,810	34,210	29,860	26,540	23,885	21,710	19,100

General Solid Carbide Milling Guide

Fractional

Type	Rc Hardness	MILLING SFM (Vc)					CHIPLOAD PER FLUTE (Fz)				
		2 flute stub / std.	2 flute extra length	3 & 4 flute stub / std.	3 & 4 flute extra length	Diamond Coated	1/32" - 1/8"	1/8" - 1/4"	1/4" - 1/2"	1/2" - 1"	1" - 1-1/4"
COBALT BASE ALLOYS											
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 35	-	-	175 - 225	150 - 200	-	.0005" - .0010"	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"	.0030" - .0050"
	> 35	-	-	125 - 175	100 - 150	-	.0003" - .0005"	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"	.0020" - .0040"
NICKEL BASE ALLOYS											
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35	-	-	125 - 175	100 - 150	-	.0005" - .0010"	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"	.0030" - .0050"
	> 35	-	-	70 - 115	70 - 100	-	.0003" - .0005"	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"	.0020" - .0040"
IRON BASE ALLOYS											
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35	-	-	175 - 225	150 - 200	-	.0005" - .0010"	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"	.0030" - .0050"
	> 35	-	-	125 - 175	100 - 150	-	.0003" - .0005"	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"	.0020" - .0040"
MONEL											
Monel - 65% Nickel		175 - 300	125 - 175	175 - 300	125 - 175	-	.0007" - .0015"	.0010" - .0025"	.0015" - .0040"	.0030" - .0050"	.0040" - .0060"
TITANIUM ALLOYS											
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		200 - 300	125 - 250	200 - 300	125 - 250	-	.0007" - .0015"	.0010" - .0025"	.0015" - .0040"	.0030" - .0050"	.0040" - .0060"
	5553 / Beta Titanium	-	-	125 - 225	100 - 200	-	.0005" - .0010"	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"	.0030" - .0050"
STAINLESS STEELS											
13/8, 15/5, 17-4, pH Types	< 35	-	-	150 - 250	100 - 150	-	.0005" - .0010"	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"	.0030" - .0050"
	> 35	-	-	125 - 175	80 - 150	-	.0003" - .0005"	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"	.0020" - .0040"
Inox, 200 Series, 300 Series	< 35	-	-	200 - 250	125 - 175	-	.0005" - .0010"	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"	.0030" - .0050"
	> 35	-	-	150 - 200	100 - 150	-	.0003" - .0005"	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"	.0020" - .0040"
304L, 316L, Nitronic 50, Inox	< 35	-	-	90 - 125	80 - 120	-	.0005" - .0008"	.0008" - .0015"	.0010" - .0020"	.0020" - .0040"	.0030" - .0050"
	> 35	-	-	75 - 110	60 - 90	-	.0003" - .0005"	.0005" - .0010"	.0010" - .0015"	.0010" - .0030"	.0020" - .0040"
400 Series	< 35	-	-	150 - 250	100 - 150	-	.0005" - .0010"	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"	.0030" - .0050"
	> 35	-	-	125 - 175	80 - 150	-	.0003" - .0005"	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"	.0020" - .0040"
HIGH STRENGTH TOOL STEELS											
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 30	-	-	150 - 225	125 - 175	-	.0005" - .0010"	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"	.0030" - .0050"
	30 - 38	-	-	90 - 125	80 - 120	-	.0003" - .0005"	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"	.0020" - .0040"
	> 38	-	-	60 - 90	50 - 80	-	.0002" - .0004"	.0003" - .0007"	.0008" - .0015"	.0010" - .0025"	.0015" - .0035"
MEDIUM ALLOY TOOL STEELS											
200, 250, 300, 8620	< 35	-	-	175 - 250	150 - 200	-	.0007" - .0015"	.0010" - .0025"	.0015" - .0040"	.0030" - .0050"	.0040" - .0060"
	> 35	-	-	100 - 175	100 - 150	-	.0005" - .0010"	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"	.0030" - .0050"
CARBON STEELS											
A36, 12L14, 1000's, 1100's, 1300's	< 35	-	-	175 - 250	150 - 200	-	.0007" - .0015"	.0010" - .0025"	.0015" - .0040"	.0030" - .0050"	.0040" - .0060"
	> 35	-	-	100 - 175	100 - 150	-	.0005" - .0010"	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"	.0030" - .0050"
CAST MATERIAL											
Steel		225 - 325	175 - 250	250 - 350	175 - 250	-	.0010" - .0020"	.0015" - .0040"	.0020" - .0060"	.0030" - .0100"	.0050" - .0100"
Ductile Iron		200 - 300	125 - 200	200 - 300	125 - 200	-	.0005" - .0015"	.0010" - .0030"	.0015" - .0040"	.0020" - .0060"	.0030" - .0080"
Gray Iron		225 - 325	175 - 250	250 - 350	175 - 250	-	.0010" - .0020"	.0015" - .0040"	.0020" - .0060"	.0030" - .0100"	.0050" - .0100"
Aluminum		250 - 350	250 - 350	250 - 350	250 - 350	-	.0010" - .0020"	.0015" - .0040"	.0020" - .0060"	.0030" - .0100"	.0050" - .0100"
ALUMINUM											
Aircraft Grade (6061, 7075)	Standard Speed	300 - 500	300 - 500	300 - 500	300 - 500	-	.0010" - .0020"	.0015" - .0040"	.0020" - .0060"	.0030" - .0100"	.0050" - .0150"
	High Speed	(SEE HIGH SPEED ALUMINUM CHART - PAGE 232)									
MAGNESIUM											
		300 - 500	300 - 500	300 - 500	300 - 500	-	.0010" - .0020"	.0015" - .0040"	.0020" - .0060"	.0030" - .0100"	.0050" - .0100"
COPPER											
Copper Alloys		300 - 400	250 - 350	300 - 450	250 - 350	-	.0007" - .0015"	.0010" - .0025"	.0015" - .0035"	.0020" - .0080"	.0040" - .0100"
BRASS, BRONZE											
Brass, Aluminum/Bronze, Low Silicon Bronze		300 - 400	200 - 300	275 - 375	200 - 300	-	.0007" - .0015"	.0010" - .0025"	.0015" - .0035"	.0020" - .0080"	.0040" - .0100"
COMPOSITE MATERIAL											
Glass Epoxy, Fiberglass, Plastics		200 - 400	200 - 400	200 - 400	200 - 500		.0010" - .0020"	.0015" - .0040"	.0020" - .0060"	.0030" - .0100"	.0050" - .0100"
Graphite, G10		(SEE GRAPHITE CHART - PAGE 242)				300 - 1000	.0010" - .0020"	.0015" - .0040"	.0020" - .0060"	.0030" - .0100"	.0050" - .0100"

When plunging into a solid, drop feed by approximately 50%.

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

High Performance Solid Carbide Milling Guide

Fractional

Type	Rc Hardness	MILLING SFM (Vc)				CHIPLOAD PER FLUTE (Fz)		
		Aluminum Series		All Other High Performance Series		1/8" - 1/4"	1/4" - 1/2"	1/2" - 1"
		Uncoated	Coated	Uncoated	X.Ceed Coated			
COBALT BASE ALLOYS								
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 35	-	-	200 - 275	275 - 400	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"
	> 35	-	-	125 - 175	175 - 250	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"
NICKEL BASE ALLOYS								
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35	-	-	150 - 200	200 - 300	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"
	> 35	-	-	90 - 125	125 - 200	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"
IRON BASE ALLOYS								
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35	-	-	200 - 300	250 - 350	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"
	> 35	-	-	150 - 200	200 - 250	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"
MONEL								
Monel - 65% Nickel		-	-	200 - 300	275 - 400	.0010" - .0025"	.0015" - .0040"	.0030" - .0050"
TITANIUM ALLOYS								
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		125 - 300	250 - 400	150 - 300	250 - 400	.0005" - .0012"	.0010" - .0025"	.0015" - .0040"
5553 / Beta Titanium		-	-	100 - 200	150 - 250	.0004" - .0010"	.0008" - .0020"	.0010" - .0030"
STAINLESS STEELS								
13/8, 15/5, 17-4, pH Types	< 35	-	-	200 - 350	250 - 300	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"
	> 35	-	-	150 - 250	200 - 250	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"
Inox, 200 Series, 300 Series	< 35	-	-	250 - 350	300 - 400	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"
	> 35	-	-	175 - 275	225 - 300	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"
304L, 316L, Nitronic 50, Inox	< 35	-	-	125 - 200	250 - 300	.0008" - .0015"	.0010" - .0020"	.0020" - .0040"
	> 35	-	-	90 - 125	200 - 250	.0005" - .0010"	.0010" - .0015"	.0010" - .0030"
400 Series	< 35	-	-	200 - 350	250 - 300	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"
	> 35	-	-	150 - 250	200 - 250	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"
HIGH STRENGTH TOOL STEELS								
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 30	-	-	225 - 300	250 - 350	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"
	30 - 38	-	-	125 - 200	150 - 250	.0005" - .0015"	.0010" - .0020"	.0010" - .0030"
	> 38	(SEE HIGH ROCKWELL CHART - PAGES 238-239)						
MEDIUM ALLOY TOOL STEELS								
200, 250, 300, 8620	< 35	-	-	250 - 350	250 - 400	.0010" - .0025"	.0015" - .0040"	.0030" - .0050"
	> 35	-	-	150 - 200	150 - 300	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"
CARBON STEELS								
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35	-	-	250 - 350	300 - 500	.0010" - .0025"	.0015" - .0040"	.0030" - .0050"
	> 35	-	-	150 - 200	250 - 400	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"
CAST MATERIAL								
Steel		-	-	175 - 250	250 - 350	.0015" - .0040"	.0020" - .0060"	.0030" - .0100"
Ductile Iron		-	-	200 - 300	250 - 400	.0015" - .0040"	.0020" - .0060"	.0030" - .0100"
Gray Iron		-	-	175 - 250	200 - 400	.0015" - .0040"	.0020" - .0060"	.0030" - .0100"
Aluminum		300 - 400	350 - 500	300 - 400	-	.0015" - .0040"	.0020" - .0060"	.0030" - .0100"
ALUMINUM								
Aircraft Grade (6061, 7075)	Standard Speed	300 - 400	300 - 600	200 - 400	300 - 500	.0015" - .0040"	.0020" - .0060"	.0030" - .0100"
	High Speed	(SEE HIGH SPEED ALUMINUM CHART - PAGE 232)						
MAGNESIUM								
		200 - 300	200 - 500	200 - 300	300 - 500	.0015" - .0040"	.0020" - .0060"	.0030" - .0100"
COPPER								
Copper Alloys		200 - 300	300 - 500	200 - 300	300 - 500	.0010" - .0025"	.0015" - .0035"	.0020" - .0080"
BRASS, BRONZE								
Brass, Aluminum/Bronze, Low Silicon Bronze		200 - 300	300 - 500	200 - 300	200 - 400	.0010" - .0025"	.0015" - .0035"	.0020" - .0080"

Beryllium added to any material adds hardness and some nickel content. If tool displays chatter, increase feed (IPM) up to 30% and reduce speed (RPM) by 10%. More detailed information is available on succeeding pages regarding the following materials: Aluminum, High Rockwell Steels, Graphite, and VRX end mills

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

General Solid Carbide Milling Guide

Metric

TECHNICAL

Type	Rc Hardness	MILLING M/Min. (Vc)					CHIPLOAD PER FLUTE (Fz)				
		2 flute stub / std.	2 flute extra length	3 & 4 flute stub / std.	3 & 4 flute extra length	DIAMOND COATED	1.0 - 3.0	3.0 - 6.0	6.0 - 12.0	12.0 - 25.0	25.0 - 32.0
COBALT BASE ALLOYS											
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 35	-	-	50 - 70	45 - 60	-	.010 - .025	.020 - .050	.025 - .075	.050 - .100	.075 - .125
	> 35	-	-	35 - 50	30 - 45	-	.005 - .015	.010 - .035	.025 - .050	.025 - .075	.050 - .100
NICKEL BASE ALLOYS											
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35	-	-	35 - 50	30 - 45	-	.010 - .025	.020 - .050	.025 - .075	.050 - .100	.075 - .125
	> 35	-	-	20 - 35	15 - 25	-	.005 - .015	.010 - .035	.025 - .050	.025 - .075	.050 - .100
IRON BASE ALLOYS											
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35	-	-	50 - 70	45 - 60	-	.010 - .025	.020 - .050	.025 - .075	.050 - .100	.075 - .125
	> 35	-	-	35 - 50	30 - 45	-	.005 - .015	.010 - .035	.025 - .050	.025 - .075	.050 - .100
MONEL											
Monel - 65% Nickel		50 - 90	35 - 50	50 - 90	35 - 50	-	.015 - .035	.025 - .065	.035 - .100	.075 - .125	.100 - .150
TITANIUM ALLOYS											
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		60 - 90	35 - 75	60 - 90	35 - 75	-	.015 - .035	.025 - .065	.035 - .100	.075 - .125	.100 - .150
	5553 / Beta Titanium	-	-	35 - 65	30 - 60	-	.010 - .025	.020 - .050	.025 - .075	.050 - .100	.075 - .125
STAINLESS STEELS											
13/8, 15/5, 17-4, pH Types	< 35	-	-	45 - 75	30 - 45	-	.010 - .025	.020 - .050	.025 - .075	.050 - .100	.075 - .125
	> 35	-	-	35 - 50	25 - 45	-	.005 - .015	.010 - .035	.025 - .050	.025 - .075	.050 - .100
Inox, 200 Series, 300 Series	< 35	-	-	60 - 80	40 - 55	-	.010 - .025	.020 - .050	.025 - .075	.050 - .100	.075 - .125
	> 35	-	-	45 - 60	30 - 45	-	.005 - .015	.010 - .035	.025 - .050	.025 - .075	.050 - .100
304L, 316L, Nitronic 50, Inox	< 35	-	-	25 - 40	25 - 35	-	.010 - .020	.020 - .035	.025 - .050	.035 - .075	.050 - .100
	> 35	-	-	20 - 35	15 - 25	-	.005 - .015	.010 - .025	.025 - .035	.025 - .050	.035 - .075
400 Series	< 35	-	-	45 - 75	30 - 45	-	.010 - .025	.020 - .050	.025 - .075	.050 - .100	.075 - .125
	> 35	-	-	35 - 50	25 - 40	-	.005 - .015	.010 - .035	.025 - .050	.025 - .075	.050 - .100
HIGH STRENGTH TOOL STEELS											
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 30	-	-	45 - 60	35 - 50	-	.010 - .025	.020 - .050	.025 - .075	.050 - .100	.075 - .125
	30 - 38	-	-	30 - 45	25 - 35	-	.005 - .015	.010 - .035	.025 - .050	.025 - .075	.050 - .100
	> 38	-	-	15 - 30	10 - 25	-	.003 - .008	.005 - .020	.015 - .040	.020 - .065	.035 - .090
MEDIUM ALLOY TOOL STEELS											
200, 250, 300, 8620	< 35	-	-	55 - 75	45 - 60	-	.015 - .035	.025 - .065	.035 - .100	.075 - .125	.100 - .150
	> 35	-	-	35 - 55	30 - 45	-	.010 - .025	.020 - .050	.025 - .075	.050 - .100	.075 - .125
CARBON STEELS											
A36, 12L14, 1000's, 1100's, 1300's	< 35	-	-	55 - 75	45 - 60	-	.015 - .035	.025 - .065	.035 - .100	.075 - .125	.100 - .150
	> 35	-	-	35 - 55	30 - 45	-	.010 - .025	.020 - .050	.025 - .075	.050 - .100	.075 - .125
CAST MATERIAL											
Steel		70 - 100	50 - 75	75 - 105	50 - 75	-	.025 - .050	.035 - .100	.050 - .150	.075 - .250	.125 - .250
Ductile Iron		60 - 90	35 - 60	60 - 90	35 - 60	-	.015 - .035	.025 - .075	.035 - .100	.050 - .150	.075 - .200
Gray Iron		70 - 100	50 - 75	75 - 105	50 - 75	-	.025 - .050	.035 - .100	.050 - .150	.075 - .250	.125 - .250
Aluminum		75 - 105	75 - 105	75 - 105	75 - 105	-	.025 - .050	.035 - .100	.050 - .150	.075 - .250	.125 - .250
ALUMINUM											
Aircraft Grade (6061, 7075)	Standard Speed	90 - 150	90 - 150	90 - 150	90 - 150	-	.025 - .050	.035 - .100	.050 - .150	.075 - .250	.125 - .300
	High Speed	<i>(SEE HIGH SPEED ALUMINUM CHART - PAGE 232)</i>									
MAGNESIUM											
		90 - 150	90 - 150	90 - 150	90 - 150	-	.025 - .050	.035 - .100	.050 - .150	.075 - .250	.125 - .250
COPPER											
Copper Alloys		120 - 150	75 - 105	90 - 135	75 - 105	-	.020 - .040	.025 - .065	.040 - .090	.050 - .200	.075 - .250
BRASS, BRONZE											
Brass, Aluminum/Bronze, Low Silicon Bronze		90 - 120	60 - 90	75 - 115	60 - 90	-	.020 - .040	.025 - .065	.040 - .090	.050 - .200	.075 - .250
COMPOSITE MATERIAL											
Glass Epoxy, Fiberglass, Plastics		60 - 120	60 - 120	60 - 120	60 - 120	60 - 150	.025 - .050	.035 - .100	.050 - .150	.075 - .250	.125 - .250
Graphite, G10		<i>(SEE GRAPHITE CHART - PAGE 242)</i>				90 - 300	.025 - .050	.035 - .100	.050 - .150	.075 - .250	.125 - .250

When plunging into a solid, drop feed by approximately 50%.

