

GARR TOOL[®]

High Performance Solid Carbide



2022

GARR TOOL sets the standard when it comes to high performance tooling. From its beginning in a garage in 1944, GARR TOOL grew quickly due to its quality products and friendly, reliable service. For over seventy-seven years in the cutting tool industry, Garr Tool Company has maintained its commitment to manufacturing the highest quality carbide cutting tools, offering competitive prices and providing unequaled customer service.

Located in Alma, Michigan USA, our current facility of over 200,000 square feet contains clean, efficient production space. An ISO 9001:2015-certified company, GARR TOOL produces thousands of tools per day on our state-of-the-art CNC grinding equipment, run by experienced, conscientious operators. Our select distributors can be found in 35 countries, and end-users worldwide trust and take pride in products that come from GARR TOOL. Our quality tools ensure that individuals in industries such as aerospace, oil and gas, automotive, medical, mold-making, and mining can work efficiently, quickly, and as safely as possible. Garr Tool Company will continue to invest in new technology to meet the future needs of our customers. Adding to our efficiency and service, Oerlikon Balzers Coating USA manages our in-house coating facility.

With a continued focus on maintaining fast, reliable service, we operate an inventory and shipping center in England to better service our customers in the UK and throughout Europe. Quality carbide tooling backed by our ingenuity, integrity, sincerity, work ethic, and personal values is paramount at Garr Tool Company. It's why you can trust GARR TOOL each and every time. We are well-known for having a large inventory in stock, allowing standard catalog items to be shipped within 24 hours at a 99+% fill rate. GARR TOOL continues to introduce new series of standard tools to meet the demands of material specific machining. We also take pride in shipping custom tools within two weeks. To see our selection of tooling, or to learn more about GARR TOOL, we encourage you to visit our website, www.garrtool.com.

All of us at Garr Tool Company, as well as our trusted worldwide network of distributors, look forward to helping you with your solid carbide round tooling needs.





A3 Series

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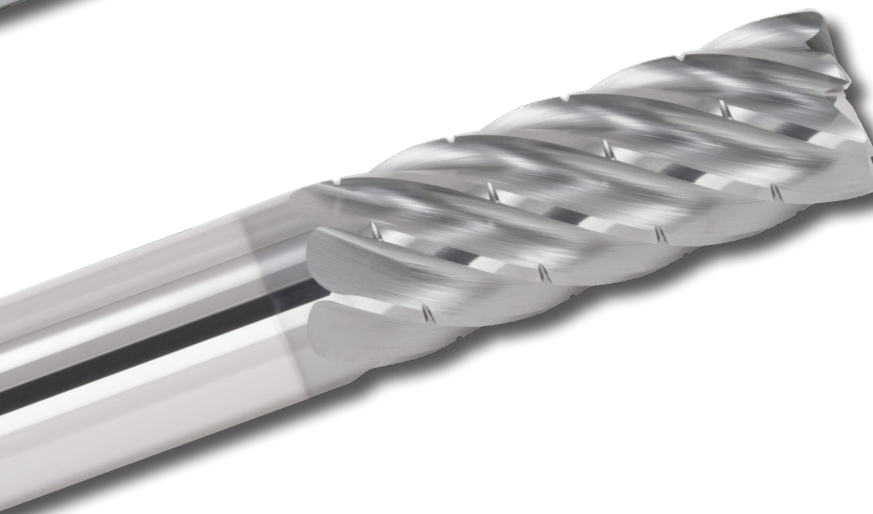
Built for High Efficiency Milling on high RPM machines



V4 Series

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Expanded line of our popular V4 Series



VX-7C Series

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An expansion of the multi-flute HEM VX-7 Series, chip splitters come standard

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DRILLS - HIGH PERFORMANCE

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1250H	2 Flute	5xD	30° Helix	AlTiN-Based Coated	23
1280H	2 Flute	5xD	30° Helix	AlTiN-Based Coated	32
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1280KH	2 Flute	5xD	30° Helix	Coolant Fed, AlTiN-Based Coated	47
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1205H	2 Flute	5xD	25° Helix	Hardlube Coated	73
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ROUGHERS				PAGE
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253M/853M	3 Flute	Square	Bright Finish	180
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263M	3 Flute	Square	Bright Finish	183
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DRILLS

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1520H, 1205H		73	HARDLUBE	2 flute, General purpose
1800H		90	HARDLUBE	2 flute, Parabolic

END MILLS

	SERIES	PAGE	COATING	DESCRIPTION
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142B		124	ALUMASTAR	High velocity, 2 flute, High metal removal rate
142M, 142R		121, 122	ALUMASTAR	High velocity, 2 flute, High metal removal rate
242M, 842M		177	BRIGHT	High performance, 2 flute, For 3000-8000 RPM
ARC		112	BRIGHT	High performance, 3 flute, Staggered helix rougher
253M, 853M		180	BRIGHT	High performance, 3 flute, Profiling and finishing
253MC		182	TiCN	High performance, 3 flute, Profiling and finishing
220M, 820M		216	BRIGHT	2 flute, General purpose, Square end
220MC		219	TiCN	2 flute, General purpose, Square end
320M, 920M		228	BRIGHT	2 flute, General purpose, Ball end
320MC		231	TiCN	2 flute, General purpose, Ball end

DRILLS

SERIES	PAGE	COATING	DESCRIPTION
1510H	64	HARDLUBE	2 flute, General purpose, Slow spiral
1550H, 1250H, 1850H	23	AlTiN-Based	2 flute, High performance, Small diameter, 1/8" or 3mm shank
1580HD	29	AlTiN-Based	2 flute, High performance, Common shank
1580H, 1280H	32	AlTiN-Based	2 flute, High performance
1580KD, 1280KD, 1880KD	37	AlTiN-Based	2 flute, High performance, Coolant fed, Common shank
1580KH, 1280KH, 1880KH	47	AlTiN-Based	2 flute, High performance, Coolant fed
1520H, 1205H	73	HARDLUBE	2 flute, General purpose
1160, 1180	17	ALUMASTAR	3 flute, High performance

END MILLS

SERIES	PAGE	COATING	DESCRIPTION
V4	139	AlCrN	High performance, 4 flute, Variable helix
V5	152	AlCrN	High performance, 5 flute, Variable helix
VX-7	160	AlCrN-Based	High performance, 7 flute, Staggered flute
VRX	164	AlTiN	High performance, 4 flute, Staggered flute
VRX-6	174	AlTiN	High performance, 6 flute, Staggered flute
TMS, TMR	132, 134	AlCrN	High performance, Multiple flute finisher
VHM	114	AlTiN	High performance, 4 flute, Staggered flute rougher
255MA, 855MA	184	AlTiN	High performance, 5 flute, Square end
255RA, 855RA	189	AlTiN	High performance, 5 flute, Corner radius
242M, 842M	177	BRIGHT	High performance, 2 flute, For 3000-8000 RPM
246MA, 846MA	191	AlTiN	High performance, 6 flute, Finisher
253MA, 853MA	178	AlTiN	High performance, 3 flute, Profiling and finishing
223MA, 823MA	220	TiAlN	3 flute, General purpose, Square end
230MA, 830MA	220	TiAlN	4 flute, General purpose, Square end
230RA, 830RA	225	TiAlN	4 flute, General purpose, Corner radius
323MA, 923MA	232	TiAlN	3 flute, General purpose, Ball end
330MA, 930MA	232	TiAlN	4 flute, General purpose, Ball end

DRILLS

SERIES	PAGE	COATING	DESCRIPTION
1510H	64	HARDLUBE	2 flute, General purpose, Slow spiral
1550H, 1250H, 1850H	23	AlTiN-Based	2 flute, High performance, Small diameter, 1/8" or 3mm shank
1580HD	29	AlTiN-Based	2 flute, High performance, Common shank
1580H, 1280H	32	AlTiN-Based	2 flute, High performance
1580KD, 1280KD, 1880KD	37	AlTiN-Based	2 flute, High performance, Coolant fed, Common shank
1580KH, 1280KH, 1880KH	47	AlTiN-Based	2 flute, High performance, Coolant fed
1520H, 1205H	73	HARDLUBE	2 flute, General purpose

END MILLS

SERIES	PAGE	COATING	DESCRIPTION
V4	139	AlCrN	High performance, 4 flute, Variable helix
V5	152	AlCrN	High performance, 5 flute, Variable helix
VX-7	160	AlCrN-Based	High performance, 7 flute, Staggered flute
VRX	164	AlTiN	High performance, 4 flute, Staggered flute
VRX-6	174	AlTiN	High performance, 6 flute, Staggered flute
253MA, 853MA	178	AlTiN	High performance, 3 flute, Profiling and finishing
255MA, 855MA	184	AlTiN	High performance, 5 flute, Square end
255RA, 855RA	189	AlTiN	High performance, 5 flute, Corner radius
VHM	114	AlTiN	High performance, 4 flute, Staggered flute rougher
ARC	112	BRIGHT	High performance, 3 flute, Staggered helix rougher
TMS, TMR	132, 134	AlCrN	High performance, Multiple flute finisher
253MC	182	TiCN	High performance, 3 flute, Profiling and finishing
246MA, 846MA	191	AlTiN	High performance, 6 flute, Finisher, Square end
223MA, 823MA	220	TiAlN	3 flute, General purpose, Square end
230MA, 830MA	220	TiAlN	4 flute, General purpose, Square end
230RA, 830RA	225	TiAlN	4 flute, General purpose, Corner radius
323MA, 923MA	232	TiAlN	3 flute, General purpose, Ball end
330MA, 930MA	232	TiAlN	4 flute, General purpose, Ball end

INCONEL, HIGH NICKEL ALLOYS

DRILLS

SERIES	PAGE	COATING	DESCRIPTION
1510H	64	HARDLUBE	2 flute, General purpose, Slow spiral
1550H, 1250H, 1850H	23	AlTiN-Based	2 flute, High performance, Small diameter, 1/8" or 3mm shank
1580HD	29	AlTiN-Based	2 flute, High performance, Common shank
1580H, 1280H	32	AlTiN-Based	2 flute, High performance
1580KD, 1280KD, 1880KD	37	AlTiN-Based	2 flute, High performance, Coolant fed, Common shank
1580KH, 1280KH, 1880KH	47	AlTiN-Based	2 flute, High performance, Coolant fed
1520H, 1205H	73	HARDLUBE	2 flute, General purpose

END MILLS







SERIES	PAGE	COATING	DESCRIPTION
V5	152	AlCrN	High performance, 5 flute, Variable helix
V4	139	AlCrN	High performance, 4 flute, Variable helix
VRX	164	AlTiN	High performance, 4 flute, Staggered flute
VRX-6	174	AlTiN	High performance, 6 flute, Staggered flute
VX-7	160	AlCrN-Based	High performance, 7 flute, Staggered flute
VHM	114	AlTiN	High performance, 4 flute, Staggered flute rougher
255MA, 855MA	184	AlTiN	High performance, 5 flute, Square end
255RA, 855RA	189	AlTiN	High performance, 5 flute, Corner radius
246MA, 846MA	191	AlTiN	High performance, 6 flute, Finisher, Square end
TMS, TMR	132, 134	AlCrN	High performance, Multiple flute finisher
230MA, 830MA	220	TiAlN	4 flute, General purpose, Square end
230RA, 830RA	225	TiAlN	4 flute, General purpose, Corner radius
330MA, 930MA	232	TiAlN	4 flute, General purpose, Ball end

Recommended tools for:




BRASS, BRONZE, COPPER, MAGNESIUM

RECOMMENDED
TOOLS

DRILLS

	SERIES	PAGE	COATING	DESCRIPTION
1160, 1180		17	ALUMASTAR	3 flute, High performance
1510H		64	HARDLUBE	2 flute, General purpose, Slow spiral
1520, 1205		67	BRIGHT	2 flute, General purpose
1520H, 1205H		73	HARDLUBE	2 flute, General purpose
1500H		59	HARDLUBE	2 flute, Straight flute
1800H		90	HARDLUBE	2 flute, Parabolic

END MILLS

	SERIES	PAGE	COATING	DESCRIPTION
143M, 143R		125, 128	ALUMASTAR	High velocity, 3 flute, High metal removal rate
142B		124	ALUMASTAR	High velocity, 2 flute, High metal removal rate
142M, 142R		121, 122	ALUMASTAR	High velocity, 2 flute, High metal removal rate
ARC		112	BRIGHT	High performance, 3 flute, Staggered helix rougher
242M, 842M		177	BRIGHT	High performance, 2 flute, For 3000-8000 RPM
253M, 853M		180	BRIGHT	High performance, 3 flute, Profiling and finishing
253MC		182	TiCN	High performance, 3 flute, Profiling and finishing
220M, 820M		216	BRIGHT	2 flute, General purpose, Square end
220MC		219	TiCN	2 flute, General purpose, Square end
320M, 920M		228	BRIGHT	2 flute, General purpose, Ball end
320MC		231	TiCN	2 flute, General purpose, Ball end









Recommended tools for:

HARDENED TOOL STEELS










(generally over 45 Rc)

RECOMMENDED
TOOLS

DRILLS

	SERIES	PAGE	COATING	DESCRIPTION
1500H		59	HARDLUBE	2 flute, Straight flute
1510H		64	HARDLUBE	2 flute, General purpose, Slow spiral
1550H, 1250H, 1850H		23	AlTiN-Based	2 flute, High performance, Small diameter, 1/8" or 3mm shank
1580HD		29	AlTiN-Based	2 flute, High performance, Common shank
1580H, 1280H		32	AlTiN-Based	2 flute, High performance
1580KD, 1280KD, 1880KD		37	AlTiN-Based	2 flute, High performance, Coolant fed, Common shank
1580KH, 1280KH, 1880KH		47	AlTiN-Based	2 flute, High performance, Coolant fed
1520H, 1205H		73	HARDLUBE	2 flute, General purpose

END MILLS

	SERIES	PAGE	COATING	DESCRIPTION
H-45		195	AlTiN	High performance, High feed, Corner radius
350MX, 950MX		196	AlTiN	High performance, High Rc finisher, Die mold
545MA		192	AlTiN	High performance, High Rc finisher, Square end
545RA		193	AlTiN	High performance, High Rc finisher, Corner radius
545BA		194	AlTiN	High performance, High Rc finisher, Ball end
VRX		164	AlTiN	High performance, 4 flute, Staggered flute
VRX-6		174	AlTiN	High performance, 6 flute, Staggered flute
230MA, 830MA		220	TiAlN	4 flute, General purpose, Square end
230RA, 830RA		225	TiAlN	4 flute, General purpose, Corner radius
330MA, 930MA		232	TiAlN	4 flute, General purpose, Ball end



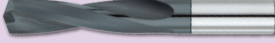



Recommended tools for:

COMPOSITE MATERIALS

(Graphite, Plastics, Carbon Fiber)

RECOMMENDED TOOLS

DRILLS

	SERIES	PAGE	COATING	DESCRIPTION
1160, 1180		17	ALUMASTAR	3 flute, High performance
154MA		109	TiAIN	4 flute, Center cutting angle
1510H		64	HARDLUBE	2 flute, General purpose, Slow spiral
1520H, 1205H		73	HARDLUBE	2 flute, General purpose
1800H		90	HARDLUBE	2 flute, Parabolic
1500H		59	HARDLUBE	2 flute, Straight flute

END MILLS

	SERIES	PAGE	COATING	DESCRIPTION
210D		197	DIAMOND	4 flute, Square end
310D		199	DIAMOND	4 flute, Ball end
210RD		198	DIAMOND	4 flute, Corner radius
143M, 143R		125, 128	ALUMASTAR	High velocity, 3 flute, High metal removal rate
142M, 142R		121, 122	ALUMASTAR	High velocity, 2 flute, High metal removal rate
142B		124	ALUMASTAR	High velocity, 2 flute, High metal removal rate
253M, 853M		180	BRIGHT	High performance, 3 flute, Profiling and finishing
253MC		182	TiCN	High performance, 3 flute, Profiling and finishing
255MC		188	TiCN	High performance, 5 flute, Profiling and finishing
220MC		219	TiCN	2 flute, General purpose, Square end
320MC		231	TiCN	2 flute, General purpose, Ball end
154M, 154MA		108, 109	BRIGHT/TiAIN	4 flute, Drill/Mill, Center cutting to a point
152M, 152MA		106, 107	BRIGHT/TiAIN	2 flute, Drill/Mill, Center cutting to a point



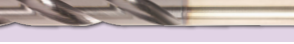
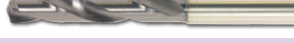
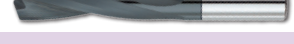

Recommended tools for:

CARBON STEELS, MEDIUM ALLOY STEELS




(generally under 45 Rc)

RECOMMENDED
TOOLS

DRILLS

SERIES	PAGE	COATING	DESCRIPTION
1580HD 	29	AlTiN-Based	2 flute, High performance, Common shank
1550H, 1250H, 1850H 	23	AlTiN-Based	2 flute, High performance, Small diameter, 1/8" or 3mm shank
1580H, 1280H 	32	AlTiN-Based	2 flute, High performance
1580KD, 1280KD, 1880KD 	37	AlTiN-Based	2 flute, High performance, Coolant fed, Common shank
1580KH, 1280KH, 1880KH 	47	AlTiN-Based	2 flute, High performance, Coolant fed
1510H 	64	HARDLUBE	2 flute, General purpose, Slow spiral
1520H, 1205H 	73	HARDLUBE	2 flute, General purpose

END MILLS

SERIES	PAGE	COATING	DESCRIPTION
V4 	139	AlCrN	High performance, 4 flute, Variable helix
V5 	152	AlCrN	High performance, 5 flute, Variable helix
VX-7 	160	AlCrN-Based	High performance, 7 flute, Staggered flute
VRX 	164	AlTiN	High performance, 4 flute, Staggered flute
VRX-6 	174	AlTiN	High performance, 6 flute, Staggered flute
VHM 	114	AlTiN	High performance, 4 flute, Staggered flute rougher
255MA, 855MA 	184	AlTiN	High performance, 5 flute, Square end
255RA, 855RA 	189	AlTiN	High performance, 5 flute, Corner radius
253MA, 853MA 	178	AlTiN	High performance, 3 flute, Profiling and finishing
230MA, 830MA 	220	TiAlN	4 flute, General purpose, Square end
230RA, 830RA 	225	TiAlN	4 flute, General purpose, Corner radius
330MA, 930MA 	232	TiAlN	4 flute, General purpose, Ball end

DRILLS

SERIES	PAGE	COATING	DESCRIPTION
1120H, 1100H	79	HARDLUBE	3 flute, General purpose
1520H, 1205H	73	HARDLUBE	2 flute, General purpose
1510H	64	HARDLUBE	2 flute, General purpose, Slow spiral
1580H, 1280H	32	AlTiN-Based	2 flute, High performance
1550H, 1250H, 1850H	23	AlTiN-Based	2 flute, High performance, Small diameter, 1/8" or 3mm shank
1580HD	29	AlTiN-Based	2 flute, High performance, Common shank
1580KH, 1280KH, 1880KH	47	AlTiN-Based	2 flute, High performance, Coolant fed
1580KD, 1280KD, 1880KD	37	AlTiN-Based	2 flute, High performance, Coolant fed, Common shank

END MILLS

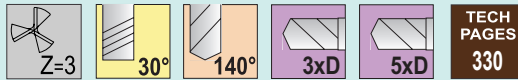
SERIES	PAGE	COATING	DESCRIPTION
VRX	164	AlTiN	High performance, 4 flute, Staggered flute
VRX-6	174	AlTiN	High performance, 6 flute, Staggered flute
V4	139	AlCrN	High performance, 4 flute, Variable helix
V5	152	AlCrN	High performance, 5 flute, Variable helix
VX-7	160	AlCrN-Based	High performance, 7 flute, Staggered flute
255MA, 855MA	184	AlTiN	High performance, 5 flute, Square end
255RA, 855RA	189	AlTiN	High performance, 5 flute, Corner radius
143M, 143R	125, 128	ALUMASTAR	High velocity, 3 flute, High metal removal rate
253MA, 853MA	178	AlTiN	High performance, 3 flute, Profiling and finishing
230MC	219	TiCN	4 flute, General purpose, Square end
230MA, 830MA	220	TiAlN	4 flute, General purpose, Square end
230RA, 830RA	225	TiAlN	4 flute, General purpose, Corner radius

TOLERANCES

<i>d</i>	+0.000" - .0005" (+0.000 - .0127mm)
<i>l₁</i>	+0.125" - .125" (+3.175 - 3.175mm)
<i>l₂</i>	+0.125" - .125" (+3.175 - 3.175mm)

NEW ITEMS

Series 1160, 1180



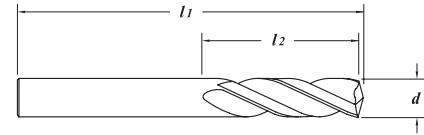
.1562" - .1910"
(3.967mm - 4.851mm)

HIGH PERFORMANCE DRILLS

Recommended for aluminum and other soft materials <40 Rc

Alumastar Coated

- High performance solid submicron grain carbide drill
- No spot drilling required
- Unique point geometry and coating for higher speeds and feeds
- High performance drill point
- Live tooling recommended on lathe processes



3xD (1160) EDP#	5xD (1180) 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							
70631		.1562	5/32"	3.967	2-1/16"	9/16"	42.99	41.12	39.25	37.38
	70161	.1562	5/32"	3.967	2-1/2"	1"	44.26	42.34	40.41	38.49
70633		.1570	#22	3.988	2-1/8"	5/8"	43.39	41.50	39.62	37.73
	70163	.1570	#22	3.988	2-1/2"	1"	44.59	42.65	40.71	38.77
70635		.1575		4.000	54	16	43.73	41.83	39.93	38.03
	70166	.1575		4.000	65	24	44.92	42.97	41.01	39.06
70637		.1590	#21	4.039	2-1/8"	5/8"	44.11	42.20	40.28	38.36
	70177	.1590	#21	4.039	2-1/2"	1"	45.23	43.26	41.30	39.33
70639		.1610	#20	4.089	2-1/8"	5/8"	44.49	42.56	40.62	38.69
	70179	.1610	#20	4.089	2-1/2"	1"	45.61	43.63	41.64	39.66
70641		.1660	#19	4.216	2-1/8"	5/8"	44.87	42.92	40.97	39.02
	70181	.1660	#19	4.216	2-3/4"	1-1/8"	45.93	43.93	41.94	39.94
70643		.1695	#18	4.305	2-1/8"	5/8"	45.22	43.25	41.29	39.32
	70183	.1695	#18	4.305	2-3/4"	1-1/8"	46.23	44.22	42.21	40.20
70645		.1719	11/64"	4.366	2-1/8"	5/8"	45.61	43.63	41.64	39.66
	70185	.1719	11/64"	4.366	2-3/4"	1-1/8"	46.56	44.54	42.51	40.49
70647		.1730	#17	4.394	2-3/16"	11/16"	45.98	43.98	41.98	39.98
	70187	.1730	#17	4.394	2-3/4"	1-1/8"	46.89	44.85	42.81	40.77
70649		.1770	#16	4.496	2-3/16"	11/16"	46.30	44.29	42.27	40.26
	70189	.1770	#16	4.496	2-3/4"	1-1/8"	47.24	45.19	43.13	41.08
70651		.1772		4.500	55	18	46.69	44.66	42.63	40.60
	70191	.1772		4.500	65	25	47.46	45.40	43.33	41.27
70653		.1800	#15	4.572	2-3/16"	11/16"	47.00	44.96	42.91	40.87
	70196	.1800	#15	4.572	2-3/4"	1-1/4"	47.86	45.78	43.70	41.62
70655		.1820	#14	4.623	2-3/16"	11/16"	47.44	45.38	43.31	41.25
	70201	.1820	#14	4.623	2-3/4"	1-1/4"	48.19	46.09	44.00	41.90
70657		.1850	#13	4.700	2-3/16"	11/16"	47.78	45.71	43.63	41.55
	70206	.1850	#13	4.700	2-3/4"	1-1/4"	48.54	46.43	44.32	42.21
70659		.1875	3/16"	4.763	2-3/16"	11/16"	48.16	46.07	43.97	41.88
	70211	.1875	3/16"	4.763	2-3/4"	1-1/4"	48.70	46.59	44.47	42.35
70661		.1890	#12	4.801	2-1/4"	3/4"	49.74	47.58	45.41	43.25
	70216	.1890	#12	4.801	2-3/4"	1-1/4"	50.51	48.31	46.12	43.92
70663		.1910	#11	4.851	2-1/4"	3/4"	50.20	48.02	45.83	43.65
	70221	.1910	#11	4.851	2-3/4"	1-1/4"	50.82	48.61	46.40	44.19

continued →

Series 1160, 1180 (continued)

.1935" - .2570"
(4.914mm - 6.528mm)

3xD (1160) EDP#	5xD (1180) EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
70665	70226	.1935	#10	4.914	2-1/4"	3/4"	50.50	48.30	46.11	43.91
		.1935	#10	4.914	2-3/4"	1-1/4"	51.14	48.92	46.69	44.47
70667	70229	.1960	#9	4.978	2-1/4"	3/4"	50.85	48.64	46.43	44.22
		.1960	#9	4.978	3"	1-5/16"	51.44	49.20	46.97	44.73
70669	70231	.1969		5.000	57	19	51.13	48.91	46.68	44.46
		.1969		5.000	75	32	51.77	49.52	47.27	45.02
70671	70236	.1990	#8	5.055	2-1/4"	3/4"	51.61	49.37	47.12	44.88
		.1990	#8	5.055	3"	1-5/16"	52.03	49.76	47.50	45.24
70673	70241	.2010	#7	5.105	2-1/4"	3/4"	51.76	49.51	47.26	45.01
		.2010	#7	5.105	3"	1-5/16"	52.23	49.96	47.69	45.42
70675	70246	.2031	13/64"	5.159	2-1/4"	3/4"	52.11	49.84	47.58	45.31
		.2031	13/64"	5.159	3"	1-5/16"	52.60	50.31	48.03	45.74
70677	70251	.2040	#6	5.182	2-3/8"	7/8"	52.46	50.18	47.90	45.62
		.2040	#6	5.182	3"	1-3/8"	52.96	50.66	48.35	46.05
70679	70256	.2055	#5	5.220	2-3/8"	7/8"	52.85	50.56	48.26	45.96
		.2055	#5	5.220	3"	1-3/8"	53.30	50.99	48.67	46.35
70681	70261	.2090	#4	5.309	2-3/8"	7/8"	53.16	50.85	48.54	46.23
		.2090	#4	5.309	3"	1-3/8"	53.60	51.27	48.94	46.61
70683	70266	.2130	#3	5.410	2-3/8"	7/8"	53.52	51.19	48.87	46.54
		.2130	#3	5.410	3"	1-3/8"	53.96	51.61	49.27	46.92
70685	70271	.2165		5.500	60	22	53.85	51.51	49.17	46.83
		.2165		5.500	75	35	54.28	51.92	49.56	47.20
70687	70276	.2188	7/32"	5.558	2-3/8"	7/8"	54.30	51.94	49.58	47.22
		.2188	7/32"	5.558	3"	1-3/8"	54.60	52.23	49.85	47.48
70689	70281	.2210	#2	5.613	2-7/16"	15/16"	54.69	52.32	49.94	47.56
		.2210	#2	5.613	3"	1-3/8"	55.69	53.27	50.85	48.43
70691	70286	.2280	#1	5.791	2-7/16"	15/16"	55.11	52.71	50.32	47.92
		.2280	#1	5.791	3"	1-3/8"	55.96	53.53	51.09	48.66
70693	70294	.2340	A	5.944	2-7/16"	15/16"	55.49	53.08	50.66	48.25
		.2340	A	5.944	3-1/4"	1-1/2"	56.52	54.07	51.61	49.15
70695	70296	.2344	15/64"	5.954	2-7/16"	15/16"	55.91	53.48	51.05	48.62
		.2344	15/64"	5.954	3-1/4"	1-1/2"	57.09	54.60	52.12	49.64
70697	70301	.2362		6.000	64	26	56.29	53.85	51.40	48.95
		.2362		6.000	82	38	57.25	54.76	52.27	49.78
70699	70306	.2380	B	6.045	2-1/2"	1"	56.68	54.22	51.75	49.29
		.2380	B	6.045	3-1/4"	1-5/8"	57.41	54.91	52.42	49.92
70701	70311	.2420	C	6.147	2-1/2"	1"	57.14	54.66	52.17	49.69
		.2420	C	6.147	3-1/4"	1-5/8"	57.78	55.26	52.75	50.24
70703	70316	.2460	D	6.248	2-1/2"	1"	57.45	54.96	52.46	49.96
		.2460	D	6.248	3-1/4"	1-5/8"	58.12	55.59	53.07	50.54
70705	70321	.2500	1/4" / E	6.350	2-1/2"	1"	57.95	55.43	52.91	50.39
		.2500	1/4" / E	6.350	3-1/4"	1-5/8"	58.43	55.89	53.35	50.81
70707	70911	.2510		6.375	2-1/2"	1"	58.70	56.14	53.59	51.04
		.2510		6.375	3-1/4"	1-5/8"	59.33	56.75	54.17	51.59
70709	70326	.2559		6.500	66	28	60.97	58.32	55.67	53.02
		.2559		6.500	82	41	61.99	59.29	56.60	53.90
70711	70331	.2570	F	6.528	2-5/8"	1-1/8"	61.94	59.25	56.55	53.86
		.2570	F	6.528	3-1/4"	1-11/16"	62.92	60.18	57.45	54.71

3xD (1160) EDP#	5xD (1180) EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
70713		.2610	G	6.629	2-5/8"	1-1/8"	62.88	60.15	57.41	54.68
	70336	.2610	G	6.629	3-1/2"	1-11/16"	63.88	61.11	58.33	55.55
70715		.2656	17/64"	6.746	2-5/8"	1-1/8"	63.83	61.05	58.28	55.50
	70341	.2656	17/64"	6.746	3-1/2"	1-11/16"	64.83	62.01	59.19	56.37
70717		.2660	H	6.756	2-11/16"	1-3/16"	64.78	61.96	59.15	56.33
	70346	.2660	H	6.756	3-1/2"	1-11/16"	65.81	62.95	60.09	57.23
70719		.2720	I	6.909	2-11/16"	1-3/16"	64.93	62.11	59.28	56.46
	70351	.2720	I	6.909	3-1/2"	1-11/16"	66.76	63.86	60.95	58.05
70721		.2756		7.000	68	30	65.87	63.01	60.14	57.28
	70356	.2756		7.000	88	43	67.70	64.76	61.81	58.87
70723		.2770	J	7.036	2-11/16"	1-3/16"	66.79	63.89	60.98	58.08
	70361	.2770	J	7.036	3-1/2"	1-11/16"	68.67	65.68	62.70	59.71
70725		.2812	9/32"	7.142	2-11/16"	1-3/16"	68.70	65.71	62.73	59.74
	70371	.2812	9/32"	7.142	3-1/2"	1-3/4"	70.60	67.53	64.46	61.39
70727		.2900	L	7.366	2-3/4"	1-1/4"	69.63	66.61	63.58	60.55
	70376	.2900	L	7.366	3-1/2"	1-3/4"	71.48	68.38	65.27	62.16
70728		.2950	M	7.493	2-3/4"	1-1/4"	70.98	67.89	64.81	61.72
	70378	.2950	M	7.493	3-3/4"	1-7/8"	72.42	69.27	66.12	62.97
NEW	70729	.2953		7.500	70	32	70.98	67.89	64.81	61.72
	70381	.2953		7.500	95	44	72.42	69.27	66.12	62.97
70731		.2969	19/64"	7.541	2-3/4"	1-1/4"	71.62	68.51	65.39	62.28
	70386	.2969	19/64"	7.541	3-3/4"	1-7/8"	73.05	69.87	66.70	63.52
70733		.3020	N	7.671	2-15/16"	1-7/16"	73.91	70.70	67.48	64.27
	70391	.3020	N	7.671	3-3/4"	1-7/8"	75.70	72.41	69.12	65.83
70735		.3125	5/16"	7.938	2-15/16"	1-7/16"	74.18	70.95	67.73	64.50
	70396	.3125	5/16"	7.938	3-3/4"	1-7/8"	75.90	72.60	69.30	66.00
70737		.3150		8.000	76	36	78.29	74.89	71.48	68.08
	70401	.3150		8.000	95	48	80.10	76.62	73.13	69.65
70739		.3160	O	8.026	2-15/16"	1-7/16"	78.29	74.89	71.48	68.08
	70406	.3160	O	8.026	3-3/4"	1-7/8"	80.10	76.62	73.13	69.65
70741		.3230	P	8.204	2-15/16"	1-7/16"	78.86	75.43	72.00	68.57
	70411	.3230	P	8.204	3-3/4"	2-3/32"	80.36	76.87	73.37	69.88
70743		.3281	21/64"	8.334	2-15/16"	1-7/16"	80.30	76.81	73.32	69.83
	70416	.3281	21/64"	8.334	4"	2-3/32"	81.05	77.53	74.00	70.48
70745		.3320	Q	8.433	3"	1-7/16"	81.74	78.19	74.63	71.08
	70421	.3320	Q	8.433	4"	2-3/32"	82.54	78.95	75.36	71.77
70747		.3346		8.500	76	36	82.10	78.53	74.96	71.39
	70426	.3346		8.500	100	53	83.10	79.49	75.87	72.26
70749		.3390	R	8.611	3"	1-7/16"	84.31	80.64	76.98	73.31
	70431	.3390	R	8.611	4"	2-3/32"	85.17	81.47	77.76	74.06
70751		.3438	11/32"	8.733	3"	1-7/16"	86.15	82.40	78.66	74.91
	70436	.3438	11/32"	8.733	4"	2-3/16"	87.95	84.13	80.30	76.48
70753		.3480	S	8.839	3-1/16"	1-1/2"	90.09	86.17	82.26	78.34
	70441	.3480	S	8.839	4"	2-3/16"	93.01	88.97	84.92	80.88
70755		.3543		9.000	78	38	92.38	88.36	84.35	80.33
	70446	.3543		9.000	100	55	93.52	89.45	85.39	81.32
NEW	70757	.3580	T	9.093	3-1/16"	1-1/2"	97.18	92.95	88.73	84.50
	70451	.3580	T	9.093	4-1/4"	2-9/32"	98.54	94.26	89.97	85.69
70759		.3594	23/64"	9.129	3-1/16"	1-1/2"	97.78	93.53	89.28	85.03
	70456	.3594	23/64"	9.129	4-1/4"	2-9/32"	99.06	94.75	90.45	86.14

continued →

Series 1160, 1180 (continued)

.3680" - .5118"
(9.347mm - 13.000mm)

3xD (1160) EDP#	5xD (1180) EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
70761		.3680	U	9.347	3-1/8"	1-9/16"	98.61	94.33	90.04	85.75
	70461	.3680	U	9.347	4-1/4"	2-9/32"	103.72	99.21	94.70	90.19
70763		.3740		9.500	79	39	99.43	95.11	90.78	86.46
	70466	.3740		9.500	108	58	104.64	100.09	95.54	90.99
70765		.3750	3/8"	9.525	3-1/8"	1-9/16"	100.03	95.68	91.33	86.98
	70471	.3750	3/8"	9.525	4-1/4"	2-3/8"	105.57	100.98	96.39	91.80
70767		.3760		9.550	3-1/8"	1-9/16"	101.94	97.50	93.07	88.64
	70913	.3760		9.550	4-1/4"	2-3/8"	106.98	102.33	97.68	93.03
70769		.3770	V	9.576	3-1/4"	1-5/8"	103.86	99.34	94.83	90.31
	70476	.3770	V	9.576	4-1/4"	2-3/8"	108.38	103.66	98.95	94.24
70771		.3860	W	9.804	3-1/4"	1-5/8"	105.67	101.08	96.48	91.89
	70481	.3860	W	9.804	4-1/2"	2-3/8"	110.10	105.31	100.53	95.74
70773		.3906	25/64"	9.921	3-1/4"	1-5/8"	107.01	102.36	97.70	93.05
	70486	.3906	25/64"	9.921	4-1/2"	2-3/8"	111.33	106.49	101.65	96.81
NEW	70775	.3937		10.000	84	43	110.25	105.46	100.66	95.87
	70491	.3937		10.000	114	60	114.34	109.37	104.40	99.43
70777		.3970	X	10.084	3-5/16"	1-11/16"	111.76	106.90	102.04	97.18
	70496	.3970	X	10.084	4-1/2"	2-1/2"	115.52	110.50	105.47	100.45
70779		.4040	Y	10.262	3-5/16"	1-11/16"	112.48	107.59	102.70	97.81
	70501	.4040	Y	10.262	4-1/2"	2-9/16"	118.71	113.55	108.39	103.23
70781		.4062	13/32"	10.317	3-5/16"	1-11/16"	115.95	110.91	105.87	100.83
	70506	.4062	13/32"	10.317	4-1/2"	2-9/16"	119.63	114.43	109.23	104.03
70783		.4134		10.500	85	43	117.02	111.94	106.85	101.76
	70511	.4134		10.500	114	67	120.64	115.39	110.15	104.90
70785		.4219	27/64"	10.716	3-3/8"	1-11/16"	118.14	113.00	107.87	102.73
	70516	.4219	27/64"	10.716	4-1/2"	2-11/16"	121.65	116.36	111.07	105.78
NEW	70787	.4331		11.000	87	45	126.45	120.96	115.46	109.96
	70521	.4331		11.000	114	68	129.79	124.15	118.50	112.86
70789		.4375	7/16"	11.113	3-7/16"	1-3/4"	126.80	121.29	115.77	110.26
	70526	.4375	7/16"	11.113	4-3/4"	2-13/16"	130.27	124.61	118.94	113.28
NEW	70791	.4528		11.500	90	47	134.47	128.62	122.78	116.93
	70531	.4528		11.500	120	70	138.53	132.51	126.48	120.46
70793		.4531	29/64"	11.509	3-9/16"	1-13/16"	134.47	128.62	122.78	116.93
	70536	.4531	29/64"	11.509	4-3/4"	2-7/8"	138.53	132.51	126.48	120.46
70795		.4688	15/32"	11.909	3-11/16"	2-1/16"	141.29	135.15	129.00	122.86
	70541	.4688	15/32"	11.909	4-3/4"	2-7/8"	144.99	138.69	132.38	126.08
70797		.4724		12.000	93	53	141.70	135.54	129.38	123.22
	70546	.4724		12.000	120	73	145.37	139.05	132.73	126.41
70799		.4844	31/64"	12.304	3-11/16"	2-1/16"	142.68	136.48	130.27	124.07
	70551	.4844	31/64"	12.304	5-5/16"	3"	147.95	141.52	135.08	128.65
70801		.4921		12.500	95	53	144.10	137.83	131.57	125.30
	70556	.4921		12.500	135	75	149.59	143.09	136.58	130.08
70803		.5000	1/2"	12.700	3-3/4"	2-1/16"	145.02	138.71	132.41	126.10
	70561	.5000	1/2"	12.700	5-3/8"	3-1/16"	149.88	143.36	136.85	130.33
70805		.5010		12.725	3-3/4"	2-1/16"	146.56	140.18	133.81	127.44
	70915	.5010		12.725	5-3/8"	3-1/16"	151.56	144.97	138.38	131.79
NEW	70807	.5118		13.000	107	55	158.95	152.04	145.13	138.22
	70566	.5118		13.000	136	78	164.91	157.74	150.57	143.40

3xD (1160) EDP#	5xD (1180) EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
70809		.5156	33/64"	13.096	4-1/4"	2-3/16"	162.71	155.64	148.56	141.49
	70571	.5156	33/64"	13.096	5-3/8"	3-1/8"	168.43	161.11	153.78	146.46
70811		.5312	17/32"	13.492	4-1/4"	2-1/4"	166.46	159.23	151.99	144.75
	70576	.5312	17/32"	13.492	5-11/16"	3-5/16"	172.06	164.58	157.10	149.62
NEW 70813		.5469	35/64"	13.891	4-1/4"	2-1/4"	173.95	166.39	158.82	151.26
	70581	.5469	35/64"	13.891	5-13/16"	3-3/8"	179.07	171.28	163.50	155.71
70815		.5512		14.000	107	59	177.71	169.98	162.26	154.53
	70586	.5512		14.000	148	86	182.62	174.68	166.74	158.80
NEW 70817		.5625	9/16"	14.287	4-1/2"	2-3/8"	189.03	180.81	172.59	164.37
	70591	.5625	9/16"	14.287	5-15/16"	3-1/2"	195.16	186.67	178.19	169.70
70819		.5781	37/64"	14.683	4-1/2"	2-1/2"	196.03	187.51	178.98	170.46
	70596	.5781	37/64"	14.683	6"	3-1/2"	201.78	193.01	184.23	175.46
70821		.5906		15.000	115	64	199.64	190.96	182.28	173.60
	70601	.5906		15.000	152	90	205.30	196.37	187.45	178.52
NEW 70823		.5938	19/32"	15.082	4-1/2"	2-1/2"	200.71	191.98	183.26	174.53
	70606	.5938	19/32"	15.082	6"	3-9/16"	206.28	197.31	188.34	179.37
NEW 70825		.6094	39/64"	15.478	4-1/2"	2-9/16"	201.74	192.97	184.20	175.43
	70611	.6094	39/64"	15.478	6-3/16"	3-11/16"	223.62	213.90	204.17	194.45
70827		.6250	5/8"	15.875	4-1/2"	2-5/8"	203.81	194.95	186.09	177.23
	70616	.6250	5/8"	15.875	6-5/16"	3-3/4"	225.56	215.75	205.95	196.14
70829		.6299		16.000	115	66	208.73	199.65	190.58	181.50
	70621	.6299		16.000	160	95	230.29	220.28	210.26	200.25



*1180 Series
High Performance Drill in aluminum*



TOLERANCES

d_1	+0.000" - .0004" (+.000 - .010mm)
d_2	h6
l_1	+0.125" - .125" (+3.175 - 3.175mm)
l_2	+0.125" - .125" (+3.175 - 3.175mm)

Series 1550H, 1250H, 1850H



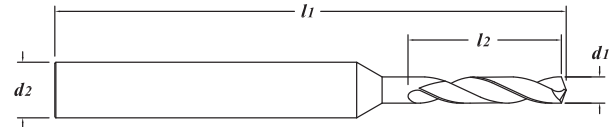
.0312" - .0354"
(0.792mm - 0.900mm)

HIGH PERFORMANCE DRILLS

Recommended for high nickel, high temperature alloys, cobalt-based alloys, stainless steels, and tool steels >40 Rc

AlTiN-based Coating

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



3xD (1550H) EDP#	5xD (1250H) EDP#	12xD (1850H) 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"	38.17	36.51	34.85	33.19
	00304		.0312	1/32"	0.792	1/8"	2"	15/64"	39.56	37.84	36.12	34.40
		00510	.0312	1/32"	0.792	1/8"	2"	7/16"	43.75	41.84	39.94	38.04
		00306	.0315		0.800	3.0	50	6.0	39.01	37.31	35.62	33.92
		00512	.0315		0.800	3.0	50	12.0	43.14	41.26	39.39	37.51
	00308		.0319		0.810	3.0	50	6.0	39.01	37.31	35.62	33.92
00106			.0320	#67	0.812	1/8"	2"	11/64"	38.17	36.51	34.85	33.19
	00310		.0320	#67	0.812	1/8"	2"	15/64"	39.56	37.84	36.12	34.40
		00516	.0320	#67	0.812	1/8"	2"	7/16"	43.75	41.84	39.94	38.04
		00518	.0323		0.820	3.0	50	12.0	43.14	41.26	39.39	37.51
00112			.0330	#66	0.838	1/8"	2"	11/64"	38.17	36.51	34.85	33.19
	00316		.0330	#66	0.838	1/8"	2"	15/64"	39.56	37.84	36.12	34.40
		00522	.0330	#66	0.838	1/8"	2"	7/16"	43.75	41.84	39.94	38.04
	00318		.0331		0.840	3.0	50	6.0	39.01	37.31	35.62	33.92
		00524	.0331		0.840	3.0	50	12.0	43.14	41.26	39.39	37.51
00116			.0335		0.850	3.0	50	4.5	37.54	35.90	34.27	32.64
		00526	.0335		0.850	3.0	50	12.0	43.14	41.26	39.39	37.51
	00322		.0339		0.860	3.0	50	6.5	39.01	37.31	35.62	33.92
		00528	.0339		0.860	3.0	50	13.0	43.14	41.26	39.39	37.51
00120			.0343		0.870	3.0	50	4.5	37.54	35.90	34.27	32.64
		00530	.0343		0.870	3.0	50	13.0	43.14	41.26	39.39	37.51
00122			.0346		0.880	3.0	50	4.5	37.54	35.90	34.27	32.64
00124			.0350	#65	0.890	3.0	50	4.5	37.54	35.90	34.27	32.64
	00328		.0350	#65	0.890	3.0	50	6.5	39.01	37.31	35.62	33.92
		00534	.0350	#65	0.890	3.0	50	13.0	43.14	41.26	39.39	37.51
	00330		.0354		0.900	3.0	50	6.5	39.01	37.31	35.62	33.92
		00536	.0354		0.900	3.0	50	13.0	43.14	41.26	39.39	37.51

continued →

Series 1550H,1250H,1850H (continued)

.0358" - .0465"
(0.910mm - 1.181mm)

3xD (1550H) EDP#	5xD (1250H) EDP#	12xD (1850H) 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								
	00332		.0358		3.0	50	6.5	39.01	37.31	35.62	33.92	
00130			.0360	#64	0.914	1/8"	2"	3/16"	38.17	36.51	34.85	33.19
	00334		.0360	#64	0.914	1/8"	2"	1/4"	39.56	37.84	36.12	34.40
		00540	.0360	#64	0.914	1/8"	2"	1/2"	43.75	41.84	39.94	38.04
00134			.0366		0.930	3.0	50	5.0	37.54	35.90	34.27	32.64
00136			.0370	#63	0.940	3.0	50	5.0	37.54	35.90	34.27	32.64
	00340		.0370	#63	0.940	3.0	50	7.0	39.01	37.31	35.62	33.92
		00546	.0370	#63	0.940	3.0	50	14.0	41.48	39.68	37.87	36.07
00138			.0374		0.950	3.0	50	5.0	37.54	35.90	34.27	32.64
00142			.0380	#62	0.965	1/8"	2"	3/16"	38.17	36.51	34.85	33.19
	00346		.0380	#62	0.965	1/8"	2"	17/64"	39.56	37.84	36.12	34.40
		00552	.0380	#62	0.965	1/8"	2"	9/16"	43.75	41.84	39.94	38.04
		00556	.0386		0.980	3.0	50	14.0	43.14	41.26	39.39	37.51
00148			.0390	#61	0.990	3.0	50	5.0	37.54	35.90	34.27	32.64
	00558		.0390	#61	0.990	3.0	50	14.0	43.14	41.26	39.39	37.51
00150			.0394		1.000	3.0	50	5.0	37.54	35.90	34.27	32.64
	00354		.0394		1.000	3.0	50	7.0	39.01	37.31	35.62	33.92
		00560	.0394		1.000	3.0	50	14.0	43.14	41.26	39.39	37.51
00152			.0400	#60	1.016	1/8"	2"	13/64"	37.80	36.16	34.51	32.87
	00356		.0400	#60	1.016	1/8"	2"	9/32"	39.20	37.50	35.79	34.09
		00562	.0400	#60	1.016	1/8"	2"	9/16"	43.34	41.46	39.57	37.69
00154			.0410	#59	1.041	1/8"	2"	13/64"	37.80	36.16	34.51	32.87
	00358		.0410	#59	1.041	1/8"	2"	9/32"	39.20	37.50	35.79	34.09
		00564	.0410	#59	1.041	1/8"	2"	9/16"	43.34	41.46	39.57	37.69
00156			.0413		1.050	3.0	50	5.5	37.17	35.55	33.94	32.32
	00360		.0413		1.050	3.0	50	7.5	37.20	35.59	33.97	32.35
		00566	.0413		1.050	3.0	50	15.0	42.78	40.92	39.06	37.20
00158			.0420	#58	1.066	1/8"	2"	7/32"	37.80	36.16	34.51	32.87
	00362		.0420	#58	1.066	1/8"	2"	5/16"	39.20	37.50	35.79	34.09
00160			.0430	#57	1.092	1/8"	2"	7/32"	37.80	36.16	34.51	32.87
	00364		.0430	#57	1.092	1/8"	2"	5/16"	39.20	37.50	35.79	34.09
		00570	.0430	#57	1.092	1/8"	2"	9/16"	43.34	41.46	39.57	37.69
00162			.0433		1.100	3.0	50	5.5	37.17	35.55	33.94	32.32
	00366		.0433		1.100	3.0	50	8.0	38.69	37.00	35.32	33.64
		00572	.0433		1.100	3.0	50	16.0	42.78	40.92	39.06	37.20
00164			.0453		1.150	3.0	50	6.0	37.17	35.55	33.94	32.32
	00368		.0453		1.150	3.0	50	8.0	38.69	37.00	35.32	33.64
		00574	.0453		1.150	3.0	50	16.0	42.78	40.92	39.06	37.20
00166			.0465	#56	1.181	1/8"	2"	15/64"	37.80	36.16	34.51	32.87
	00370		.0465	#56	1.181	1/8"	2"	11/32"	39.20	37.50	35.79	34.09
		00576	.0465	#56	1.181	1/8"	2"	5/8"	43.34	41.46	39.57	37.69

Series 1550H,1250H,1850H (continued)

.0469" - .0689"
(1.191mm - 1.750mm)

HIGH PERFORMANCE
DRILLS

3xD (1550H) EDP#	5xD (1250H) EDP#	12xD (1850H) 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	3/64"	Metric							
00168			.0469	3/64"	1.191	1/8"	2"	15/64"	37.80	36.16	34.51	32.87
	00372		.0469	3/64"	1.191	1/8"	2"	11/32"	39.20	37.50	35.79	34.09
		00578	.0469	3/64"	1.191	1/8"	2"	5/8"	43.34	41.46	39.57	37.69
00170			.0472		1.200	3.0	50	6.0	37.17	35.55	33.94	32.32
	00374		.0472		1.200	3.0	50	9.0	38.69	37.00	35.32	33.64
		00580	.0472		1.200	3.0	50	18.0	42.78	40.92	39.06	37.20
00172			.0492		1.250	3.0	50	6.5	37.17	35.55	33.94	32.32
	00376		.0492		1.250	3.0	50	9.0	38.69	37.00	35.32	33.64
		00582	.0492		1.250	3.0	50	18.0	42.78	40.92	39.06	37.20
00174			.0512		1.300	3.0	50	6.5	36.81	35.21	33.61	32.01
	00378		.0512		1.300	3.0	50	9.0	38.28	36.62	34.95	33.29
		00584	.0512		1.300	3.0	50	18.0	42.33	40.49	38.65	36.81
00176			.0520	#55	1.320	1/8"	2"	17/64"	37.09	35.48	33.86	32.25
	00380		.0520	#55	1.320	1/8"	2"	3/8"	38.85	37.16	35.47	33.78
		00586	.0520	#55	1.320	1/8"	2"	3/4"	42.94	41.07	39.21	37.34
00178			.0531		1.350	3.0	50	6.5	36.81	35.21	33.61	32.01
	00382		.0531		1.350	3.0	50	9.5	38.28	36.62	34.95	33.29
		00588	.0531		1.350	3.0	50	19.0	42.33	40.49	38.65	36.81
00180			.0550	#54	1.397	1/8"	2"	9/32"	37.09	35.48	33.86	32.25
	00384		.0550	#54	1.397	1/8"	2"	3/8"	38.85	37.16	35.47	33.78
		00590	.0550	#54	1.397	1/8"	2"	3/4"	42.94	41.07	39.21	37.34
00182			.0551		1.400	3.0	50	7.0	36.81	35.21	33.61	32.01
	00386		.0551		1.400	3.0	50	10.0	38.28	36.62	34.95	33.29
		00592	.0551		1.400	3.0	65	20.0	44.26	42.34	40.41	38.49
00184			.0571		1.450	3.0	50	7.0	36.81	35.21	33.61	32.01
	00388		.0571		1.450	3.0	50	10.5	38.28	36.62	34.95	33.29
		00594	.0571		1.450	3.0	65	21.0	44.26	42.34	40.41	38.49
00186			.0591		1.500	3.0	50	7.5	36.81	35.21	33.61	32.01
	00390		.0591		1.500	3.0	50	10.5	38.28	36.62	34.95	33.29
		00596	.0591		1.500	3.0	65	21.0	44.26	42.34	40.41	38.49
00188			.0595	#53	1.511	1/8"	2"	19/64"	37.09	35.48	33.86	32.25
	00392		.0595	#53	1.511	1/8"	2"	7/16"	38.85	37.16	35.47	33.78
		00598	.0595	#53	1.511	1/8"	2-1/2"	13/16"	44.91	42.96	41.00	39.05
00190			.0610		1.550	3.0	50	7.5	36.43	34.85	33.26	31.68
	00394		.0610		1.550	3.0	50	11.0	37.93	36.28	34.63	32.98
		00600	.0610		1.550	3.0	65	22.0	43.90	41.99	40.08	38.17
00192			.0625	1/16"	1.587	1/8"	2"	5/16"	37.09	35.48	33.86	32.25
	00396		.0625	1/16"	1.587	1/8"	2"	7/16"	38.48	36.81	35.13	33.46
		00602	.0625	1/16"	1.587	1/8"	2-1/2"	13/16"	44.51	42.57	40.64	38.70
00194			.0630		1.600	3.0	50	7.5	36.43	34.85	33.26	31.68
	00398		.0630		1.600	3.0	50	11.0	37.93	36.28	34.63	32.98
		00604	.0630		1.600	3.0	65	22.0	43.90	41.99	40.08	38.17
00196			.0635	#52	1.613	1/8"	2"	5/16"	37.09	35.48	33.86	32.25
	00400		.0635	#52	1.613	1/8"	2"	15/32"	38.48	36.81	35.13	33.46
		00606	.0635	#52	1.613	1/8"	2-1/2"	7/8"	44.51	42.57	40.64	38.70
00198			.0650		1.650	3.0	50	8.5	36.43	34.85	33.26	31.68
	00402		.0650		1.650	3.0	50	11.5	37.93	36.28	34.63	32.98
		00608	.0650		1.650	3.0	65	23.0	43.90	41.99	40.08	38.17
00200			.0669		1.700	3.0	50	8.5	36.43	34.85	33.26	31.68
	00404		.0669		1.700	3.0	50	11.5	37.93	36.28	34.63	32.98
		00610	.0669		1.700	3.0	65	23.0	43.90	41.99	40.08	38.17
00202			.0670	#51	1.702	1/8"	2"	11/32"	37.09	35.48	33.86	32.25
	00406		.0670	#51	1.702	1/8"	2"	15/32"	38.48	36.81	35.13	33.46
		00612	.0670	#51	1.702	1/8"	2-1/2"	7/8"	44.51	42.57	40.64	38.70
00204			.0689		1.750	3.0	50	9.0	36.43	34.85	33.26	31.68
	00408		.0689		1.750	3.0	50	12.0	37.93	36.28	34.63	32.98
		00614	.0689		1.750	3.0	65	24.0	43.90	41.99	40.08	38.17

continued →

Series 1550H,1250H,1850H (continued)

.0700" - .0846"
(1.778mm - 2.150mm)



TOLERANCES	
d1	+0.000" - .0004" (+0.00 - .010mm)
d2	h6
l1	+0.125" - .125" (+3.175 - 3.175mm)
l2	+0.125" - .125" (+3.175 - 3.175mm)

Recommended for high nickel, high temperature alloys, cobalt-based alloys, stainless steels, and tool steels >40 Rc

AlTiN-based Coating

High performance solid submicron grain carbide drill on 3mm or 1/8" diameter shank