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

High Performance Solid Carbide Milling Guide

Metric

Type	Rc Hardness	MILLING M/Min. (Vc)				CHIPLOAD PER FLUTE (Fz)		
		Aluminum Series		All Other High Performance Series		3.0 - 6.0	6.0 - 12.0	12.0 - 25.0
		Uncoated	Coated	Uncoated	X.Ceed Coated			
COBALT BASE ALLOYS								
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-4, L-605	< 35	-	-	60 - 80	80 - 120	.020 - .050	.025 - .075	.050 - .100
	> 35	-	-	40 - 50	50 - 75	.010 - .035	.025 - .050	.025 - .075
NICKEL BASE ALLOYS								
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35	-	-	45 - 60	60 - 90	.020 - .050	.025 - .075	.050 - .100
	> 35	-	-	25 - 40	40 - 60	.010 - .035	.025 - .050	.025 - .075
IRON BASE ALLOYS								
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35	-	-	60 - 90	75 - 105	.020 - .050	.025 - .075	.050 - .100
	> 35	-	-	45 - 60	60 - 75	.010 - .035	.025 - .050	.025 - .075
MONEL								
Monel - 65% Nickel		-	-	60 - 90	80 - 120	.025 - .065	.035 - .100	.075 - .125
TITANIUM ALLOYS								
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		40 - 90	75 - 120	45 - 90	75 - 120	.010 - .025	.025 - .065	.035 - .100
5553 / Beta Titanium		-	-	30 - 60	45 - 75	.008 - .020	.020 - .050	.025 - .075
STAINLESS STEELS								
13/8, 15/5, 17-4, pH Types	< 35	-	-	60 - 105	75 - 90	.020 - .050	.025 - .075	.050 - .100
	> 35	-	-	45 - 75	60 - 75	.010 - .035	.025 - .050	.025 - .075
Inox, 200 Series, 300 Series	< 35	-	-	75 - 105	90 - 120	.020 - .050	.025 - .075	.050 - .100
	> 35	-	-	50 - 80	65 - 90	.010 - .035	.025 - .050	.025 - .075
304L, 316L, Nitronic 50, Inox	< 35	-	-	40 - 60	75 - 90	.020 - .035	.025 - .050	.035 - .075
	> 35	-	-	25 - 40	60 - 75	.010 - .025	.025 - .035	.025 - .050
400 Series	< 35	-	-	60 - 105	75 - 90	.020 - .050	.025 - .075	.050 - .100
	> 35	-	-	45 - 75	60 - 75	.010 - .035	.025 - .050	.025 - .075
HIGH STRENGTH TOOL STEELS								
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 30	-	-	65 - 90	75 - 105	.020 - .050	.025 - .075	.050 - .100
	30 - 38	-	-	40 - 60	45 - 75	.010 - .035	.025 - .050	.025 - .075
	> 38	(SEE HIGH ROCKWELL CHART - PAGES 238-239)						
MEDIUM ALLOY TOOL STEELS								
200, 250, 300, 8620	< 35	-	-	75 - 105	75 - 120	.025 - .065	.035 - .100	.075 - .125
	> 35	-	-	45 - 60	45 - 90	.020 - .050	.025 - .075	.050 - .100
CARBON STEELS								
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35	-	-	75 - 105	90 - 150	.025 - .065	.035 - .100	.075 - .125
	> 35	-	-	45 - 60	75 - 120	.020 - .050	.025 - .075	.050 - .100
CAST MATERIAL								
Steel		-	-	50 - 75	75 - 120	.035 - .100	.050 - .150	.075 - .250
Ductile Iron		-	-	60 - 90	90 - 125	.035 - .100	.050 - .150	.075 - .250
Gray Iron		-	-	50 - 75	75 - 125	.035 - .100	.050 - .150	.075 - .250
Aluminum		90 - 120	90 - 150	90 - 120	-	.035 - .100	.050 - .150	.075 - .250
ALUMINUM								
Aircraft Grade (6061, 7075)	Standard Speed	90 - 120	90 - 180	60 - 120	90 - 150	.035 - .100	.050 - .150	.075 - .250
	High Speed	(SEE HIGH SPEED ALUMINUM CHART - PAGE 232)						
MAGNESIUM								
		60 - 90	60 - 150	60 - 90	90 - 150	.035 - .100	.050 - .150	.075 - .250
COPPER								
Copper Alloys		60 - 90	90 - 150	60 - 90	90 - 150	.025 - .065	.040 - .090	.050 - .200
BRASS, BRONZE								
Brass, Aluminum/Bronze, Low Silicon Bronze		60 - 90	90 - 150	60 - 90	60 - 120	.025 - .065	.040 - .090	.050 - .200

Beryllium added to any material adds hardness and some nickel content. If tool displays chatter, increase feed (M/Min.) up to 30% and reduce speed (RPM) by 10%.
More detailed information is available on succeeding pages regarding the following materials: Aluminum, High Rockwell Steels, Graphite, and VRX end mills

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL Application Guide for Alumastar Coated End Mills in Aircraft Grade Aluminum

Fractional

Diameter	SLOTTING		SIDE MILLING
	Axial = .5xD	Axial = 1xD	Axial ≤ 1xD Radial ≤ .5xD
	SFM = 1500 - 2000	SFM = 750 - 1500	SFM = 1500 - 2000
CPT = 1.5% - 3% of diameter	CPT = 1% - 2% of diameter	CPT = 2% - 3% of diameter	
3/16"	.0028" - .0056"	.0018" - .0037"	.0037" - .0056"
1/4"	.0037" - .0074"	.0025" - .0050"	.0050" - .0075"
5/16"	.0052" - .0104"	.0031" - .0062"	.0062" - .0094"
3/8"	.0055" - .0110"	.0037" - .0074"	.0075" - .0112"
1/2"	.0075" - .0150"	.0050" - .0100"	.0100" - .0150"
5/8"	.0093" - .0186"	.0062" - .0125"	.0125" - .0187"
3/4"	.0112" - .0224"	.0075" - .0150"	.0150" - .0225"
1"	.0150" - .0300"	.0100" - .0200"	.0200" - .0300"

Metric

Diameter	SLOTTING		SIDE MILLING
	Axial = .5xD	Axial = 1xD	Axial ≤ 1xD Radial ≤ 0.5xD
	M/Min. = 450 - 760	M/Min. = 225 - 450	M/Min. = 450 - 760
CPT = 1.5% - 3% of diameter	CPT = 1% - 2% of diameter	CPT = 2% - 3% of diameter	
4.0	.060 - .120	.040 - .080	.080 - .120
6.0	.090 - .180	.060 - .120	.120 - .180
8.0	.120 - .240	.080 - .160	.160 - .240
10.0	.150 - .300	.100 - .200	.200 - .300
12.0	.180 - .360	.120 - .240	.240 - .360
16.0	.240 - .480	.160 - .320	.320 - .480
20.0	.300 - .600	.200 - .400	.400 - .600
25.0	.375 - .750	.250 - .500	.500 - .750

CPT = Chipload per flute (Fz)

For CAT 40 machines using tools over 5/8" diameter, speeds and feeds may need to be reduced by as much as 50%

END MILL NOTES: Climb milling recommended for best finish
 Figures shown are based on 6061 / 7075
 CAT 50 Taper holders are recommended for 3/4" and 1" diameter end mills
 In controlled slotting tests, 4000 SFM, 1% diameter Chipload Per Flute, and 50% of Dia. axial depth were obtained
 In cases for tools with slower SFM (M/Min.), reference Series 242M/842M, page 62

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL VRX/VHM Series End Mills

Application Guide

Fractional

Material	Rc	SFM (Vc)	CHIPLOAD PER FLUTE Recommendations (Fz)									*Profiling	Slotting
			1/8"	3/16"	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"	Radial	Axial
Stainless Steel: 303		290-375	.0004"-.0008"	.0008"-.0010"	.0010"-.0015"	.0013"-.0020"	.0015"-.0020"	.0020"-.0030"	.0025"-.0035"	.0030"-.0040"	.0035"-.0045"	1 x D	1 x D
Stainless Steel: 304, 316, 400 Series, Kovar, Invar		250-300	.0003"-.0006"	.0006"-.0010"	.0008"-.0015"	.0010"-.0020"	.0012"-.0020"	.0015"-.0020"	.0020"-.0025"	.0025"-.0030"	.0025"-.0035"	1 x D	1 x D
Stainless Steel: 304L, 316L, 8620, 17/4, 15/5, 13/8, PH Mat'l	< 35	250-300	.0003"-.0006"	.0006"-.0008"	.0007"-.0010"	.0010"-.0015"	.0015"-.0020"	.0015"-.0025"	.0020"-.0030"	.0025"-.0035"	.0030"-.0040"	1 x D	1 x D
	> 35	200-250	.0003"-.0006"	.0006"-.0008"	.0007"-.0010"	.0008"-.0010"	.0010"-.0015"	.0010"-.0020"	.0015"-.0025"	.0020"-.0030"	.0020"-.0030"	0.5 x D	0.5 x D
High Temperature Alloys: Inconel 625/718, A286	< 35	125-175	.0004"-.0008"	.0008"-.0010"	.0010"-.0015"	.0012"-.0020"	.0020"-.0025"	.0025"-.0030"	.0030"-.0035"	.0030"-.0035"	.0030"-.0040"	0.5 x D	0.3 x D
	> 35	80-100	.0003"-.0006"	.0007"-.0010"	.0008"-.0010"	.0010"-.0015"	.0010"-.0015"	.0010"-.0015"	.0012"-.0020"	.0015"-.0025"	.0015"-.0025"	0.2 x D	0.2 x D
Titanium: 6AL4V, CP		150-200	.0004"-.0008"	.0008"-.0010"	.0010"-.0015"	.0010"-.0020"	.0015"-.0020"	.0020"-.0030"	.0025"-.0030"	.0030"-.0035"	.0030"-.0040"	1 x D	1 x D
Carbon Steels: 1000 Series	< 35	400-600	.0004"-.0008"	.0008"-.0010"	.0010"-.0015"	.0010"-.0020"	.0015"-.0020"	.0020"-.0030"	.0025"-.0035"	.0030"-.0040"	.0035"-.0045"	0.3 x D	0.5 x D
	> 35	275-425	.0003"-.0006"	.0006"-.0008"	.0008"-.0012"	.0010"-.0015"	.0010"-.0020"	.0015"-.0025"	.0020"-.0025"	.0020"-.0030"	.0025"-.0035"	0.3 x D	0.5 x D
High Strength Tool Steel: 4130, 4140, A2, D2, P20, H13	< 30	250-400	.0003"-.0006"	.0006"-.0010"	.0008"-.0015"	.0010"-.0020"	.0012"-.0020"	.0015"-.0022"	.0020"-.0025"	.0025"-.0030"	.0025"-.0035"	0.5 x D	1 x D
	30-38	250-400	.0003"-.0006"	.0006"-.0008"	.0007"-.0010"	.0008"-.0010"	.0010"-.0015"	.0010"-.0020"	.0015"-.0025"	.0020"-.0030"	.0020"-.0030"	0.3 x D	1 x D
	> 38	(SEE HIGH ROCKWELL CHART - PAGE 238)											
Gray Cast Iron		400-500	.0005"-.0010"	.0010"-.0020"	.0010"-.0020"	.0015"-.0020"	.0015"-.0025"	.0020"-.0035"	.0025"-.0035"	.0030"-.0040"	.0040"-.0050"	1 x D	1 x D

Metric

Material	Rc	M/Min. (Vc)	CHIPLOAD PER FLUTE - Metric Recommendations (Fz)									*Profiling	Slotting
			3.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0	Radial	Axial
Stainless Steel: 303		90-115	.010-.020	.020-.025	.025-.038	.033-.050	.038-.050	.050-.076	.063-.089	.076-.102	.089-.114	1 x D	1 x D
Stainless Steel: 304, 316, 400 Series, Kovar, Invar		75-90	.008-.015	.015-.025	.020-.038	.025-.050	.030-.050	.038-.050	.050-.063	.063-.076	.063-.089	1 x D	1 x D
Stainless Steel: 304L, 316L, 17/4, 15/5, 13/8, PH Materials	< 35	75-85	.008-.015	.015-.020	.018-.025	.025-.038	.038-.050	.038-.063	.050-.076	.063-.089	.076-.102	1 x D	1 x D
	> 35	60-75	.008-.015	.015-.020	.018-.025	.020-.025	.025-.038	.025-.050	.038-.063	.050-.076	.050-.076	.5 x D	.5 x D
High Temperature Alloys: Inconel 625/718, A286	< 35	40-55	.010-.020	.020-.025	.025-.038	.030-.050	.050-.063	.063-.076	.076-.089	.076-.089	.076-.102	.5 x D	.3 x D
	> 35	25-30	.008-.015	.018-.025	.020-.025	.025-.038	.025-.038	.025-.038	.030-.050	.038-.063	.038-.063	.2 x D	.2 x D
Titanium: 6AL4V, CP		45-60	.010-.020	.020-.025	.025-.038	.025-.050	.038-.050	.050-.076	.063-.076	.076-.089	.076-.102	1 x D	1 x D
Carbon Steels: 1000 Series	< 35	125-185	.010-.020	.020-.025	.025-.038	.025-.050	.038-.050	.050-.076	.063-.089	.076-.102	.089-.114	.3 x D	.5 x D
	> 35	85-130	.008-.015	.015-.020	.020-.030	.025-.038	.025-.050	.038-.063	.050-.063	.050-.076	.063-.089	.3 x D	.5 x D
High Strength Tool Steel: 4130, 4140, A2, D2, P20, H13	< 30	75-125	.008-.015	.015-.025	.020-.038	.025-.050	.030-.050	.038-.056	.050-.063	.063-.076	.063-.089	.5 x D	1 x D
	30-38	75-125	.006-.015	.015-.020	.018-.025	.020-.025	.025-.038	.025-.050	.038-.063	.050-.076	.050-.076	.3 x D	1 x D
	> 38	(SEE HIGH ROCKWELL CHART - PAGE 239)											
Gray Cast Iron		125-150	.013-.025	.025-.050	.025-.050	.038-.050	.038-.063	.050-.089	.063-.089	.076-.102	.102-.127	1 x D	1 x D

* For profiling, axial = 1xD

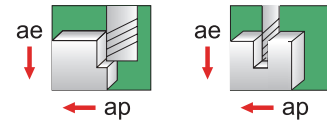
NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL Milling Guide for V4 End Mills in Titanium, Inconel, and Stainless

Fractional

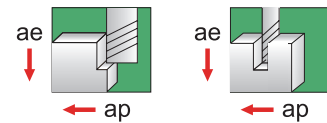
	Titanium Alloys	Nickel or Cobalt-based Material	Stainless (400 Series, pH Series)
	SFM = 100 - 200	SFM = 50 - 100	SFM = 100 - 225
DIAMETER	CPT (Fz)	CPT (Fz)	CPT (Fz)
.1575" - .2755"	.0004" - .0008"	.0003" - .0006"	.0005" - .0010"
.2756" - .3124"	.0005" - .0010"	.0004" - .0008"	.0007" - .0012"
.3125" - .3749"	.0007" - .0012"	.0005" - .0010"	.0008" - .0015"
.3750" - .4999"	.0008" - .0015"	.0007" - .0012"	.0010" - .0018"
.5000" - .6249"	.0010" - .0018"	.0008" - .0015"	.0012" - .0020"
.6250" - .7499"	.0012" - .0020"	.0010" - .0018"	.0015" - .0022"
.7500" - .8749"	.0015" - .0022"	.0012" - .0020"	.0018" - .0025"
.8750" - 1.000"	.0018" - .0025"	.0015" - .0022"	.0022" - .0030"

	Profiling Side Cutting	Slotting Pocket Milling
Axial (ae)	1xD	100% of Dia.
Radial (ap)	100% of Dia.	1xD



	Titanium Alloys	Nickel or Cobalt-based Material	Stainless (400 Series, pH Series)
	SFM = 150 - 250	SFM = 60 - 125	SFM = 150 - 300
DIAMETER	CPT (Fz)	CPT (Fz)	CPT (Fz)
.1575" - .2755"	.0008" - .0011"	.0004" - .0008"	.0008" - .0012"
.2756" - .3124"	.0010" - .0015"	.0005" - .0010"	.0010" - .0018"
.3125" - .3749"	.0012" - .0018"	.0007" - .0012"	.0012" - .0020"
.3750" - .4999"	.0012" - .0021"	.0008" - .0015"	.0015" - .0022"
.5000" - .6249"	.0015" - .0025"	.0010" - .0018"	.0018" - .0030"
.6250" - .7499"	.0018" - .0030"	.0012" - .0020"	.0020" - .0033"
.7500" - .8749"	.0020" - .0032"	.0015" - .0022"	.0023" - .0037"
.8750" - 1.000"	.0025" - .0035"	.0018" - .0025"	.0027" - .0040"

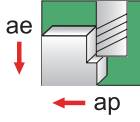
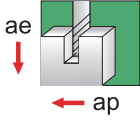
	Profiling Side Cutting	Slotting Pocket Milling
Axial (ae)	1xD	50% of Dia.
Radial (ap)	50% of Dia.	1xD

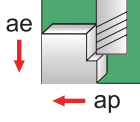
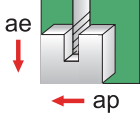


NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL Milling Guide for V4 End Mills in Titanium, Inconel, and Stainless

Metric

	Titanium Alloys	Nickel or Cobalt-based Material	Stainless (400 Series, pH Series)		Profiling Side Cutting	Slotting Pocket Milling
	SMM = 30 - 60	SMM = 15 - 30	SMM = 30 - 70	Axial (ae)	1xD	100% of Dia.
DIAMETER	CPT (Fz)	CPT (Fz)	CPT (Fz)	Radial (ap)	100% of Dia.	1xD
4.0 - 7.0	.010 - .020	.005 - .008	.010 - .025			
7.0 - 8.0	.012 - .025	.010 - .020	.015 - .030			
8.0 - 10.0	.015 - .030	.012 - .025	.020 - .040			
10.0 - 13.0	.020 - .040	.015 - .030	.025 - .045			
13.0 - 16.0	.025 - .045	.020 - .040	.030 - .050			
16.0 - 19.0	.030 - .050	.025 - .045	.035 - .055			
19.0 - 22.0	.035 - .055	.030 - .050	.045 - .065			
22.0 - 25.0	.045 - .065	.035 - .055	.055 - .075			

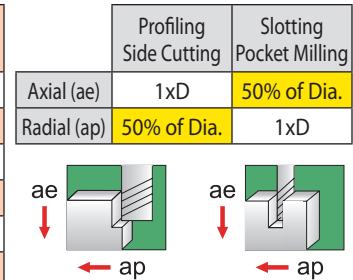
	Titanium Alloys	Nickel or Cobalt-based Material	Stainless (400 Series, pH Series)		Profiling Side Cutting	Slotting Pocket Milling
	SMM = 45 - 75	SMM = 20 - 40	SMM = 45 - 90	Axial (ae)	1xD	50% of Dia.
DIAMETER	CPT (Fz)	CPT (Fz)	CPT (Fz)	Radial (ap)	50% of Dia.	1xD
4.0 - 7.0	.020 - .030	.010 - .020	.020 - .030			
7.0 - 8.0	.025 - .040	.013 - .025	.025 - .045			
8.0 - 10.0	.030 - .045	.018 - .030	.030 - .050			
10.0 - 13.0	.030 - .050	.020 - .040	.035 - .055			
13.0 - 16.0	.035 - .060	.025 - .045	.045 - .075			
16.0 - 19.0	.045 - .075	.030 - .050	.050 - .080			
19.0 - 22.0	.050 - .080	.035 - .055	.055 - .095			
22.0 - 25.0	.060 - .090	.045 - .065	.065 - .105			

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

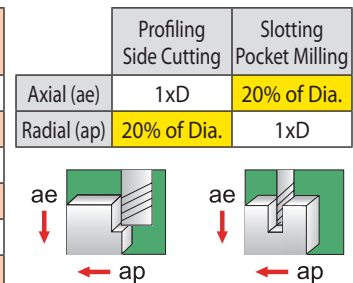
GARR TOOL Milling Guide for V5 End Mills in Titanium, Inconel, and Stainless

Fractional

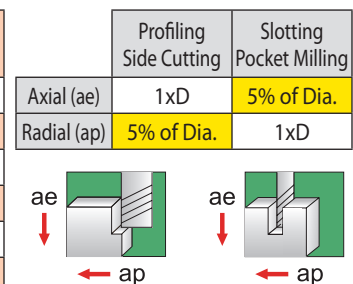
	Titanium Alloys	Nickel or Cobalt-based Material	Stainless (400 Series, pH Series)
	SFM = 150 - 250	SFM = 60 - 125	SFM = 150 - 300
DIAMETER	CPT (Fz)	CPT (Fz)	CPT (Fz)
.2362" - .2755"	.0008" - .0011"	.0004" - .0008"	.0008" - .0012"
.2756" - .3124"	.0010" - .0015"	.0005" - .0010"	.0010" - .0018"
.3125" - .3749"	.0012" - .0018"	.0007" - .0012"	.0012" - .0020"
.3750" - .4999"	.0012" - .0021"	.0008" - .0015"	.0015" - .0022"
.5000" - .6249"	.0015" - .0025"	.0010" - .0018"	.0018" - .0030"
.6250" - .7499"	.0018" - .0030"	.0012" - .0020"	.0020" - .0033"
.7500" - .8749"	.0020" - .0032"	.0015" - .0022"	.0025" - .0037"
.8750" - 1.000"	.0025" - .0035"	.0018" - .0025"	.0030" - .0042"



	Titanium Alloys	Nickel or Cobalt-based Material	Stainless (400 Series, pH Series)
	SFM = 300 - 500	SFM = 100 - 200	SFM = 250 - 400
DIAMETER	CPT (Fz)	CPT (Fz)	CPT (Fz)
.2362" - .2755"	.0008" - .0012"	.0004" - .0008"	.0008" - .0012"
.2756" - .3124"	.0010" - .0018"	.0005" - .0010"	.0012" - .0018"
.3125" - .3749"	.0012" - .0020"	.0007" - .0012"	.0015" - .0022"
.3750" - .4999"	.0015" - .0022"	.0008" - .0015"	.0018" - .0025"
.5000" - .6249"	.0018" - .0030"	.0010" - .0018"	.0020" - .0030"
.6250" - .7499"	.0020" - .0033"	.0012" - .0020"	.0025" - .0035"
.7500" - .8749"	.0025" - .0037"	.0015" - .0022"	.0030" - .0040"
.8750" - 1.000"	.0030" - .0042"	.0018" - .0025"	.0035" - .0045"



	Titanium Alloys	Nickel or Cobalt-based Material	Stainless (400 Series, pH Series)
	SFM = 400 - 700	SFM = 150 - 250	SFM = 300 - 500
DIAMETER	CPT (Fz)	CPT (Fz)	CPT (Fz)
.2362" - .2755"	.0008" - .0012"	.0005" - .0010"	.0010" - .0015"
.2756" - .3124"	.0012" - .0018"	.0007" - .0012"	.0012" - .0020"
.3125" - .3749"	.0015" - .0022"	.0008" - .0015"	.0015" - .0025"
.3750" - .4999"	.0018" - .0025"	.0010" - .0018"	.0018" - .0030"
.5000" - .6249"	.0020" - .0030"	.0012" - .0020"	.0020" - .0035"
.6250" - .7499"	.0025" - .0035"	.0015" - .0022"	.0022" - .0040"
.7500" - .8749"	.0030" - .0040"	.0018" - .0025"	.0025" - .0045"
.8750" - 1.000"	.0035" - .0045"	.0022" - .0030"	.0030" - .0050"



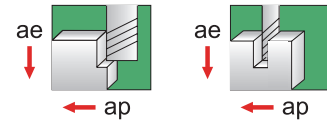
NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL Milling Guide for V5 End Mills in Titanium, Inconel, and Stainless

Metric

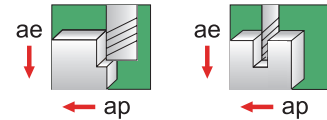
DIAMETER	Titanium Alloys	Nickel or Cobalt-based Material	Stainless (400 Series, pH Series)
	SMM = 45 - 75	SMM = 20 - 40	SMM = 45 - 90
	CPT (Fz)	CPT (Fz)	CPT (Fz)
6.0 - 8.0	.020 - .030	.010 - .020	.020 - .030
8.0 - 10.0	.025 - .040	.013 - .025	.025 - .045
10.0 - 12.0	.030 - .045	.018 - .030	.030 - .050
12.0 - 14.0	.030 - .050	.020 - .040	.035 - .055
14.0 - 16.0	.035 - .060	.025 - .045	.045 - .075
16.0 - 18.0	.045 - .075	.030 - .050	.050 - .080
18.0 - 20.0	.050 - .080	.035 - .055	.055 - .095
22.0 - 25.0	.060 - .090	.045 - .065	.065 - 0.105

	Profiling Side Cutting	Slotting Pocket Milling
Axial (ae)	1xD	50% of Dia.
Radial (ap)	50% of Dia.	1xD



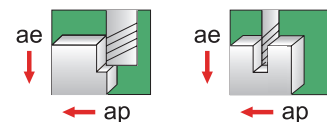
DIAMETER	Titanium Alloys	Nickel or Cobalt-based Material	Stainless (400 Series, pH Series)
	SMM = 90 - 150	SMM = 30 - 60	SMM = 75 - 120
	CPT (Fz)	CPT (Fz)	CPT (Fz)
6.0 - 8.0	.020 - .030	.010 - .020	.020 - .030
8.0 - 10.0	.025 - .045	.013 - .025	.030 - .045
10.0 - 12.0	.035 - .055	.020 - .035	.045 - .060
12.0 - 14.0	.045 - .060	.025 - .040	.050 - .070
14.0 - 16.0	.050 - .075	.030 - .045	.055 - .075
16.0 - 18.0	.055 - .080	.035 - .055	.065 - .085
18.0 - 20.0	.060 - .085	.040 - .065	.070 - .090
22.0 - 25.0	.065 - .090	.045 - .075	.080 - .100

	Profiling Side Cutting	Slotting Pocket Milling
Axial (ae)	1xD	20% of Dia.
Radial (ap)	20% of Dia.	1xD



DIAMETER	Titanium Alloys	Nickel or Cobalt-based Material	Stainless (400 Series, pH Series)
	SMM = 120 - 210	SMM = 45 - 75	SMM = 90 - 150
	CPT (Fz)	CPT (Fz)	CPT (Fz)
6.0 - 8.0	.020 - .040	.010 - .020	.025 - .045
8.0 - 10.0	.040 - .055	.013 - .025	.040 - .060
10.0 - 12.0	.050 - .060	.020 - .040	.050 - .070
12.0 - 14.0	.055 - .065	.025 - .045	.055 - .075
14.0 - 16.0	.060 - .075	.030 - .050	.065 - .085
16.0 - 18.0	.070 - .090	.035 - .060	.080 - .100
18.0 - 20.0	.085 - .100	.040 - .070	.090 - .110
22.0 - 25.0	.090 - .110	.045 - .080	.095 - .120

	Profiling Side Cutting	Slotting Pocket Milling
Axial (ae)	1xD	5% of Dia.
Radial (ap)	5% of Dia.	1xD



NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

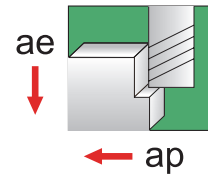
GARR TOOL Milling Guide for High Rc Finishers in Hardened Steel (*Fractional*)

(Reference series: 545MA, 545BA, 545RA, VRX)

DIAMETER	38 - 45 HRc		45 - 50 HRc		50 - 55 HRc		55 - 60 HRc		60 - 65 HRc		65 - 70 HRc	
	RPM	CPT (Fz)	RPM	CPT (Fz)	RPM	CPT (Fz)	RPM	CPT (Fz)	RPM	CPT (Fz)	RPM	CPT (Fz)
1/8"	13750	.0009"	7650	.0008"	5350	.0006"	3820	.0005"	2300	.0004"	1850	.0003"
3/16"	9200	.0012"	5100	.0010"	3570	.0008"	2550	.0007"	1530	.0006"	1225	.0004"
1/4"	6900	.0015"	3850	.0012"	2675	.0010"	1910	.0008"	1150	.0007"	925	.0006"
3/8"	4600	.0018"	2550	.0015"	1800	.0012"	1275	.0010"	765	.0009"	615	.0008"
1/2"	3450	.0022"	1950	.0018"	1350	.0014"	955	.0012"	575	.0012"	460	.0010"
5/8"	2750	.0027"	1550	.0022"	1100	.0020"	765	.0018"	460	.0015"	370	.0013"
3/4"	2300	.0030"	1275	.0027"	900	.0025"	640	.0022"	390	.0017"	310	.0017"
1"	1720	.0033"	960	.0030"	675	.0027"	480	.0025"	290	.0023"	230	.0019"

Profiling / Side Cutting	
Axial (ae)	1xD
Radial (ap)	5% of Dia.

Slotting / Pocket Milling	
Axial (ae)	5% of Dia.
Radial (ap)	1xD



High Speed Machining

DIAMETER	38 - 45 HRc		45 - 50 HRc		50 - 55 HRc		55 - 60 HRc		60 - 65 HRc		65 - 70 HRc	
	RPM	CPT (Fz)	RPM	CPT (Fz)	RPM	CPT (Fz)	RPM	CPT (Fz)	RPM	CPT (Fz)	RPM	CPT (Fz)
1/8"	36670	.0006"	30600	.0005"	24500	.0004"	18340	.0004"	13750	.0003"	11460	.0002"
3/16"	24450	.0009"	20400	.0008"	16300	.0006"	12230	.0005"	9200	.0004"	7650	.0003"
1/4"	18340	.0012"	15300	.0010"	12230	.0008"	9200	.0007"	6900	.0005"	5750	.0004"
3/8"	12225	.0015"	10200	.0012"	8150	.0010"	6100	.0008"	4600	.0007"	3850	.0006"
1/2"	9170	.0018"	7650	.0015"	6100	.0012"	4600	.0010"	3450	.0009"	2870	.0008"
5/8"	7335	.0022"	6100	.0018"	4900	.0014"	3700	.0012"	2750	.0011"	2300	.0010"
3/4"	6115	.0027"	5100	.0022"	4100	.0020"	3100	.0018"	2300	.0014"	1900	.0013"
1"	4585	.0030"	3820	.0027"	3100	.0025"	2300	.0022"	1720	.0019"	1450	.0017"

Profiling / Side Cutting	
Axial (ae)	1xD
Radial (ap)	2% of Dia.

Slotting / Pocket Milling	
Axial (ae)	2% of Dia.
Radial (ap)	1xD

D = Tool Diameter

Example: 2% of Dia., when D = 1/2" (.02 x .500") = .010" per pass

Preferable method is to run tools with air blast to keep chips away from the cutting edge.
If air is not available, either coolant spray or dry machining is acceptable.

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

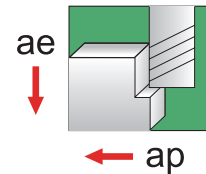
GARR TOOL Milling Guide for High Rc Finishers in Hardened Steel (*Metric*)

(Reference series: 545MA, 545BA, 545RA, VRX)

DIAMETER	38 - 45 HRC		45 - 50 HRC		50 - 55 HRC		55 - 60 HRC		60 - 65 HRC		65 - 70 HRC	
	M/Min. = 135	M/Min. = 75	M/Min. = 75	M/Min. = 50	M/Min. = 50	M/Min. = 40	M/Min. = 40	M/Min. = 25	M/Min. = 25	M/Min. = 20	M/Min. = 20	
	RPM	CPT (Fz)	RPM	CPT (Fz)	RPM	CPT (Fz)	RPM	CPT (Fz)	RPM	CPT (Fz)	RPM	CPT (Fz)
3.0	14500	.025	8100	.020	5650	.015	4050	.010	2400	.008	1950	.007
4.0	10900	.030	6100	.025	4200	.020	3000	.015	1800	.010	1450	.008
6.0	7300	.035	4050	.030	2800	.025	2000	.020	1200	.015	970	.010
8.0	5450	.040	3000	.035	2100	.030	1500	.025	900	.020	725	.015
12.0	3650	.055	2000	.045	1400	.035	1000	.030	600	.025	480	.020
16.0	2700	.065	1500	.055	1050	.050	750	.045	450	.030	360	.025
18.0	2400	.075	1350	.065	950	.060	675	.055	400	.045	320	.030
20.0	2150	.078	1200	.070	850	.065	600	.058	360	.050	290	.040
25.0	1750	.080	1000	.075	700	.070	500	.060	300	.055	250	.045

Profiling / Side Cutting	
Axial (ae)	1xD
Radial (ap)	5% of Dia.

Slotting / Pocket Milling	
Axial (ae)	5% of Dia.
Radial (ap)	1xD



High Speed Machining

DIAMETER	38 - 45 HRC		45 - 50 HRC		50 - 55 HRC		55 - 60 HRC		60 - 65 HRC		65 - 70 HRC	
	M/Min. = 365	M/Min. = 305	M/Min. = 305	M/Min. = 240	M/Min. = 240	M/Min. = 180	M/Min. = 180	M/Min. = 135	M/Min. = 135	M/Min. = 115	M/Min. = 115	
	RPM	CPT (Fz)	RPM	CPT (Fz)	RPM	CPT (Fz)	RPM	CPT (Fz)	RPM	CPT (Fz)	RPM	CPT (Fz)
3.0	38800	.020	32300	.015	25800	.008	19400	.008	14500	.007	12100	.005
4.0	29100	.025	24200	.020	19400	.015	14500	.010	10900	.008	9100	.007
6.0	19400	.030	16100	.025	12900	.020	9700	.015	7300	.010	6050	.008
8.0	14500	.035	12100	.030	9700	.025	7250	.020	5450	.015	4500	.010
12.0	9700	.045	8075	.035	6450	.030	4850	.025	3650	.020	3000	.015
16.0	7250	.055	6050	.045	4850	.035	3600	.030	2700	.025	2300	.020
18.0	6450	.065	5400	.055	4300	.050	3200	.045	2400	.030	2000	.025
20.0	5800	.070	4850	.060	3850	.055	2900	.050	2150	.040	1800	.028
25.0	4650	.075	3870	.065	3100	.060	2300	.055	1750	.045	1450	.030

Profiling / Side Cutting	
Axial (ae)	1xD
Radial (ap)	2% of Dia.