3xD (1550H) EDP#	5xD (1250H) EDP#	12xD (1850H) EDP#	d1 † Diameter		d2 Shank Diameter	l1 Overall Length	l2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
00206			.0700	#50	1.778	1/8"	2"	23/64"	36.72	35.12	33.53	31.93
	00410		.0700	#50	1.778	1/8"	2"	1/2"	38.10	36.44	34.79	33.13
		00616	.0700	#50	1.778	1/8"	2-1/2"	1"	44.06	42.14	40.23	38.31
00208			.0709		1.800	3.0	50	9.0	36.09	34.52	32.95	31.38
	00412		.0709		1.800	3.0	50	13.0	37.57	35.94	34.30	32.67
		00618	.0709		1.800	3.0	65	26.0	43.46	41.57	39.68	37.79
00210			.0728		1.850	3.0	50	9.5	36.09	34.52	32.95	31.38
		00620	.0728		1.850	3.0	65	26.0	43.46	41.57	39.68	37.79
00212			.0730	#49	1.854	1/8"	2"	3/8"	36.72	35.12	33.53	31.93
	00416		.0730	#49	1.854	1/8"	2"	1/2"	38.10	36.44	34.79	33.13
		00622	.0730	#49	1.854	1/8"	2-1/2"	1"	44.06	42.14	40.23	38.31
00214			.0748		1.900	3.0	50	9.5	36.09	34.52	32.95	31.38
	00418		.0748		1.900	3.0	50	13.5	37.57	35.94	34.30	32.67
		00624	.0748		1.900	3.0	65	27.0	43.46	41.57	39.68	37.79
00216			.0760	#48	1.930	1/8"	2"	3/8"	36.72	35.12	33.53	31.93
	00420		.0760	#48	1.930	1/8"	2"	17/32"	38.10	36.44	34.79	33.13
		00626	.0760	#48	1.930	1/8"	2-1/2"	1-1/8"	46.43	44.41	42.39	40.37
00218			.0768		1.950	3.0	50	10.0	36.09	34.52	32.95	31.38
	00422		.0768		1.950	3.0	50	14.0	37.57	35.94	34.30	32.67
		00628	.0768		1.950	3.0	65	28.0	45.79	43.80	41.81	39.82
00220			.0781	5/64"	1.983	1/8"	2"	13/32"	36.72	35.12	33.53	31.93
	00424		.0781	5/64"	1.983	1/8"	2"	9/16"	38.10	36.44	34.79	33.13
		00630	.0781	5/64"	1.983	1/8"	2-1/2"	1-1/8"	46.43	44.41	42.39	40.37
00222			.0785	#47	1.994	1/8"	2"	13/32"	36.72	35.12	33.53	31.93
	00426		.0785	#47	1.994	1/8"	2"	9/16"	38.10	36.44	34.79	33.13
		00632	.0785	#47	1.994	1/8"	2-1/2"	1-1/8"	46.43	44.41	42.39	40.37
00224			.0787		2.000	3.0	50	10.0	36.09	34.52	32.95	31.38
	00428		.0787		2.000	3.0	50	14.0	37.57	35.94	34.30	32.67
		00634	.0787		2.000	3.0	65	28.0	45.79	43.80	41.81	39.82
00226			.0807		2.050	3.0	50	10.5	35.71	34.16	32.60	31.05
	00430		.0807		2.050	3.0	50	14.0	37.19	35.57	33.96	32.34
		00636	.0807		2.050	3.0	65	28.0	45.38	43.41	41.43	39.46
00228			.0810	#46	2.057	1/8"	2"	27/64"	36.35	34.77	33.19	31.61
	00432		.0810	#46	2.057	1/8"	2"	9/16"	37.75	36.11	34.47	32.83
		00638	.0810	#46	2.057	1/8"	2-1/2"	1-1/8"	46.05	44.04	42.04	40.04
00230			.0820	#45	2.083	1/8"	2"	27/64"	36.35	34.77	33.19	31.61
	00434		.0820	#45	2.083	1/8"	2"	9/16"	37.75	36.11	34.47	32.83
		00640	.0820	#45	2.083	1/8"	2-1/2"	1-1/8"	46.05	44.04	42.04	40.04
00232			.0827		2.100	3.0	50	10.5	35.71	34.16	32.60	31.05
	00436		.0827		2.100	3.0	50	14.5	37.19	35.57	33.96	32.34
		00642	.0827		2.100	3.0	65	29.0	45.38	43.41	41.43	39.46
00234			.0846		2.150	3.0	50	11.0	35.71	34.16	32.60	31.05
	00438		.0846		2.150	3.0	50	14.5	37.19	35.57	33.96	32.34
		00644	.0846		2.150	3.0	65	29.0	45.38	43.41	41.43	39.46

3xD (1550H) EDP#	5xD (1250H) EDP#	12xD (1850H) 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								
00236			.0860	#44	2.184	1/8"	2"	7/16"	36.35	34.77	33.19	31.61
	00440		.0860	#44	2.184	1/8"	2"	19/32"	37.75	36.11	34.47	32.83
		00646	.0860	#44	2.184	1/8"	2-1/2"	1-3/16"	46.05	44.04	42.04	40.04
00238			.0866		2.200	3.0	50	11.0	35.71	34.16	32.60	31.05
	00442		.0866		2.200	3.0	50	15.5	37.19	35.57	33.96	32.34
		00648	.0866		2.200	3.0	65	31.0	45.38	43.41	41.43	39.46
00240			.0886		2.250	3.0	50	11.5	35.71	34.16	32.60	31.05
00242			.0890	#43	2.260	1/8"	2"	29/64"	36.35	34.77	33.19	31.61
	00446		.0890	#43	2.260	1/8"	2"	5/8"	37.75	36.11	34.47	32.83
		00652	.0890	#43	2.260	1/8"	2-1/2"	1-1/4"	46.05	44.04	42.04	40.04
00244			.0906		2.300	3.0	50	11.5	35.35	33.81	32.28	30.74
	00448		.0906		2.300	3.0	50	16.0	36.83	35.23	33.63	32.03
		00654	.0906		2.300	3.0	65	32.0	44.94	42.99	41.03	39.08
00246			.0925		2.350	3.0	50	12.0	35.35	33.81	32.28	30.74
	00450		.0925		2.350	3.0	50	16.0	35.42	33.88	32.34	30.80
		00656	.0925		2.350	3.0	65	32.0	44.94	42.99	41.03	39.08
00248			.0935	#42	2.375	1/8"	2"	31/64"	35.97	34.41	32.84	31.28
	00452		.0935	#42	2.375	1/8"	2"	21/32"	37.38	35.75	34.13	32.50
		00658	.0935	#42	2.375	1/8"	3"	1-5/16"	45.61	43.63	41.64	39.66
00250			.0938	3/32"	2.382	1/8"	2"	31/64"	35.97	34.41	32.84	31.28
	00454		.0938	3/32"	2.382	1/8"	2"	21/32"	37.38	35.75	34.13	32.50
		00660	.0938	3/32"	2.382	1/8"	3"	1-5/16"	45.61	43.63	41.64	39.66
00252			.0945		2.400	3.0	50	12.0	35.35	33.81	32.28	30.74
	00456		.0945		2.400	3.0	50	17.0	36.83	35.23	33.63	32.03
		00662	.0945		2.400	3.0	75	34.0	44.94	42.99	41.03	39.08
00254			.0960	#41	2.438	1/8"	2"	31/64"	35.97	34.41	32.84	31.28
	00458		.0960	#41	2.438	1/8"	2"	43/64"	37.38	35.75	34.13	32.50
		00664	.0960	#41	2.438	1/8"	3"	1-11/32"	45.61	43.63	41.64	39.66
00256			.0965		2.450	3.0	50	12.5	35.35	33.81	32.28	30.74
		00666	.0965		2.450	3.0	75	34.0	44.94	42.99	41.03	39.08
00258			.0980	#40	2.489	1/8"	2"	1/2"	35.97	34.41	32.84	31.28
	00462		.0980	#40	2.489	1/8"	2"	11/16"	37.38	35.75	34.13	32.50
		00668	.0980	#40	2.489	1/8"	3"	1-3/8"	45.61	43.63	41.64	39.66
00260			.0984		2.500	3.0	50	12.5	35.35	33.81	32.28	30.74
	00464		.0984		2.500	3.0	50	17.5	36.83	35.23	33.63	32.03
		00670	.0984		2.500	3.0	75	35.0	44.94	42.99	41.03	39.08
00262			.0995	#39	2.527	1/8"	2"	1/2"	35.97	34.41	32.84	31.28
	00466		.0995	#39	2.527	1/8"	2"	11/16"	37.38	35.75	34.13	32.50
		00672	.0995	#39	2.527	1/8"	3"	1-3/8"	45.61	43.63	41.64	39.66
00264			.1004		2.550	3.0	50	13.0	35.02	33.50	31.97	30.45
	00468		.1004		2.550	3.0	50	17.5	36.50	34.91	33.33	31.74
		00674	.1004		2.550	3.0	75	35.0	44.56	42.63	40.69	38.75
00266			.1015	#38	2.578	1/8"	2"	17/32"	35.65	34.10	32.55	31.00
	00470		.1015	#38	2.578	1/8"	2"	45/64"	37.05	35.44	33.83	32.22
		00676	.1015	#38	2.578	1/8"	3"	1-13/32"	45.21	43.24	41.28	39.31
00268			.1024		2.600	3.0	50	13.0	35.02	33.50	31.97	30.45
	00472		.1024		2.600	3.0	50	18.0	36.50	34.91	33.33	31.74
		00678	.1024		2.600	3.0	75	36.0	44.56	42.63	40.69	38.75
00270			.1040	#37	2.641	1/8"	2"	17/32"	35.65	34.10	32.55	31.00
	00474		.1040	#37	2.641	1/8"	2"	23/32"	37.05	35.44	33.83	32.22
		00680	.1040	#37	2.641	1/8"	3"	1-7/16"	45.21	43.24	41.28	39.31
00272			.1043		2.650	3.0	50	13.5	35.02	33.50	31.97	30.45
	00476		.1043		2.650	3.0	50	18.5	36.50	34.91	33.33	31.74
		00682	.1043		2.650	3.0	75	37.0	44.56	42.63	40.69	38.75

continued →

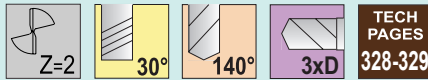
Series 1550H,1250H,1850H (continued)

.1063" - .1250"
(2.700mm - 3.175mm)

3xD (1550H) EDP#	5xD (1250H) EDP#	12xD (1850H) 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							
00274			.1063	2.700	3.0	50	13.5	35.02	33.50	31.97	30.45
	00478		.1063	2.700	3.0	50	19.0	36.50	34.91	33.33	31.74
		00684	.1063	2.700	3.0	75	38.0	44.56	42.63	40.69	38.75
00276			.1065	#36 2.705	1/8"	2"	17/32"	35.65	34.10	32.55	31.00
	00480		.1065	#36 2.705	1/8"	2"	3/4"	37.05	35.44	33.83	32.22
		00686	.1065	#36 2.705	1/8"	3"	1-1/2"	45.21	43.24	41.28	39.31
00278			.1083	2.750	3.0	50	14.0	35.02	33.50	31.97	30.45
	00482		.1083	2.750	3.0	50	19.5	36.50	34.91	33.33	31.74
		00688	.1083	2.750	3.0	75	39.0	44.56	42.63	40.69	38.75
00280			.1094	7/64" 2.778	1/8"	2"	9/16"	35.65	34.10	32.55	31.00
	00484		.1094	7/64" 2.778	1/8"	2"	49/64"	37.05	35.44	33.83	32.22
		00690	.1094	7/64" 2.778	1/8"	3"	1-9/16"	45.21	43.24	41.28	39.31
00282			.1100	#35 2.794	1/8"	2"	9/16"	35.65	34.10	32.55	31.00
	00486		.1100	#35 2.794	1/8"	2"	49/64"	37.05	35.44	33.83	32.22
		00692	.1100	#35 2.794	1/8"	3"	1-9/16"	45.21	43.24	41.28	39.31
00284			.1102	2.800	3.0	50	14.0	35.02	33.50	31.97	30.45
	00488		.1102	2.800	3.0	50	19.5	36.50	34.91	33.33	31.74
		00694	.1102	2.800	3.0	75	39.0	44.56	42.63	40.69	38.75
00286			.1110	#34 2.819	1/8"	2"	9/16"	35.65	34.10	32.55	31.00
	00490		.1110	#34 2.819	1/8"	2"	25/32"	37.05	35.44	33.83	32.22
		00696	.1110	#34 2.819	1/8"	3"	1-5/8"	45.21	43.24	41.28	39.31
00288			.1122	2.850	3.0	50	14.5	35.02	33.50	31.97	30.45
		00698	.1122	2.850	3.0	75	40.0	44.56	42.63	40.69	38.75
00290			.1130	#33 2.870	1/8"	2"	19/32"	35.65	34.10	32.55	31.00
	00494		.1130	#33 2.870	1/8"	2"	51/64"	37.05	35.44	33.83	32.22
		00700	.1130	#33 2.870	1/8"	3"	1-5/8"	45.21	43.24	41.28	39.31
00292			.1142	2.900	3.0	50	14.5	35.02	33.50	31.97	30.45
	00496		.1142	2.900	3.0	50	20.0	36.50	34.91	33.33	31.74
		00702	.1142	2.900	3.0	75	40.0	44.56	42.63	40.69	38.75
00294			.1160	#32 2.946	1/8"	2"	19/32"	35.65	34.10	32.55	31.00
	00498		.1160	#32 2.946	1/8"	2"	13/16"	37.05	35.44	33.83	32.22
		00704	.1160	#32 2.946	1/8"	3"	1-5/8"	45.21	43.24	41.28	39.31
00296			.1161	2.950	3.0	50	15.0	35.02	33.50	31.97	30.45
		00706	.1161	2.950	3.0	75	42.0	44.56	42.63	40.69	38.75
00298			.1181	3.000	3.0	50	15.0	32.90	31.47	30.04	28.61
	00502		.1181	3.000	3.0	50	21.0	34.37	32.88	31.38	29.89
		00708	.1181	3.000	3.0	75	42.0	42.04	40.22	38.39	36.56
00300			.1200	#31 3.048	1/8"	2"	5/8"	35.65	34.10	32.55	31.00
	00504		.1200	#31 3.048	1/8"	2"	7/8"	37.05	35.44	33.83	32.22
		00710	.1200	#31 3.048	1/8"	3"	1-3/4"	45.21	43.24	41.28	39.31
00302			.1250	1/8" 3.175	1/8"	2"	5/8"	33.53	32.08	30.62	29.16
	00506		.1250	1/8" 3.175	1/8"	2"	7/8"	34.93	33.41	31.89	30.37
		00712	.1250	1/8" 3.175	1/8"	3"	1-3/4"	42.70	40.84	38.99	37.13

TOLERANCES

<i>d1</i> *	3mm - 6mm	+016mm +.004mm (+.00063" +.00015")
	> 6mm - 10mm	+021mm +.006mm (+.00082" +.00023")
	> 10mm - 18mm	+025mm +.007mm (+.00098" +.00027")
	> 18mm - 20mm	+029mm +.008mm (+.00114" +.00031")
<i>d2</i>	h6	
<i>l1</i>	+3.175mm -3.175mm (+.125" -.125")	
<i>l2</i>	+3.175mm -3.175mm (+.125" -.125")	
<i>l4</i>	+1.980mm -.000mm (+.078" -.000")	



Series 1580HD

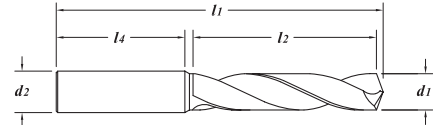
.1181" - .2342"
(3.000mm - 5.950mm)

HIGH PERFORMANCE DRILLS

Recommended for high nickel, high temperature alloys, cobalt-based alloys, stainless steels, and tool steels >40 Rc

AlTiN-based Coating

- High performance solid submicron grain carbide drill with reinforced shank
- Up to 50% faster than standard carbide drills
- 30° helix for better chip evacuation
- Honed cutting edge
- Can be used as a pilot drill
- 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	47.23	45.18	43.12	41.07
20095	.1220	3.100	6.0	62	20	36	47.23	45.18	43.12	41.07
20105	.1248	3.170	6.0	62	20	36	47.23	45.18	43.12	41.07
20115	.1260	3.200	6.0	62	20	36	47.23	45.18	43.12	41.07
20125	.1280	3.250	6.0	62	20	36	47.23	45.18	43.12	41.07
20135	.1299	3.300	6.0	62	20	36	47.23	45.18	43.12	41.07
20145	.1339	3.400	6.0	62	20	36	47.23	45.18	43.12	41.07
20155	.1378	3.500	6.0	62	20	36	47.23	45.18	43.12	41.07
20165	.1417	3.600	6.0	62	20	36	47.23	45.18	43.12	41.07
20175	.1457	3.700	6.0	62	20	36	47.23	45.18	43.12	41.07
20185	.1476	3.750	6.0	62	20	36	47.23	45.18	43.12	41.07
20195	.1496	3.800	6.0	66	24	36	47.23	45.18	43.12	41.07
20205	.1535	3.900	6.0	66	24	36	47.23	45.18	43.12	41.07
20215	.1575	4.000	6.0	66	24	36	47.23	45.18	43.12	41.07
20225	.1614	4.100	6.0	66	24	36	47.23	45.18	43.12	41.07
20235	.1654	4.200	6.0	66	24	36	47.23	45.18	43.12	41.07
20245	.1673	4.250	6.0	66	24	36	47.23	45.18	43.12	41.07
20255	.1693	4.300	6.0	66	24	36	47.23	45.18	43.12	41.07
20265	.1732	4.400	6.0	66	24	36	47.23	45.18	43.12	41.07
20275	.1772	4.500	6.0	66	24	36	47.23	45.18	43.12	41.07
20285	.1811	4.600	6.0	66	24	36	47.23	45.18	43.12	41.07
20295	.1831	4.650	6.0	66	24	36	47.23	45.18	43.12	41.07
20305	.1850	4.700	6.0	66	24	36	47.23	45.18	43.12	41.07
20315	.1870	4.750	6.0	66	24	36	47.23	45.18	43.12	41.07
20325	.1890	4.800	6.0	66	28	36	47.23	45.18	43.12	41.07
20335	.1929	4.900	6.0	66	28	36	47.23	45.18	43.12	41.07
20345	.1969	5.000	6.0	66	28	36	47.23	45.18	43.12	41.07
20355	.2008	5.100	6.0	66	28	36	47.23	45.18	43.12	41.07
20365	.2027	5.150	6.0	66	28	36	47.23	45.18	43.12	41.07
20375	.2047	5.200	6.0	66	28	36	47.23	45.18	43.12	41.07
20385	.2087	5.300	6.0	66	28	36	47.23	45.18	43.12	41.07
20395	.2165	5.500	6.0	66	28	36	47.23	45.18	43.12	41.07
20405	.2185	5.550	6.0	66	28	36	47.23	45.18	43.12	41.07
20408	.2205	5.600	6.0	66	28	36	47.23	45.18	43.12	41.07
20412	.2244	5.700	6.0	66	28	36	47.23	45.18	43.12	41.07
20415	.2283	5.800	6.0	66	28	36	47.23	45.18	43.12	41.07
20425	.2323	5.900	6.0	66	28	36	47.23	45.18	43.12	41.07
20435	.2342	5.950	6.0	66	28	36	47.23	45.18	43.12	41.07

continued →

Series 1580HD (continued)

.2362" - .4252"
(6.000mm - 10.800mm)

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								
20445	.2362	6.000	6.0	66	28	36	47.23	45.18	43.12	41.07
20448	.2402	6.100	8.0	79	34	36	64.98	62.15	59.33	56.50
20452	.2441	6.200	8.0	79	34	36	64.98	62.15	59.33	56.50
20454	.2480	6.300	8.0	79	34	36	64.98	62.15	59.33	56.50
20455	.2500	6.350	8.0	79	34	36	64.98	62.15	59.33	56.50
20462	.2520	6.400	8.0	79	34	36	64.98	62.15	59.33	56.50
20465	.2559	6.500	8.0	79	34	36	64.98	62.15	59.33	56.50
20468	.2571	6.530	8.0	79	34	36	64.98	62.15	59.33	56.50
20472	.2598	6.600	8.0	79	34	36	64.98	62.15	59.33	56.50
20473	.2638	6.700	8.0	79	34	36	64.98	62.15	59.33	56.50
20475	.2657	6.750	8.0	79	34	36	64.98	62.15	59.33	56.50
20485	.2677	6.800	8.0	79	34	36	64.98	62.15	59.33	56.50
20495	.2717	6.900	8.0	79	34	36	64.98	62.15	59.33	56.50
20505	.2756	7.000	8.0	79	34	36	64.98	62.15	59.33	56.50
20515	.2795	7.100	8.0	79	41	36	64.98	62.15	59.33	56.50
20525	.2815	7.150	8.0	79	41	36	64.98	62.15	59.33	56.50
20535	.2835	7.200	8.0	79	41	36	64.98	62.15	59.33	56.50
20542	.2874	7.300	8.0	79	41	36	64.98	62.15	59.33	56.50
20545	.2913	7.400	8.0	79	41	36	64.98	62.15	59.33	56.50
20555	.2953	7.500	8.0	79	41	36	64.98	62.15	59.33	56.50
20565	.2972	7.550	8.0	79	41	36	64.98	62.15	59.33	56.50
20575	.2992	7.600	8.0	79	41	36	64.98	62.15	59.33	56.50
20585	.3031	7.700	8.0	79	41	36	64.98	62.15	59.33	56.50
20595	.3071	7.800	8.0	79	41	36	64.98	62.15	59.33	56.50
20605	.3130	7.950	8.0	79	41	36	64.98	62.15	59.33	56.50
20615	.3150	8.000	8.0	79	41	36	64.98	62.15	59.33	56.50
20622	.3189	8.100	10.0	89	47	40	90.40	86.47	82.54	78.61
20625	.3228	8.200	10.0	89	47	40	90.40	86.47	82.54	78.61
20635	.3268	8.300	10.0	89	47	40	90.40	86.47	82.54	78.61
20645	.3287	8.350	10.0	89	47	40	90.40	86.47	82.54	78.61
20652	.3307	8.400	10.0	89	47	40	90.40	86.47	82.54	78.61
20655	.3346	8.500	10.0	89	47	40	90.40	86.47	82.54	78.61
20665	.3386	8.600	10.0	89	47	40	90.40	86.47	82.54	78.61
20675	.3425	8.700	10.0	89	47	40	90.40	86.47	82.54	78.61
20685	.3445	8.750	10.0	89	47	40	90.40	86.47	82.54	78.61
20695	.3465	8.800	10.0	89	47	40	90.40	86.47	82.54	78.61
20705	.3504	8.900	10.0	89	47	40	90.40	86.47	82.54	78.61
20715	.3543	9.000	10.0	89	47	40	90.40	86.47	82.54	78.61
20725	.3583	9.100	10.0	89	47	40	90.40	86.47	82.54	78.61
20735	.3602	9.150	10.0	89	47	40	90.40	86.47	82.54	78.61
20745	.3622	9.200	10.0	89	47	40	90.40	86.47	82.54	78.61
20755	.3661	9.300	10.0	89	47	40	90.40	86.47	82.54	78.61
20762	.3701	9.400	10.0	89	47	40	90.40	86.47	82.54	78.61
20765	.3740	9.500	10.0	89	47	40	90.40	86.47	82.54	78.61
20775	.3760	9.550	10.0	89	47	40	90.40	86.47	82.54	78.61
20778	.3780	9.600	10.0	89	47	40	90.40	86.47	82.54	78.61
20782	.3819	9.700	10.0	89	47	40	90.40	86.47	82.54	78.61
20785	.3858	9.800	10.0	89	47	40	90.40	86.47	82.54	78.61
20795	.3898	9.900	10.0	89	47	40	90.40	86.47	82.54	78.61
20805	.3937	10.000	10.0	89	47	40	90.40	86.47	82.54	78.61
20812	.3976	10.100	12.0	102	55	45	117.61	112.50	107.38	102.27
20815	.4016	10.200	12.0	102	55	45	117.61	112.50	107.38	102.27
20825	.4055	10.300	12.0	102	55	45	117.61	112.50	107.38	102.27
20835	.4134	10.500	12.0	102	55	45	117.61	112.50	107.38	102.27
20842	.4173	10.600	12.0	102	55	45	117.61	112.50	107.38	102.27
20845	.4213	10.700	12.0	102	55	45	117.61	112.50	107.38	102.27
20855	.4252	10.800	12.0	102	55	45	117.61	112.50	107.38	102.27

Series 1580HD (continued)

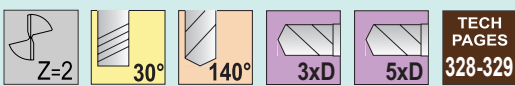
.4331" - .7874"
(11.000mm - 20.000mm)

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								
20865	.4331	11.000	12.0	102	55	45	117.61	112.50	107.38	102.27
20875	.4370	11.100	12.0	102	55	45	117.61	112.50	107.38	102.27
20885	.4409	11.200	12.0	102	55	45	117.61	112.50	107.38	102.27
20892	.4488	11.400	12.0	102	55	45	117.61	112.50	107.38	102.27
20895	.4528	11.500	12.0	102	55	45	117.61	112.50	107.38	102.27
20905	.4606	11.700	12.0	102	55	45	117.61	112.50	107.38	102.27
20915	.4685	11.900	12.0	102	55	45	117.61	112.50	107.38	102.27
20925	.4724	12.000	12.0	102	55	45	117.61	112.50	107.38	102.27
20935	.4764	12.100	14.0	107	60	45	147.50	141.09	134.67	128.26
20941	.4803	12.200	14.0	107	60	45	147.50	141.09	134.67	128.26
20945	.4842	12.300	14.0	107	60	45	147.50	141.09	134.67	128.26
20955	.4921	12.500	14.0	107	60	45	147.50	141.09	134.67	128.26
20961	.4961	12.600	14.0	107	60	45	147.50	141.09	134.67	128.26
20965	.5000	12.700	14.0	107	60	45	147.50	141.09	134.67	128.26
20975	.5039	12.800	14.0	107	60	45	147.50	141.09	134.67	128.26
20978	.5051	12.830	14.0	107	60	45	147.50	141.09	134.67	128.26
20981	.5079	12.900	14.0	107	60	45	147.50	141.09	134.67	128.26
20982	.5098	12.950	14.0	107	60	45	147.50	141.09	134.67	128.26
20985	.5118	13.000	14.0	107	60	45	147.50	141.09	134.67	128.26
20998	.5236	13.300	14.0	107	60	45	147.50	141.09	134.67	128.26
21005	.5315	13.500	14.0	107	60	45	147.50	141.09	134.67	128.26
21015	.5394	13.700	14.0	107	60	45	147.50	141.09	134.67	128.26
21025	.5433	13.800	14.0	107	60	45	147.50	141.09	134.67	128.26
21035	.5512	14.000	14.0	107	60	45	147.50	141.09	134.67	128.26
21045	.5551	14.100	16.0	115	65	48	175.32	167.70	160.07	152.45
21053	.5591	14.200	16.0	115	65	48	175.32	167.70	160.07	152.45
21055	.5610	14.250	16.0	115	65	48	175.32	167.70	160.07	152.45
21065	.5630	14.300	16.0	115	65	48	175.32	167.70	160.07	152.45
21075	.5709	14.500	16.0	115	65	48	175.32	167.70	160.07	152.45
21085	.5787	14.700	16.0	115	65	48	175.32	167.70	160.07	152.45
21105	.5906	15.000	16.0	115	65	48	175.32	167.70	160.07	152.45
21115	.5945	15.100	16.0	115	65	48	175.32	167.70	160.07	152.45
21125	.6102	15.500	16.0	115	65	48	175.32	167.70	160.07	152.45
21135	.6181	15.700	16.0	115	65	48	175.32	167.70	160.07	152.45
21145	.6220	15.800	16.0	115	65	48	175.32	167.70	160.07	152.45
21155	.6299	16.000	16.0	115	65	48	175.32	167.70	160.07	152.45
21159	.6331	16.080	18.0	123	73	48	232.70	222.59	212.47	202.35
21175	.6496	16.500	18.0	123	73	48	232.70	222.59	212.47	202.35
21185	.6555	16.650	18.0	123	73	48	232.70	222.59	212.47	202.35
21195	.6693	17.000	18.0	123	73	48	232.70	222.59	212.47	202.35
21215	.6870	17.450	18.0	123	73	48	232.70	222.59	212.47	202.35
21225	.6890	17.500	18.0	123	73	48	232.70	222.59	212.47	202.35
21235	.7027	17.850	18.0	123	73	48	232.70	222.59	212.47	202.35
21245	.7087	18.000	18.0	123	73	48	232.70	222.59	212.47	202.35
21255	.7185	18.250	20.0	131	79	50	318.68	304.82	290.97	277.11
21265	.7283	18.500	20.0	131	79	50	318.68	304.82	290.97	277.11
21275	.7342	18.650	20.0	131	79	50	318.68	304.82	290.97	277.11
21295	.7500	19.050	20.0	131	79	50	318.68	304.82	290.97	277.11
21304	.7598	19.300	20.0	131	79	50	318.68	304.82	290.97	277.11
21315	.7677	19.500	20.0	131	79	50	318.68	304.82	290.97	277.11
21325	.7815	19.850	20.0	131	79	50	318.68	304.82	290.97	277.11
21335	.7874	20.000	20.0	131	79	50	318.68	304.82	290.97	277.11

Series 1580H, 1280H

.1181" - .1719"
(3.000mm - 4.366mm)

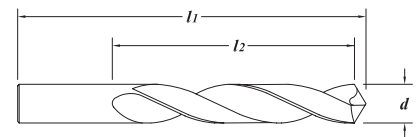


TOLERANCES		
d	+.0000" - .0005" (+.0000 - .0127mm)	
l_1	$\leq 1/8"$	+.125" - .062" (+3.175 - 1.588mm)
	$> 1/8"$	+.125" - .125" (+3.175 - 3.175mm)
l_2	$\leq 1/8"$	+.125" - .062" (+3.175 - 1.588mm)
	$> 1/8"$	+.125" - .125" (+3.175 - 3.175mm)

Recommended for high nickel, high temperature alloys, cobalt-based alloys, stainless steels, and tool steels >40 Rc

AlTiN-based Coating

- 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
- Live tooling recommended on lathe processes