Slotting / Pocket Milling	
Axial (ae)	2% of Dia.
Radial (ap)	1xD

D = Tool Diameter

Example: 2% of Dia., when D = 12mm (.02 x 12mm) = .24mm per pass

Preferable method is to run tools with air blast to keep chips away from the cutting edge.
If air is not available, either coolant spray or dry machining is acceptable.

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

Speed and Feed Recommendations for Cutting Die Molds (*Fractional*)

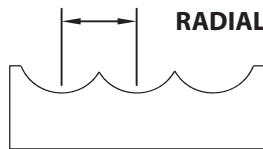
Roughing

(Reference series: 350MX)

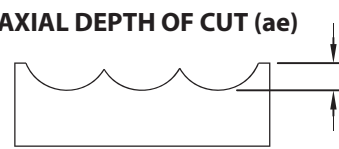
DIAMETER	RPM		CHIPLOAD PER FLUTE (Fz)	
	40 - 50 HRc	50 - 60 HRc	40 - 50 HRc	50 - 60 HRc
1/32"	20,000 - 40,000	20,000 - 40,000	.0005" - .0007"	.0004" - .0005"
1/16"	20,000 - 40,000	20,000 - 40,000	.0010" - .0015"	.0008" - .0010"
3/32"	20,000 - 32,000	20,000 - 30,000	.0015" - .0020"	.0010" - .0015"
1/8"	18,000 - 24,000	15,000 - 20,000	.0020" - .0025"	.0015" - .0020"
3/16"	12,000 - 16,000	10,000 - 14,000	.0030" - .0040"	.0020" - .0030"
1/4"	9,000 - 12,000	7,500 - 10,000	.0040" - .0050"	.0025" - .0040"
5/16"	7,000 - 10,000	6,000 - 8,500	.0050" - .0065"	.0035" - .0050"
3/8"	6,000 - 8,000	5,000 - 7,000	.0060" - .0075"	.0045" - .0060"
1/2"	4,500 - 6,000	4,000 - 5,500	.0080" - .0100"	.0055" - .0080"
5/8"	3,500 - 5,000	3,000 - 4,500	.0090" - .0110"	.0065" - .0090"
3/4"	3,000 - 4,000	2,500 - 3,500	.0100" - .0120"	.0075" - .0100"
1"	2,300 - 3,000	2,000 - 2,500	.0110" - .0130"	.0085" - .0110"

Semi-Finishing and Finishing

DIAMETER	RPM		CHIPLOAD PER FLUTE (Fz)	
	40 - 50 HRc	50 - 60 HRc	40 - 50 HRc	50 - 60 HRc
1/32"	20,000 - 40,000	20,000 - 40,000	.0004" - .0005"	.0003" - .0004"
1/16"	20,000 - 40,000	20,000 - 40,000	.0008" - .0010"	.0005" - .0008"
3/32"	20,000 - 40,000	20,000 - 40,000	.0010" - .0015"	.0008" - .0012"
1/8"	20,000 - 40,000	20,000 - 36,000	.0015" - .0020"	.0010" - .0015"
3/16"	20,000 - 32,000	20,000 - 25,000	.0020" - .0030"	.0015" - .0020"
1/4"	18,000 - 25,000	15,000 - 18,000	.0025" - .0040"	.0020" - .0030"
5/16"	14,000 - 19,000	12,000 - 14,000	.0035" - .0050"	.0025" - .0040"
3/8"	12,000 - 16,000	10,000 - 12,000	.0045" - .0060"	.0030" - .0045"
1/2"	9,000 - 12,000	7,500 - 9,000	.0055" - .0080"	.0040" - .0060"
5/8"	6,500 - 9,000	5,000 - 7,000	.0065" - .0090"	.0050" - .0070"
3/4"	5,500 - 7,500	4,000 - 6,000	.0075" - .0100"	.0060" - .0080"
1"	4,000 - 6,000	3,500 - 5,500	.0085" - .0110"	.0070" - .0090"



RADIAL STEP OVER (ap)



AXIAL DEPTH OF CUT (ae)

Roughing	
Axial (ae)	15% - 25% of Dia.
Radial (ap)	20% - 30% of Dia.

Semi-Finishing	
Axial (ae)	5% - 8% of Dia.
Radial (ap)	2% - 5% of Dia.

Finishing	
Axial (ae)	1% - 3% of Dia.
Radial (ap)	.5% - 1% of Dia.

High pressure air is recommended for clearing chips away from the cut.

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

Speed and Feed Recommendations for Cutting Die Molds (Metric)

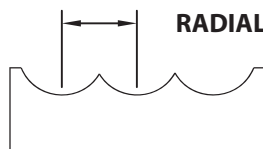
Roughing

(Reference series: 950MX)

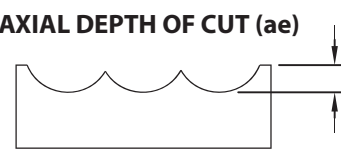
DIAMETER	RPM		CHIPLOAD PER FLUTE (Fz)	
	40 - 50 HRc	50 - 60 HRc	40 - 50 HRc	50 - 60 HRc
1.0	20,000 - 40,000	20,000 - 40,000	.013 - .018	.010 - .013
1.5	20,000 - 40,000	20,000 - 40,000	.025 - .038	.020 - .025
2.0	20,000 - 32,000	20,000 - 30,000	.038 - .050	.025 - .038
3.0	18,000 - 24,000	15,000 - 20,000	.050 - .065	.038 - .050
4.0	12,000 - 16,000	10,000 - 14,000	.075 - .100	.050 - .075
6.0	9,000 - 12,000	7,500 - 10,000	.100 - .125	.065 - .100
8.0	7,000 - 10,000	6,000 - 8,500	.125 - .165	.088 - .125
10.0	6,000 - 8,000	5,000 - 7,000	.150 - .190	.110 - .150
12.0	4,500 - 6,000	4,000 - 5,500	.200 - .250	.140 - .200
16.0	3,500 - 5,000	3,000 - 4,500	.225 - .275	.165 - .225
20.0	3,000 - 4,000	2,500 - 3,500	.250 - .300	.190 - .250
25.0	2,300 - 3,000	2,000 - 2,500	.275 - .325	.215 - .275

Semi-Finishing and Finishing

DIAMETER	RPM		CHIPLOAD PER FLUTE (Fz)	
	40 - 50 HRc	50 - 60 HRc	40 - 50 HRc	50 - 60 HRc
1.0	20,000 - 40,000	20,000 - 40,000	.010 - .013	.008 - .010
1.5	20,000 - 40,000	20,000 - 40,000	.020 - .025	.013 - .020
2.0	20,000 - 40,000	20,000 - 40,000	.025 - .038	.020 - .030
3.0	20,000 - 40,000	20,000 - 36,000	.038 - .050	.025 - .038
4.0	20,000 - 32,000	20,000 - 25,000	.050 - .075	.038 - .050
6.0	18,000 - 25,000	15,000 - 18,000	.065 - .100	.050 - .075
8.0	14,000 - 19,000	12,000 - 14,000	.088 - .125	.065 - .100
10.0	12,000 - 16,000	10,000 - 12,000	.110 - .150	.075 - .110
12.0	9,000 - 12,000	7,500 - 9,000	.140 - .200	.100 - .150
16.0	6,500 - 9,000	5,000 - 7,000	.165 - .225	.125 - .175
20.0	5,500 - 7,500	4,000 - 6,000	.190 - .250	.150 - .200
25.0	4,000 - 6,000	3,500 - 5,500	.215 - .275	.175 - .225



RADIAL STEP OVER (ap)



AXIAL DEPTH OF CUT (ae)

Roughing	
Axial (ae)	15% - 25% of Dia.
Radial (ap)	20% - 30% of Dia.

Semi-Finishing	
Axial (ae)	5% - 8% of Dia.
Radial (ap)	2% - 5% of Dia.

Finishing	
Axial (ae)	1% - 3% of Dia.
Radial (ap)	.5% - 1% of Dia.

High pressure air is recommended for clearing chips away from the cut.

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

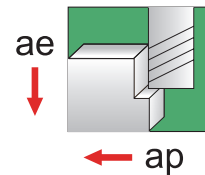
Speed and Feed Recommendations for Diamond Coated End Mills in Graphite

Fractional

DIAMETER	RPM	CHIPLOAD PER FLUTE (Fz)
1/32" - 1/16"	15,000 - 35,000	.0005" - .0010"
1/16" - 1/8"	8000 - 31,000	.0008" - .0015"
1/8" - 3/16"	8000 - 31,000	.0010" - .0020"
3/16" - 1/4"	8000 - 25,000	.0010" - .0020"
1/4" - 5/16"	6000 - 23,000	.0020" - .0040"
5/16" - 3/8"	6000 - 20,000	.0020" - .0040"
3/8" - 1/2"	6000 - 20,000	.0030" - .0050"
1/2" - 5/8"	4500 - 15,000	.0050" - .0060"
5/8" - 3/4"	4500 - 12,000	.0060" - .0070"
3/4" - 1"	4500 - 12,000	.0070" - .0080"

Generally, tools will run at maximum RPM in relation to the corresponding parameters below:

	SLOTING	PROFILING
Axial (ae)	5% of Dia.	1xD
Radial (ap)	1xD	10% of Dia.



Metric

DIAMETER	RPM	CHIPLOAD PER FLUTE (Fz)
1.0 - 3.0	15,000 - 35,000	.015 - .030
3.0 - 6.0	8000 - 31,000	.030 - .050
6.0 - 10.0	6000 - 31,000	.050 - .100
10.0 - 12.0	6000 - 25,000	.080 - .130
16.0 - 20.0	4500 - 15,000	.130 - .150
20.0 - 25.0	4500 - 12,000	.150 - .200

These recommendations are suggested for use primarily in graphite cutting applications. Rigid work holding, machine stability and part integrity are critical!

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL Reaming Guide

Type	Rc Hardness	Recommended SFM	Chipload Per Flute (Fz)			
			Series 4100	.0590" - .1250" (1.499 - 3.175mm)	.1251" - .2500" (3.178 - 6.350mm)	.2501" - .3750" (6.353 - 9.525mm)
COBALT BASE ALLOYS						
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 35 > 35	80-120 60-80	.0003"-0.0008"	.0005"-0.0010"	.0008"-0.0012"	.0010"-0.0015"
NICKEL BASE ALLOYS						
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35 > 35	100-125 80-110	.0003"-0.0008"	.0005"-0.0010"	.0008"-0.0012"	.0010"-0.0015"
IRON BASE ALLOYS						
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35 > 35	150-175 120-150	.0004"-0.0009"	.0006"-0.0012"	.0009"-0.0013"	.0010"-0.0017"
MONEL						
Monel - 65% Nickel		75-110	.0003"-0.0008"	.0005"-0.0010"	.0008"-0.0012"	.0010"-0.0015"
TITANIUM ALLOYS						
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		120-150	.0004"-0.0009"	.0006"-0.0012"	.0009"-0.0013"	.0010"-0.0017"
STAINLESS STEELS						
(Precipitation) 13/8, 15/5, 17-4, pH Types	< 35 > 35	100-125 80-110	.0004"-0.0009"	.0006"-0.0012"	.0009"-0.0013"	.0010"-0.0017"
(Austenitic) Inox, 200 Series, 300 Series	< 35 > 35	100-125 80-110	.0004"-0.0009"	.0006"-0.0012"	.0009"-0.0013"	.0010"-0.0017"
(Austenitic) 304L, 316L, Nitronic 50, Inox	< 35 > 35	80-100 60-80	.0003"-0.0008"	.0005"-0.0010"	.0008"-0.0012"	.0010"-0.0015"
(Martensitic) 400 Series	< 35 > 35	100-125 80-110	.0004"-0.0009"	.0006"-0.0012"	.0009"-0.0013"	.0010"-0.0017"
HIGH STRENGTH TOOL STEELS						
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 35 > 35	100-125 80-110	.0003"-0.0008"	.0005"-0.0010"	.0008"-0.0012"	.0010"-0.0015"
MEDIUM ALLOY TOOL STEELS						
200, 250, 300, 8620	< 35 > 35	100-125 80-110	.0004"-0.0009"	.0006"-0.0012"	.0009"-0.0013"	.0010"-0.0017"
CARBON STEELS						
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35 > 35	100-125 80-110	.0004"-0.0009"	.0006"-0.0012"	.0009"-0.0013"	.0010"-0.0017"
CAST MATERIAL						
Steel		125-150	.0003"-0.0008"	.0005"-0.0010"	.0008"-0.0012"	.0010"-0.0015"
Ductile Iron		150-225	.0005"-0.0010"	.0007"-0.0012"	.0010"-0.0015"	.0010"-0.0018"
Gray Iron		125-200	.0005"-0.0010"	.0007"-0.0012"	.0010"-0.0015"	.0010"-0.0018"
Aluminum		150-225	.0005"-0.0010"	.0007"-0.0012"	.0010"-0.0015"	.0010"-0.0018"
ALUMINUM						
Aircraft Grade (6061, 7075)		225	.0005"-0.0010"	.0007"-0.0012"	.0010"-0.0015"	.0010"-0.0018"
MAGNESIUM						
		225	.0005"-0.0010"	.0007"-0.0012"	.0010"-0.0015"	.0010"-0.0018"
COPPER						
Copper Alloys		225	.0005"-0.0010"	.0007"-0.0012"	.0010"-0.0015"	.0010"-0.0018"
BRASS, BRONZE						
Brass, Aluminum/Bronze, Low Silicon Bronze		125-200	.0005"-0.0010"	.0007"-0.0012"	.0010"-0.0015"	.0010"-0.0018"
COMPOSITE MATERIAL						
Glass Epoxy, Fiberglass, Plastics, Graphite, G10		150	.0003"-0.0008"	.0005"-0.0010"	.0008"-0.0012"	.0010"-0.0015"

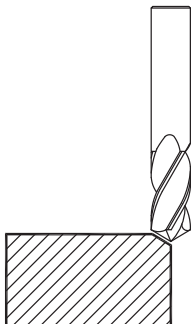
NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

Speeds and Feeds - Drill Mills

Fractional

* Chamfering *

Type	Rc Hardness	SFM (Vc)		CHIPLOAD PER FLUTE (Fz)				
		154M, 154MA 152M, 152MA	1600 152D, 152DA	3/32" - 1/8"	1/8" - 1/4"	1/4" - 3/8"	3/8" - 1/2"	1/2" - 3/4"
COBALT BASE ALLOYS								
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 35 > 35	175 - 225 125 - 175	150 - 200 100 - 150	.0003" - .0008" .0002" - .0004"	.0005" - .0010" .0003" - .0005"	.0008" - .0020" .0005" - .0015"	.0010" - .0030" .0010" - .0020"	.0020" - .0040" .0010" - .0030"
NICKEL BASE ALLOYS								
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35 > 35	125 - 175 70 - 115	100 - 150 70 - 100	.0003" - .0008" .0002" - .0004"	.0005" - .0010" .0003" - .0005"	.0008" - .0020" .0005" - .0015"	.0010" - .0030" .0010" - .0020"	.0020" - .0040" .0010" - .0030"
TITANIUM ALLOYS								
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		200 - 300	125 - 250	.0005" - .0010"	.0007" - .0015"	.0010" - .0025"	.0015" - .0040"	.0030" - .0050"
5553 / Beta Titanium		175 - 225	150 - 200	.0003" - .0008"	.0005" - .0010"	.0008" - .0020"	.0010" - .0030"	.0020" - .0040"
STAINLESS STEELS								
13/8, 15/5, 17-4, pHTypes	< 35 > 35	150 - 250 125 - 175	100 - 150 80 - 150	.0003" - .0008" .0002" - .0004"	.0005" - .0010" .0003" - .0005"	.0008" - .0020" .0005" - .0015"	.0010" - .0030" .0010" - .0020"	.0020" - .0040" .0010" - .0030"
Inox, 200 Series, 300 Series	< 35 > 35	200 - 250 150 - 200	125 - 175 100 - 150	.0003" - .0008" .0002" - .0004"	.0005" - .0010" .0003" - .0005"	.0008" - .0020" .0005" - .0015"	.0010" - .0030" .0010" - .0020"	.0020" - .0040" .0010" - .0030"
304L, 316L, Nitronic 50, Inox	< 35 > 35	90 - 125 75 - 110	80 - 120 60 - 90	.0003" - .0006" .0002" - .0004"	.0005" - .0008" .0003" - .0005"	.0008" - .0015" .0005" - .0010"	.0010" - .0020" .0010" - .0015"	.0020" - .0040" .0010" - .0030"
400 Series	< 35 > 35	150 - 250 125 - 175	100 - 150 80 - 150	.0003" - .0008" .0002" - .0004"	.0005" - .0010" .0003" - .0005"	.0008" - .0020" .0005" - .0015"	.0010" - .0030" .0010" - .0020"	.0020" - .0040" .0010" - .0030"
HIGH STRENGTH TOOL STEELS								
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 30 30 - 38 > 38	150 - 225 90 - 125 60 - 90	125 - 175 80 - 120 40 - 70	.0003" - .0008" .0002" - .0004" .0002" - .0003"	.0005" - .0010" .0003" - .0005" .0002" - .0004"	.0008" - .0020" .0005" - .0015" .0003" - .0006"	.0010" - .0030" .0010" - .0020" .0005" - .0010"	.0020" - .0040" .0010" - .0030" .0006" - .0020"
TOOL STEELS								
200, 250, 300, 8620, A36, 12L14, 1018, 1020	< 35 > 35	175 - 250 100 - 175	150 - 200 100 - 150	.0005" - .0010" .0003" - .0008"	.0007" - .0015" .0005" - .0010"	.0010" - .0025" .0008" - .0020"	.0015" - .0040" .0010" - .0030"	.0030" - .0050" .0020" - .0040"
CAST MATERIAL								
Steel, Iron		250 - 350	175 - 250	.0007" - .0015"	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"	.0030" - .0060"
Aluminum		250 - 350	250 - 350	.0007" - .0015"	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"	.0030" - .0060"
ALUMINUM								
Aircraft Grade (6061, 7075)		350 - 500	300 - 400	.0007" - .0015"	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"	.0030" - .0060"
COPPER								
Copper Alloys		250 - 350	150 - 300	.0005" - .0010"	.0007" - .0015"	.0010" - .0025"	.0015" - .0035"	.0020" - .0050"
BRASS, BRONZE								
Brass, Aluminum/Bronze, Low Silicon Bronze		250 - 350	150 - 300	.0005" - .0010"	.0007" - .0015"	.0010" - .0025"	.0015" - .0035"	.0020" - .0050"
COMPOSITE MATERIAL								
Glass Epoxy, Fiberglass, Plastics		250 - 450	200 - 400	.0007" - .0015"	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"	.0030" - .0060"
Graphite, G10, Carbon Fiber		300 - 500	250 - 450	.0007" - .0015"	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"	.0030" - .0060"



Chamfering a corner

DRILL MILL USES:

Chamfering - for all metals, use general milling speeds and feeds. Depending on depth, use diameter at top of part to determine chipload. For example, if using 1/4" diameter, 90° point and depth is 1/8", calculate the chipload based on 1/8" diameter.

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

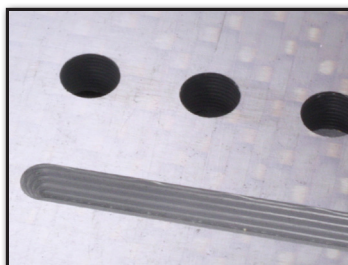
Speeds and Feeds - Drill Mills

Metric

*** Chamfering ***

TECHNICAL

Type	Rc Hardness	SFM (Vc)		CHIPLOAD PER FLUTE (Fz)				
		154M, 154MA 152M, 152MA	1600 152D, 152DA	2.0 - 3.0	3.0 - 6.0	6.0 - 10.0	10.0 - 14.0	14.0 - 20.0
COBALT BASE ALLOYS								
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-4, L-605	< 35 > 35	50 - 70 35 - 50	45 - 60 30 - 45	.008 - .020 .003 - .010	.010 - .025 .005 - .015	.020 - .050 .010 - .035	.025 - .075 .025 - .050	.050 - .100 .025 - .075
NICKEL BASE ALLOYS								
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35 > 35	35 - 50 20 - 35	30 - 45 15 - 25	.006 - .020 .003 - .010	.010 - .025 .005 - .015	.020 - .050 .010 - .035	.025 - .075 .025 - .050	.050 - .100 .025 - .075
TITANIUM ALLOYS								
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		60 - 90	35 - 75	.008 - .025	.015 - .035	.025 - .065	.035 - .100	.075 - .125
5553 / Beta Titanium		50 - 65	45 - 60	.006 - .020	.010 - .025	.020 - .050	.025 - .075	.050 - .100
STAINLESS STEELS								
13/8, 15/5, 17-4, pH Types	< 35 > 35	45 - 75 35 - 50	30 - 45 25 - 45	.006 - .020 .003 - .010	.010 - .025 .005 - .015	.020 - .050 .010 - .035	.025 - .075 .025 - .050	.050 - .100 .025 - .075
Inox, 200 Series, 300 Series	< 35 > 35	60 - 80 45 - 60	40 - 55 30 - 45	.008 - .020 .003 - .010	.010 - .025 .005 - .015	.020 - .050 .010 - .035	.025 - .075 .025 - .050	.050 - .100 .025 - .075
304L, 316L, Nitronic 50, Inox	< 35 > 35	25 - 40 20 - 35	25 - 35 15 - 25	.006 - .015 .003 - .010	.010 - .020 .005 - .015	.020 - .035 .010 - .025	.025 - .050 .025 - .035	.035 - .075 .025 - .050
400 Series	< 35 > 35	45 - 70 35 - 50	30 - 45 25 - 40	.006 - .020 .003 - .010	.010 - .025 .005 - .015	.020 - .050 .010 - .035	.025 - .075 .025 - .050	.050 - .100 .025 - .075
HIGH STRENGTH TOOL STEELS								
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 30 30 - 38 > 38	45 - 60 30 - 45 15 - 30	35 - 50 25 - 35 10 - 25	.006 - .020 .003 - .010 .002 - .006	.010 - .025 .005 - .015 .003 - .008	.020 - .050 .010 - .035 .005 - .020	.025 - .075 .025 - .050 .015 - .040	.050 - .100 .025 - .075 .020 - .065
TOOL STEELS								
200, 250, 300, 8620, A36, 12L14, 1018, 1020	< 35 > 35	55 - 75 35 - 55	45 - 60 30 - 45	.008 - .025 .006 - .020	.015 - .035 .010 - .025	.025 - .065 .020 - .050	.035 - .100 .025 - .075	.075 - .125 .050 - .100
CAST MATERIAL								
Steel, Iron		75 - 105	50 - 75	.010 - .035	.025 - .050	.035 - .100	.050 - .150	.075 - 250
Aluminum		75 - 105	75 - 105	.010 - .035	.025 - .050	.035 - .100	.050 - .150	.075 - 250
ALUMINUM								
Aircraft Grade (6061, 7075)		90 - 150	90 - 150	.010 - .035	.025 - .050	.035 - .100	.050 - .150	.075 - 250
COPPER								
Copper Alloys		75 - 115	60 - 90	.008 - .025	.020 - .040	.025 - .065	.040 - .090	.050 - 200
BRASS, BRONZE								
Brass, Aluminum/Bronze, Low Silicon Bronze		75 - 115	60 - 90	.008 - .025	.020 - .040	.025 - .065	.040 - .090	.050 - 200
COMPOSITE MATERIAL								
Glass Epoxy, Fiberglass, Plastics		60 - 120	60 - 120	.010 - .035	.025 - .050	.035 - .100	.050 - .150	.075 - 250
Graphite, G10, Carbon Fiber		90 - 150	75 - 135	.010 - .035	.025 - .050	.035 - .100	.050 - .150	.075 - 250



NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

Speeds and Feeds - Drill Mills

Fractional

* Through Hole *

Type	Rc Hardness	SFM (Vc)		CHIPLOAD PER FLUTE (Fz)			
		152M, 152MA 154M, 154MA	152D, 152DA	1/8" - 1/4"	1/4" - 3/8"	3/8" - 1/2"	1/2" - 3/4"
TITANIUM ALLOYS							
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25Ni-4Zr-2Mo-Si		-	125 - 250	.0007" - .0015"	.0010" - .0025"	.0015" - .0040"	.0030" - .0050"
STAINLESS STEELS							
13/8, 15/5, 17-4, pH Types	< 35 > 35	-	100 - 150 80 - 150	.0005" - .0010" .0003" - .0005"	.0008" - .0020" .0005" - .0015"	.0010" - .0030" .0010" - .0020"	.0020" - .0040" .0010" - .0030"
HIGH STRENGTH TOOL STEELS							
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 30 30 - 38	-	125 - 175 80 - 120	.0005" - .0010" .0003" - .0005"	.0008" - .0020" .0005" - .0015"	.0010" - .0030" .0010" - .0020"	.0020" - .0040" .0010" - .0030"
MEDIUM ALLOY TOOL STEELS							
200, 250, 300, 8620	< 35 > 35	-	150 - 200 100 - 150	.0007" - .0015" .0005" - .0010"	.0010" - .0025" .0008" - .0020"	.0015" - .0040" .0010" - .0030"	.0030" - .0050" .0020" - .0040"
CARBON STEELS							
A36, 12L14, 1000's, 1100's, 1300's	< 35 > 35	175 - 250 -	150 - 200 100 - 150	.0007" - .0015" .0005" - .0010"	.0010" - .0025" .0008" - .0020"	.0015" - .0040" .0010" - .0030"	.0030" - .0050" .0020" - .0040"
CAST MATERIAL							
Steel		-	175 - 250	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"	.0030" - .0060"
Ductile Iron		-	175 - 250	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"	.0030" - .0060"
Gray Iron		-	175 - 250	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"	.0030" - .0060"
Aluminum		250 - 350	250 - 350	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"	.0030" - .0060"
ALUMINUM							
Aircraft Grade (6061, 7075)		350 - 500	300 - 400	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"	.0030" - .0060"
MAGNESIUM							
		250 - 400	250 - 350	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"	.0030" - .0060"
COPPER							
Copper Alloys		250 - 350	150 - 300	.0007" - .0015"	.0010" - .0025"	.0015" - .0035"	.0020" - .0050"
BRASS, BRONZE							
Brass, Aluminum/Bronze, Low Silicon Bronze		250 - 350	150 - 300	.0007" - .0015"	.0010" - .0025"	.0015" - .0035"	.0020" - .0050"
COMPOSITE MATERIAL							
Glass Epoxy, Fiberglass, Plastics		250 - 450	200 - 400	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"	.0030" - .0060"
Graphite, G10, Carbon Fiber		300 - 500	250 - 450	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"	.0030" - .0060"



NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

Speeds and Feeds - Drill Mills

Metric

* Through Hole *

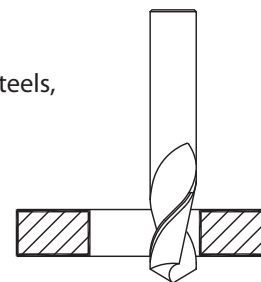
TECHNICAL

Type	Rc Hardness	SFM (Vc)		CHIPLOAD PER FLUTE (Fz)			
		152M, 152MA 154M, 154MA	152D, 152DA	3.0 - 6.0	6.0 - 10.0	10.0 - 14.0	14.0 - 20.0
TITANIUM ALLOYS							
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		-	35 - 75	.015 - .035	.025 - .065	.035 - .100	.075 - .125
STAINLESS STEELS							
13/8, 15/5, 17-4, pH Types	< 35 > 35	-	30 - 45 25 - 45	.010 - .025 .005 - .015	.020 - .050 .010 - .035	.025 - .075 .025 - .050	.050 - .100 .025 - .075
HIGH STRENGTH TOOL STEELS							
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 30 30 - 38	-	35 - 50 25 - 35	.010 - .025 .005 - .015	.020 - .050 .010 - .035	.025 - .075 .025 - .050	.050 - .100 .025 - .075
MEDIUM ALLOY TOOL STEELS							
200, 250, 300, 8620	< 35 > 35	-	45 - 60 30 - 45	.015 - .035 .010 - .025	.025 - .065 .020 - .050	.035 - .100 .025 - .075	.075 - .125 .050 - .100
CARBON STEELS							
A36, 12L14, 1000's, 1100's, 1300's	< 35 > 35	55 - 75 -	45 - 60 30 - 45	.015 - .035 .010 - .025	.025 - .065 .020 - .050	.035 - .100 .025 - .075	.075 - .125 .050 - .100
CAST MATERIAL							
Steel		-	50 - 75	.025 - .050	.035 - .075	.050 - .100	.075 - .150
Ductile Iron		-	60 - 90	.025 - .050	.035 - .075	.050 - .100	.075 - .150
Gray Iron		-	50 - 75	.025 - .050	.035 - .075	.050 - .100	.075 - .150
Aluminum		75 - 105	75 - 105	.025 - .050	.035 - .075	.050 - .100	.075 - .150
ALUMINUM							
Aircraft Grade (6061, 7075)		90 - 150	90 - 150	.025 - .050	.035 - .075	.050 - .100	.075 - .150
MAGNESIUM							
		90 - 135	75 - 105	.020 - .040	.025 - .065	.040 - .090	.050 - .125
COPPER							
Copper Alloys		75 - 115	60 - 90	.020 - .040	.025 - .065	.040 - .090	.050 - .125
BRASS, BRONZE							
Brass, Aluminum/Bronze, Low Silicon Bronze		75 - 115	60 - 90	.020 - .040	.025 - .065	.040 - .090	.050 - .125
COMPOSITE MATERIAL							
Glass Epoxy, Fiberglass, Plastics		60 - 120	60 - 120	.025 - .050	.035 - .075	.050 - .100	.075 - .150
Graphite, G10, Carbon Fiber		90 - 150	75 - 135	.025 - .050	.035 - .075	.050 - .100	.075 - .150

DRILL MILL USES:

Through Hole - mostly for composites, plastics, softer steels, copper, aluminum and similar metals.

Drilling through, then side milling



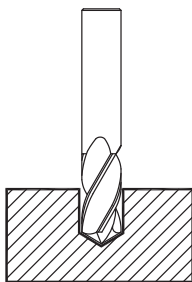
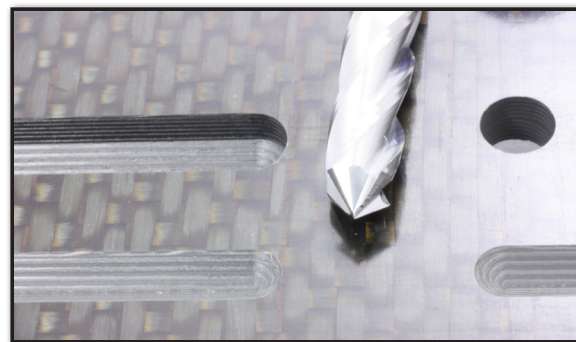
NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

Speeds and Feeds - Drill Mills

Fractional

* Solids *

Type	Rc Hardness	SFM (Vc)	CHIPLOAD PER FLUTE (Fz)			
		152M, 152MA 154M, 154MA	1/8" - 1/4"	1/4" - 3/8"	3/8" - 1/2"	1/2" - 3/4"
STAINLESS STEELS						
13/8, 15/5, 17-4, pH Types	< 35	125 - 175	.0003" - .0008"	.0005" - .0010"	.0008" - .0020"	.0010" - .0030"
400 Series	< 35	125 - 175	.0003" - .0008"	.0005" - .0010"	.0008" - .0020"	.0010" - .0030"
HIGH STRENGTH TOOL STEELS						
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 30	125 - 200	.0003" - .0008"	.0005" - .0010"	.0008" - .0020"	.0010" - .0030"
	30 - 38	90 - 125	.0002" - .0004"	.0003" - .0005"	.0005" - .0015"	.0010" - .0020"
MEDIUM ALLOY TOOL STEELS						
200, 250, 300	< 35	150 - 225	.0005" - .0010"	.0007" - .0015"	.0010" - .0025"	.0015" - .0040"
CARBON STEELS						
A36, 1000's, 1100's, 1300's	< 35	150 - 250	.0005" - .0010"	.0007" - .0015"	.0010" - .0025"	.0015" - .0040"
CAST MATERIAL						
Steel		150 - 250	.0007" - .0015"	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"
Aluminum		200 - 350	.0007" - .0015"	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"
ALUMINUM						
Aircraft Grade (6061, 7075)		250 - 400	.0007" - .0015"	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"
MAGNESIUM						
		250 - 400	.0007" - .0015"	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"
COPPER						
Copper Alloys		250 - 350	.0005" - .0010"	.0007" - .0015"	.0010" - .0025"	.0015" - .0035"
BRASS, BRONZE						
Brass, Aluminum/Bronze, Low Silicon Bronze		250 - 350	.0005" - .0010"	.0007" - .0015"	.0010" - .0025"	.0015" - .0035"
COMPOSITE MATERIAL						
Glass Epoxy, Fiberglass, Plastics		250 - 450	.0007" - .0015"	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"
Graphite, G10, Carbon Fiber		300 - 500	.0007" - .0015"	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"



Slotting

DRILL MILL USES:

Solids - primarily for use in composites and plastics.