3xD (1580H) EDP#	5xD (1280H) EDP#	d †		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
		Decimal	Diameter Metric						
20301		.1181	3.000	46	16	32.90	31.47	30.04	28.61
	21301	.1181	3.000	50	19	34.39	32.89	31.40	29.90
20306		.1200	#31 3.048	1-13/16"	5/8"	33.24	31.79	30.35	28.90
	21306	.1200	#31 3.048	2"	3/4"	34.66	33.15	31.65	30.14
20311		.1250	1/8" 3.175	1-15/16"	11/16"	33.53	32.08	30.62	29.16
	21311	.1250	1/8" 3.175	2"	3/4"	34.94	33.42	31.90	30.38
20316		.1285	#30 3.264	1-15/16"	11/16"	33.83	32.36	30.89	29.42
	21316	.1285	#30 3.264	2-1/4"	3/4"	35.25	33.72	32.18	30.65
20321		.1360	#29 3.454	2-1/16"	3/4"	34.16	32.67	31.19	29.70
	21321	.1360	#29 3.454	2-1/4"	7/8"	35.51	33.97	32.42	30.88
20326		.1378	3.500	52	19	34.49	32.99	31.49	29.99
	21326	.1378	3.500	57	22	35.80	34.24	32.69	31.13
20331		.1405	#28 3.569	2-1/16"	3/4"	34.81	33.30	31.78	30.27
	21331	.1405	#28 3.569	2-1/4"	7/8"	36.09	34.52	32.95	31.38
20336		.1406	9/64" 3.571	2-1/16"	3/4"	35.11	33.58	32.06	30.53
	21336	.1406	9/64" 3.571	2-1/4"	7/8"	36.40	34.82	33.23	31.65
20341		.1440	#27 3.658	2-1/16"	3/4"	35.42	33.88	32.34	30.80
	21341	.1440	#27 3.658	2-1/4"	7/8"	36.64	35.05	33.45	31.86
20346		.1470	#26 3.734	2-3/16"	13/16"	35.70	34.14	32.59	31.04
	21346	.1470	#26 3.734	2-1/4"	7/8"	36.94	35.33	33.73	32.12
20351		.1495	#25 3.797	2-3/16"	13/16"	36.08	34.51	32.94	31.37
	21351	.1495	#25 3.797	2-1/4"	15/16"	37.21	35.60	33.98	32.36
20356		.1520	#24 3.861	2-3/16"	13/16"	36.36	34.78	33.20	31.62
	21356	.1520	#24 3.861	2-1/4"	15/16"	37.48	35.85	34.22	32.59
20361		.1540	#23 3.912	2-3/16"	13/16"	36.69	35.09	33.50	31.90
	21361	.1540	#23 3.912	2-1/4"	15/16"	37.80	36.16	34.51	32.87
20366		.1562	5/32" 3.967	2-3/16"	13/16"	36.97	35.37	33.76	32.15
	21366	.1562	5/32" 3.967	2-1/2"	15/16"	38.07	36.41	34.76	33.10
20371		.1570	#22 3.988	2-3/16"	13/16"	37.32	35.70	34.07	32.45
	21371	.1570	#22 3.988	2-1/2"	15/16"	38.34	36.67	35.01	33.34
20376		.1575	4.000	56	21	37.62	35.98	34.35	32.71
	21376	.1575	4.000	65	24	38.63	36.95	35.27	33.59
20381		.1590	#21 4.039	2-3/16"	13/16"	37.94	36.29	34.64	32.99
	21381	.1590	#21 4.039	2-1/2"	15/16"	38.90	37.21	35.52	33.83
20386		.1610	#20 4.089	2-3/16"	13/16"	38.26	36.60	34.93	33.27
	21386	.1610	#20 4.089	2-1/2"	15/16"	39.22	37.51	35.81	34.10
20391		.1660	#19 4.216	2-9/32"	15/16"	38.59	36.92	35.24	33.56
	21391	.1660	#19 4.216	2-1/2"	1"	39.49	37.77	36.06	34.34
20396		.1695	#18 4.305	2-9/32"	15/16"	38.89	37.20	35.51	33.82
	21396	.1695	#18 4.305	2-1/2"	1"	39.76	38.03	36.30	34.57
20401		.1719	11/64" 4.366	2-9/32"	15/16"	39.22	37.51	35.81	34.10
	21401	.1719	11/64" 4.366	2-1/2"	1"	40.04	38.30	36.56	34.82

3xD (1580H) EDP#	5xD (1280H) EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
20406		.1730	#17	4.394	2-9/32"	15/16"	39.54	37.82	36.10	34.38
	21406	.1730	#17	4.394	2-1/2"	1"	40.32	38.57	36.81	35.06
20411		.1770	#16	4.496	2-9/32"	15/16"	39.81	38.08	36.35	34.62
	21411	.1770	#16	4.496	2-1/2"	1"	40.63	38.86	37.10	35.33
20416		.1772		4.500	58	24	40.15	38.40	36.66	34.91
	21416	.1772		4.500	65	25	40.92	39.14	37.36	35.58
20421		.1800	#15	4.572	2-9/32"	15/16"	40.42	38.67	36.91	35.15
	21421	.1800	#15	4.572	2-3/4"	1"	41.17	39.38	37.59	35.80
20426		.1820	#14	4.623	2-9/32"	15/16"	40.79	39.02	37.24	35.47
	21426	.1820	#14	4.623	2-3/4"	1"	41.45	39.64	37.84	36.04
20431		.1850	#13	4.700	2-9/32"	15/16"	41.09	39.30	37.52	35.73
	21431	.1850	#13	4.700	2-3/4"	1-1/4"	41.76	39.94	38.13	36.31
20436		.1875	3/16"	4.763	2-13/32"	1"	41.42	39.62	37.82	36.02
	21436	.1875	3/16"	4.763	2-3/4"	1-1/4"	42.06	40.23	38.40	36.57
20441		.1890	#12	4.801	2-13/32"	1"	41.73	39.92	38.10	36.29
	21441	.1890	#12	4.801	2-3/4"	1-1/4"	42.33	40.49	38.65	36.81
20446		.1910	#11	4.851	2-13/32"	1"	42.11	40.28	38.45	36.62
	21446	.1910	#11	4.851	2-3/4"	1-1/4"	42.58	40.73	38.88	37.03
20451		.1935	#10	4.915	2-13/32"	1"	42.37	40.52	38.68	36.84
	21451	.1935	#10	4.915	2-3/4"	1-1/4"	42.88	41.02	39.15	37.29
20456		.1960	#9	4.978	2-13/32"	1"	42.67	40.81	38.96	37.10
	21456	.1960	#9	4.978	3"	1-5/16"	43.15	41.27	39.40	37.52
20461		.1969		5.000	61	25	42.90	41.03	39.17	37.30
	21461	.1969		5.000	75	33	43.45	41.56	39.67	37.78
20466		.1990	#8	5.055	2-13/32"	1"	43.30	41.42	39.53	37.65
	21466	.1990	#8	5.055	3"	1-5/16"	43.68	41.78	39.88	37.98
20471		.2010	#7	5.105	2-13/32"	1"	43.42	41.54	39.65	37.76
	21471	.2010	#7	5.105	3"	1-5/16"	43.87	41.97	40.06	38.15
20476		.2031	13/64"	5.159	2-13/32"	1"	43.71	41.81	39.91	38.01
	21476	.2031	13/64"	5.159	3"	1-5/16"	44.19	42.27	40.35	38.43
20481		.2040	#6	5.182	2-13/32"	1"	44.01	42.10	40.18	38.27
	21481	.2040	#6	5.182	3"	1-3/8"	44.52	42.58	40.65	38.71
20486		.2055	#5	5.220	2-13/32"	1"	44.33	42.41	40.48	38.55
	21486	.2055	#5	5.220	3"	1-3/8"	44.82	42.87	40.92	38.97
20491		.2090	#4	5.309	2-13/32"	1"	44.60	42.66	40.72	38.78
	21491	.2090	#4	5.309	3"	1-3/8"	45.11	43.15	41.19	39.23
20496		.2130	#3	5.410	2-5/8"	1-3/32"	44.90	42.94	40.99	39.04
	21496	.2130	#3	5.410	3"	1-3/8"	45.43	43.45	41.48	39.50
20501		.2165		5.500	67	28	45.18	43.22	41.25	39.29
	21501	.2165		5.500	75	35	45.70	43.71	41.73	39.74
20506		.2188	7/32"	5.558	2-5/8"	1-3/32"	45.55	43.57	41.59	39.61
	21506	.2188	7/32"	5.558	3"	1-3/8"	45.99	43.99	41.99	39.99
20511		.2210	#2	5.613	2-5/8"	1-3/32"	45.89	43.89	41.90	39.90
	21511	.2210	#2	5.613	3"	1-3/8"	46.98	44.94	42.89	40.85
20516		.2280	#1	5.791	2-5/8"	1-3/32"	46.24	44.23	42.22	40.21
	21516	.2280	#1	5.791	3"	1-3/8"	47.22	45.17	43.11	41.06
20521		.2340	A	5.944	2-5/8"	1-3/32"	46.55	44.53	42.50	40.48
	21521	.2340	A	5.944	3-1/4"	1-1/2"	47.92	45.84	43.75	41.67
20526		.2344	15/64"	5.954	2-5/8"	1-3/32"	46.91	44.87	42.83	40.79
	21526	.2344	15/64"	5.954	3-1/4"	1-1/2"	48.05	45.96	43.87	41.78
20531		.2362		6.000	67	28	47.23	45.18	43.12	41.07
	21531	.2362		6.000	80	38	48.20	46.10	44.01	41.91
20536		.2380	B	6.045	2-3/4"	1-7/32"	47.55	45.49	43.42	41.35
	21536	.2380	B	6.045	3-1/4"	1-5/8"	48.33	46.23	44.13	42.03

continued →

Series 1580H, 1280H (continued)

.2420" - .3438"
(6.147mm - 8.733mm)

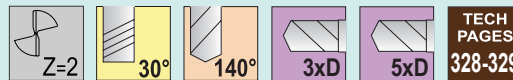
3xD (1580H) EDP#	5xD (1280H) EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
20541		.2420	C	6.147	2-3/4"	1-7/32"	47.93	45.85	43.76	41.68
	21541	.2420	C	6.147	3-1/4"	1-5/8"	48.67	46.55	44.44	42.32
20546		.2460	D	6.248	2-3/4"	1-7/32"	48.20	46.10	44.01	41.91
	21546	.2460	D	6.248	3-1/4"	1-5/8"	48.98	46.85	44.72	42.59
20551		.2500	1/4" / E	6.350	2-3/4"	1-7/32"	48.62	46.51	44.39	42.28
	21551	.2500	1/4" / E	6.350	3-1/4"	1-5/8"	49.25	47.11	44.97	42.83
20556		.2559		6.500	70	31	49.39	47.25	45.10	42.95
	21556	.2559		6.500	80	41	50.13	47.95	45.77	43.59
20561		.2570	F	6.528	2-3/4"	1-7/32"	50.17	47.99	45.81	43.63
	21561	.2570	F	6.528	3-1/4"	1-11/16"	50.99	48.77	46.56	44.34
20566		.2610	G	6.629	2-3/4"	1-7/32"	50.93	48.72	46.50	44.29
	21566	.2610	G	6.629	3-1/2"	1-11/16"	51.87	49.61	47.36	45.10
20571		.2656	17/64"	6.746	2-15/16"	1-11/32"	51.70	49.46	47.21	44.96
	21571	.2656	17/64"	6.746	3-1/2"	1-11/16"	52.70	50.41	48.12	45.83
20576		.2660	H	6.756	2-15/16"	1-11/32"	52.46	50.18	47.90	45.62
	21576	.2660	H	6.756	3-1/2"	1-11/16"	53.60	51.27	48.94	46.61
20581		.2720	I	6.909	2-15/16"	1-11/32"	53.25	50.93	48.62	46.30
	21581	.2720	I	6.909	3-1/2"	1-11/16"	54.46	52.10	49.73	47.36
20586		.2756		7.000	75	34	54.03	51.68	49.33	46.98
	21586	.2756		7.000	88	43	55.30	52.90	50.49	48.09
20591		.2770	J	7.036	2-15/16"	1-11/32"	54.77	52.39	50.01	47.63
	21591	.2770	J	7.036	3-1/2"	1-11/16"	56.18	53.74	51.29	48.85
20596		.2810	K	7.137	2-15/16"	1-11/32"	55.56	53.14	50.73	48.31
	21596	.2810	K	7.137	3-1/2"	1-3/4"	57.07	54.59	52.11	49.63
20601		.2812	9/32"	7.142	2-15/16"	1-11/32"	56.33	53.88	51.43	48.98
	21601	.2812	9/32"	7.142	3-1/2"	1-3/4"	57.94	55.42	52.90	50.38
20606		.2900	L	7.366	2-15/16"	1-11/32"	57.10	54.62	52.13	49.65
	21606	.2900	L	7.366	3-1/2"	1-3/4"	58.73	56.18	53.62	51.07
20611		.2950	M	7.493	2-15/16"	1-11/32"	58.21	55.68	53.15	50.62
	21611	.2950	M	7.493	3-3/4"	1-3/4"	59.57	56.98	54.39	51.80
20616		.2953		7.500	75	34	58.21	55.68	53.15	50.62
	21616	.2953		7.500	95	44	59.57	56.98	54.39	51.80
20621		.2969	19/64"	7.541	3-3/32"	1-15/32"	58.72	56.17	53.61	51.06
	21621	.2969	19/64"	7.541	3-3/4"	1-7/8"	60.17	57.55	54.94	52.32
20626		.3020	N	7.671	3-3/32"	1-15/32"	61.35	58.69	56.02	53.35
	21626	.3020	N	7.671	3-3/4"	1-7/8"	62.55	59.83	57.11	54.39
20631		.3125	5/16"	7.938	3-3/32"	1-15/32"	61.57	58.89	56.22	53.54
	21631	.3125	5/16"	7.938	3-3/4"	1-7/8"	62.74	60.02	57.29	54.56
20636		.3150		8.000	79	37	64.98	62.15	59.33	56.50
	21636	.3150		8.000	95	48	66.14	63.26	60.39	57.51
20641		.3160	O	8.026	3-3/32"	1-15/32"	64.98	62.15	59.33	56.50
	21641	.3160	O	8.026	3-3/4"	1-7/8"	66.14	63.26	60.39	57.51
20646		.3230	P	8.204	3-3/32"	1-15/32"	65.45	62.60	59.76	56.91
	21646	.3230	P	8.204	3-3/4"	2-3/32"	66.38	63.49	60.61	57.72
20651		.3281	21/64"	8.334	3-3/32"	1-15/32"	66.65	63.76	60.86	57.96
	21651	.3281	21/64"	8.334	4"	2-3/32"	67.00	64.09	61.17	58.26
20656		.3320	Q	8.433	3-3/32"	1-15/32"	67.85	64.90	61.95	59.00
	21656	.3320	Q	8.433	4"	2-3/32"	68.33	65.36	62.39	59.42
20661		.3346		8.500	79	37	68.14	65.18	62.21	59.25
	21661	.3346		8.500	100	53	68.83	65.84	62.84	59.85
20666		.3390	R	8.611	3-5/16"	1-9/16"	69.98	66.94	63.89	60.85
	21666	.3390	R	8.611	4"	2-3/32"	70.73	67.65	64.58	61.50
20671		.3438	11/32"	8.733	3-5/16"	1-9/16"	71.51	68.40	65.29	62.18
	21671	.3438	11/32"	8.733	4"	2-3/16"	73.20	70.02	66.83	63.65

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)

Series 1580H, 1280H (continued)

.3480" - .4531"
(8.839mm - 11.509mm)



Recommended for high nickel, high temperature alloys, cobalt-based alloys, stainless steels, and tool steels >40 Rc

AlTiN-based Coating

High performance - high penetration solid submicron grain carbide drill



HIGH PERFORMANCE DRILLS

3xD (1580H) EDP#	5xD (1280H) 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							
20676		.3480	S	8.839	3-5/16"	1-9/16"	73.88	70.66	67.45	64.24
	21676	.3480	S	8.839	4"	2-3/16"	76.06	72.75	69.45	66.14
20681		.3543		9.000	84	40	75.75	72.46	69.16	65.87
	21681	.3543		9.000	100	56	76.51	73.18	69.86	66.53
20686		.3580	T	9.093	3-5/16"	1-9/16"	78.72	75.30	71.87	68.45
	21686	.3580	T	9.093	4-1/4"	2-9/32"	79.53	76.08	72.62	69.16
20691		.3594	23/64"	9.129	3-5/16"	1-9/16"	79.21	75.77	72.32	68.88
	21691	.3594	23/64"	9.129	4-1/4"	2-9/32"	80.02	76.54	73.06	69.58
20696		.3680	U	9.347	3-5/16"	1-9/16"	80.86	77.34	73.83	70.31
	21696	.3680	U	9.347	4-1/4"	2-9/32"	84.57	80.89	77.22	73.54
20701		.3740		9.500	84	40	81.54	77.99	74.45	70.90
	21701	.3740		9.500	105	58	85.40	81.69	77.97	74.26
20706		.3750	3/8"	9.525	3-1/2"	1-11/16"	82.02	78.45	74.89	71.32
	21706	.3750	3/8"	9.525	4-1/4"	2-3/8"	86.25	82.50	78.75	75.00
20711		.3770	V	9.576	3-1/2"	1-11/16"	85.17	81.47	77.76	74.06
	21711	.3770	V	9.576	4-1/4"	2-3/8"	88.37	84.52	80.68	76.84
20716		.3860	W	9.804	3-1/2"	1-11/16"	86.66	82.90	79.13	75.36
	21716	.3860	W	9.804	4-1/2"	2-3/8"	89.93	86.02	82.11	78.20
20721		.3906	25/64"	9.921	3-1/2"	1-11/16"	87.75	83.93	80.12	76.30
	21721	.3906	25/64"	9.921	4-1/2"	2-3/8"	91.01	87.05	83.10	79.14
20726		.3937		10.000	89	43	90.40	86.47	82.54	78.61
	21726	.3937		10.000	115	60	93.76	89.68	85.61	81.53
20731		.3970	X	10.084	3-1/2"	1-11/16"	91.63	87.65	83.66	79.68
	21731	.3970	X	10.084	4-1/2"	2-1/2"	94.90	90.77	86.65	82.52
20736		.4040	Y	10.262	3-1/2"	1-11/16"	92.23	88.22	84.21	80.20
	21736	.4040	Y	10.262	4-1/2"	2-9/16"	97.76	93.51	89.26	85.01
20741		.4062	13/32"	10.317	3-1/2"	1-11/16"	95.08	90.95	86.81	82.68
	21741	.4062	13/32"	10.317	4-1/2"	2-9/16"	98.61	94.33	90.04	85.75
20746		.4130	Z	10.490	3-1/2"	1-11/16"	95.97	91.80	87.62	83.45
	21746	.4130	Z	10.490	4-1/2"	2-5/8"	99.51	95.18	90.86	86.53
20751		.4134		10.500	89	43	95.97	91.80	87.62	83.45
	21751	.4134		10.500	115	67	99.51	95.18	90.86	86.53
20756		.4219	27/64"	10.716	3-3/4"	1-13/16"	96.88	92.66	88.45	84.24
	21756	.4219	27/64"	10.716	4-1/2"	2-11/16"	100.41	96.04	91.68	87.31
20761		.4331		11.000	95	46	103.98	99.46	94.94	90.42
	21761	.4331		11.000	115	68	107.73	103.05	98.36	93.68
20766		.4375	7/16"	11.113	3-3/4"	1-13/16"	103.98	99.46	94.94	90.42
	21766	.4375	7/16"	11.113	4-3/4"	2-13/16"	108.17	103.47	98.76	94.06
20771		.4528		11.500	95	46	111.61	106.76	101.90	97.05
	21771	.4528		11.500	120	71	115.59	110.56	105.54	100.51
20776		.4531	29/64"	11.509	3-3/4"	1-13/16"	111.61	106.76	101.90	97.05
	21776	.4531	29/64"	11.509	4-3/4"	2-7/8"	115.59	110.56	105.54	100.51

continued →

Series 1580H, 1280H (continued)

.4688" - .6299"
(11.908mm - 16.000mm)

3xD (1580H) EDP#	5xD (1280H) EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
20781		.4688	15/32"	11.908	4"	1-15/16"	117.27	112.17	107.07	101.97
	21781	.4688	15/32"	11.908	4-3/4"	2-7/8"	121.39	116.12	110.84	105.56
20786		.4724		12.000	102	49	117.61	112.50	107.38	102.27
	21786	.4724		12.000	120	73	121.76	116.47	111.17	105.88
20791		.4844	31/64"	12.304	4"	1-15/16"	118.43	113.28	108.13	102.98
	21791	.4844	31/64"	12.304	5-5/16"	3"	123.12	117.77	112.41	107.06
20796		.4921		12.500	102	49	119.60	114.40	109.20	104.00
	21796	.4921		12.500	135	76	124.59	119.17	113.76	108.34
20801		.5000	1/2"	12.700	4"	1-15/16"	120.37	115.14	109.90	104.67
	21801	.5000	1/2"	12.700	5-3/8"	3-1/16"	124.84	119.42	113.99	108.56
20806		.5118		13.000	107	53	131.93	126.19	120.46	114.72
	21806	.5118		13.000	135	78	135.76	129.86	123.95	118.05
20811		.5156	33/64"	13.096	4-7/32"	2-3/32"	135.06	129.18	123.31	117.44
	21811	.5156	33/64"	13.096	5-3/8"	3-1/8"	138.93	132.89	126.85	120.81
20816		.5312	17/32"	13.492	4-7/32"	2-3/32"	138.16	132.15	126.15	120.14
	21816	.5312	17/32"	13.492	5-11/16"	3-5/16"	142.20	136.02	129.83	123.65
20821		.5315		13.500	110	56	141.29	135.15	129.00	122.86
	21821	.5315		13.500	145	84	145.34	139.02	132.70	126.38
20826		.5469	35/64"	13.891	4-5/16"	2-7/32"	144.38	138.11	131.83	125.55
	21826	.5469	35/64"	13.891	5-13/16"	3-3/8"	148.50	142.04	135.59	129.13
20831		.5512		14.000	110	56	147.50	141.09	134.67	128.26
	21831	.5512		14.000	145	86	151.71	145.11	138.52	131.92
20836		.5625	9/16"	14.288	4-9/16"	2-15/32"	158.78	151.88	144.97	138.07
	21836	.5625	9/16"	14.288	5-15/16"	3-1/2"	163.04	155.95	148.86	141.77
20841		.5709		14.500	116	63	161.76	154.73	147.69	140.66
	21841	.5709		14.500	150	89	166.04	158.82	151.60	144.38
20846		.5781	37/64"	14.684	4-15/16"	2-9/16"	164.66	157.50	150.34	143.18
	21846	.5781	37/64"	14.684	6"	3-1/2"	169.02	161.67	154.32	146.97
20851		.5906		15.000	125	65	167.69	160.40	153.11	145.82
	21851	.5906		15.000	150	90	172.19	164.70	157.22	149.73
20856		.5938	19/32"	15.083	4-15/16"	2-9/16"	168.60	161.27	153.94	146.61
	21856	.5938	19/32"	15.083	6"	3-9/16"	173.08	165.55	158.03	150.50
20861		.6094	39/64"	15.479	5-1/16"	2-13/16"	169.46	162.10	154.73	147.36
	21861	.6094	39/64"	15.479	6-3/16"	3-11/16"	187.57	179.41	171.26	163.10
20866		.6102		15.500	129	71	170.34	162.93	155.53	148.12
	21866	.6102		15.500	160	94	188.43	180.24	172.04	163.85
20871		.6250	5/8"	15.875	5-1/4"	3-1/8"	171.20	163.76	156.31	148.87
	21871	.6250	5/8"	15.875	6-5/16"	3-3/4"	189.31	181.08	172.85	164.62
20876		.6299		16.000	133	79	175.32	167.70	160.07	152.45
	21876	.6299		16.000	160	95	193.56	185.14	176.73	168.31

TOLERANCES		
d_1 *	3mm - 6mm	+0.016mm +0.004mm (+0.0063" +0.0015")
	> 6mm - 10mm	+0.021mm +0.006mm (+0.0082" +0.0023")
	> 10mm - 18mm	+0.025mm +0.007mm (+0.0098" +0.0027")
	> 18mm - 20mm	+0.029mm +0.008mm (+0.0114" +0.0031")
d_2	h6	
l_1	+3.175mm -3.175mm (+.125" -.125")	
l_2	+3.175mm -3.175mm (+.125" -.125")	
l_4	+1.980mm -.000mm (+.078" -.000")	

**NEW
ITEMS**

Series 1580KD, 1280KD, 1880KD



**TECH
PAGES
328-329**

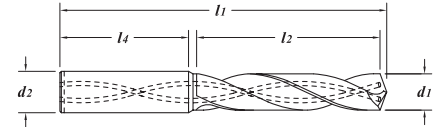
.1181" - .1470"
(3.000mm - 3.734mm)

**HIGH PERFORMANCE
DRILLS**

Recommended for high nickel, high temperature alloys, cobalt-based alloys, stainless steels, and tool steels >40 Rc

AlTiN-based Coating

- High performance solid submicron grain carbide drill with reinforced shank
- 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
- Can be used as a pilot drill
- 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.

	3xD (1580KD) EDP#	5xD (1280KD) EDP#	7xD (1880KD) 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									
	27995			.1181	3.000	6.0	62	20	36	60.57	57.94	55.30	52.67	
		25065		.1181	3.000	6.0	66	28	36	71.50	68.39	65.28	62.17	
NEW			26942	.1181	3.000	6.0	70	30	36	85.82	82.09	78.36	74.63	
	28005			.1220	3.100	6.0	62	20	36	60.57	57.94	55.30	52.67	
		25075		.1220	3.100	6.0	66	28	36	71.50	68.39	65.28	62.17	
	28015			.1248	3.170	6.0	62	20	36	60.57	57.94	55.30	52.67	
		25085		.1248	3.170	6.0	66	28	36	71.50	68.39	65.28	62.17	
NEW			26946	.1248	3.170	6.0	70	30	36	85.82	82.09	78.36	74.63	
NEW	28018			.1250	1/8"	3.175	6.0	62	20	36	60.57	57.94	55.30	52.67
NEW		25088		.1250	1/8"	3.175	6.0	66	28	36	71.50	68.39	65.28	62.17
NEW			26948	.1250	1/8"	3.175	6.0	70	30	36	85.82	82.09	78.36	74.63
	28025			.1260	3.200	6.0	62	20	36	60.57	57.94	55.30	52.67	
		25095		.1260	3.200	6.0	66	28	36	71.50	68.39	65.28	62.17	
NEW			26950	.1260	3.200	6.0	70	30	36	85.82	82.09	78.36	74.63	
	28035			.1280	3.250	6.0	62	20	36	60.57	57.94	55.30	52.67	
		25105		.1280	3.250	6.0	66	28	36	71.50	68.39	65.28	62.17	
NEW			26952	.1280	3.250	6.0	70	30	36	85.82	82.09	78.36	74.63	
NEW	28038			.1285	#30	3.264	6.0	62	20	36	60.57	57.94	55.30	52.67
NEW		25108		.1285	#30	3.264	6.0	66	28	36	71.50	68.39	65.28	62.17
NEW			26954	.1285	#30	3.264	6.0	70	30	36	85.82	82.09	78.36	74.63
	28045			.1299	3.300	6.0	62	20	36	60.57	57.94	55.30	52.67	
		25115		.1299	3.300	6.0	66	28	36	71.50	68.39	65.28	62.17	
NEW			26956	.1299	3.300	6.0	70	30	36	85.82	82.09	78.36	74.63	
	28055			.1339	3.400	6.0	62	20	36	60.57	57.94	55.30	52.67	
		25125		.1339	3.400	6.0	66	28	36	71.50	68.39	65.28	62.17	
NEW	28058			.1360	#29	3.454	6.0	62	20	36	60.57	57.94	55.30	52.67
NEW		25128		.1360	#29	3.454	6.0	66	28	36	71.50	68.39	65.28	62.17
NEW			26960	.1360	#29	3.454	6.0	70	30	36	85.82	82.09	78.36	74.63
	28065			.1378	3.500	6.0	62	20	36	60.57	57.94	55.30	52.67	
		25135		.1378	3.500	6.0	66	28	36	71.50	68.39	65.28	62.17	
NEW			26962	.1378	3.500	6.0	75	37	36	85.82	82.09	78.36	74.63	
	28075			.1417	3.600	6.0	62	20	36	60.57	57.94	55.30	52.67	
		25145		.1417	3.600	6.0	66	28	36	71.50	68.39	65.28	62.17	
	28085			.1457	3.700	6.0	62	20	36	60.57	57.94	55.30	52.67	
		25155		.1457	3.700	6.0	66	28	36	71.50	68.39	65.28	62.17	
NEW	28088			.1470	#26	3.734	6.0	62	20	36	60.57	57.94	55.30	52.67
NEW		25158		.1470	#26	3.734	6.0	66	28	36	71.50	68.39	65.28	62.17
NEW			26968	.1470	#26	3.734	6.0	75	37	36	85.82	82.09	78.36	74.63

continued →

Series 1580KD, 1280KD, 1880KD (continued)

.1476" - .1820"
(3.750mm - 4.622mm)

	3xD (1580KD) EDP#	5xD (1280KD) EDP#	7xD (1880KD) 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								
	28095			.1476	3.750	6.0	62	20	36	60.57	57.94	55.30	52.67
		25165		.1476	3.750	6.0	66	28	36	71.50	68.39	65.28	62.17
NEW			26972	.1476	3.750	6.0	75	37	36	85.82	82.09	78.36	74.63
NEW	28098			.1495	#25 3.797	6.0	62	20	36	60.57	57.94	55.30	52.67
NEW		25172		.1495	#25 3.797	6.0	66	28	36	71.50	68.39	65.28	62.17
NEW			26978	.1495	#25 3.797	6.0	75	37	36	85.82	82.09	78.36	74.63
	28105			.1496	3.800	6.0	66	24	36	60.57	57.94	55.30	52.67
		25175		.1496	3.800	6.0	74	36	36	71.50	68.39	65.28	62.17
	28115			.1535	3.900	6.0	66	24	36	60.57	57.94	55.30	52.67
			25185	.1535	3.900	6.0	74	36	36	71.50	68.39	65.28	62.17
NEW			26982	.1535	3.900	6.0	75	37	36	85.82	82.09	78.36	74.63
NEW	28118			.1562	5/32" 3.967	6.0	66	24	36	60.57	57.94	55.30	52.67
NEW		25192		.1562	5/32" 3.967	6.0	74	36	36	71.50	68.39	65.28	62.17
NEW			26984	.1562	5/32" 3.967	6.0	75	37	36	85.82	82.09	78.36	74.63
	28125			.1563	3.970	6.0	66	24	36	60.57	57.94	55.30	52.67
		25195		.1563	3.970	6.0	74	36	36	71.50	68.39	65.28	62.17
	28135			.1575	4.000	6.0	66	24	36	60.57	57.94	55.30	52.67
		25205		.1575	4.000	6.0	74	36	36	71.50	68.39	65.28	62.17
NEW			26986	.1575	4.000	6.0	75	37	36	85.82	82.09	78.36	74.63
NEW	28138			.1590	#21 4.038	6.0	66	24	36	60.57	57.94	55.30	52.67
NEW		25208		.1590	#21 4.038	6.0	74	36	36	71.50	68.39	65.28	62.17
NEW			26988	.1590	#21 4.038	6.0	75	37	36	85.82	82.09	78.36	74.63
NEW	28140			.1610	#20 4.089	6.0	66	24	36	60.57	57.94	55.30	52.67
NEW		25212		.1610	#20 4.089	6.0	74	36	36	71.50	68.39	65.28	62.17
NEW			26990	.1610	#20 4.089	6.0	75	37	36	85.82	82.09	78.36	74.63
	28145			.1614	4.100	6.0	66	24	36	60.57	57.94	55.30	52.67
		25215		.1614	4.100	6.0	74	36	36	71.50	68.39	65.28	62.17
NEW			26992	.1614	4.100	6.0	75	37	36	85.82	82.09	78.36	74.63
	28155			.1654	4.200	6.0	66	24	36	60.57	57.94	55.30	52.67
		25225		.1654	4.200	6.0	74	36	36	71.50	68.39	65.28	62.17
NEW			26994	.1654	4.200	6.0	75	37	36	85.82	82.09	78.36	74.63
NEW	28158			.1660	#19 4.216	6.0	66	24	36	60.57	57.94	55.30	52.67
NEW		25228		.1660	#19 4.216	6.0	74	36	36	71.50	68.39	65.28	62.17
NEW			26996	.1660	#19 4.216	6.0	85	45	36	85.82	82.09	78.36	74.63
	28165			.1673	4.250	6.0	66	24	36	60.57	57.94	55.30	52.67
		25235		.1673	4.250	6.0	74	36	36	71.50	68.39	65.28	62.17
NEW			26998	.1673	4.250	6.0	85	45	36	85.82	82.09	78.36	74.63
	28175			.1693	4.300	6.0	66	24	36	60.57	57.94	55.30	52.67
		25245		.1693	4.300	6.0	74	36	36	71.50	68.39	65.28	62.17
NEW	28178			.1719	11/64" 4.366	6.0	66	24	36	60.57	57.94	55.30	52.67
NEW		25248		.1719	11/64" 4.366	6.0	74	36	36	71.50	68.39	65.28	62.17
NEW			27002	.1719	11/64" 4.366	6.0	85	45	36	85.82	82.09	78.36	74.63
	28185			.1732	4.400	6.0	66	24	36	60.57	57.94	55.30	52.67
		25255		.1732	4.400	6.0	74	36	36	71.50	68.39	65.28	62.17
NEW			27004	.1732	4.400	6.0	85	45	36	85.82	82.09	78.36	74.63
NEW	28188			.1770	#16 4.496	6.0	66	24	36	60.57	57.94	55.30	52.67
NEW		25262		.1770	#16 4.496	6.0	74	36	36	71.50	68.39	65.28	62.17
NEW			27006	.1770	#16 4.496	6.0	85	45	36	85.82	82.09	78.36	74.63
	28195			.1772	4.500	6.0	66	24	36	60.57	57.94	55.30	52.67
		25265		.1772	4.500	6.0	74	36	36	71.50	68.39	65.28	62.17
NEW			27008	.1772	4.500	6.0	85	45	36	85.82	82.09	78.36	74.63
	28205			.1811	4.600	6.0	66	24	36	60.57	57.94	55.30	52.67
		25275		.1811	4.600	6.0	74	36	36	71.50	68.39	65.28	62.17
NEW			27011	.1811	4.600	6.0	85	45	36	85.82	82.09	78.36	74.63
NEW	28208			.1820	#14 4.622	6.0	66	24	36	60.57	57.94	55.30	52.67
NEW		25280		.1820	#14 4.622	6.0	74	36	36	71.50	68.39	65.28	62.17
NEW			27012	.1820	#14 4.622	6.0	90	50	36	85.82	82.09	78.36	74.63

Series 1580KD, 1280KD, 1880KD (continued)

.1831" - .2283"
(4.650mm - 5.800mm)

HIGH PERFORMANCE
DRILLS

	3xD (1580KD) EDP#	5xD (1280KD) EDP#	7xD (1880KD) EDP#	<i>d</i> ₁ Diameter		<i>d</i> ₂ Shank Diameter	<i>l</i> ₁ Overall Length	<i>l</i> ₂ Flute Length	<i>l</i> ₄ Shank Length	1-11	12-24	25-49	50-100
				Decimal	Metric								
		25285		.1831	4.650	6.0	74	36	36	71.50	68.39	65.28	62.17
NEW			27014	.1831	4.650	6.0	90	50	36	85.82	82.09	78.36	74.63
	28225			.1850	4.700	6.0	66	24	36	60.57	57.94	55.30	52.67
		25295		.1850	4.700	6.0	74	36	36	71.50	68.39	65.28	62.17
	28235			.1870	4.750	6.0	66	24	36	60.57	57.94	55.30	52.67
		25305		.1870	4.750	6.0	74	36	36	71.50	68.39	65.28	62.17
NEW			27016	.1870	4.750	6.0	90	50	36	85.82	82.09	78.36	74.63
NEW	28238			.1875	3/16"	4.762	6.0	66	28	60.57	57.94	55.30	52.67
NEW		25310		.1875	3/16"	4.762	6.0	74	36	68.75	65.76	62.77	59.78
NEW			27018	.1875	3/16"	4.762	6.0	90	50	85.82	82.09	78.36	74.63
	28245			.1890	#12	4.800	6.0	66	28	60.57	57.94	55.30	52.67
		25315		.1890	#12	4.800	6.0	82	44	71.50	68.39	65.28	62.17
NEW			27021	.1890	#12	4.800	6.0	90	50	85.82	82.09	78.36	74.63
	28255			.1929	4.900	6.0	66	28	36	60.57	57.94	55.30	52.67
		25325		.1929	4.900	6.0	82	44	36	71.50	68.39	65.28	62.17
NEW			27022	.1929	4.900	6.0	90	50	36	85.82	82.09	78.36	74.63
NEW	28258			.1960	#9	4.978	6.0	66	28	60.57	57.94	55.30	52.67
NEW		25330		.1960	#9	4.978	6.0	82	44	71.50	68.39	65.28	62.17
NEW			27024	.1960	#9	4.978	6.0	90	50	85.82	82.09	78.36	74.63
	28265			.1969	5.000	6.0	66	28	36	60.57	57.94	55.30	52.67
		25335		.1969	5.000	6.0	82	44	36	71.50	68.39	65.28	62.17
NEW			27026	.1969	5.000	6.0	90	50	36	85.82	82.09	78.36	74.63
	28275			.2008	5.100	6.0	66	28	36	60.57	57.94	55.30	52.67
		25345		.2008	5.100	6.0	82	44	36	71.50	68.39	65.28	62.17
NEW	28278			.2010	#7	5.105	6.0	66	28	60.57	57.94	55.30	52.67
NEW		25348		.2010	#7	5.105	6.0	82	44	71.50	68.39	65.28	62.17
NEW			27031	.2010	#7	5.105	6.0	97	57	85.82	82.09	78.36	74.63
	28285			.2027	5.150	6.0	66	28	36	60.57	57.94	55.30	52.67
		25355		.2027	5.150	6.0	82	44	36	71.50	68.39	65.28	62.17
	28295			.2047	5.200	6.0	66	28	36	60.57	57.94	55.30	52.67
		25365		.2047	5.200	6.0	82	44	36	71.50	68.39	65.28	62.17
	28305			.2087	5.300	6.0	66	28	36	60.57	57.94	55.30	52.67
		25375		.2087	5.300	6.0	82	44	36	71.50	68.39	65.28	62.17
NEW	28308			.2130	#3	5.410	6.0	66	28	60.57	57.94	55.30	52.67
NEW		25380		.2130	#3	5.410	6.0	82	44	71.50	68.39	65.28	62.17
NEW			27036	.2130	#3	5.410	6.0	97	57	85.82	82.09	78.36	74.63
	28315			.2165	5.500	6.0	66	28	36	60.57	57.94	55.30	52.67
		25385		.2165	5.500	6.0	82	44	36	71.50	68.39	65.28	62.17
NEW			27038	.2165	5.500	6.0	97	57	36	85.82	82.09	78.36	74.63
	28325			.2185	5.550	6.0	66	28	36	60.57	57.94	55.30	52.67
		25395		.2185	5.550	6.0	82	44	36	71.50	68.39	65.28	62.17
NEW	28328			.2188	7/32"	5.557	6.0	66	28	60.57	57.94	55.30	52.67
NEW		25398		.2188	7/32"	5.557	6.0	82	44	71.50	68.39	65.28	62.17
NEW			27041	.2188	7/32"	5.557	6.0	97	57	85.82	82.09	78.36	74.63
	28335			.2205	5.600	6.0	66	28	36	60.57	57.94	55.30	52.67
		25397		.2205	5.600	6.0	82	44	36	71.50	68.39	65.28	62.17
NEW			27042	.2205	5.600	6.0	97	57	36	85.82	82.09	78.36	74.63
	28345			.2244	5.700	6.0	66	28	36	60.57	57.94	55.30	52.67
		25400		.2244	5.700	6.0	82	44	36	71.50	68.39	65.28	62.17
NEW			27044	.2244	5.700	6.0	97	57	36	85.82	82.09	78.36	74.63
NEW	28348			.2280	#1	5.791	6.0	66	28	60.57	57.94	55.30	52.67
NEW		25403		.2280	#1	5.791	6.0	82	44	71.50	68.39	65.28	62.17
NEW			27046	.2280	#1	5.791	6.0	97	57	85.82	82.09	78.36	74.63
	28355			.2283	5.800	6.0	66	28	36	60.57	57.94	55.30	52.67
		25405		.2283	5.800	6.0	82	44	36	71.50	68.39	65.28	62.17
			27048	.2283	5.800	6.0	97	57	36	85.82	82.09	78.36	74.63

continued →

Series 1580KD, 1280KD, 1880KD (continued)

.2323" - .2812"
(5.900mm - 7.142mm)

	3xD (1580KD) EDP#	5xD (1280KD) EDP#	7xD (1880KD) 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								
	28365			.2323	5.900	6.0	66	28	36	60.57	57.94	55.30	52.67
		25415		.2323	5.900	6.0	82	44	36	71.50	68.39	65.28	62.17
NEW			27051	.2323	5.900	6.0	97	57	36	85.82	82.09	78.36	74.63
	28375			.2342	5.950	6.0	66	28	36	60.57	57.94	55.30	52.67
		25425		.2342	5.950	6.0	82	44	36	71.50	68.39	65.28	62.17
NEW			27052	.2342	5.950	6.0	97	57	36	85.82	82.09	78.36	74.63
	28385			.2362	6.000	6.0	66	28	36	60.57	57.94	55.30	52.67
		25435		.2362	6.000	6.0	82	44	36	71.50	68.39	65.28	62.17
NEW			27054	.2362	6.000	6.0	97	57	36	85.82	82.09	78.36	74.63
	28395			.2402	6.100	8.0	79	34	36	84.39	80.72	77.05	73.38
		25437		.2402	6.100	8.0	91	53	36	100.53	96.16	91.79	87.42
	28405			.2441	6.200	8.0	79	34	36	84.39	80.72	77.05	73.38
		25440		.2441	6.200	8.0	91	53	36	100.53	96.16	91.79	87.42
	28415			.2480	6.300	8.0	79	34	36	84.39	80.72	77.05	73.38
		25443		.2480	6.300	8.0	91	53	36	100.53	96.16	91.79	87.42
	28425			.2500	6.350	8.0	79	34	36	84.39	80.72	77.05	73.38
		25445		.2500	6.350	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW			27056	.2500	6.350	8.0	106	66	36	121.37	116.09	110.82	105.54
	28435			.2520	6.400	8.0	79	34	36	84.39	80.72	77.05	73.38
		25450		.2520	6.400	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW			27058	.2520	6.400	8.0	106	66	36	121.37	116.09	110.82	105.54
	28445			.2559	6.500	8.0	79	34	36	84.39	80.72	77.05	73.38
		25455		.2559	6.500	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW			27061	.2559	6.500	8.0	106	66	36	121.37	116.09	110.82	105.54
	28446			.2571	6.530	8.0	79	34	36	84.39	80.72	77.05	73.38
		25457		.2571	6.530	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW			27062	.2571	6.530	8.0	106	66	36	121.37	116.09	110.82	105.54
	28455			.2598	6.600	8.0	79	34	36	84.39	80.72	77.05	73.38
		25460		.2598	6.600	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW			27064	.2598	6.600	8.0	106	66	36	121.37	116.09	110.82	105.54
		25463		.2638	6.700	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW			27066	.2638	6.700	8.0	106	66	36	121.37	116.09	110.82	105.54
NEW	28463			.2656	6.746	8.0	79	34	36	84.39	80.72	77.05	73.38
NEW		25464		.2656	6.746	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW			27068	.2656	6.746	8.0	106	66	36	121.37	116.09	110.82	105.54
	28465			.2657	6.750	8.0	79	34	36	84.39	80.72	77.05	73.38
		25465		.2657	6.750	8.0	91	53	36	100.53	96.16	91.79	87.42
	28475			.2677	6.800	8.0	79	34	36	84.39	80.72	77.05	73.38
		25475		.2677	6.800	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW			27071	.2677	6.800	8.0	106	66	36	121.37	116.09	110.82	105.54
	28485			.2717	6.900	8.0	79	34	36	84.39	80.72	77.05	73.38
		25485		.2717	6.900	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW			27072	.2717	6.900	8.0	116	76	36	121.37	116.09	110.82	105.54
	28495			.2756	7.000	8.0	79	34	36	84.39	80.72	77.05	73.38
		25495		.2756	7.000	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW			27074	.2756	7.000	8.0	116	76	36	121.37	116.09	110.82	105.54
NEW	28498			.2770	7.035	8.0	79	41	36	84.39	80.72	77.05	73.38
NEW		25498		.2770	7.035	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW			27076	.2770	7.035	8.0	116	76	36	121.37	116.09	110.82	105.54
	28505			.2795	7.100	8.0	79	41	36	84.39	80.72	77.05	73.38
		25505		.2795	7.100	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW	28508			.2812	7.142	8.0	79	41	36	84.39	80.72	77.05	73.38
NEW		25512		.2812	7.142	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW			27079	.2812	7.142	8.0	116	76	36	121.37	116.09	110.82	105.54

Series 1580KD, 1280KD, 1880KD (continued)

.2815" - .3386"
(7.150mm - 8.600mm)

HIGH PERFORMANCE
DRILLS

	3xD (1580KD) EDP#	5xD (1280KD) EDP#	7xD (1880KD) 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								
	28515			.2815	7.150	8.0	79	41	36	84.39	80.72	77.05	73.38
		25515		.2815	7.150	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW			27082	.2815	7.150	8.0	116	76	36	121.37	116.09	110.82	105.54
	28525			.2835	7.200	8.0	79	41	36	84.39	80.72	77.05	73.38
		25525		.2835	7.200	8.0	91	53	36	100.53	96.16	91.79	87.42
	28535			.2874	7.300	8.0	79	41	36	84.39	80.72	77.05	73.38
		25530		.2874	7.300	8.0	91	53	36	100.53	96.16	91.79	87.42
	28545			.2913	7.400	8.0	79	41	36	84.39	80.72	77.05	73.38
		25535		.2913	7.400	8.0	91	53	36	100.53	96.16	91.79	87.42
	28555			.2953	7.500	8.0	79	41	36	84.39	80.72	77.05	73.38
		25545		.2953	7.500	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW			27086	.2953	7.500	8.0	116	76	36	121.37	116.09	110.82	105.54
	28565			.2972	7.550	8.0	79	41	36	84.39	80.72	77.05	73.38
		25555		.2972	7.550	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW			27088	.2972	7.550	8.0	116	76	36	121.37	116.09	110.82	105.54
	28575			.2992	7.600	8.0	79	41	36	84.39	80.72	77.05	73.38
		25565		.2992	7.600	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW	28578			.3020	N 7.670	8.0	79	41	36	84.39	80.72	77.05	73.38
NEW		25570		.3020	N 7.670	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW			27092	.3020	N 7.670	8.0	116	76	36	121.37	116.09	110.82	105.54
	28585			.3031	7.700	8.0	79	41	36	84.39	80.72	77.05	73.38
		25575		.3031	7.700	8.0	91	53	36	100.53	96.16	91.79	87.42
	28595			.3071	7.800	8.0	79	41	36	84.39	80.72	77.05	73.38
		25585		.3071	7.800	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW			27096	.3071	7.800	8.0	116	76	36	121.37	116.09	110.82	105.54
NEW	28602			.3125	5/16" 7.937	8.0	79	41	36	84.39	80.72	77.05	73.38
NEW		25593		.3125	5/16" 7.937	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW			27101	.3125	5/16" 7.937	8.0	116	76	36	121.37	116.09	110.82	105.54
	28605			.3130	7.950	8.0	79	41	36	84.39	80.72	77.05	73.38
		25595		.3130	7.950	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW			27102	.3130	7.950	8.0	116	76	36	121.37	116.09	110.82	105.54
	28615			.3150	8.000	8.0	79	41	36	84.39	80.72	77.05	73.38
		25605		.3150	8.000	8.0	91	53	36	100.53	96.16	91.79	87.42
NEW			27104	.3150	8.000	8.0	116	76	36	121.37	116.09	110.82	105.54
	28625			.3189	8.100	10.0	89	47	40	113.71	108.77	103.82	98.88
		25610		.3189	8.100	10.0	103	61	40	129.52	123.89	118.26	112.63
	28635			.3228	8.200	10.0	89	47	40	113.71	108.77	103.82	98.88
		25615		.3228	8.200	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW	28638			.3230	P 8.204	10.0	89	47	40	113.71	108.77	103.82	98.88
NEW		25618		.3230	P 8.204	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW			27108	.3230	P 8.204	10.0	131	87	40	165.51	158.31	151.12	143.92
	28645			.3268	8.300	10.0	89	47	40	113.71	108.77	103.82	98.88
		25625		.3268	8.300	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW	28648			.3281	21/64" 8.333	10.0	89	47	40	113.71	108.77	103.82	98.88
NEW		25628		.3281	21/64" 8.333	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW			27112	.3281	21/64" 8.333	10.0	131	87	40	165.51	158.31	151.12	143.92
	28655			.3287	8.350	10.0	89	47	40	113.71	108.77	103.82	98.88
		25635		.3287	8.350	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW			27114	.3287	8.350	10.0	131	87	40	165.51	158.31	151.12	143.92
	28665			.3307	8.400	10.0	89	47	40	113.71	108.77	103.82	98.88
		25640		.3307	8.400	10.0	103	61	40	129.52	123.89	118.26	112.63
	28675			.3346	8.500	10.0	89	47	40	113.71	108.77	103.82	98.88
		25645		.3346	8.500	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW			27118	.3346	8.500	10.0	131	87	40	165.51	158.31	151.12	143.92
	28685			.3386	8.600	10.0	89	47	40	113.71	108.77	103.82	98.88
		25655		.3386	8.600	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW			27121	.3386	8.600	10.0	131	87	40	165.51	158.31	151.12	143.92

continued →

Series 1580KD, 1280KD, 1880KD (continued)

.3390" - .3906"
(8.610mm - 9.920mm)

	3xD (1580KD) EDP#	5xD (1280KD) EDP#	7xD (1880KD) 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								
NEW	28688			.3390	R 8.610	10.0	89	47	40	113.71	108.77	103.82	98.88
NEW		25658		.3390	R 8.610	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW			27122	.3390	R 8.610	10.0	131	87	40	165.51	158.31	151.12	143.92
	28695			.3425	8.700	10.0	89	47	40	113.71	108.77	103.82	98.88
		25665		.3425	8.700	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW			27124	.3425	8.700	10.0	131	87	40	165.51	158.31	151.12	143.92
NEW	28698			.3438	11/32" 8.732	10.0	89	47	40	113.71	108.77	103.82	98.88
NEW		25670		.3438	11/32" 8.732	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW			27126	.3438	11/32" 8.732	10.0	131	87	40	165.51	158.31	151.12	143.92
	28725			.3445	8.750	10.0	89	47	40	113.71	108.77	103.82	98.88
		25675		.3445	8.750	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW			27128	.3445	8.750	10.0	131	87	40	165.51	158.31	151.12	143.92
	28735			.3465	8.800	10.0	89	47	40	113.71	108.77	103.82	98.88
		25685		.3465	8.800	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW			27130	.3465	8.800	10.0	131	87	40	165.51	158.31	151.12	143.92
	28745			.3504	8.900	10.0	89	47	40	113.71	108.77	103.82	98.88
		25695		.3504	8.900	10.0	103	61	40	129.52	123.89	118.26	112.63
	28755			.3543	9.000	10.0	89	47	40	113.71	108.77	103.82	98.88
		25705		.3543	9.000	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW			27134	.3543	9.000	10.0	131	87	40	165.51	158.31	151.12	143.92
	28765			.3583	9.100	10.0	89	47	40	113.71	108.77	103.82	98.88
		25715		.3583	9.100	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW	28768			.3594	23/64" 9.128	10.0	89	47	40	113.71	108.77	103.82	98.88
NEW		25720		.3594	23/64" 9.128	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW			27138	.3594	23/64" 9.128	10.0	139	95	40	165.51	158.31	151.12	143.92
		25725		.3602	9.150	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW			27140	.3602	9.150	10.0	139	95	40	165.51	158.31	151.12	143.92
	28815			.3622	9.200	10.0	89	47	40	113.71	108.77	103.82	98.88
		25735		.3622	9.200	10.0	103	61	40	129.52	123.89	118.26	112.63
	28825			.3661	9.300	10.0	89	47	40	113.71	108.77	103.82	98.88
		25745		.3661	9.300	10.0	103	61	40	129.52	123.89	118.26	112.63
	28845			.3701	9.400	10.0	89	47	40	113.71	108.77	103.82	98.88
		25750		.3701	9.400	10.0	103	61	40	129.52	123.89	118.26	112.63
	28855			.3740	9.500	10.0	89	47	40	113.71	108.77	103.82	98.88
		25755		.3740	9.500	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW			27146	.3740	9.500	10.0	139	95	40	165.51	158.31	151.12	143.92
NEW	28858			.3750	3/8" 9.525	10.0	89	47	40	113.71	108.77	103.82	98.88
NEW		25760		.3750	3/8" 9.525	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW			27148	.3750	3/8" 9.525	10.0	139	95	40	165.51	158.31	151.12	143.92
	28875			.3760	9.550	10.0	89	47	40	113.71	108.77	103.82	98.88
		25765		.3760	9.550	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW			27150	.3760	9.550	10.0	139	95	40	165.51	158.31	151.12	143.92
	28878			.3780	9.600	10.0	89	47	40	113.71	108.77	103.82	98.88
		25767		.3780	9.600	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW			27152	.3780	9.600	10.0	139	95	40	165.51	158.31	151.12	143.92
	28882			.3819	9.700	10.0	89	47	40	113.71	108.77	103.82	98.88
		25770		.3819	9.700	10.0	103	61	40	129.52	123.89	118.26	112.63
	28885			.3858	9.800	10.0	89	47	40	113.71	108.77	103.82	98.88
		25775		.3858	9.800	10.0	103	61	40	129.52	123.89	118.26	112.63
	28895			.3898	9.900	10.0	89	47	40	113.71	108.77	103.82	98.88
		25785		.3898	9.900	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW			27160	.3898	9.900	10.0	139	95	40	165.51	158.31	151.12	143.92
NEW	28898			.3906	25/64" 9.920	10.0	89	47	40	113.71	108.77	103.82	98.88
NEW		25787		.3906	25/64" 9.920	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW			27162	.3906	25/64" 9.920	10.0	139	95	40	165.51	158.31	151.12	143.92

Series 1580KD, 1280KD, 1880KD (continued)

.3937" - .4688"
(10.000mm - 11.907mm)

HIGH PERFORMANCE
DRILLS

	3xD (1580KD) EDP#	5xD (1280KD) EDP#	7xD (1880KD) 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								
	28905			.3937	10.000	10.0	89	47	40	113.71	108.77	103.82	98.88
		25795		.3937	10.000	10.0	103	61	40	129.52	123.89	118.26	112.63
NEW			27164	.3937	10.000	10.0	139	95	40	165.51	158.31	151.12	143.92
	28925			.3976	10.100	12.0	102	55	45	147.23	140.83	134.43	128.03
		25800		.3976	10.100	12.0	118	71	45	167.05	159.79	152.52	145.26
	28935			.4016	10.200	12.0	102	55	45	147.23	140.83	134.43	128.03
		25805		.4016	10.200	12.0	118	71	45	167.05	159.79	152.52	145.26
	28945			.4055	10.300	12.0	102	55	45	147.23	140.83	134.43	128.03
		25815		.4055	10.300	12.0	118	71	45	167.05	159.79	152.52	145.26
NEW			27170	.4055	10.300	12.0	155	106	45	215.11	205.76	196.40	187.05
NEW	28948			.4062	13/32"	10.317	12.0	102	55	147.23	140.83	134.43	128.03
NEW		25817		.4062	13/32"	10.317	12.0	118	71	167.05	159.79	152.52	145.26
NEW			27172	.4062	13/32"	10.317	12.0	155	106	215.11	205.76	196.40	187.05
NEW	28953			.4130	Z	10.490	12.0	102	55	147.23	140.83	134.43	128.03
NEW		25823		.4130	Z	10.490	12.0	118	71	167.05	159.79	152.52	145.26
NEW			27178	.4130	Z	10.490	12.0	155	106	215.11	205.76	196.40	187.05
	28955			.4134	10.500	12.0	102	55	45	147.23	140.83	134.43	128.03
		25825		.4134	10.500	12.0	118	71	45	167.05	159.79	152.52	145.26
NEW			27180	.4134	10.500	12.0	155	106	45	215.11	205.76	196.40	187.05
	28965			.4173	10.600	12.0	102	55	45	147.23	140.83	134.43	128.03
		25830		.4173	10.600	12.0	118	71	45	167.05	159.79	152.52	145.26
NEW			27182	.4173	10.600	12.0	155	106	45	215.11	205.76	196.40	187.05
	28975			.4213	10.700	12.0	102	55	45	147.23	140.83	134.43	128.03
		25835		.4213	10.700	12.0	118	71	45	167.05	159.79	152.52	145.26
NEW			27184	.4213	10.700	12.0	155	106	45	215.11	205.76	196.40	187.05
NEW	28978			.4219	27/64"	10.716	12.0	102	55	147.23	140.83	134.43	128.03
NEW		25838		.4219	27/64"	10.716	12.0	118	71	167.05	159.79	152.52	145.26
NEW			27186	.4219	27/64"	10.716	12.0	155	106	215.11	205.76	196.40	187.05
	28985			.4252	10.800	12.0	102	55	45	147.23	140.83	134.43	128.03
		25845		.4252	10.800	12.0	118	71	45	167.05	159.79	152.52	145.26
	28995			.4331	11.000	12.0	102	55	45	147.23	140.83	134.43	128.03
		25855		.4331	11.000	12.0	118	71	45	167.05	159.79	152.52	145.26
NEW			27190	.4331	11.000	12.0	163	114	45	215.11	205.76	196.40	187.05
	29005			.4370	11.100	12.0	102	55	45	147.23	140.83	134.43	128.03
		25865		.4370	11.100	12.0	118	71	45	167.05	159.79	152.52	145.26
NEW	29008			.4375	7/16"	11.112	12.0	102	55	147.23	140.83	134.43	128.03
NEW		25868		.4375	7/16"	11.112	12.0	118	71	167.05	159.79	152.52	145.26
NEW			27194	.4375	7/16"	11.112	12.0	163	114	215.11	205.76	196.40	187.05
	29015			.4409	11.200	12.0	102	55	45	147.23	140.83	134.43	128.03
		25875		.4409	11.200	12.0	118	71	45	167.05	159.79	152.52	145.26
	29025			.4488	11.400	12.0	102	55	45	147.23	140.83	134.43	128.03
		25880		.4488	11.400	12.0	118	71	45	167.05	159.79	152.52	145.26
	29035			.4528	11.500	12.0	102	55	45	147.23	140.83	134.43	128.03
		25885		.4528	11.500	12.0	118	71	45	167.05	159.79	152.52	145.26
NEW	29038			.4531	29/64"	11.508	12.0	102	55	147.23	140.83	134.43	128.03
NEW		25888		.4531	29/64"	11.508	12.0	118	71	167.05	159.79	152.52	145.26
NEW			27200	.4531	29/64"	11.508	12.0	163	114	215.11	205.76	196.40	187.05
	29045			.4606	11.700	12.0	102	55	45	147.23	140.83	134.43	128.03
		25895		.4606	11.700	12.0	118	71	45	167.05	159.79	152.52	145.26
	29055			.4685	11.900	12.0	102	55	45	147.23	140.83	134.43	128.03
NEW	29058			.4688	15/32"	11.907	12.0	102	55	147.23	140.83	134.43	128.03
NEW		25910		.4688	15/32"	11.907	12.0	118	71	167.05	159.79	152.52	145.26
NEW			27208	.4688	15/32"	11.907	12.0	163	114	215.11	205.76	196.40	187.05

continued →

Series 1580KD, 1280KD, 1880KD (continued)