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

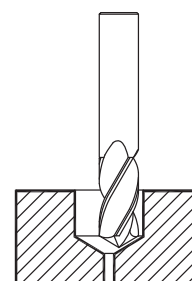
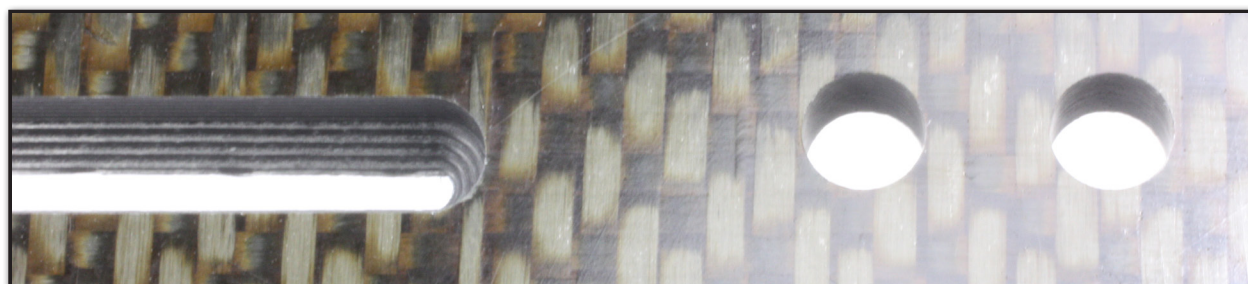
Speeds and Feeds - Drill Mills

Metric

*** Solids ***

TECHNICAL

Type	Rc Hardness	SFM (Vc)	CHIPLOAD PER FLUTE (Fz)			
		152M, 152MA 154M, 154MA	3.0 - 6.0	6.0 - 10.0	10.0 - 14.0	14.0 - 20.0
STAINLESS STEELS						
13/8, 15/5, 17-4, pH Types	< 35	45 - 75	.006 - .020	.010 - .025	.020 - .050	.025 - .075
400 Series	< 35	45 - 75	.006 - .020	.010 - .025	.020 - .050	.025 - .075
HIGH STRENGTH TOOL STEELS						
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 30 30 - 38	45 - 60	.006 - .020	.010 - .025	.020 - .050	.025 - .075
		30 - 45	.003 - .010	.005 - .015	.010 - .035	.025 - .050
MEDIUM ALLOY TOOL STEELS						
200, 250, 300	< 35	55 - 75	.008 - .025	.015 - .035	.025 - .065	.035 - .100
CARBON STEELS						
A36, 1000's, 1100's, 1300's	< 35	55 - 75	.008 - .025	.015 - .035	.025 - .065	.035 - .100
CAST MATERIAL						
Steel		75 - 105	.010 - .035	.025 - .050	.035 - .075	.050 - .100
Aluminum		75 - 105	.010 - .035	.020 - .050	.035 - .075	.050 - .100
ALUMINUM						
Aircraft Grade (6061, 7075)		90 - 150	.010 - .035	.025 - .050	.035 - .075	.050 - .100
MAGNESIUM						
		90 - 135	.008 - .025	.020 - .040	.025 - .065	.040 - .090
COPPER						
Copper Alloys		75 - 115	.008 - .025	.020 - .040	.025 - .065	.040 - .090
BRASS, BRONZE						
Brass, Aluminum/Bronze, Low Silicon Bronze		75 - 115	.008 - .025	.020 - .040	.025 - .065	.040 - .090
COMPOSITE MATERIAL						
Glass Epoxy, Fiberglass, Plastics		60 - 120	.010 - .035	.025 - .050	.035 - .075	.050 - .100
Graphite, G10, Carbon Fiber		90 - 150	.010 - .035	.025 - .050	.035 - .075	.050 - .100



Milling pre-drilled through hole to size

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL Drilling Guide

Fractional

TECHNICAL

Type	Rc Hardness	RECOMMENDED SFM BY SERIES						
		1100, 1120	4000	1200, 1205, 1520, 1600, 1400	1500, 1510, 1300	1700	1700K	1800H
COBALT BASE ALLOYS								
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 35 > 35	80 - 120 -	80 - 120 -	100 - 150 80 - 110	100 - 150 80 - 110	- -	- -	- -
NICKEL BASE ALLOYS								
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35 > 35	100 - 125 -	100 - 125 -	100 - 150 90 - 125	125 - 175 90 - 125	- -	- -	- -
IRON BASE ALLOYS								
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35 > 35	100 - 125 -	100 - 125 -	100 - 150 90 - 125	125 - 175 90 - 150	- -	- -	- -
MONEL								
Monel - 65% Nickel		-	-	100 - 150	100 - 150	-	-	-
TITANIUM ALLOYS								
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		125 - 175	125 - 175	150 - 200	150 - 200	-	-	-
STAINLESS STEELS								
(Precipitation) 13/8, 15/5, 17-4, pH Types	< 35 > 35	- -	125 - 150 -	125 - 175 80 - 125	150 - 200 100 - 150	- -	- -	- -
(Austenitic) Inox, 200 Series, 300 Series	< 35 > 35	- -	125 - 150 -	100 - 175 100 - 125	150 - 200 125 - 150	- -	- -	- -
(Austenitic) 304L, 316L, Nitronic 50, Inox	< 35 > 35	- -	100 - 125 -	80 - 100 60 - 90	90 - 125 80 - 100	- -	- -	- -
(Martensitic) 400 Series	< 35 > 35	- -	125 - 150 -	100 - 150 80 - 125	125 - 175 100 - 140	- -	- -	- -
HIGH STRENGTH TOOL STEELS								
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 35 35 - 50	- -	125 - 150 -	100 - 175 80 - 130	125 - 175 80 - 130	- -	- -	- -
Thompson Shaft, Armor Plate (Class 1)	> 50	-	-	-	70 - 90	-	-	-
MEDIUM ALLOY TOOL STEELS								
200, 250, 300, 8620	< 35 > 35	- -	125 - 150 -	125 - 175 100 - 150	125 - 175 100 - 150	- -	- -	- -
CARBON STEELS								
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35 > 35	- -	125 - 150 -	125 - 175 100 - 125	150 - 200 100 - 175	- -	- -	- -
CAST MATERIAL								
Steel		150 - 200	150 - 200	125 - 175	-	100 - 150	125 - 225	-
Ductile Iron		200 - 400	200 - 300	125 - 200	150 - 250	100 - 175	150 - 300	-
Gray Iron		175 - 300	150 - 250	100 - 200	150 - 250	150 - 250	150 - 300	-
Aluminum		200 - 400	175 - 300	150 - 250	-	175 - 300	200 - 350	250 - 400
ALUMINUM								
Aircraft Grade (6061, 7075)		-	200	250 - 350	-	-	-	250 - 400
MAGNESIUM								
		-	200	200 - 300	-	-	-	200 - 400
COPPER								
Copper Alloys		-	200	150 - 250	-	-	-	-
BRASS, BRONZE								
Brass, Aluminum/Bronze, Low Silicon Bronze		-	-	150 - 300 125 - 200	- -	- -	- -	200 - 400 200 - 400
COMPOSITE MATERIAL								
Glass Epoxy, Fiberglass, Plastics, Graphite, G10		200	200	150 - 300	150 - 300	-	-	-

INCREASE SFM 20%-40% FOR HARDLUBE COATING

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL Drilling Guide

Fractional

Type	Rc Hardness	CHIPLOAD PER FLUTE (Fz)				
		1/16" - 1/8"	1/8" - 1/4"	1/4" - 3/8"	3/8" - 1/2"	1/2" - 5/8"
COBALT BASE ALLOYS						
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 35	.0004" - .0010"	.0008" - .0020"	.0015" - .0025"	.0020" - .0040"	.0025" - .0050"
	> 35	.0004" - .0010"	.0005" - .0010"	.0010" - .0015"	.0010" - .0020"	.0015" - .0030"
NICKEL BASE ALLOYS						
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35	.0005" - .0015"	.0010" - .0015"	.0015" - .0025"	.0020" - .0040"	.0025" - .0050"
	> 35	.0004" - .0010"	.0008" - .0015"	.0010" - .0015"	.0015" - .0030"	.0020" - .0040"
IRON BASE ALLOYS						
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35	.0010" - .0015"	.0010" - .0020"	.0015" - .0035"	.0020" - .0050"	.0030" - .0060"
	> 35	.0008" - .0015"	.0010" - .0020"	.0015" - .0025"	.0020" - .0040"	.0025" - .0050"
MONEL						
Monel - 65% Nickel		.0004" - .0010"	.0008" - .0015"	.0010" - .0015"	.0015" - .0030"	.0020" - .0040"
TITANIUM ALLOYS						
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		.0008" - .0015"	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"	.0025" - .0050"
STAINLESS STEELS						
(Precipitation) 13/8, 15/5, 17-4, pH Types	< 35	.0005" - .0015"	.0010" - .0020"	.0015" - .0035"	.0020" - .0040"	.0025" - .0050"
	> 35	.0004" - .0010"	.0008" - .0015"	.0010" - .0015"	.0015" - .0030"	.0020" - .0040"
(Austenitic) Inox, 200 Series, 300 Series	< 35	.0005" - .0015"	.0010" - .0020"	.0015" - .0035"	.0020" - .0040"	.0025" - .0050"
	> 35	.0004" - .0010"	.0008" - .0015"	.0010" - .0015"	.0015" - .0030"	.0020" - .0040"
(Austenitic) 304L, 316L, Nitronic 50, Inox	< 35	.0004" - .0010"	.0008" - .0015"	.0010" - .0015"	.0015" - .0030"	.0020" - .0040"
	> 35	.0003" - .0008"	.0005" - .0010"	.0010" - .0015"	.0010" - .0020"	.0015" - .0030"
(Martensitic) 400 Series	< 35	.0005" - .0015"	.0010" - .0020"	.0015" - .0035"	.0020" - .0040"	.0025" - .0050"
	> 35	.0004" - .0010"	.0008" - .0015"	.0010" - .0015"	.0015" - .0030"	.0020" - .0040"
HIGH STRENGTH TOOL STEELS						
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 35	.0005" - .0015"	.0010" - .0020"	.0015" - .0025"	.0015" - .0030"	.0020" - .0040"
	35 - 50	.0004" - .0010"	.0008" - .0020"	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"
Thompson Shaft, Armor Plate (Class 1)	> 50	.0003" - .0006"	.0005" - .0010"	.0008" - .0015"	.0010" - .0020"	.0015" - .0030"
MEDIUM ALLOY TOOL STEELS						
200, 250, 300, 8620	< 35	.0010" - .0015"	.0015" - .0025"	.0020" - .0030"	.0020" - .0040"	.0025" - .0050"
	> 35	.0005" - .0010"	.0010" - .0020"	.0010" - .0025"	.0015" - .0030"	.0020" - .0040"
CARBON STEELS						
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35	.0010" - .0015"	.0015" - .0025"	.0020" - .0030"	.0020" - .0040"	.0025" - .0050"
	> 35	.0005" - .0010"	.0010" - .0020"	.0010" - .0025"	.0015" - .0035"	.0020" - .0040"
CAST MATERIAL						
Steel		.0008" - .0015"	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"	.0025" - .0050"
Ductile Iron		.0010" - .0020"	.0010" - .0030"	.0015" - .0035"	.0025" - .0040"	.0030" - .0050"
Gray Iron		.0010" - .0020"	.0010" - .0030"	.0015" - .0035"	.0025" - .0040"	.0030" - .0050"
Aluminum		.0010" - .0020"	.0015" - .0040"	.0020" - .0050"	.0030" - .0060"	.0035" - .0070"
ALUMINUM						
Aircraft Grade (6061, 7075)		.0010" - .0020"	.0015" - .0040"	.0020" - .0050"	.0030" - .0060"	.0035" - .0070"
MAGNESIUM						
		.0010" - .0020"	.0010" - .0030"	.0015" - .0035"	.0025" - .0040"	.0030" - .0050"
COPPER						
Copper Alloys		.0010" - .0020"	.0010" - .0030"	.0015" - .0035"	.0025" - .0040"	.0030" - .0050"
BRASS, BRONZE						
Brass, Aluminum/Bronze, Low Silicon Bronze		.0010" - .0020"	.0010" - .0030"	.0015" - .0035"	.0025" - .0040"	.0030" - .0050"
		.0008" - .0015"	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"	.0025" - .0050"
COMPOSITE MATERIAL						
Glass Epoxy, Fiberglass, Plastics, Graphite, G10		.0006" - .0015"	.0008" - .0020"	.0010" - .0025"	.0015" - .0030"	.0020" - .0040"

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL Drilling Guide

Metric

TECHNICAL

Type	Rc Hardness	RECOMMENDED M/Min. BY SERIES						
		1100, 1120	4000	1200, 1205, 1520, 1600, 1400	1500, 1510, 1300	1700	1700K	1800H
COBALT BASE ALLOYS								
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 35	25 - 40	25 - 40	30 - 45	30 - 45	-	-	-
	> 35	-	-	25 - 35	25 - 35	-	-	-
NICKEL BASE ALLOYS								
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35	30 - 40	30 - 40	30 - 45	40 - 50	-	-	-
	> 35	-	-	25 - 40	25 - 40	-	-	-
IRON BASE ALLOYS								
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35	30 - 40	30 - 40	40 - 50	40 - 50	-	-	-
	> 35	-	-	30 - 40	30 - 45	-	-	-
MONEL								
Monel - 65% Nickel		-	-	30 - 45	30 - 45	-	-	-
TITANIUM ALLOYS								
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		-	40 - 50	45 - 60	45 - 60	-	-	-
STAINLESS STEELS								
(Precipitation) 13/8, 15/5, 17-4, pH Types	< 35	-	40 - 45	40 - 50	45 - 60	-	-	-
	> 35	-	-	25 - 40	30 - 45	-	-	-
(Austenitic) Inox, 200 Series, 300 Series	< 35	-	40 - 45	30 - 50	45 - 60	-	-	-
	> 35	-	-	30 - 40	40 - 45	-	-	-
(Austenitic) 304L, 316L, Nitronic 50, Inox	< 35	-	30 - 40	25 - 30	30 - 40	-	-	-
	> 35	-	-	20 - 30	25 - 30	-	-	-
(Martensitic) 400 Series	< 35	-	40 - 45	30 - 45	40 - 55	-	-	-
	> 35	-	-	25 - 40	30 - 45	-	-	-
HIGH STRENGTH TOOL STEELS								
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 35	-	40 - 45	30 - 55	40 - 55	-	-	-
	35 - 50	-	-	25 - 40	25 - 40	-	-	-
Thompson Shaft, Armor Plate (Class 1)	> 50	-	-	-	20 - 30	-	-	-
MEDIUM ALLOY TOOL STEELS								
200, 250, 300, 8620	< 35	-	40 - 45	40 - 55	40 - 55	-	-	-
	> 35	-	-	30 - 45	30 - 45	-	-	-
CARBON STEELS								
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35	-	40 - 45	40 - 55	45 - 60	-	-	-
	> 35	-	-	30 - 40	30 - 55	-	-	-
CAST MATERIAL								
Ductile Iron		60 - 120	60 - 90	40 - 60	45 - 75	40 - 60	50 - 80	-
Gray Iron		50 - 90	45 - 75	30 - 60	45 - 75	40 - 60	50 - 80	-
Aluminum		60 - 120	55 - 90	45 - 70	-	40 - 70	60 - 90	70 - 120
Steel		45 - 60	45 - 60	40 - 55	-	40 - 60	50 - 80	-
ALUMINUM								
Aircraft Grade (6061, 7075)		-	60	75 - 100	-	-	-	70 - 120
MAGNESIUM								
		-	60	60 - 90	-	-	-	60 - 120
COPPER								
Copper Alloys		-	60	45 - 70	-	-	-	-
BRASS, BRONZE								
Brass, Aluminum/Bronze, Low Silicon Bronze		-	-	45 - 90	-	-	-	60 - 120
		-	-	40 - 60	-	-	-	60 - 120
COMPOSITE MATERIAL								
Glass Epoxy, Fiberglass, Plastics, Graphite, G10		60	60	45 - 90	45 - 90	-	-	-

INCREASE M/Min. 20%-40% FOR HARDLUBE COATING

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL Drilling Guide

Metric

Type	Rc Hardness	CHIPLOAD PER FLUTE (Fz)				
		2.0 - 3.0	3.0 - 6.0	6.0 - 10.0	10.0 - 13.0	13.0 - 16.0
COBALT BASE ALLOYS						
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-4, L-605	< 35	.010 - .025	.020 - .050	.040 - .065	.050 - .100	.065 - .125
	> 35	.010 - .025	.013 - .025	.025 - .040	.025 - .050	.040 - .075
NICKEL BASE ALLOYS						
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35	.013 - .040	.025 - .040	.040 - .065	.050 - .100	.065 - .125
	> 35	.010 - .025	.020 - .040	.025 - .040	.040 - .075	.050 - .100
IRON BASE ALLOYS						
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35	.025 - .040	.025 - .050	.040 - .090	.050 - .100	.075 - .150
	> 35	.020 - .040	.025 - .050	.040 - .065	.040 - .075	.065 - .125
MONEL						
Monel - 65% Nickel		.010 - .025	.020 - .040	.025 - .040	.040 - .075	.050 - .100
TITANIUM ALLOYS						
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		.020 - .040	.025 - .050	.040 - .075	.050 - .100	.065 - .125
STAINLESS STEELS						
(Precipitation) 13/8, 15/5, 17-4, pH Types	< 35	.013 - .040	.025 - .050	.040 - .090	.050 - .100	.065 - .125
	> 35	.010 - .025	.020 - .040	.025 - .040	.040 - .075	.050 - .100
(Austenitic) Inox, 200 Series, 300 Series	< 35	.013 - .040	.025 - .050	.040 - .090	.050 - .100	.065 - .125
	> 35	.010 - .025	.020 - .040	.025 - .040	.040 - .075	.050 - .100
(Austenitic) 304L, 316L, Nitronic 50, Inox	< 35	.010 - .025	.020 - .040	.025 - .040	.040 - .075	.050 - .100
	> 35	.008 - .020	.013 - .025	.025 - .040	.025 - .050	.040 - .075
(Martensitic) 400 Series	< 35	.013 - .040	.025 - .050	.040 - .090	.050 - .100	.065 - .125
	> 35	.010 - .025	.020 - .040	.025 - .040	.040 - .075	.050 - .100
HIGH STRENGTH TOOL STEELS						
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 35	.013 - .040	.025 - .050	.040 - .065	.050 - .100	.075 - .125
	35 - 50	.010 - .025	.020 - .050	.025 - .050	.030 - .075	.040 - .100
Thompson Shaft, Armor Plate (Class 1)	> 50	.008 - .020	.010 - .030	.015 - .040	.020 - .060	.030 - .080
MEDIUM ALLOY TOOL STEELS						
200, 250, 300, 8620	< 35	.025 - .040	.040 - .065	.050 - .075	.050 - .100	.065 - .125
	> 35	.013 - .040	.025 - .050	.025 - .065	.040 - .075	.050 - .100
CARBON STEELS						
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35	.025 - .040	.040 - .065	.050 - .075	.050 - .100	.065 - .125
	> 35	.013 - .040	.025 - .050	.025 - .065	.040 - .090	.050 - .100
CAST MATERIAL						
Steel		.020 - .040	.025 - .050	.040 - .075	.050 - .100	.065 - .125
Ductile Iron		.025 - .050	.025 - .075	.040 - .090	.065 - .100	.075 - .125
Gray Iron		.025 - .050	.025 - .075	.040 - .090	.065 - .100	.075 - .125
Aluminum		.025 - .050	.025 - .100	.050 - .125	.075 - .150	.090 - .180
ALUMINUM						
Aircraft Grade (6061, 7075)		.025 - .050	.025 - .100	.050 - .125	.075 - .150	.090 - .180
MAGNESIUM						
		.025 - .050	.025 - .075	.040 - .090	.065 - .100	.075 - .125
COPPER						
Copper Alloys		.025 - .050	.025 - .075	.040 - .090	.065 - .100	.075 - .125
BRASS, BRONZE						
Brass, Aluminum/Bronze, Low Silicon Bronze		.025 - .050	.025 - .075	.040 - .090	.065 - .100	.075 - .125
		.020 - .040	.025 - .050	.040 - .075	.050 - .100	.065 - .125
COMPOSITE MATERIAL						
Glass Epoxy, Fiberglass, Plastics, Graphite, G10		.015 - .040	.020 - .050	.025 - .065	.040 - .075	.050 - .100