.4724" - .5610"
(12.000mm - 14.250mm)

	3xD (1580KD) EDP#	5xD (1280KD) EDP#	7xD (1880KD) 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								
	29065			.4724	12.000	12.0	102	55	45	147.23	140.83	134.43	128.03
		25915		.4724	12.000	12.0	118	71	45	167.05	159.79	152.52	145.26
NEW			27210	.4724	12.000	12.0	163	114	45	215.11	205.76	196.40	187.05
	29075			.4764	12.100	14.0	107	60	45	205.67	196.72	187.78	178.84
		25925		.4764	12.100	14.0	124	77	45	246.47	235.75	225.04	214.32
	29085			.4803	12.200	14.0	107	60	45	205.67	196.72	187.78	178.84
		25930		.4803	12.200	14.0	124	77	45	246.47	235.75	225.04	214.32
	29095			.4842	12.300	14.0	107	60	45	205.67	196.72	187.78	178.84
		25935		.4842	12.300	14.0	124	77	45	246.47	235.75	225.04	214.32
NEW	29098			.4844	31/64"	12.303	14.0	107	60	205.67	196.72	187.78	178.84
NEW		25937		.4844	31/64"	12.303	14.0	124	77	246.47	235.75	225.04	214.32
NEW			27214	.4844	31/64"	12.303	14.0	182	133	287.20	274.71	262.23	249.74
	29115			.4921	12.500	14.0	107	60	45	205.67	196.72	187.78	178.84
		25945		.4921	12.500	14.0	124	77	45	246.47	235.75	225.04	214.32
NEW			27218	.4921	12.500	14.0	182	133	45	287.20	274.71	262.23	249.74
	29125			.4961	12.600	14.0	107	60	45	205.67	196.72	187.78	178.84
		25950		.4961	12.600	14.0	124	77	45	246.47	235.75	225.04	214.32
	29135			.5000	1/2"	12.700	14.0	107	60	205.67	196.72	187.78	178.84
		25955		.5000	1/2"	12.700	14.0	124	77	246.47	235.75	225.04	214.32
NEW			27220	.5000	1/2"	12.700	14.0	182	133	287.20	274.71	262.23	249.74
	29145			.5039	12.800	14.0	107	60	45	205.67	196.72	187.78	178.84
		25960		.5039	12.800	14.0	124	77	45	246.47	235.75	225.04	214.32
	29148			.5051	12.830	14.0	107	60	45	205.67	196.72	187.78	178.84
		25961		.5051	12.830	14.0	124	77	45	246.47	235.75	225.04	214.32
NEW			27224	.5051	12.830	14.0	182	133	45	287.20	274.71	262.23	249.74
	29155			.5079	12.900	14.0	107	60	45	205.67	196.72	187.78	178.84
NEW			27226	.5079	12.900	14.0	182	133	45	287.20	274.71	262.23	249.74
	29161			.5098	12.950	14.0	107	60	45	197.75	189.16	180.56	171.96
NEW			27228	.5098	12.950	14.0	182	133	45	287.20	274.71	262.23	249.74
	29165			.5118	13.000	14.0	107	60	45	205.67	196.72	187.78	178.84
		25965		.5118	13.000	14.0	124	77	45	246.47	235.75	225.04	214.32
NEW			27230	.5118	13.000	14.0	182	133	45	287.20	274.71	262.23	249.74
	29175			.5157	13.100	14.0	107	60	45	205.67	196.72	187.78	178.84
		25975		.5157	13.100	14.0	124	77	45	246.47	235.75	225.04	214.32
	29181			.5236	13.300	14.0	107	60	45	205.67	196.72	187.78	178.84
NEW	29184			.5312	17/32"	13.492	14.0	107	60	205.67	196.72	187.78	178.84
NEW		25983		.5312	17/32"	13.492	14.0	124	77	246.47	235.75	225.04	214.32
NEW			27238	.5312	17/32"	13.492	14.0	182	133	287.20	274.71	262.23	249.74
	29185			.5315	13.500	14.0	107	60	45	205.67	196.72	187.78	178.84
		25985		.5315	13.500	14.0	124	77	45	246.47	235.75	225.04	214.32
NEW			27240	.5315	13.500	14.0	182	133	45	287.20	274.71	262.23	249.74
	29195			.5394	13.700	14.0	107	60	45	205.67	196.72	187.78	178.84
		25995		.5394	13.700	14.0	124	77	45	246.47	235.75	225.04	214.32
	29205			.5433	13.800	14.0	107	60	45	205.67	196.72	187.78	178.84
		26005		.5433	13.800	14.0	124	77	45	246.47	235.75	225.04	214.32
	29215			.5512	14.000	14.0	107	60	45	205.67	196.72	187.78	178.84
		26015		.5512	14.000	14.0	124	77	45	246.47	235.75	225.04	214.32
NEW			27250	.5512	14.000	14.0	182	133	45	287.20	274.71	262.23	249.74
	29225			.5551	14.100	16.0	115	65	48	251.39	240.46	229.53	218.60
		26025		.5551	14.100	16.0	133	83	48	327.73	313.48	299.23	284.98
	29235			.5591	14.200	16.0	115	65	48	251.39	240.46	229.53	218.60
		26027		.5591	14.200	16.0	133	83	48	327.73	313.48	299.23	284.98
	29245			.5610	14.250	16.0	115	65	48	251.39	240.46	229.53	218.60

Series 1580KD, 1280KD, 1880KD (continued)

.5625" - .7283"
(14.287mm - 18.500mm)

HIGH PERFORMANCE
DRILLS

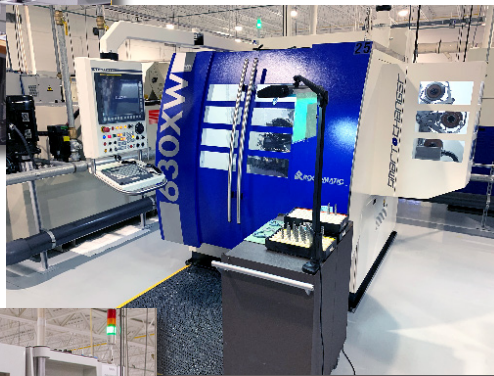
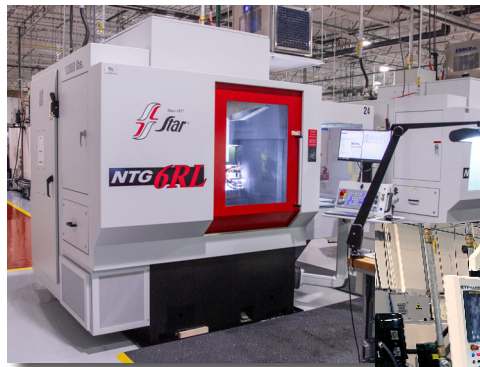
	3xD (1580KD) EDP#	5xD (1280KD) EDP#	7xD (1880KD) EDP#	<i>d1</i> Diameter		<i>d2</i> Shank Diameter	<i>l1</i> Overall Length	<i>l2</i> Flute Length	<i>l4</i> Shank Length	1-11	12-24	25-49	50-100	
				Decimal	Metric									
NEW	29250			.5625	9/16"	14.287	16.0	115	65	48	251.39	240.46	229.53	218.60
NEW		26042		.5625	9/16"	14.287	16.0	133	83	48	327.73	313.48	299.23	284.98
NEW			27254	.5625	9/16"	14.287	16.0	204	152	48	379.91	363.40	346.88	330.36
	29255			.5630		14.300	16.0	115	65	48	251.39	240.46	229.53	218.60
		26045		.5630		14.300	16.0	133	83	48	327.73	313.48	299.23	284.98
	29265			.5709		14.500	16.0	115	65	48	251.39	240.46	229.53	218.60
		26055		.5709		14.500	16.0	133	83	48	327.73	313.48	299.23	284.98
NEW			27258	.5709		14.500	16.0	204	152	48	379.91	363.40	346.88	330.36
	29275			.5787		14.700	16.0	115	65	48	251.39	240.46	229.53	218.60
		26065		.5787		14.700	16.0	133	83	48	327.73	313.48	299.23	284.98
	29285			.5827		14.800	16.0	115	65	48	251.39	240.46	229.53	218.60
		26067		.5827		14.800	16.0	133	83	48	327.73	313.48	299.23	284.98
	29305			.5906		15.000	16.0	115	65	48	251.39	240.46	229.53	218.60
		26075		.5906		15.000	16.0	133	83	48	327.73	313.48	299.23	284.98
NEW			27264	.5906		15.000	16.0	204	152	48	379.91	363.40	346.88	330.36
NEW	29308			.5938	19/32"	15.082	16.0	115	65	48	251.39	240.46	229.53	218.60
NEW		26083		.5938	19/32"	15.082	16.0	133	83	48	327.73	313.48	299.23	284.98
NEW			27266	.5938	19/32"	15.082	16.0	204	152	48	379.91	363.40	346.88	330.36
	29315			.5945		15.100	16.0	115	65	48	251.39	240.46	229.53	218.60
		26085		.5945		15.100	16.0	133	83	48	327.73	313.48	299.23	284.98
NEW			27268	.5945		15.100	16.0	204	152	48	379.91	363.40	346.88	330.36
	29325			.6102		15.500	16.0	115	65	48	251.39	240.46	229.53	218.60
		26095		.6102		15.500	16.0	133	83	48	327.73	313.48	299.23	284.98
		26105		.6181		15.700	16.0	133	83	48	327.73	313.48	299.23	284.98
	29345			.6220		15.800	16.0	115	65	48	251.39	240.46	229.53	218.60
		26107		.6220		15.800	16.0	133	83	48	327.73	313.48	299.23	284.98
NEW			27276	.6220		15.800	16.0	204	152	48	379.91	363.40	346.88	330.36
NEW	29348			.6250	5/8"	15.875	16.0	115	65	48	251.39	240.46	229.53	218.60
NEW		26108		.6250	5/8"	15.875	16.0	133	83	48	327.73	313.48	299.23	284.98
NEW			27278	.6250	5/8"	15.875	16.0	204	152	48	379.91	363.40	346.88	330.36
		26115		.6299		16.000	16.0	133	83	48	327.73	313.48	299.23	284.98
NEW			27282	.6299		16.000	16.0	204	152	48	379.91	363.40	346.88	330.36
	29363			.6331		16.080	18.0	123	73	48	317.85	304.03	290.21	276.39
		26118		.6331		16.080	18.0	143	93	48	389.62	372.68	355.74	338.80
	29365			.6339		16.100	18.0	123	73	48	317.85	304.03	290.21	276.39
		26119		.6339		16.100	18.0	143	93	48	389.62	372.68	355.74	338.80
		26123		.6378		16.200	18.0	143	93	48	389.62	372.68	355.74	338.80
	29375			.6398		16.250	18.0	123	73	48	317.85	304.03	290.21	276.39
		26125		.6398		16.250	18.0	143	93	48	389.62	372.68	355.74	338.80
	29385			.6496		16.500	18.0	123	73	48	317.85	304.03	290.21	276.39
		26135		.6496		16.500	18.0	143	93	48	389.62	372.68	355.74	338.80
	29395			.6555		16.650	18.0	123	73	48	317.85	304.03	290.21	276.39
		26145		.6555		16.650	18.0	143	93	48	389.62	372.68	355.74	338.80
	29405			.6693		17.000	18.0	123	73	48	317.85	304.03	290.21	276.39
		26155		.6693		17.000	18.0	143	93	48	389.62	372.68	355.74	338.80
	29415			.6713		17.050	18.0	123	73	48	317.85	304.03	290.21	276.39
		26165		.6713		17.050	18.0	143	93	48	389.62	372.68	355.74	338.80
	29425			.6870		17.450	18.0	123	73	48	317.85	304.03	290.21	276.39
		26175		.6870		17.450	18.0	143	93	48	389.62	372.68	355.74	338.80
	29435			.6890		17.500	18.0	123	73	48	317.85	304.03	290.21	276.39
		26185		.6890		17.500	18.0	143	93	48	389.62	372.68	355.74	338.80
	29445			.7027		17.850	18.0	123	73	48	317.85	304.03	290.21	276.39
		26195		.7027		17.850	18.0	143	93	48	389.62	372.68	355.74	338.80
	29455			.7087		18.000	18.0	123	73	48	317.85	304.03	290.21	276.39
		26205		.7087		18.000	18.0	143	93	48	389.62	372.68	355.74	338.80
		26215		.7185		18.250	20.0	153	101	50	472.93	452.36	431.80	411.24
		26225		.7283		18.500	20.0	153	101	50	472.93	452.36	431.80	411.24

continued →

Series 1580KD, 1280KD, 1880KD (continued)

.7342" - .7874"
(18.650mm - 20.000mm)

3xD (1580KD) EDP#	5xD (1280KD) EDP#	7xD (1880KD) 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								
	26235		.7342	18.650	20.0	153	101	50	472.93	452.36	431.80	411.24
	26245		.7480	19.000	20.0	153	101	50	472.93	452.36	431.80	411.24
29505			.7500	3/4"	19.050	20.0	131	79	419.91	401.65	383.40	365.14
	26255		.7500	3/4"	19.050	20.0	153	101	472.93	452.36	431.80	411.24
29545			.7579	19.250	20.0	131	79	50	419.91	401.65	383.40	365.14
29546			.7590	19.280	20.0	131	79	50	419.91	401.65	383.40	365.14
	26260		.7590	19.280	20.0	153	101	50	472.93	452.36	431.80	411.24
29551			.7598	19.300	20.0	131	79	50	419.91	401.65	383.40	365.14
	26261		.7598	19.300	20.0	153	101	50	472.93	452.36	431.80	411.24
29565			.7677	19.500	20.0	131	79	50	419.91	401.65	383.40	365.14
	26281		.7795	19.800	20.0	153	101	50	472.93	452.36	431.80	411.24
29595			.7815	19.850	20.0	131	79	50	419.91	401.65	383.40	365.14
29605			.7874	20.000	20.0	131	79	50	419.91	401.65	383.40	365.14



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)



TECH PAGES
328-329

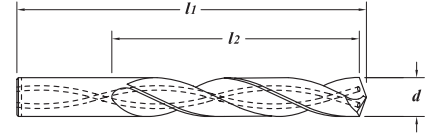
Series 1580KH, 1280KH, 1880KH

.1181" - .1540"
(3.000mm - 3.912mm)

Recommended for high nickel, high temperature alloys, cobalt-based alloys, stainless steels, and tool steels >40 Rc

AlTiN-based Coating

- 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
- Live tooling recommended on lathe processes



HIGH PERFORMANCE DRILLS

3xD (1580KH) EDP#	5xD (1280KH) EDP#	7xD (1880KH) EDP#	d †		l1 Overall Length	l2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Diameter Metric							
22010			.1181	3.000	46	16	42.18	40.35	38.51	36.68	
	25366		.1181	3.000	50	19	46.66	44.63	42.60	40.57	
22015		26366	.1181	3.000	65	28	52.06	49.80	47.53	45.27	
	25371		.1200	#31	3.048	1-13/16"	5/8"	42.63	40.78	38.92	37.07
		26371	.1200	#31	3.048	2"	3/4"	47.02	44.98	42.93	40.89
22020			.1200	#31	3.048	2-1/2"	1-1/8"	52.50	50.22	47.93	45.65
	25376		.1250	1/8"	3.175	1-15/16"	11/16"	42.99	41.12	39.25	37.38
		26376	.1250	1/8"	3.175	2"	3/4"	47.41	45.35	43.29	41.23
22025			.1250	1/8"	3.175	2-1/2"	1-1/8"	52.91	50.61	48.31	46.01
	25381		.1285	#30	3.264	1-15/16"	11/16"	43.38	41.49	39.61	37.72
		26381	.1285	#30	3.264	2-1/4"	3/4"	47.83	45.75	43.67	41.59
22030			.1285	#30	3.264	2-1/2"	1-1/8"	53.39	51.07	48.75	46.43
	25386		.1360	#29	3.454	2-1/16"	3/4"	43.78	41.88	39.97	38.07
		26386	.1360	#29	3.454	2-1/4"	7/8"	48.19	46.09	44.00	41.90
22035			.1360	#29	3.454	3"	1-1/4"	53.77	51.44	49.10	46.76
	25391		.1378	3.500	52	19	44.23	42.31	40.38	38.46	
		26391	.1378	3.500	57	22	48.55	46.44	44.33	42.22	
22040			.1378	3.500	75	32	54.20	51.84	49.49	47.13	
	25396		.1405	#28	3.569	2-1/16"	3/4"	44.63	42.69	40.75	38.81
		26396	.1405	#28	3.569	2-1/4"	7/8"	48.96	46.83	44.70	42.57
22045			.1405	#28	3.569	3"	1-1/4"	54.64	52.26	49.89	47.51
	25401		.1406	9/64"	3.571	2-1/16"	3/4"	45.02	43.07	41.11	39.15
		26401	.1406	9/64"	3.571	2-1/4"	7/8"	49.38	47.23	45.09	42.94
22050			.1406	9/64"	3.571	3"	1-1/4"	55.10	52.70	50.31	47.91
	25406		.1440	#27	3.658	2-1/16"	3/4"	45.43	43.45	41.48	39.50
		26406	.1440	#27	3.658	2-1/4"	7/8"	49.70	47.54	45.38	43.22
22055			.1440	#27	3.658	3"	1-3/8"	55.48	53.06	50.65	48.24
	25411		.1470	#26	3.734	2-3/16"	13/16"	45.77	43.78	41.79	39.80
		26411	.1470	#26	3.734	2-1/4"	7/8"	50.13	47.95	45.77	43.59
22060			.1470	#26	3.734	3"	1-3/8"	55.94	53.50	51.07	48.64
	25416		.1495	#25	3.797	2-3/16"	13/16"	46.24	44.23	42.22	40.21
		26416	.1495	#25	3.797	2-1/4"	15/16"	50.51	48.31	46.12	43.92
22065			.1495	#25	3.797	3"	1-3/8"	56.37	53.92	51.47	49.02
	25421		.1520	#24	3.861	2-3/16"	13/16"	46.62	44.59	42.57	40.54
		26421	.1520	#24	3.861	2-1/4"	15/16"	50.86	48.65	46.44	44.23
22070			.1520	#24	3.861	3"	1-1/2"	56.76	54.30	51.83	49.36
	25426		.1540	#23	3.912	2-3/16"	13/16"	47.02	44.98	42.93	40.89
		26426	.1540	#23	3.912	2-1/4"	15/16"	51.29	49.06	46.83	44.60

continued →

Series 1580KH, 1280KH, 1880KH (continued)

.1562" - .1935"
(3.967mm - 4.915mm)

3xD (1580KH) EDP#	5xD (1280KH) EDP#	7xD (1880KH) EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric							
22075			.1562	5/32"	3.967	2-3/16"	13/16"	47.40	45.34	43.28	41.22
	25431		.1562	5/32"	3.967	2-1/2"	15/16"	51.66	49.41	47.17	44.92
		26431	.1562	5/32"	3.967	3"	1-1/2"	57.65	55.14	52.64	50.13
22080			.1570	#22	3.988	2-3/16"	13/16"	47.83	45.75	43.67	41.59
	25436		.1570	#22	3.988	2-1/2"	15/16"	52.01	49.75	47.49	45.23
		26436	.1570	#22	3.988	3"	1-1/2"	58.05	55.53	53.00	50.48
22085			.1575		4.000	56	21	48.21	46.11	44.02	41.92
	25441		.1575		4.000	65	24	52.43	50.15	47.87	45.59
		26441	.1575		4.000	75	38	58.50	55.96	53.41	50.87
22090			.1590	#21	4.039	2-3/16"	13/16"	48.66	46.54	44.43	42.31
	25446		.1590	#21	4.039	2-1/2"	15/16"	52.79	50.49	48.20	45.90
		26446	.1590	#21	4.039	3"	1-1/2"	58.88	56.32	53.76	51.20
22095			.1610	#20	4.089	2-3/16"	13/16"	49.05	46.92	44.78	42.65
	25451		.1610	#20	4.089	2-1/2"	15/16"	53.19	50.88	48.56	46.25
		26451	.1610	#20	4.089	3"	1-1/2"	59.34	56.76	54.18	51.60
22100			.1660	#19	4.216	2-9/32"	15/16"	49.47	47.32	45.17	43.02
	25456		.1660	#19	4.216	2-1/2"	1"	53.59	51.26	48.93	46.60
		26456	.1660	#19	4.216	3"	1-1/2"	59.80	57.20	54.60	52.00
22105			.1695	#18	4.305	2-9/32"	15/16"	49.88	47.71	45.54	43.37
	25461		.1695	#18	4.305	2-1/2"	1"	53.98	51.63	49.29	46.94
		26461	.1695	#18	4.305	3-1/2"	1-3/4"	60.20	57.59	54.97	52.35
22110			.1719	11/64"	4.366	2-9/32"	15/16"	50.28	48.09	45.91	43.72
	25466		.1719	11/64"	4.366	2-1/2"	1"	54.35	51.99	49.62	47.26
		26466	.1719	11/64"	4.366	3-1/2"	1-3/4"	60.63	57.99	55.36	52.72
22115			.1730	#17	4.394	2-9/32"	15/16"	50.69	48.49	46.28	44.08
	25471		.1730	#17	4.394	2-1/2"	1"	54.71	52.33	49.95	47.57
		26471	.1730	#17	4.394	3-1/2"	1-3/4"	61.03	58.38	55.72	53.07
22120			.1770	#16	4.496	2-9/32"	15/16"	51.04	48.82	46.60	44.38
	25476		.1770	#16	4.496	2-1/2"	1"	55.11	52.71	50.32	47.92
		26476	.1770	#16	4.496	3-1/2"	1-3/4"	61.51	58.84	56.16	53.49
22125			.1772		4.500	58	24	51.49	49.25	47.01	44.77
	25481		.1772		4.500	65	25	55.52	53.11	50.69	48.28
		26481	.1772		4.500	88	45	61.95	59.26	56.56	53.87
22130			.1800	#15	4.572	2-9/32"	15/16"	51.81	49.56	47.30	45.05
	25486		.1800	#15	4.572	2-3/4"	1"	55.89	53.46	51.03	48.60
		26486	.1800	#15	4.572	3-1/2"	1-3/4"	62.35	59.64	56.93	54.22
22135			.1820	#14	4.623	2-9/32"	15/16"	52.31	50.04	47.76	45.49
	25491		.1820	#14	4.623	2-3/4"	1"	56.25	53.80	51.36	48.91
		26491	.1820	#14	4.623	3-1/2"	1-3/4"	62.76	60.03	57.30	54.57
22140			.1850	#13	4.699	2-9/32"	15/16"	52.68	50.39	48.10	45.81
	25496		.1850	#13	4.699	2-3/4"	1-1/4"	56.65	54.19	51.72	49.26
		26496	.1850	#13	4.699	3-1/2"	1-3/4"	63.20	60.46	57.71	54.96
22145			.1875	3/16"	4.763	2-13/32"	1"	53.11	50.80	48.49	46.18
	25501		.1875	3/16"	4.763	2-3/4"	1-1/4"	57.06	54.58	52.10	49.62
		26501	.1875	3/16"	4.763	4"	2"	63.69	60.92	58.15	55.38
22150			.1890	#12	4.801	2-13/32"	1"	53.49	51.16	48.84	46.51
	25506		.1890	#12	4.801	2-3/4"	1-1/4"	57.42	54.92	52.43	49.93
		26506	.1890	#12	4.801	4"	2"	64.07	61.28	58.50	55.71
22155			.1910	#11	4.851	2-13/32"	1"	53.98	51.63	49.29	46.94
	25511		.1910	#11	4.851	2-3/4"	1-1/4"	57.79	55.28	52.76	50.25
		26511	.1910	#11	4.851	4"	2"	64.49	61.69	58.88	56.08
22160			.1935	#10	4.915	2-13/32"	1"	54.29	51.93	49.57	47.21
	25516		.1935	#10	4.915	2-3/4"	1-1/4"	58.22	55.69	53.16	50.63
		26516	.1935	#10	4.915	4"	2"	64.94	62.12	59.29	56.47

Series 1580KH, 1280KH, 1880KH (continued)

.1960" - .2420"
(4.978mm - 6.147mm)

HIGH PERFORMANCE
DRILLS

3xD (1580KH) EDP#	5xD (1280KH) EDP#	7xD (1880KH) EDP#	d^+ Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric							
22165			.1960	#9	4.978	2-13/32"	1"	54.69	52.32	49.94	47.56
	25521		.1960	#9	4.978	3"	1-5/16"	58.56	56.01	53.47	50.92
		26521	.1960	#9	4.978	4"	2"	65.32	62.48	59.64	56.80
22170			.1969		5.000	61	25	55.00	52.61	50.22	47.83
	25526		.1969		5.000	75	33	58.96	56.40	53.83	51.27
		26526	.1969		5.000	100	50	65.78	62.92	60.06	57.20
22175			.1990	#8	5.055	2-13/32"	1"	55.51	53.10	50.68	48.27
	25531		.1990	#8	5.055	3"	1-5/16"	59.26	56.68	54.11	51.53
		26531	.1990	#8	5.055	4"	2"	66.11	63.24	60.36	57.49
22180			.2010	#7	5.105	2-13/32"	1"	55.67	53.25	50.83	48.41
	25536		.2010	#7	5.105	3"	1-5/16"	59.52	56.94	54.35	51.76
		26536	.2010	#7	5.105	4"	2"	66.41	63.53	60.64	57.75
22185			.2031	13/64"	5.159	2-13/32"	1"	56.04	53.60	51.17	48.73
	25541		.2031	13/64"	5.159	3"	1-5/16"	59.96	57.35	54.75	52.14
		26541	.2031	13/64"	5.159	4"	2"	66.91	64.00	61.09	58.18
22190			.2040	#6	5.182	2-13/32"	1"	56.43	53.98	51.52	49.07
	25546		.2040	#6	5.182	3"	1-3/8"	60.41	57.78	55.16	52.53
		26546	.2040	#6	5.182	4"	2"	67.39	64.46	61.53	58.60
22195			.2055	#5	5.220	2-13/32"	1"	56.82	54.35	51.88	49.41
	25551		.2055	#5	5.220	3"	1-3/8"	60.80	58.16	55.51	52.87
		26551	.2055	#5	5.220	4"	2"	67.85	64.90	61.95	59.00
22200			.2090	#4	5.309	2-13/32"	1"	57.19	54.70	52.22	49.73
	25556		.2090	#4	5.309	3"	1-3/8"	61.23	58.56	55.90	53.24
		26556	.2090	#4	5.309	4"	2"	68.30	65.33	62.36	59.39
22205			.2130	#3	5.410	2-5/8"	1-3/32"	57.57	55.07	52.56	50.06
	25561		.2130	#3	5.410	3"	1-3/8"	61.62	58.94	56.26	53.58
		26561	.2130	#3	5.410	4"	2"	68.76	65.77	62.78	59.79
22210			.2165		5.500	67	28	57.94	55.42	52.90	50.38
	25566		.2165		5.500	75	35	62.00	59.30	56.61	53.91
		26566	.2165		5.500	100	50	69.17	66.17	63.16	60.15
22215			.2188	7/32"	5.558	2-5/8"	1-3/32"	58.42	55.88	53.34	50.80
	25571		.2188	7/32"	5.558	3"	1-3/8"	62.13	59.43	56.73	54.03
		26571	.2188	7/32"	5.558	4"	2"	69.59	66.56	63.54	60.51
22220			.2210	#2	5.613	2-5/8"	1-3/32"	58.83	56.28	53.72	51.16
	25576		.2210	#2	5.613	3"	1-3/8"	63.19	60.45	57.70	54.95
		26576	.2210	#2	5.613	4"	2"	70.68	67.61	64.53	61.46
22225			.2280	#1	5.791	2-5/8"	1-3/32"	59.27	56.69	54.12	51.54
	25581		.2280	#1	5.791	3"	1-3/8"	63.42	60.67	57.91	55.15
		26581	.2280	#1	5.791	4-1/8"	2-1/8"	80.98	77.46	73.94	70.42
22230			.2340	A	5.944	2-5/8"	1-3/32"	59.70	57.10	54.51	51.91
	25586		.2340	A	5.944	3-1/4"	1-1/2"	71.17	68.08	64.98	61.89
		26586	.2340	A	5.944	4-1/8"	2-1/8"	85.50	81.79	78.07	74.35
22235			.2344	15/64"	5.954	2-5/8"	1-3/32"	60.13	57.52	54.90	52.29
	25591		.2344	15/64"	5.954	3-1/4"	1-1/2"	71.30	68.20	65.10	62.00
		26591	.2344	15/64"	5.954	4-1/8"	2-1/8"	85.63	81.91	78.18	74.46
22240			.2362		6.000	67	28	60.57	57.94	55.30	52.67
	25596		.2362		6.000	80	38	71.50	68.39	65.28	62.17
		26596	.2362		6.000	105	55	85.82	82.09	78.36	74.63
22245			.2380	B	6.045	2-3/4"	1-7/32"	63.97	61.19	58.41	55.63
	25601		.2380	B	6.045	3-1/4"	1-5/8"	73.76	70.55	67.35	64.14
		26601	.2380	B	6.045	4-1/8"	2-1/8"	89.07	85.20	81.32	77.45
22250			.2420	C	6.147	2-3/4"	1-7/32"	64.50	61.70	58.89	56.09
	25606		.2420	C	6.147	3-1/4"	1-5/8"	74.11	70.88	67.66	64.44
		26606	.2420	C	6.147	4-1/4"	2-1/4"	89.41	85.53	81.64	77.75

continued →

Series 1580KH, 1280KH, 1880KH (continued)

.2460" - .3125"
(6.248mm - 7.938mm)

3xD (1580KH) EDP#	5xD (1280KH) EDP#	7xD (1880KH) EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric							
22255			.2460	D	6.248	2-3/4"	1-7/32"	64.86	62.04	59.22	56.40
	25611		.2460	D	6.248	3-1/4"	1-5/8"	74.43	71.19	67.96	64.72
		26611	.2460	D	6.248	4-1/4"	2-1/4"	89.75	85.84	81.94	78.04
22260			.2500	1/4" / E	6.350	2-3/4"	1-7/32"	65.40	62.56	59.71	56.87
	25616		.2500	1/4" / E	6.350	3-1/4"	1-5/8"	74.75	71.50	68.25	65.00
		26616	.2500	1/4" / E	6.350	4-1/4"	2-1/4"	90.07	86.15	82.24	78.32
22265			.2559		6.500	70	31	66.47	63.58	60.69	57.80
	25621		.2559		6.500	80	41	75.67	72.38	69.09	65.80
		26621	.2559		6.500	105	58	91.01	87.05	83.10	79.14
22270			.2570	F	6.528	2-3/4"	1-7/32"	67.49	64.56	61.62	58.69
	25626		.2570	F	6.528	3-1/4"	1-11/16"	77.42	74.05	70.69	67.32
		26626	.2570	F	6.528	4-3/8"	2-3/8"	94.51	90.40	86.29	82.18
22275			.2610	G	6.629	2-3/4"	1-7/32"	68.52	65.54	62.56	59.58
	25631		.2610	G	6.629	3-1/2"	1-11/16"	78.37	74.97	71.56	68.15
		26631	.2610	G	6.629	4-3/8"	2-3/8"	95.48	91.33	87.18	83.03
22280			.2656	17/64"	6.746	2-15/16"	1-11/32"	69.58	66.55	63.53	60.50
	25636		.2656	17/64"	6.746	3-1/2"	1-11/16"	79.28	75.83	72.39	68.94
		26636	.2656	17/64"	6.746	4-3/8"	2-3/8"	96.40	92.21	88.02	83.83
22285			.2660	H	6.756	2-15/16"	1-11/32"	70.60	67.53	64.46	61.39
	25641		.2660	H	6.756	3-1/2"	1-11/16"	80.22	76.74	73.25	69.76
		26641	.2660	H	6.756	4-3/8"	2-3/8"	97.42	93.18	88.95	84.71
22290			.2720	I	6.909	2-15/16"	1-11/32"	71.63	68.52	65.40	62.29
	25646		.2720	I	6.909	3-1/2"	1-11/16"	80.33	76.84	73.34	69.85
		26646	.2720	I	6.909	4-3/8"	2-3/8"	97.51	93.27	89.03	84.79
22295			.2756		7.000	75	34	72.67	69.51	66.35	63.19
	25651		.2756		7.000	88	43	81.24	77.70	74.17	70.64
		26651	.2756		7.000	110	61	98.44	94.16	89.88	85.60
22300			.2770	J	7.036	2-15/16"	1-11/32"	73.67	70.47	67.26	64.06
	25656		.2770	J	7.036	3-1/2"	1-11/16"	85.34	81.63	77.92	74.21
		26656	.2770	J	7.036	4-3/8"	2-3/8"	103.42	98.92	94.43	89.93
22305			.2810	K	7.137	2-15/16"	1-11/32"	74.77	71.52	68.27	65.02
	25661		.2810	K	7.137	3-1/2"	1-3/4"	86.30	82.54	78.79	75.04
		26661	.2810	K	7.137	4-7/16"	2-7/16"	104.40	99.86	95.32	90.78
22310			.2812	9/32"	7.142	2-15/16"	1-11/32"	75.81	72.51	69.22	65.92
	25666		.2812	9/32"	7.142	3-1/2"	1-3/4"	87.23	83.44	79.64	75.85
		26666	.2812	9/32"	7.142	4-7/16"	2-7/16"	105.36	100.78	96.20	91.62
22315			.2900	L	7.366	2-15/16"	1-11/32"	76.82	73.48	70.14	66.80
	25671		.2900	L	7.366	3-1/2"	1-3/4"	87.62	83.81	80.00	76.19
		26671	.2900	L	7.366	4-7/16"	2-7/16"	105.77	101.17	96.57	91.97
22320			.2950	M	7.493	2-15/16"	1-11/32"	78.30	74.90	71.49	68.09
	25676		.2950	M	7.493	3-3/4"	1-3/4"	88.14	84.30	80.47	76.64
		26676	.2950	M	7.493	4-7/16"	2-7/16"	106.28	101.66	97.04	92.42
22325			.2953		7.500	75	34	78.30	74.90	71.49	68.09
	25681		.2953		7.500	95	44	88.14	84.30	80.47	76.64
		26681	.2953		7.500	115	66	106.28	101.66	97.04	92.42
22330			.2969	19/64"	7.541	3-3/32"	1-15/32"	78.97	75.54	72.10	68.67
	25686		.2969	19/64"	7.541	3-3/4"	1-7/8"	94.15	90.06	85.96	81.87
		26686	.2969	19/64"	7.541	4-9/16"	2-9/16"	114.75	109.76	104.77	99.78
22335			.3020	N	7.671	3-3/32"	1-15/32"	82.55	78.96	75.37	71.78
	25691		.3020	N	7.671	3-3/4"	1-7/8"	96.27	92.08	87.90	83.71
		26691	.3020	N	7.671	4-9/16"	2-9/16"	116.97	111.88	106.80	101.71
22340			.3125	5/16"	7.938	3-3/32"	1-15/32"	82.83	79.23	75.63	72.03
	25696		.3125	5/16"	7.938	3-3/4"	1-7/8"	96.49	92.29	88.10	83.90
		26696	.3125	5/16"	7.938	4-11/16"	2-9/16"	117.17	112.08	106.98	101.89

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)



Series 1580KH, 1280KH, 1880KH (continued)

.3150" - .3750"
(8.000mm - 9.525mm)

Recommended for high nickel, high temperature alloys, cobalt-based alloys, stainless steels, and tool steels >40 Rc

AlTiN-based Coating

High performance - high penetration solid submicron grain carbide drill



HIGH PERFORMANCE DRILLS

3xD (1580KH) EDP#	5xD (1280KH) EDP#	7xD (1880KH) 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						
22345			.3150	8.000	79	37	84.39	80.72	77.05	73.38
	25701		.3150	8.000	95	48	100.54	96.17	91.80	87.43
		26701	.3150	8.000	120	69	121.37	116.09	110.82	105.54
22350			.3160	O 8.026	3-3/32"	1-15/32"	84.39	80.72	77.05	73.38
	25706		.3160	O 8.026	3-3/4"	1-7/8"	101.46	97.05	92.64	88.23
		26706	.3160	O 8.026	4-11/16"	2-11/16"	123.42	118.05	112.69	107.32
22355			.3230	P 8.204	3-3/32"	1-15/32"	85.00	81.30	77.61	73.91
	25711		.3230	P 8.204	3-3/4"	2-3/32"	101.73	97.31	92.88	88.46
		26711	.3230	P 8.204	4-11/16"	2-11/16"	123.68	118.31	112.93	107.55
22360			.3281	21/64" 8.334	3-3/32"	1-15/32"	86.60	82.83	79.07	75.30
	25716		.3281	21/64" 8.334	4"	2-3/32"	102.40	97.94	93.49	89.04
		26716	.3281	21/64" 8.334	4-11/16"	2-11/16"	124.37	118.97	113.56	108.15
22365			.3320	Q 8.433	3-3/32"	1-15/32"	88.14	84.30	80.47	76.64
	25721		.3320	Q 8.433	4"	2-3/32"	102.98	98.51	94.03	89.55
		26721	.3320	Q 8.433	4-15/16"	2-15/16"	124.99	119.56	114.12	108.69
22370			.3346	8.500	79	37	88.49	84.65	80.80	76.95
	25726		.3346	8.500	100	53	103.52	99.02	94.52	90.02
		26726	.3346	8.500	125	75	125.53	120.08	114.62	109.16
22375			.3390	R 8.611	3-5/16"	1-9/16"	90.87	86.92	82.97	79.02
	25731		.3390	R 8.611	4"	2-3/32"	106.92	102.27	97.62	92.97
		26731	.3390	R 8.611	4-15/16"	2-15/16"	131.47	125.75	120.04	114.32
22380			.3438	11/32" 8.733	3-5/16"	1-9/16"	92.87	88.84	84.80	80.76
	25736		.3438	11/32" 8.733	4"	2-3/16"	109.55	104.79	100.02	95.26
		26736	.3438	11/32" 8.733	4-15/16"	2-15/16"	134.26	128.43	122.59	116.75
22385			.3480	S 8.839	3-5/16"	1-9/16"	95.94	91.77	87.60	83.43
	25741		.3480	S 8.839	4"	2-3/16"	112.03	107.16	102.29	97.42
		26741	.3480	S 8.839	5"	3"	136.82	130.87	124.92	118.97
22390			.3543	9.000	84	40	98.39	94.12	89.84	85.56
	25746		.3543	9.000	100	56	112.49	107.60	102.71	97.82
		26746	.3543	9.000	125	77	137.32	131.35	125.38	119.41
22395			.3580	T 9.093	3-5/16"	1-9/16"	102.26	97.81	93.37	88.92
	25751		.3580	T 9.093	4-1/4"	2-9/32"	114.62	109.64	104.65	99.67
		26751	.3580	T 9.093	5"	3"	144.35	138.07	131.80	125.52
22400			.3594	23/64" 9.129	3-5/16"	1-9/16"	102.88	98.41	93.93	89.46
	25756		.3594	23/64" 9.129	4-1/4"	2-9/32"	115.06	110.06	105.05	100.05
		26756	.3594	23/64" 9.129	5"	3"	144.85	138.56	132.26	125.96
22405			.3680	U 9.347	3-5/16"	1-9/16"	104.43	99.89	95.35	90.81
	25761		.3680	U 9.347	4-1/4"	2-9/32"	121.96	116.66	111.35	106.05
		26761	.3680	U 9.347	5"	3"	153.26	146.60	139.93	133.27
22410			.3740	9.500	84	40	105.27	100.69	96.12	91.54
	25766		.3740	9.500	105	58	122.56	117.23	111.90	106.57
		26766	.3740	9.500	130	80	154.22	147.51	140.81	134.10
22415			.3750	3/8" 9.525	3-1/2"	1-11/16"	105.92	101.31	96.71	92.10
	25771		.3750	3/8" 9.525	4-1/4"	2-3/8"	125.59	120.13	114.67	109.21
		26771	.3750	3/8" 9.525	5-1/8"	3-1/8"	158.29	151.40	144.52	137.64

continued →

Series 1580KH, 1280KH, 1880KH (continued)

.3770" - .4921"
(9.576mm - 12.500mm)

3xD (1580KH) EDP#	5xD (1280KH) EDP#	7xD (1880KH) EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric							
22420			.3770	V	9.576	3-1/2"	1-11/16"	109.99	105.20	100.42	95.64
	25776		.3770	V	9.576	4-1/4"	2-3/8"	126.01	120.53	115.05	109.57
		26776	.3770	V	9.576	5-1/8"	3-1/8"	160.78	153.79	146.80	139.81
22425			.3860	W	9.804	3-1/2"	1-11/16"	111.91	107.04	102.18	97.31
	25781		.3860	W	9.804	4-1/2"	2-3/8"	127.39	121.85	116.31	110.77
		26781	.3860	W	9.804	5-1/8"	3-1/8"	161.33	154.32	147.30	140.29
22430			.3906	25/64"	9.921	3-1/2"	1-11/16"	113.31	108.38	103.46	98.53
	25786		.3906	25/64"	9.921	4-1/2"	2-3/8"	128.34	122.76	117.18	111.60
		26786	.3906	25/64"	9.921	5-1/4"	3-1/4"	162.31	155.25	148.20	141.14
22435			.3937		10.000	89	43	113.71	108.77	103.82	98.88
	25791		.3937		10.000	115	60	129.51	123.88	118.25	112.62
		26791	.3937		10.000	135	83	165.51	158.31	151.12	143.92
22440			.3970	X	10.084	3-1/2"	1-11/16"	114.71	109.73	104.74	99.75
	25796		.3970	X	10.084	4-1/2"	2-1/2"	133.92	128.10	122.27	116.45
		26796	.3970	X	10.084	5-1/4"	3-1/4"	169.20	161.84	154.49	147.13
22445			.4040	Y	10.262	3-1/2"	1-11/16"	115.49	110.47	105.45	100.43
	25801		.4040	Y	10.262	4-1/2"	2-9/16"	134.52	128.67	122.82	116.97
		26801	.4040	Y	10.262	5-3/8"	3-3/8"	172.55	165.04	157.54	150.04
22450			.4062	13/32"	10.317	3-1/2"	1-11/16"	119.04	113.86	108.69	103.51
	25806		.4062	13/32"	10.317	4-1/2"	2-9/16"	137.10	131.14	125.18	119.22
		26806	.4062	13/32"	10.317	5-3/8"	3-3/8"	173.52	165.98	158.43	150.89
22455			.4130	Z	10.490	3-1/2"	1-11/16"	120.14	114.92	109.69	104.47
	25811		.4130	Z	10.490	4-1/2"	2-5/8"	139.25	133.20	127.14	121.09
		26811	.4130	Z	10.490	5-3/8"	3-3/8"	176.40	168.73	161.06	153.39
22460			.4134		10.500	89	43	120.14	114.92	109.69	104.47
	25816		.4134		10.500	115	67	139.25	133.20	127.14	121.09
		26816	.4134		10.500	135	86	176.40	168.73	161.06	153.39
22465			.4219	27/64"	10.716	3-3/4"	1-13/16"	121.27	116.00	110.72	105.45
	25821		.4219	27/64"	10.716	4-1/2"	2-11/16"	141.22	135.08	128.94	122.80
		26821	.4219	27/64"	10.716	5-7/16"	3-7/16"	178.60	170.83	163.07	155.30
22470			.4331		11.000	95	46	130.16	124.50	118.84	113.18
	25826		.4331		11.000	115	68	146.30	139.94	133.58	127.22
		26826	.4331		11.000	135	88	185.51	177.44	169.38	161.31
22475			.4375	7/16"	11.113	3-3/4"	1-13/16"	130.16	124.50	118.84	113.18
	25831		.4375	7/16"	11.113	4-3/4"	2-13/16"	149.26	142.77	136.28	129.79
		26831	.4375	7/16"	11.113	5-7/16"	3-7/16"	189.47	181.24	173.00	164.76
22480			.4528		11.500	95	46	139.73	133.65	127.58	121.50
	25836		.4528		11.500	120	71	154.59	147.87	141.15	134.43
		26836	.4528		11.500	140	91	196.20	187.67	179.14	170.61
22485			.4531	29/64"	11.509	3-3/4"	1-13/16"	139.73	133.65	127.58	121.50
	25841		.4531	29/64"	11.509	4-3/4"	2-7/8"	159.88	152.93	145.98	139.03
		26841	.4531	29/64"	11.509	5-9/16"	3-13/16"	202.34	193.55	184.75	175.95
22490			.4688	15/32"	11.908	4"	1-15/16"	146.81	140.43	134.04	127.66
	25846		.4688	15/32"	11.908	4-3/4"	2-7/8"	163.53	156.42	149.31	142.20
		26846	.4688	15/32"	11.908	5-9/16"	3-13/16"	207.40	198.39	189.37	180.35
22495			.4724		12.000	102	49	147.25	140.84	134.44	128.04
	25851		.4724		12.000	120	73	167.05	159.79	152.52	145.26
		26851	.4724		12.000	140	98	212.73	203.48	194.23	184.98
22500			.4844	31/64"	12.304	4"	1-15/16"	156.25	149.46	142.66	135.87
	25856		.4844	31/64"	12.304	5-5/16"	3"	174.28	166.71	159.13	151.55
		26856	.4844	31/64"	12.304	5-9/16"	3-13/16"	218.26	208.77	199.28	189.79
22505			.4921		12.500	102	49	164.69	157.53	150.37	143.21
	25861		.4921		12.500	135	76	187.07	178.94	170.80	162.67
		26861	.4921		12.500	150	102	219.47	209.92	200.38	190.84

Series 1580KH, 1280KH, 1880KH (continued)

.5000" - .6299"
(12.700mm - 16.000mm)

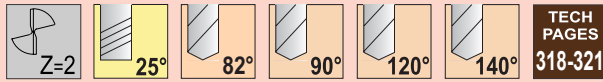
HIGH PERFORMANCE
DRILLS

3xD (1580KH) EDP#	5xD (1280KH) EDP#	7xD (1880KH) EDP#	d^+ Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric							
22510			.5000	1/2"	12.700	4"	1-15/16"	165.73	158.52	151.32	144.11
	25866		.5000	1/2"	12.700	5-3/8"	3-1/16"	188.84	180.63	172.42	164.21
		26866	.5000	1/2"	12.700	6"	4"	220.26	210.68	201.11	191.53
22515			.5118		13.000	107	53	183.95	175.96	167.96	159.96
	25871		.5118		13.000	135	78	214.15	204.84	195.53	186.22
		26871	.5118		13.000	150	102	230.59	220.56	210.54	200.51
22520			.5156	33/64"	13.096	4-7/32"	2-3/32"	188.31	180.13	171.94	163.75
	25876		.5156	33/64"	13.096	5-3/8"	3-1/8"	223.22	213.51	203.81	194.10
		26876	.5156	33/64"	13.096	6"	4"	240.29	229.85	219.40	208.95
22525			.5312	17/32"	13.492	4-7/32"	2-3/32"	192.63	184.25	175.88	167.50
	25881		.5312	17/32"	13.492	5-11/16"	3-5/16"	226.81	216.95	207.09	197.23
		26881	.5312	17/32"	13.492	6-1/8"	4-1/8"	244.19	233.57	222.96	212.34
22530			.5315		13.500	110	56	196.98	188.42	179.85	171.29
	25886		.5315		13.500	145	84	230.31	220.30	210.28	200.27
		26886	.5315		13.500	155	105	247.96	237.18	226.40	215.62
22535			.5469	35/64"	13.891	4-5/16"	2-7/32"	201.28	192.53	183.78	175.03
	25891		.5469	35/64"	13.891	5-13/16"	3-3/8"	242.93	232.36	221.80	211.24
		26891	.5469	35/64"	13.891	6-1/8"	4-1/8"	255.71	244.60	233.48	222.36
22540			.5512		14.000	110	56	205.65	196.71	187.77	178.83
	25896		.5512		14.000	145	86	246.49	235.77	225.06	214.34
		26896	.5512		14.000	155	105	259.49	248.20	236.92	225.64
22545			.5625	9/16"	14.288	4-9/16"	2-15/32"	227.68	217.78	207.88	197.98
	25901		.5625	9/16"	14.288	5-15/16"	3-1/2"	265.56	254.01	242.47	230.92
		26901	.5625	9/16"	14.288	6-1/4"	4-3/8"	280.15	267.97	255.79	243.61
22550			.5709		14.500	116	63	231.98	221.89	211.81	201.72
	25906		.5709		14.500	150	89	267.66	256.03	244.39	232.75
		26906	.5709		14.500	160	109	282.37	270.09	257.82	245.54
22555			.5781	37/64"	14.684	4-15/16"	2-9/16"	236.12	225.85	215.59	205.32
	25911		.5781	37/64"	14.684	6"	3-1/2"	268.40	256.73	245.06	233.39
		26911	.5781	37/64"	14.684	6-1/4"	4-3/8"	283.13	270.82	258.51	246.20
22560			.5906		15.000	125	65	240.45	230.00	219.54	209.09
	25916		.5906		15.000	150	90	271.88	260.06	248.24	236.42
		26916	.5906		15.000	160	112	286.81	274.34	261.87	249.40
22565			.5938	19/32"	15.083	4-15/16"	2-9/16"	241.78	231.26	220.75	210.24
	25921		.5938	19/32"	15.083	6"	3-9/16"	278.97	266.84	254.71	242.58
		26921	.5938	19/32"	15.083	6-3/8"	4-3/8"	294.26	281.47	268.67	255.88
22570			.6094	39/64"	15.479	5-1/16"	2-13/16"	242.97	232.41	221.84	211.28
	25926		.6094	39/64"	15.479	6-3/16"	3-11/16"	313.95	300.30	286.65	273.00
		26926	.6094	39/64"	15.479	6-7/16"	4-7/16"	331.13	316.73	302.34	287.94
22575			.6102		15.500	129	71	244.24	233.62	223.00	212.38
	25931		.6102		15.500	160	94	314.81	301.13	287.44	273.75
		26931	.6102		15.500	165	113	332.07	317.64	303.20	288.76
22580			.6250	5/8"	15.875	5-1/4"	3-1/8"	245.44	234.77	224.10	213.43
	25936		.6250	5/8"	15.875	6-5/16"	3-3/4"	323.50	309.43	295.37	281.30
		26936	.6250	5/8"	15.875	6-9/16"	4-9/16"	341.26	326.43	311.59	296.75
22585			.6299		16.000	133	79	251.39	240.46	229.53	218.60
	25941		.6299		16.000	160	95	327.74	313.49	299.24	284.99
		26941	.6299		16.000	165	117	345.74	330.70	315.67	300.64

Series 1600

NEW ITEMS

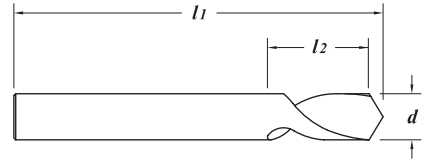
.0787" - .3750"
(2.000mm - 9.525mm)



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)

N/C Spotting

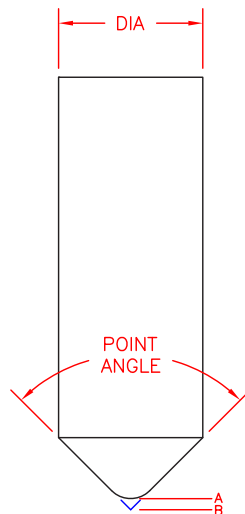
- Solid submicron grain carbide drill
- For spotting to stabilize long drills
- Can be used for chamfering
- Rough, angled or spherical surfaces
- No O.D. clearance
- For locating on true position
- Live tooling recommended on lathe processes



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						
91650	91500	91572	91240	.0787	2.000	50	10	10.29	9.85	9.40	8.95
91652	91505	91575	91245	.0938	3/32"	2"	3/8"	11.66	11.15	10.65	10.14
-	91507	-	-	.1181	3.000	38	6	12.87	12.31	11.75	11.19
-	91510	91580	91250	.1181	3.000	50	10	13.74	13.15	12.55	11.95
-	91512	-	-	.1181	3.000	75	10	15.94	15.25	14.55	13.86
-	91514	-	-	.1250	1/8"	1-1/2"	1/4"	12.87	12.31	11.75	11.19
91656	91000	91100	91260	.1250	1/8"	2"	3/8"	13.74	13.15	12.55	11.95
-	91002	-	-	.1250	1/8"	3"	3/8"	15.94	15.25	14.55	13.86
91658	91520	91590	91270	.1575	4.000	50	12	15.87	15.18	14.49	13.80
-	91522	-	-	.1875	3/16"	2"	3/8"	15.87	15.18	14.49	13.80
-	91524	-	-	.1875	3/16"	2-1/2"	1/2"	16.43	15.72	15.00	14.29
91660	91010	91110	91280	.1875	3/16"	3"	3/4"	17.97	17.19	16.41	15.63
-	91012	-	-	.1875	3/16"	4"	3/4"	21.02	20.11	19.19	18.28
-	91014	-	-	.1969	5.000	50	10	17.26	16.51	15.76	15.01
-	91530	91600	91290	.1969	5.000	65	15	18.88	18.06	17.24	16.42
-	91532	-	-	.1969	5.000	75	15	20.34	19.46	18.57	17.69
-	91534	-	-	.2362	6.000	50	12	19.40	18.56	17.71	16.87
91664	91540	91610	91300	.2362	6.000	65	20	19.85	18.99	18.12	17.26
-	91542	-	-	.2362	6.000	75	20	21.33	20.41	19.48	18.55
-	91544	-	-	.2362	6.000	100	20	24.91	23.83	22.74	21.66
-	91546	-	-	.2500	1/4"	2"	1/2"	19.40	18.56	17.71	16.87
-	91547	-	-	.2500	1/4"	2-1/2"	5/8"	19.85	18.99	18.12	17.26
91666	91020	91120	91310	.2500	1/4"	3"	3/4"	21.33	20.41	19.48	18.55
-	91021	-	-	.2500	1/4"	4"	3/4"	24.91	23.83	22.74	21.66
-	91022	-	-	.2500	1/4"	6"	3/4"	36.86	35.26	33.65	32.05
-	91023	-	-	.3125	5/16"	2"	1/2"	23.51	22.48	21.46	20.44
-	91024	-	-	.3125	5/16"	2-1/2"	5/8"	24.08	23.03	21.99	20.94
91668	91025	91125	91315	.3125	5/16"	3"	1"	25.81	24.68	23.56	22.44
-	91026	-	-	.3125	5/16"	4"	1"	30.73	29.39	28.06	26.72
-	91548	-	-	.3150	8.000	50	12	23.51	22.48	21.46	20.44
-	91549	-	-	.3150	8.000	65	16	24.08	23.03	21.99	20.94
91670	91550	91620	91320	.3150	8.000	75	25	25.81	24.68	23.56	22.44
-	91551	-	-	.3150	8.000	100	25	30.73	29.39	28.06	26.72
-	91028	-	-	.3750	3/8"	2"	1/2"	25.15	24.06	22.96	21.87
-	91029	-	-	.3750	3/8"	2-1/2"	5/8"	26.07	24.94	23.80	22.67
91672	91030	91130	91330	.3750	3/8"	3"	1"	27.99	26.77	25.56	24.34
-	91031	-	-	.3750	3/8"	4"	1"	34.27	32.78	31.29	29.80
-	91032	-	-	.3750	3/8"	6"	1"	49.86	47.70	45.53	43.36