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL High Performance Drilling Guide

Fractional - Mini Drills

Type	Rc Hardness	Recommended SFM	CHIPLOAD PER FLUTE (Fz)		
		Series 1250H 1550H 1850H	1/32" - 0.99mm (.0312" - .0390")	1.00mm - 2.00mm (.0394" - .0787")	2.01mm - 1/8" (.0791" - .1250")
COBALT BASE ALLOYS					
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 35	100 - 150	.0002" - .0004"	.0004" - .0008"	.0006" - .0012"
	> 35	80 - 110	.0002" - .0004"	.0003" - .0006"	.0005" - .0010"
NICKEL BASE ALLOYS					
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35	125 - 150	.0003" - .0005"	.0004" - .0008"	.0006" - .0012"
	> 35	100 - 125	.0002" - .0004"	.0003" - .0006"	.0005" - .0010"
IRON BASE ALLOYS					
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35	125 - 175	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
	> 35	80 - 100	.0003" - .0006"	.0004" - .0008"	.0006" - .0012"
MONEL					
Monel - 65% Nickel		75 - 125	.0002" - .0004"	.0003" - .0006"	.0005" - .0010"
TITANIUM ALLOYS					
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		150 - 200	.0003" - .0006"	.0004" - .0008"	.0006" - .0012"
STAINLESS STEELS					
(Precipitation) 13/8, 15/5, 17-4, pH Types	< 35	125 - 175	.0003" - .0005"	.0004" - .0008"	.0006" - .0012"
	> 35	80 - 125	.0002" - .0004"	.0003" - .0006"	.0005" - .0010"
(Austenitic) Inox, 200 Series, 300 Series	< 35	100 - 175	.0003" - .0005"	.0004" - .0008"	.0006" - .0012"
	> 35	80 - 125	.0002" - .0004"	.0003" - .0006"	.0005" - .0010"
(Austenitic) 304L, 316L, Nitronic 50, Inox	< 35	80 - 100	.0003" - .0005"	.0004" - .0008"	.0006" - .0012"
	> 35	60 - 90	.0002" - .0004"	.0003" - .0006"	.0005" - .0010"
(Martensitic) 400 Series	< 35	100 - 150	.0003" - .0005"	.0004" - .0008"	.0006" - .0012"
	> 35	80 - 125	.0002" - .0004"	.0003" - .0006"	.0005" - .0010"
HIGH STRENGTH TOOL STEELS					
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 35	100 - 175	.0003" - .0006"	.0004" - .0008"	.0006" - .0012"
	35-48	80 - 130	.0002" - .0005"	.0003" - .0008"	.0006" - .0012"
	> 48	60 - 80	.0002" - .0004"	.0003" - .0006"	.0005" - .0010"
MEDIUM ALLOY TOOL STEELS					
200, 250, 300, 8620	< 35	125 - 175	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
	> 35	80 - 125	.0003" - .0005"	.0004" - .0008"	.0006" - .0012"
CARBON STEELS					
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35	125 - 175	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
	> 35	80 - 125	.0003" - .0005"	.0004" - .0008"	.0006" - .0012"
CAST MATERIAL					
Steel		100 - 175	.0003" - .0006"	.0004" - .0008"	.0006" - .0012"
Ductile Iron		100 - 200	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
Gray Iron		80 - 175	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
Aluminum		100 - 250	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
ALUMINUM					
2014, 2024, 6061-(T1-T6), 7075, Extruded		125 - 300	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
MAGNESIUM					
		125 - 250	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
COPPER					
Copper Alloys		125 - 250	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
BRASS					
Short Chips Long Chips		125 - 250	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
		100 - 200	.0003" - .0005"	.0004" - .0008"	.0006" - .0012"
BRONZE					
Short Chips Long Chips		100 - 250	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
		80 - 175	.0003" - .0006"	.0004" - .0008"	.0006" - .0012"

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL High Performance Drilling Guide

Mini Drills - Metric

Type	Rc Hardness	Recommended M/Min.	CHIPLOAD PER FLUTE (Fz)		
		Series 1250H 1550H 1850H	1/32" - 0.99mm (.0312" - .0390")	1.00mm - 2.00mm (.0394" - .0787")	2.01mm - 1/8" (.0791" - .1250")
COBALT BASE ALLOYS					
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 35	30 - 45	.005 - .010	.010 - .020	.015 - .030
	> 35	25 - 35	.005 - .010	.008 - .015	.013 - .025
NICKEL BASE ALLOYS					
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35	40 - 45	.008 - .013	.010 - .020	.015 - .030
	> 35	30 - 40	.005 - .010	.008 - .015	.013 - .025
IRON BASE ALLOYS					
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35	40 - 50	.010 - .020	.015 - .030	.020 - .038
	> 35	25 - 30	.008 - .015	.010 - .020	.015 - .030
MONEL					
Monel - 65% Nickel		20 - 40	.005 - .010	.008 - .015	.013 - .025
TITANIUM ALLOYS					
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		45 - 60	.008 - .015	.010 - .020	.015 - .030
STAINLESS STEELS					
(Precipitation) 13/8, 15/5, 17-4, pH Types	< 35	40 - 50	.008 - .013	.010 - .020	.015 - .030
	> 35	25 - 40	.005 - .010	.008 - .015	.013 - .025
(Austenitic) Inox, 200 Series, 300 Series	< 35	30 - 50	.008 - .013	.010 - .020	.015 - .030
	> 35	25 - 40	.005 - .010	.008 - .015	.013 - .025
(Austenitic) 304L, 316L, Nitronic 50, Inox	< 35	25 - 30	.008 - .013	.010 - .020	.015 - .030
	> 35	20 - 25	.005 - .010	.008 - .015	.013 - .025
(Martensitic) 400 Series	< 35	30 - 45	.008 - .013	.010 - .020	.015 - .030
	> 35	25 - 40	.005 - .010	.008 - .015	.013 - .025
HIGH STRENGTH TOOL STEELS					
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 35	30 - 50	.008 - .015	.010 - .020	.015 - .030
	35-48	25 - 40	.005 - .013	.008 - .020	.015 - .030
	> 48	20 - 25	.005 - .010	.008 - .015	.013 - .025
MEDIUM ALLOY TOOL STEELS					
200, 250, 300, 8620	< 35	40 - 50	.010 - .020	.015 - .030	.020 - .038
	> 35	25 - 40	.008 - .013	.010 - .020	.015 - .030
CARBON STEELS					
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35	40 - 50	.010 - .020	.015 - .030	.020 - .038
	> 35	25 - 40	.008 - .013	.010 - .020	.015 - .030
CAST MATERIAL					
Steel		30 - 50	.008 - .015	.010 - .020	.015 - .030
Ductile Iron		30 - 60	.010 - .020	.015 - .030	.020 - .038
Gray Iron		25 - 50	.010 - .020	.015 - .030	.020 - .038
Aluminum		30 - 75	.010 - .020	.015 - .030	.020 - .038
ALUMINUM					
2014, 2024, 6061-(T1-T6), 7075, Extruded		40 - 90	.010 - .020	.015 - .030	.020 - .038
MAGNESIUM					
		40 - 75	.010 - .020	.015 - .030	.020 - .038
COPPER					
Copper Alloys		40 - 75	.010 - .020	.015 - .030	.020 - .038
BRASS					
Short Chips Long Chips		40 - 75	.010 - .020	.015 - .030	.020 - .038
		30 - 60	.008 - .013	.010 - .020	.015 - .030
BRONZE					
Short Chips Long Chips		30 - 75	.010 - .020	.015 - .030	.020 - .038
		25 - 50	.008 - .015	.010 - .020	.015 - .030

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL High Performance Drilling Guide

Fractional

TECHNICAL

Type	Rc Hardness	Recommended SFM		CHIPLOAD PER FLUTE (Fz)				
		NON-COOLANT	COOLANT FED	1/8" - 1/4"	1/4" - 3/8"	3/8" - 1/2"	1/2" - 5/8"	5/8" - 3/4"
		1580H 1280H 1580HD	1580KH 1280KH 1880KH 1580KD 1280KD					
COBALT BASE ALLOYS								
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 35	185	225	.0010" - .0020"	.0020" - .0030"	.0025" - .0035"	.0030" - .0040"	.0035" - .0055"
	> 35	125	180	.0005" - .0015"	.0015" - .0025"	.0020" - .0030"	.0025" - .0035"	.0030" - .0045"
NICKEL BASE ALLOYS								
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35	150	225	.0010" - .0020"	.0020" - .0030"	.0025" - .0035"	.0030" - .0040"	.0035" - .0055"
	> 35	125	180	.0005" - .0015"	.0015" - .0025"	.0020" - .0030"	.0025" - .0035"	.0030" - .0045"
IRON BASE ALLOYS								
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35	200	300	.0015" - .0025"	.0025" - .0030"	.0025" - .0035"	.0035" - .0045"	.0035" - .0055"
	> 35	150	240	.0005" - .0015"	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0030" - .0045"
MONEL								
Monel - 65% Nickel		150	225	.0010" - .0020"	.0015" - .0025"	.0020" - .0030"	.0025" - .0035"	.0035" - .0055"
TITANIUM ALLOYS								
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		225	350	.0010" - .0020"	.0020" - .0030"	.0025" - .0035"	.0030" - .0040"	.0035" - .0055"
STAINLESS STEELS								
(Precipitation) 13/8, 15/5, 17-4, pH Types	< 35	225	300	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"	.0040" - .0055"
	> 35	175	240	.0005" - .0015"	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"
(Austenitic) Inox, 200 Series, 300 Series	< 35	225	300	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"	.0040" - .0055"
	> 35	175	225	.0010" - .0015"	.0015" - .0020"	.0020" - .0025"	.0025" - .0035"	.0035" - .0045"
(Austenitic) 304L, 316L, Nitronic 50, Inox	< 35	125	175	.0010" - .0015"	.0015" - .0020"	.0020" - .0030"	.0030" - .0040"	.0025" - .0040"
	> 35	80	100	.0003" - .0010"	.0010" - .0015"	.0015" - .0025"	.0025" - .0035"	.0020" - .0040"
(Martensitic) 400 Series	< 35	225	300	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"	.0040" - .0055"
	> 35	175	240	.0005" - .0015"	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"
HIGH STRENGTH TOOL STEELS								
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 35	200	300	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"	.0045" - .0055"
	> 35	175	240	.0005" - .0015"	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"
MEDIUM ALLOY TOOL STEELS								
200, 250, 300, 8620	< 35	200	300	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"	.0045" - .0065"
	> 35	175	240	.0005" - .0015"	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"
CARBON STEELS								
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35	200	300	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"	.0045" - .0065"
	> 35	175	240	.0005" - .0015"	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"
CAST MATERIAL								
Steel		200	300	.0025" - .0035"	.0035" - .0045"	.0035" - .0045"	.0045" - .0055"	.0065" - .0075"
Ductile Iron		250	350	.0025" - .0035"	.0035" - .0045"	.0035" - .0045"	.0045" - .0055"	.0065" - .0075"
Gray Iron		250	400	.0025" - .0035"	.0035" - .0045"	.0035" - .0045"	.0045" - .0055"	.0065" - .0075"
ALUMINUM								
2014, 2024, 6061-(T1-T6), 7075		300 - 400	300 - 500	.0035" - .0045"	.0045" - .0055"	.0065" - .0075"	.0085" - .0095"	.0085" - .0095"
Die Cast, Extruded		250 - 300	300 - 400	.0025" - .0035"	.0035" - .0045"	.0055" - .0065"	.0075" - .0085"	.0075" - .0085"
MAGNESIUM								
		300	400	.0035" - .0045"	.0045" - .0055"	.0065" - .0075"	.0085" - .0095"	.0085" - .0095"
COPPER								
Copper Alloys		300	400	.0025" - .0035"	.0035" - .0045"	.0035" - .0045"	.0045" - .0055"	.0065" - .0075"
BRASS								
Short Chips		300	400	.0035" - .0045"	.0045" - .0055"	.0065" - .0075"	.0085" - .0095"	.0085" - .0095"
Long Chips		200	300	.0025" - .0035"	.0035" - .0045"	.0055" - .0065"	.0075" - .0085"	.0075" - .0085"
BRONZE								
Short Chips		200	300	.0025" - .0035"	.0035" - .0045"	.0035" - .0045"	.0055" - .0065"	.0075" - .0085"
Long Chips		150	250	.0015" - .0025"	.0025" - .0035"	.0025" - .0035"	.0045" - .0055"	.0065" - .0075"

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL High Performance Drilling Guide

Metric

Type	Rc Hardness	Recommended M/Min.		CHIPLOAD PER FLUTE (Fz)				
		NON-COOLANT	COOLANT FED	3.0 - 6.0	6.0 - 10.0	10.0 - 13.0	13.0 - 16.0	16.0 - 20.0
		1580H 1280H 1580HD	1580KH 1280KH 1880KH 1580KD 1280KD					
COBALT BASE ALLOYS								
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 35	60	70	.035 - .060	.060 - .085	.075 - .100	.085 - .110	.095 - .130
	> 35	40	55	.025 - .050	.050 - .075	.060 - .085	.075 - .100	.095 - .110
NICKEL BASE ALLOYS								
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35	60	70	.035 - .060	.060 - .085	.075 - .100	.085 - .125	.085 - .110
	> 35	40	55	.025 - .050	.050 - .075	.060 - .085	.075 - .100	.085 - .100
IRON BASE ALLOYS								
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35	60	90	.050 - .075	.075 - .085	.085 - .100	.100 - .125	.110 - .140
	> 35	45	70	.025 - .050	.050 - .075	.075 - .085	.085 - .100	.095 - .110
MONEL								
Monel - 65% Nickel		45	70	.035 - .060	.050 - .075	.060 - .085	.075 - .100	.085 - .120
TITANIUM ALLOYS								
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		70	100	.035 - .060	.060 - .085	.075 - .100	.085 - .110	.095 - .130
STAINLESS STEELS								
(Precipitation) 13/8, 15/5, 17-4, pH Types	< 35	70	90	.050 - .075	.075 - .085	.085 - .100	.100 - .125	.100 - .140
	> 35	50	70	.025 - .050	.050 - .075	.075 - .085	.085 - .100	.085 - .110
(Austenitic) Inox, 200 Series, 300 Series	< 35	70	90	.050 - .075	.075 - .085	.085 - .100	.100 - .125	.100 - .140
	> 35	50	70	.035 - .050	.050 - .060	.060 - .075	.075 - .100	.075 - .110
(Austenitic) 304L, 316L, Nitronic 50, Inox	< 35	40	55	.035 - .050	.050 - .060	.060 - .085	.085 - .110	.075 - .110
	> 35	20	30	.025 - .035	.035 - .050	.050 - .075	.075 - .100	.075 - .110
(Martensitic) 400 Series	< 35	70	90	.050 - .075	.075 - .085	.085 - .100	.100 - .125	.100 - .130
	> 35	50	70	.025 - .050	.050 - .075	.075 - .085	.085 - .100	.085 - .110
HIGH STRENGTH TOOL STEELS								
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 35	60	90	.050 - .075	.075 - .085	.085 - .100	.100 - .125	.100 - .130
	> 35	50	70	.025 - .050	.050 - .075	.075 - .085	.085 - .100	.085 - .100
MEDIUM ALLOY TOOL STEELS								
200, 250, 300, 8620	< 35	60	90	.050 - .075	.075 - .085	.085 - .100	.100 - .125	.100 - .140
	> 35	50	70	.025 - .050	.050 - .075	.075 - .085	.085 - .100	.085 - .110
CARBON STEELS								
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35	60	90	.050 - .075	.075 - .085	.085 - .100	.100 - .125	.100 - .140
	> 35	50	70	.025 - .050	.050 - .075	.075 - .085	.085 - .100	.085 - .120
CAST MATERIAL								
Steel		60	90	.060 - .090	.100 - .125	.100 - .125	.125 - .150	.175 - .200
Ductile Iron		75	100	.060 - .090	.100 - .125	.100 - .125	.125 - .150	.175 - .200
Gray Iron		75	120	.060 - .090	.100 - .125	.100 - .125	.125 - .150	.175 - .200
ALUMINUM								
2014, 2024, 6061-(T1-T6), 7075		90 - 120	90 - 150	.090 - .120	.125 - .150	.175 - .200	.225 - .250	.225 - .250
Die Cast, Extruded		75 - 90	90 - 120	.060 - .100	.100 - .120	.150 - .175	.200 - .225	.200 - .225
MAGNESIUM								
		90	120	.080 - .120	.125 - .150	.175 - .200	.225 - .250	.225 - .250
COPPER								
Copper Alloys		90	120	.060 - .100	.100 - .125	.100 - .125	.125 - .150	.175 - .200
BRASS								
Short Chips		90	120	.080 - .120	.125 - .150	.175 - .200	.225 - .250	.225 - .250
Long Chips		60	90	.060 - .090	.100 - .125	.150 - .175	.200 - .225	.200 - .225
BRONZE								
Short Chips		60	90	.060 - .100	.100 - .125	.100 - .125	.150 - .175	.200 - .225
Long Chips		45	70	.040 - .060	.060 - .085	.075 - .100	.125 - .150	.175 - .200

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL Aluminum Series 3-Flute Drill Application Guide

Fractional

CHIPLOAD PER FLUTE (Fz)								
Material	Type	SFM	3/16"	1/4"	5/16"	3/8"	1/2"	5/8"
Aluminum Alloy	6061	450 - 650	.0020" - .0040"	.0025" - .0050"	.0035" - .0060"	.0045" - .0070"	.0055" - .0080"	.0065" - .0100"
Cast Aluminum	380	300 - 500	.0015" - .0030"	.0020" - .0040"	.0030" - .0050"	.0030" - .0060"	.0035" - .0070"	.0040" - .0080"
Magnesium		250 - 500	.0015" - .0030"	.0020" - .0040"	.0030" - .0050"	.0030" - .0060"	.0035" - .0070"	.0040" - .0080"
Copper & Brass		250 - 400	.0010" - .0025"	.0020" - .0030"	.0020" - .0030"	.0020" - .0040"	.0030" - .0050"	.0030" - .0060"
Titanium	6Al-4V	100 - 300	.0010" - .0020"	.0020" - .0030"	.0020" - .0030"	.0020" - .0040"	.0030" - .0050"	.0030" - .0060"

Metric

CHIPLOAD PER FLUTE (Fz)								
Material	Type	M/Min.	4.0	6.0	8.0	10.0	12.0	16.0
Aluminum Alloy	6061	180 - 240	.050 - .100	.065 - .125	.090 - .150	.115 - .175	.150 - .200	.165 - .250
Cast Aluminum	380	135 - 180	.050 - .100	.100 - .125	.100 - .150	.125 - .175	.150 - .200	.100 - .200
Magnesium		120 - 180	.038 - .075	.050 - .100	.075 - .125	.075 - .150	.090 - .175	.100 - .200
Copper & Brass		120 - 180	.025 - .060	.050 - .075	.050 - .075	.050 - .100	.075 - .125	.075 - .150
Titanium	6Al-4V	30 - 90	.025 - .050	.050 - .075	.050 - .075	.050 - .100	.075 - .125	.075 - .150

PHYSICAL PROPERTIES AND CHARACTERISTICS OF ALUMASTAR COATING

Property/Characteristic	Description
Nomenclature	TiB ₂
Color	Silver
Hardness	4000 Hv
Coating Thickness	1-2 µm
Thermal Stability	850° C (1562° F)
Deposition Temperature	450° C (842° F)
Applications	Aluminum, AlSi Alloys (<12% Si), Magnesium, Copper, Titanium Alloys, Non-ferrous

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

Decimal Equivalent Chart

Diameter	Decimal Equiv.
#80	.0135
.35mm	.0138
#79	.0145
1/64"	.0156
.40mm	.0158
#78	.0160
.45mm	.0177
#77	.0180
.50mm	.0197
#76	.0200
#75	.0210
.55mm	.0217
#74	.0225
.60mm	.0236
#73	.0240
#72	.0250
.65mm	.0256
#71	.0260
.70mm	.0276
#70	.0280
#69	.0292
.75mm	.0295
#68	.0310
1/32"	.0312
.80mm	.0315
#67	.0320
#66	.0330
.85mm	.0335
#65	.0350
.90mm	.0354
#64	.0360
#63	.0370
.95mm	.0374
#62	.0380
#61	.0390
1.00mm	.0394
#60	.0400
#59	.0410
1.05mm	.0413
#58	.0420
#57	.0430
1.10mm	.0433
1.15mm	.0453
#56	.0465
3/64"	.0469
1.20mm	.0472
1.25mm	.0492
1.30mm	.0512
#55	.0520
1.35mm	.0531
#54	.0550
1.40mm	.0551
1.45mm	.0571
1.50mm	.0591
#53	.0595
1.55mm	.0610
1/16"	.0625
1.60mm	.0630
#52	.0635
1.65mm	.0650
1.70mm	.0669
#51	.0670
1.75mm	.0689
#50	.0700
1.80mm	.0709
1.85mm	.0728

Diameter	Decimal Equiv.
#49	.0730
1.90mm	.0748
#48	.0760
1.95mm	.0768
5/64"	.0781
#47	.0785
2.00mm	.0787
2.05mm	.0807
#46	.0810
#45	.0820
2.10mm	.0827
2.15mm	.0846
#44	.0860
2.20mm	.0866
2.25mm	.0886
#43	.0890
2.30mm	.0906
2.35mm	.0925
#42	.0935
3/32"	.0938
2.40mm	.0945
#41	.0960
2.45mm	.0965
#40	.0980
2.50mm	.0984
#39	.0995
#38	.1015
2.60mm	.1024
#37	.1040
2.70mm	.1063
#36	.1065
2.75mm	.1083
7/64"	.1094
#35	.1100
2.80mm	.1102
#34	.1110
#33	.1130
2.90mm	.1142
#32	.1160
3.00mm	.1181
#31	.1200
3.10mm	.1220
1/8"	.1250
3.20mm	.1260
3.25mm	.1280
#30	.1285
3.30mm	.1299
3.40mm	.1339
#29	.1360
3.50mm	.1378
#28	.1405
9/64"	.1406
3.60mm	.1417
#27	.1440
3.70mm	.1457
#26	.1470
3.75mm	.1476
#25	.1495
3.80mm	.1496
#24	.1520
3.90mm	.1535
#23	.1540
5/32"	.1562
#22	.1570
4.00mm	.1575
#21	.1590
#20	.1610

Diameter	Decimal Equiv.
4.10mm	.1614
4.20mm	.1654
#19	.1660
4.25mm	.1673
4.30mm	.1693
#18	.1695
11/64"	.1719
#17	.1730
4.40mm	.1732
#16	.1770
4.50mm	.1772
#15	.1800
4.60mm	.1811
#14	.1820
#13	.1850
4.70mm	.1850
4.75mm	.1870
3/16"	.1875
4.80mm	.1890
#12	.1890
#11	.1910
4.90mm	.1929
#10	.1935
#9	.1960
5.00mm	.1969
#8	.1990
5.10mm	.2008
#7	.2010
13/64"	.2031
#6	.2040
5.20mm	.2047
#5	.2055
5.25mm	.2067
5.30mm	.2087
#4	.2090
5.40mm	.2126
#3	.2130
5.50mm	.2165
7/32"	.2188
5.60mm	.2205
#2	.2210
5.70mm	.2244
5.75mm	.2264
#1	.2280
5.80mm	.2283
5.90mm	.2323
A	.2340
15/64"	.2344
6.00mm	.2362
B	.2380
6.10mm	.2402
C	.2420
6.20mm	.2441
D	.2460
6.25mm	.2461
6.30mm	.2480
1/4"	.2500
E	.2500
6.40mm	.2520
6.50mm	.2559
F	.2570
6.60mm	.2598
G	.2610
6.70mm	.2638
17/64"	.2656
6.75mm	.2657
H	.2660

Diameter	Decimal Equiv.
6.80mm	.2677
6.90mm	.2717
I	.2720
7.00mm	.2756
J	.2770
7.10mm	.2795
K	.2810
9/32"	.2812
7.20mm	.2835
7.25mm	.2854
7.30mm	.2874
L	.2900
7.40mm	.2913
M	.2950
7.50mm	.2953
19/64"	.2969
7.60mm	.2992
N	.3020
7.70mm	.3031
7.75mm	.3051
7.80mm	.3071
7.90mm	.3110
5/16"	.3125
8.00mm	.3150
O	.3160
8.10mm	.3189
8.20mm	.3228
P	.3230
8.25mm	.3248
8.30mm	.3268
21/64"	.3281
8.40mm	.3307
Q	.3320
8.50mm	.3346
8.60mm	.3386
R	.3390
8.70mm	.3425
11/32"	.3438
8.75mm	.3445
8.80mm	.3465
S	.3480
8.90mm	.3504
9.00mm	.3543
T	.3580
9.10mm	.3583
23/64"	.3594
9.20mm	.3622
9.25mm	.3642
9.30mm	.3661
U	.3680
9.40mm	.3701
9.50mm	.3740
3/8"	.3750
V	.3770
9.60mm	.3780
9.70mm	.3819
9.75mm	.3839
9.80mm	.3858
W	.3860
9.90mm	.3898
25/64"	.3906
10.00mm	.3937
X	.3970
Y	.4040
13/32"	.4062
Z	.4130
10.50mm	.4134

Diameter	Decimal Equiv.
27/64"	.4219
11.00mm	.4331
7/16"	.4375
11.50mm	.4528
29/64"	.4531
15/32"	.4688
12.00mm	.4724
31/64"	.4844
12.50mm	.4921
1/2"	.5000
13.00mm	.5118
33/64"	.5156
17/32"	.5312
13.50mm	.5315
35/64"	.5469
14.00mm	.5512
9/16"	.5625
14.50mm	.5709
37/64"	.5781
15.00mm	.5906
19/32"	.5938
39/64"	.6094
15.50mm	.6102
5/8"	.6250
16.00mm	.6299
41/64"	.6406
16.50mm	.6496
21/32"	.6562
17.00mm	.6693
43/64"	.6719
11/16"	.6875
17.50mm	.6890
45/64"	.7031
18.00mm	.7087
23/32"	.7188
18.50mm	.7283
47/64"	.7344
19.00mm	.7480
3/4"	.7500
49/64"	.7656
19.50mm	.7677
25/32"	.7812
20.00mm	.7874
51/64"	.7969
20.50mm	.8071
13/16"	.8125
21.00mm	.8268
53/64"	.8281
27/32"	.8438
21.50mm	.8465
55/64"	.8594
22.00mm	.8661
7/8"	.8750
22.50mm	.8858
57/64"	.8906
23.00mm	.9055
29/32"	.9062
59/64"	.9219
23.50mm	.9252
15/16"	.9375
24.00mm	.9449
61/64"	.9531
24.50mm	.9646
31/32"	.9688
25.00mm	.9843
63/64"	.9844
1"	1.0000

Standards

Every Garr carbide cutting tool is manufactured from premium submicron grain carbide unless otherwise noted.

Each of our styles of end mills are center cutting.

Altered Standards - 48 Hour Delivery

Many special tooling needs can be satisfied by adding a flat, a corner radius, or by making a minor diameter change to one of our standard tools. Garr Tool Company will ship altered standards within 48 hours. Contact us for pricing.

Garr Tool cannot be responsible for tools altered by other parties.

Solid Carbide Specials - 2 Week Delivery

Blueprint and non-blueprint specials will be quoted within 24 hours. Uncoated tooling made from stock material will be manufactured to your specifications within two weeks.

Solid carbide cutting tools which are 1" or less in diameter and up to 12" in length can be produced from premium submicron grain carbide in the time it takes most manufacturers to quote and order material.

Garr Tool Company can take care of your special round tooling needs. We deliver!

Reconditioning Service

With our state-of-the-art reconditioning department, you can expect quality reground tools at competitive prices. Let us be your 'local' source for regrinding.

Check Us Out

Our web site, www.garrtool.com, enhances the level of customer service you have come to expect from us. Increase the speed and accuracy of special pricing requests by e-mailing prints for quote to sales@garrtool.com.

A collection of 'fill-in-the-blank' prints is available for download from our website to aid in quoting of specials.

GARR TOOL®

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We are not responsible for errors in printing should they occur.

Printed in the United States.

Solid micrograin carbide tested for milling of carbon fiber and glass-filled composites

There are many challenges to machining composite materials. Keeping the material from delaminating is key. Our tools have higher rake angles and combinations of left hand and/or right hand spirals to help eliminate 'fraying' of the laminate.

Please specify what type of end cut your job requires (i.e. - no end cut, burr type, end mill type, or drill point)

Having a quality dust collection system helps prolong tool life and quality of parts

'Clamping' of part to table can cause stress fractures in material

Please specify what coating, if any, your job requires:

- Polycrystalline Diamond (increases tool life up to 20x of an uncoated carbide mill)
- Amorphous Diamond / DLC (increases tool life up to 10x of an uncoated carbide mill)
- Alcrona Coated (increases tool life up to 5x of an uncoated carbide mill)
- TiCN Coated (increases tool life up to 3x of an uncoated carbide mill)

These are non-stock specials - uncoated tools built to order in two weeks



SERIES 700 - FIBERGLASS ROUTER
For cutting glass-filled epoxies

End cut examples



SERIES 701 - KEVLAR ROUTER
Gives a clean edge when trimming Aramid Fibers (Kevlar)

End cut examples



SERIES 702 - CARBON FIBER ROUTER
For trim milling of single-layer panels



SERIES 703 - CARBON FIBER ROUTER
For rough cutting of stacked panels with or without honeycomb cores

Solid micrograin carbide tested for drilling of carbon fiber and glass-filled composites

Having a quality dust collection system helps prolong tool life and quality of parts

'Clamping' of part to table can cause stress fractures in material

These are non-stock specials - uncoated tools built to order in two weeks



SERIES 740 - DAGGER

For enlarging existing holes in skin panels, but can drill from solid
For near reamer finishes in carbon and glass fiber materials
Coatings of choice for this series are polycrystalline diamond and amorphous diamond

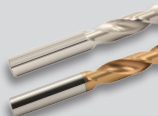
SERIES 780 - 8-FACET POINT (NON-COOLANT FED)

Double angle drill point geometry reduces cutting forces to eliminate exit burrs
Works well in carbon fiber especially when the honeycomb core is either titanium or aluminum
Works in glass-filled epoxy, harder plastics, softer steels, CFRP (Carbon Fiber Reinforced Plastic), and aluminum
Can be coated with a variety of coatings depending on your application



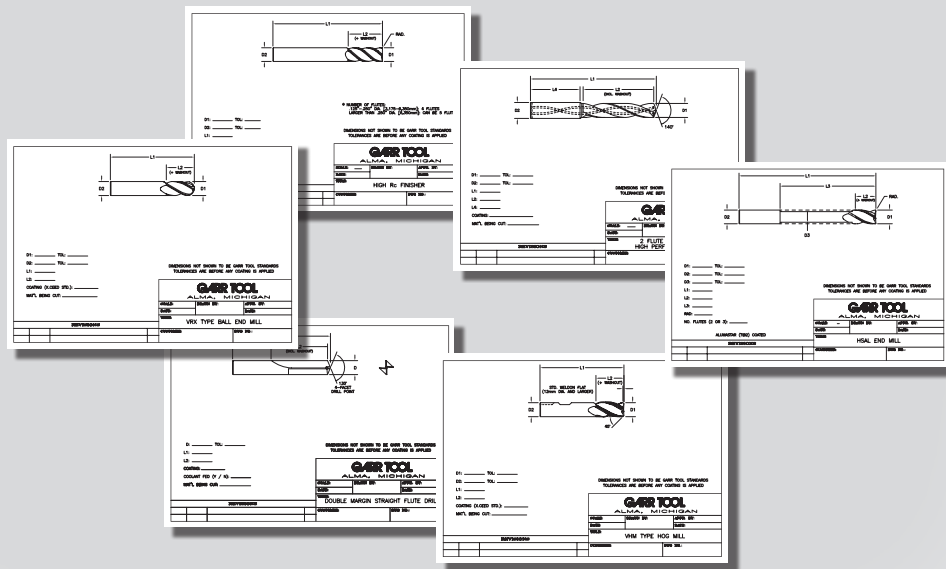
SERIES 780K - 8-FACET POINT (COOLANT FED)

Double angle drill point geometry reduces cutting forces to eliminate exit burrs
Works in glass-filled epoxy, harder plastics, softer steels, CFRP, and aluminum when running through-the-spindle coolant
Coolant fed tooling is not for use in carbon fiber as it may delaminate the material
Coatings of choice for this drill are either Helica or Alumastar



SERIES 790 - MODIFIED BRAD POINT

Designed for drilling CFRP
Excellent entry and exit hole quality
Designed to prevent delamination
Good for drilling panels and paper honeycomb core
Coatings of choice for this drill are polycrystalline diamond, amorphous diamond, or helica for extra tool life



Access an assortment of 'fill-in-the-blank' prints from our website to aid in the quoting of specials.

www.garrtool.com

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