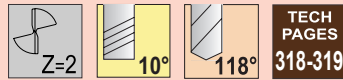
82° EDP#	90° EDP#	120° EDP#	140° EDP#	d^+ Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
				Decimal	Metric						
-	91558	-	-	.3937	10.000	65	16	33.32	31.87	30.42	28.97
-	91559	-	-	.3937	10.000	70	20	34.20	32.71	31.23	29.74
-	91560	91630	91340	.3937	10.000	88	25	38.62	36.94	35.26	33.58
-	91561	-	-	.3937	10.000	100	25	41.95	40.13	38.30	36.48
-	91564	-	-	.4375	7/16"	11.113	2-3/4"	36.96	35.35	33.75	32.14
91676	91565	91635	91345	.4375	7/16"	11.113	4"	43.11	41.24	39.36	37.49
-	91568	-	-	.4724		12.000	65	39.38	37.66	35.95	34.24
-	91569	-	-	.4724		12.000	75	40.08	38.34	36.59	34.85
-	91570	91640	91350	.4724		12.000	100	46.41	44.40	42.38	40.36
-	91038	-	-	.5000	1/2"	12.700	2-1/2"	40.63	38.86	37.10	35.33
-	91039	-	-	.5000	1/2"	12.700	3"	41.23	39.44	37.64	35.85
91680	91040	91140	91360	.5000	1/2"	12.700	4"	48.27	46.17	44.07	41.97
-	91041	-	-	.5000	1/2"	12.700	6"	72.94	69.77	66.60	63.43
-	91050	91170	91370	.5512		14.000	100	83.18	79.56	75.95	72.33
91684	91060	91180	-	.5625	9/16"	14.287	4"	90.70	86.76	82.81	78.87
-	91067	-	-	.6250	5/8"	15.875	3"	86.68	82.91	79.14	75.37
-	91068	-	-	.6250	5/8"	15.875	3-1/2"	87.27	83.48	79.68	75.89
-	91069	-	-	.6250	5/8"	15.875	4"	96.15	91.97	87.79	83.61
91686	91070	91190	91390	.6250	5/8"	15.875	5"	111.29	106.45	101.61	96.77
NEW	-	91077	-	.6299		16.000	75	89.48	85.59	81.70	77.81
-	91078	-	-	.6299		16.000	88	90.14	86.22	82.30	78.38
NEW	-	91079	-	.6299		16.000	100	98.24	93.97	89.70	85.43
91688	91080	91200	91400	.6299		16.000	125	114.26	109.30	104.33	99.36
91690	91090	91210	-	.7087		18.000	125	156.75	149.93	143.12	136.30
-	91148	-	-	.7500	3/4"	19.050	3"	131.42	125.71	119.99	114.28
-	91149	-	-	.7500	3/4"	19.050	4"	136.06	130.14	124.23	118.31
91692	91150	91220	91420	.7500	3/4"	19.050	5"	161.00	154.00	147.00	140.00
NEW	-	91159	-	.7874		20.000	100	152.02	145.41	138.80	132.19
-	91160	91230	91430	.7874		20.000	125	174.32	166.74	159.16	151.58
NEW	-	91161	-	.7874		20.000	150	192.49	184.12	175.75	167.38

DIAMETER	DRILL POINT ANGLE				
	82°	90°	120°	140°	
2mm	.0787	.003	.002	.001	.001
3/32"	.0938	.003	.003	.002	.001
3mm	.1181	.004	.004	.002	.001
1/8"	.1250	.004	.004	.002	.001
4mm	.1575	.005	.005	.003	.002
3/16"	.1875	.006	.006	.003	.002
5mm	.1969	.007	.006	.003	.002
6mm	.2362	.008	.007	.004	.003
1/4"	.2500	.009	.008	.004	.003
5/16"	.3125	.011	.009	.005	.003
8mm	.3150	.011	.009	.005	.003
3/8"	.3750	.013	.011	.006	.004
10mm	.3937	.014	.012	.007	.004
7/16"	.4375	.015	.013	.008	.005
12mm	.4724	.016	.014	.008	.005
1/2"	.5000	.017	.015	.009	.005
14mm	.5512	.019	.017	.010	.006
9/16"	.5625	.019	.017	.010	.006
5/8"	.6250	.022	.019	.011	.007
16mm	.6299	.022	.019	.011	.007
18mm	.7087	.024	.021	.012	.008
3/4"	.7500	.026	.023	.013	.008
20mm	.7874	.027	.024	.014	.009



Garr Tool series 1600 spotting drills are not only useful for starting holes, but also for leaving the desired chamfer when programmed to the correct depth. Because spotting drills do not come to a true point, but have a small "flat" as shown in the figure to the left, the length deviation from the chart must be taken into account to leave the correct chamfer length. This chart gives the distance from the theoretical drill point 'B' to the actual drill point 'A'. These values can be used to compensate for the "flat" on our spotting drills in your calculations.

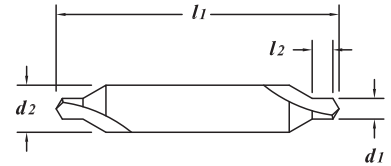
Series 1400



TOLERANCES	
d_1	+0.003" -0.000" (+0.0762 -0.0000mm)
d_2	h6
l_1	+0.125" -0.125" (+3.175 -3.175mm)
l_2	+0.008" -0.008" (+0.203 -0.203mm)

Combined Drill and Countersink

Solid submicron grain carbide drill
 For center drilling applications
 60° ±0°30' included countersink angle
 Live tooling recommended on lathe processes
 Drill length (l_2) is equal to drill diameter (d_1)
 Not able to be altered



EDP #	Number	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 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	15.42	14.75	14.08	13.41
58040	2	.0781	5/64"	1.984	3/16"	2"	.0781	24.28	23.22	22.17	21.11
58050	3	.1094	7/64"	2.779	1/4"	2"	.1094	27.65	26.44	25.24	24.04
58060	4	.1250	1/8"	3.175	5/16"	2-1/8"	.1250	38.70	37.02	35.33	33.65
58070	5	.1875	3/16"	4.763	7/16"	2-3/4"	.1875	55.28	52.88	50.47	48.07
58080	6	.2188	7/32"	5.558	1/2"	3"	.2188	73.59	70.39	67.19	63.99



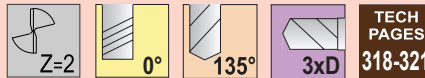
Tool prep, Coating inspection

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)

Series 1500

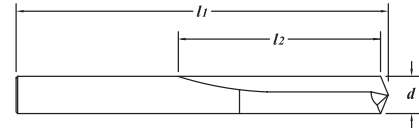
.0625" - .1660"
(1.588mm - 4.216mm)



Recommended for high nickel, cobalt-based, and powdered metals

Hard Metal

- Solid submicron grain carbide drill
- Straight flute design provides excellent rigidity
- Materials 40 Rc and higher
- Live tooling recommended on lathe processes
- Hardlube Coating - page 59



GENERAL PURPOSE DRILLS

EDP#	d [†] Diameter		l1 Overall Length	l2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
59165	.0625	1/16"	1.588	1-3/4"	5/8"	10.60	10.14	9.68	9.22
59180	.0700	#50	1.778	1-3/4"	3/4"	10.60	10.14	9.68	9.22
59185	.0730	#49	1.854	1-3/4"	3/4"	10.60	10.14	9.68	9.22
59190	.0760	#48	1.930	1-3/4"	3/4"	10.60	10.14	9.68	9.22
59195	.0781	5/64"	1.984	1-3/4"	3/4"	10.60	10.14	9.68	9.22
59200	.0785	#47	1.994	1-3/4"	7/8"	10.60	10.14	9.68	9.22
39000	.0787		2.000	50	22	10.60	10.14	9.68	9.22
59210	.0810	#46	2.057	2"	7/8"	10.60	10.14	9.68	9.22
59215	.0820	#45	2.083	2"	7/8"	10.60	10.14	9.68	9.22
59220	.0860	#44	2.184	2"	7/8"	10.60	10.14	9.68	9.22
59225	.0890	#43	2.261	2"	7/8"	10.60	10.14	9.68	9.22
59230	.0935	#42	2.375	2"	7/8"	10.60	10.14	9.68	9.22
59235	.0938	3/32"	2.383	2"	7/8"	10.60	10.14	9.68	9.22
59240	.0960	#41	2.438	2"	7/8"	12.09	11.56	11.04	10.51
59245	.0980	#40	2.489	2"	7/8"	12.09	11.56	11.04	10.51
39050	.0984		2.500	50	22	12.09	11.56	11.04	10.51
59255	.0995	#39	2.527	2"	7/8"	12.09	11.56	11.04	10.51
59260	.1015	#38	2.578	2"	7/8"	12.09	11.56	11.04	10.51
59265	.1040	#37	2.642	2"	7/8"	12.09	11.56	11.04	10.51
59270	.1065	#36	2.705	2"	7/8"	12.09	11.56	11.04	10.51
59275	.1094	7/64"	2.779	2"	1"	12.09	11.56	11.04	10.51
59280	.1100	#35	2.794	2"	1"	12.57	12.02	11.48	10.93
59285	.1110	#34	2.819	2"	1"	12.57	12.02	11.48	10.93
59290	.1130	#33	2.870	2"	1"	12.57	12.02	11.48	10.93
59295	.1160	#32	2.946	2"	1"	12.57	12.02	11.48	10.93
39100	.1181		3.000	50	25	12.57	12.02	11.48	10.93
59305	.1200	#31	3.048	2"	1"	12.57	12.02	11.48	10.93
59310	.1250	1/8"	3.175	2"	1"	11.59	11.09	10.58	10.08
59315	.1285	#30	3.264	2"	1"	13.67	13.08	12.48	11.89
59320	.1360	#29	3.454	2"	1"	13.67	13.08	12.48	11.89
39150	.1378		3.500	50	25	13.67	13.08	12.48	11.89
59330	.1405	#28	3.569	2"	1"	13.67	13.08	12.48	11.89
59335	.1406	9/64"	3.571	2"	1"	13.67	13.08	12.48	11.89
59340	.1440	#27	3.658	2"	1"	14.04	13.43	12.82	12.21
59345	.1470	#26	3.734	2"	1"	14.75	14.11	13.47	12.83
59350	.1495	#25	3.797	2"	1"	14.75	14.11	13.47	12.83
59355	.1520	#24	3.861	2"	1"	14.75	14.11	13.47	12.83
59360	.1540	#23	3.912	2"	1"	14.75	14.11	13.47	12.83
59365	.1562	5/32"	3.967	2-1/2"	1-1/8"	14.75	14.11	13.47	12.83
59370	.1570	#22	3.988	2-1/2"	1-1/8"	15.99	15.29	14.60	13.90
39200	.1575		4.000	63	28	15.99	15.29	14.60	13.90
59380	.1590	#21	4.039	2-1/2"	1-1/8"	16.36	15.65	14.94	14.23
59385	.1610	#20	4.089	2-1/2"	1-1/8"	16.36	15.65	14.94	14.23
59390	.1660	#19	4.216	2-1/2"	1-1/8"	16.97	16.24	15.50	14.76

continued →

Series 1500 (continued)

.1695" - .5000"
(4.305mm - 12.700mm)

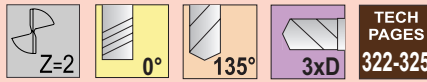
EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
59395	.1695	#18	4.305	2-1/2"	1-3/16"	16.97	16.24	15.50	14.76
59400	.1719	11/64"	4.366	2-1/2"	1-3/16"	16.97	16.24	15.50	14.76
59405	.1730	#17	4.394	2-1/2"	1-3/16"	17.34	16.59	15.83	15.08
59410	.1770	#16	4.496	2-1/2"	1-3/16"	17.34	16.59	15.83	15.08
39250	.1772		4.500	63	28	17.34	16.59	15.83	15.08
59420	.1800	#15	4.572	2-1/2"	1-3/16"	17.34	16.59	15.83	15.08
59425	.1820	#14	4.623	2-1/2"	1-3/16"	18.31	17.51	16.72	15.92
59430	.1850	#13	4.700	2-1/2"	1-3/16"	18.31	17.51	16.72	15.92
59435	.1875	3/16"	4.763	2-1/2"	1-3/16"	17.60	16.83	16.07	15.30
59440	.1890	#12	4.801	2-1/2"	1-3/16"	18.18	17.39	16.60	15.81
59445	.1910	#11	4.851	2-1/2"	1-3/16"	18.18	17.39	16.60	15.81
59450	.1935	#10	4.915	2-1/2"	1-1/4"	19.26	18.43	17.59	16.75
59455	.1960	#9	4.978	2-1/2"	1-1/4"	19.26	18.43	17.59	16.75
39300	.1969		5.000	63	32	19.26	18.43	17.59	16.75
59465	.1990	#8	5.055	2-1/2"	1-1/4"	19.91	19.04	18.18	17.31
59470	.2010	#7	5.105	2-1/2"	1-1/4"	19.91	19.04	18.18	17.31
59475	.2031	13/64"	5.159	2-1/2"	1-1/4"	19.91	19.04	18.18	17.31
59480	.2040	#6	5.182	2-1/2"	1-1/4"	21.00	20.09	19.17	18.26
59485	.2055	#5	5.220	2-1/2"	1-1/4"	21.00	20.09	19.17	18.26
59490	.2090	#4	5.309	2-1/2"	1-1/4"	21.00	20.09	19.17	18.26
59495	.2130	#3	5.410	2-1/2"	1-1/4"	21.00	20.09	19.17	18.26
39350	.2165		5.500	63	32	21.00	20.09	19.17	18.26
59505	.2188	7/32"	5.558	2-1/2"	1-1/2"	21.00	20.09	19.17	18.26
59510	.2210	#2	5.613	2-1/2"	1-1/2"	22.46	21.48	20.51	19.53
59515	.2280	#1	5.791	2-1/2"	1-1/2"	22.46	21.48	20.51	19.53
59525	.2344	15/64"	5.954	2-1/2"	1-1/2"	25.04	23.95	22.86	21.77
39400	.2362		6.000	63	38	25.04	23.95	22.86	21.77
59550	.2500	1/4"	6.350	2-1/2"	1-1/2"	23.58	22.55	21.53	20.50
59570	.2656	17/64"	6.746	2-1/2"	1-1/2"	28.58	27.34	26.09	24.85
39500	.2756		7.000	63	38	29.29	28.02	26.74	25.47
59600	.2812	9/32"	7.142	2-1/2"	1-1/2"	29.29	28.02	26.74	25.47
39520	.2953		7.500	63	41	30.77	29.44	28.10	26.76
59620	.2969	19/64"	7.541	2-1/2"	1-5/8"	30.77	29.44	28.10	26.76
59630	.3125	5/16"	7.938	2-1/2"	1-5/8"	30.77	29.44	28.10	26.76
39540	.3150		8.000	63	41	32.36	30.95	29.55	28.14
59650	.3281	21/64"	8.334	3"	1-5/8"	33.32	31.87	30.42	28.97
39560	.3346		8.500	76	41	37.21	35.60	33.98	32.36
59670	.3438	11/32"	8.733	3"	1-5/8"	37.21	35.60	33.98	32.36
39580	.3543		9.000	76	41	40.41	38.65	36.90	35.14
59690	.3594	23/64"	9.129	3"	1-3/4"	40.41	38.65	36.90	35.14
59705	.3750	3/8"	9.525	3"	1-3/4"	44.06	42.14	40.23	38.31
59720	.3906	25/64"	9.921	3"	1-3/4"	49.80	47.63	45.47	43.30
39620	.3937		10.000	76	44	49.80	47.63	45.47	43.30
59740	.4062	13/32"	10.317	3"	1-3/4"	55.65	53.23	50.81	48.39
39640	.4134		10.500	76	44	58.24	55.70	53.17	50.64
59755	.4219	27/64"	10.716	3"	1-3/4"	61.27	58.61	55.94	53.28
39660	.4331		11.000	76	44	62.38	59.66	56.95	54.24
59765	.4375	7/16"	11.113	3"	1-3/4"	62.38	59.66	56.95	54.24
59775	.4531	29/64"	11.509	3"	1-3/4"	65.40	62.56	59.71	56.87
59780	.4688	15/32"	11.908	3"	1-3/4"	65.40	62.56	59.71	56.87
39700	.4724		12.000	76	44	65.40	62.56	59.71	56.87
59790	.4844	31/64"	12.304	3"	1-3/4"	65.40	62.56	59.71	56.87
39720	.4921		12.500	76	44	66.88	63.98	61.07	58.16
59800	.5000	1/2"	12.700	3"	1-3/4"	66.88	63.98	61.07	58.16

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)

Series 1500H

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

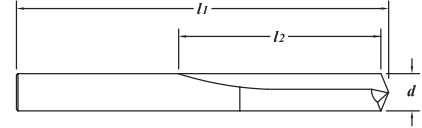


Recommended for high nickel, cobalt-based, and powdered metals

Hard Metal

Hardlube Coating

- Solid submicron grain carbide drill
- Straight flute design provides excellent rigidity
- Materials 40 Rc and higher
- Excellent heat resistance and lubricity
- Live tooling recommended on lathe processes
- Uncoated - page 57



GENERAL PURPOSE 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							
59166	.0625	1/16"	1.588	1-3/4"	5/8"	12.74	12.19	11.63	11.08
59181	.0700	#50	1.778	1-3/4"	3/4"	12.74	12.19	11.63	11.08
59186	.0730	#49	1.854	1-3/4"	3/4"	12.74	12.19	11.63	11.08
59191	.0760	#48	1.930	1-3/4"	3/4"	12.74	12.19	11.63	11.08
59196	.0781	5/64"	1.984	1-3/4"	3/4"	12.74	12.19	11.63	11.08
59201	.0785	#47	1.994	1-3/4"	7/8"	12.74	12.19	11.63	11.08
39001	.0787		2.000	50	22	12.74	12.19	11.63	11.08
59211	.0810	#46	2.057	2"	7/8"	12.74	12.19	11.63	11.08
59216	.0820	#45	2.083	2"	7/8"	12.74	12.19	11.63	11.08
59221	.0860	#44	2.184	2"	7/8"	12.74	12.19	11.63	11.08
59226	.0890	#43	2.261	2"	7/8"	12.74	12.19	11.63	11.08
59231	.0935	#42	2.375	2"	7/8"	12.74	12.19	11.63	11.08
59236	.0938	3/32"	2.383	2"	7/8"	12.74	12.19	11.63	11.08
59241	.0960	#41	2.438	2"	7/8"	14.17	13.55	12.94	12.32
59246	.0980	#40	2.489	2"	7/8"	14.17	13.55	12.94	12.32
39051	.0984		2.500	50	22	14.17	13.55	12.94	12.32
59256	.0995	#39	2.527	2"	7/8"	14.17	13.55	12.94	12.32
59261	.1015	#38	2.578	2"	7/8"	14.17	13.55	12.94	12.32
59266	.1040	#37	2.642	2"	7/8"	14.17	13.55	12.94	12.32
59271	.1065	#36	2.705	2"	7/8"	14.17	13.55	12.94	12.32
59276	.1094	7/64"	2.779	2"	1"	14.17	13.55	12.94	12.32
59281	.1100	#35	2.794	2"	1"	14.70	14.06	13.42	12.78
59286	.1110	#34	2.819	2"	1"	14.70	14.06	13.42	12.78
59291	.1130	#33	2.870	2"	1"	14.70	14.06	13.42	12.78
59296	.1160	#32	2.946	2"	1"	14.70	14.06	13.42	12.78
39101	.1181		3.000	50	25	14.70	14.06	13.42	12.78
59306	.1200	#31	3.048	2"	1"	14.70	14.06	13.42	12.78
59311	.1250	1/8"	3.175	2"	1"	13.70	13.10	12.51	11.91
59316	.1285	#30	3.264	2"	1"	15.78	15.09	14.41	13.72
59321	.1360	#29	3.454	2"	1"	15.78	15.09	14.41	13.72
39151	.1378		3.500	50	25	15.78	15.09	14.41	13.72
59331	.1405	#28	3.569	2"	1"	15.78	15.09	14.41	13.72
59336	.1406	9/64"	3.571	2"	1"	15.78	15.09	14.41	13.72
59341	.1440	#27	3.658	2"	1"	16.13	15.43	14.73	14.03
59346	.1470	#26	3.734	2"	1"	16.87	16.14	15.40	14.67
59351	.1495	#25	3.797	2"	1"	16.87	16.14	15.40	14.67
59356	.1520	#24	3.861	2"	1"	16.87	16.14	15.40	14.67
59361	.1540	#23	3.912	2"	1"	16.87	16.14	15.40	14.67
59366	.1562	5/32"	3.967	2-1/2"	1-1/8"	16.87	16.14	15.40	14.67
59371	.1570	#22	3.988	2-1/2"	1-1/8"	18.08	17.29	16.51	15.72
39201	.1575		4.000	63	28	18.08	17.29	16.51	15.72
59381	.1590	#21	4.039	2-1/2"	1-1/8"	18.47	17.67	16.86	16.06
59386	.1610	#20	4.089	2-1/2"	1-1/8"	18.47	17.67	16.86	16.06
59391	.1660	#19	4.216	2-1/2"	1-1/8"	19.08	18.25	17.42	16.59

continued →

Series 1500H (continued)

.1695" - .5000"
(4.305mm - 12.700mm)

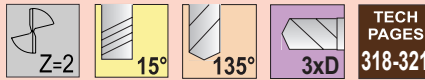
EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
59396	.1695	#18	4.305	2-1/2"	1-3/16"	19.08	18.25	17.42	16.59
59401	.1719	11/64"	4.366	2-1/2"	1-3/16"	19.08	18.25	17.42	16.59
59406	.1730	#17	4.394	2-1/2"	1-3/16"	19.45	18.60	17.76	16.91
59411	.1770	#16	4.496	2-1/2"	1-3/16"	19.45	18.60	17.76	16.91
39251	.1772		4.500	63	28	19.45	18.60	17.76	16.91
59421	.1800	#15	4.572	2-1/2"	1-3/16"	19.45	18.60	17.76	16.91
59426	.1820	#14	4.623	2-1/2"	1-3/16"	20.39	19.50	18.62	17.73
59431	.1850	#13	4.700	2-1/2"	1-3/16"	20.39	19.50	18.62	17.73
59436	.1875	3/16"	4.763	2-1/2"	1-3/16"	19.68	18.82	17.97	17.11
59441	.1890	#12	4.801	2-1/2"	1-3/16"	21.78	20.83	19.89	18.94
59446	.1910	#11	4.851	2-1/2"	1-3/16"	21.78	20.83	19.89	18.94
59451	.1935	#10	4.915	2-1/2"	1-1/4"	22.89	21.89	20.90	19.90
59456	.1960	#9	4.978	2-1/2"	1-1/4"	22.89	21.89	20.90	19.90
39301	.1969		5.000	63	32	22.89	21.89	20.90	19.90
59466	.1990	#8	5.055	2-1/2"	1-1/4"	23.51	22.48	21.46	20.44
59471	.2010	#7	5.105	2-1/2"	1-1/4"	23.51	22.48	21.46	20.44
59476	.2031	13/64"	5.159	2-1/2"	1-1/4"	23.51	22.48	21.46	20.44
59481	.2040	#6	5.182	2-1/2"	1-1/4"	24.61	23.54	22.47	21.40
59486	.2055	#5	5.220	2-1/2"	1-1/4"	24.61	23.54	22.47	21.40
59491	.2090	#4	5.309	2-1/2"	1-1/4"	24.61	23.54	22.47	21.40
59496	.2130	#3	5.410	2-1/2"	1-1/4"	24.61	23.54	22.47	21.40
39351	.2165		5.500	63	32	24.61	23.54	22.47	21.40
59506	.2188	7/32"	5.558	2-1/2"	1-1/2"	24.61	23.54	22.47	21.40
59511	.2210	#2	5.613	2-1/2"	1-1/2"	26.08	24.95	23.81	22.68
59516	.2280	#1	5.791	2-1/2"	1-1/2"	26.08	24.95	23.81	22.68
59526	.2344	15/64"	5.954	2-1/2"	1-1/2"	28.62	27.38	26.13	24.89
39401	.2362		6.000	63	38	28.62	27.38	26.13	24.89
59551	.2500	1/4"	6.350	2-1/2"	1-1/2"	27.16	25.98	24.80	23.62
39451	.2559		6.500	63	38	34.98	33.46	31.94	30.42
59571	.2656	17/64"	6.746	2-1/2"	1-1/2"	34.98	33.46	31.94	30.42
39501	.2756		7.000	63	38	35.70	34.14	32.59	31.04
59601	.2812	9/32"	7.142	2-1/2"	1-1/2"	35.70	34.14	32.59	31.04
39521	.2953		7.500	63	41	37.18	35.56	33.95	32.33
59621	.2969	19/64"	7.541	2-1/2"	1-5/8"	37.18	35.56	33.95	32.33
59631	.3125	5/16"	7.938	2-1/2"	1-5/8"	37.18	35.56	33.95	32.33
39541	.3150		8.000	63	41	38.79	37.10	35.42	33.73
59651	.3281	21/64"	8.334	3"	1-5/8"	39.73	38.01	36.28	34.55
39561	.3346		8.500	76	41	43.64	41.75	39.85	37.95
59671	.3438	11/32"	8.733	3"	1-5/8"	43.64	41.75	39.85	37.95
39581	.3543		9.000	76	41	47.23	45.18	43.12	41.07
59691	.3594	23/64"	9.129	3"	1-3/4"	47.23	45.18	43.12	41.07
39601	.3740		9.500	76	41	50.91	48.70	46.48	44.27
59706	.3750	3/8"	9.525	3"	1-3/4"	50.91	48.70	46.48	44.27
59721	.3906	25/64"	9.921	3"	1-3/4"	57.19	54.70	52.22	49.73
39621	.3937		10.000	76	44	57.19	54.70	52.22	49.73
59741	.4062	13/32"	10.317	3"	1-3/4"	63.05	60.31	57.57	54.83
59756	.4219	27/64"	10.716	3"	1-3/4"	68.71	65.73	62.74	59.75
39661	.4331		11.000	76	44	69.78	66.75	63.71	60.68
59766	.4375	7/16"	11.113	3"	1-3/4"	69.78	66.75	63.71	60.68
39681	.4528		11.500	76	44	71.59	68.48	65.36	62.25
59776	.4531	29/64"	11.509	3"	1-3/4"	72.82	69.65	66.49	63.32
59781	.4688	15/32"	11.908	3"	1-3/4"	72.82	69.65	66.49	63.32
39701	.4724		12.000	76	44	72.82	69.65	66.49	63.32
59791	.4844	31/64"	12.304	3"	1-3/4"	72.82	69.65	66.49	63.32
39721	.4921		12.500	76	44	74.27	71.04	67.81	64.58
59801	.5000	1/2"	12.700	3"	1-3/4"	74.27	71.04	67.81	64.58

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)

Series 1510

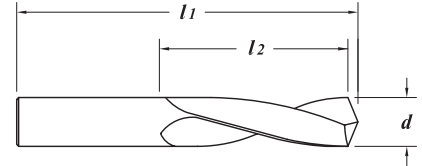
.0625" - .1575"
(1.588mm - 4.000mm)



Recommended for titanium, inconel, hastelloy, waspaly, and stainless steel

Slow Helix

- Solid submicron grain carbide drill
- Heavy web for extra rigidity and added strength
- Thinned point
- Live tooling recommended on lathe processes
- Hardlube Coating - page 64



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							
19070	.0625	1/16"	1.588	1-3/4"	5/8"	7.81	7.47	7.13	6.79
19075	.0635	#52	1.613	1-3/4"	11/16"	7.94	7.59	7.25	6.90
19080	.0670	#51	1.702	1-3/4"	11/16"	8.05	7.70	7.35	7.00
19085	.0700	#50	1.778	1-3/4"	11/16"	8.26	7.90	7.54	7.18
19090	.0730	#49	1.854	1-3/4"	11/16"	8.44	8.07	7.71	7.34
19095	.0760	#48	1.930	1-3/4"	11/16"	8.73	8.35	7.97	7.59
19100	.0781	5/64"	1.984	1-3/4"	11/16"	9.05	8.66	8.26	7.87
19105	.0785	#47	1.994	1-3/4"	3/4"	9.35	8.94	8.54	8.13
19115	.0787		2.000	45	19	9.51	9.10	8.68	8.27
19120	.0810	#46	2.057	1-3/4"	3/4"	9.65	9.23	8.81	8.39
19125	.0820	#45	2.083	1-3/4"	3/4"	9.94	9.50	9.07	8.64
19130	.0860	#44	2.184	1-3/4"	3/4"	10.27	9.82	9.38	8.93
19135	.0890	#43	2.261	1-3/4"	3/4"	10.57	10.11	9.65	9.19
19140	.0935	#42	2.375	1-3/4"	3/4"	10.72	10.25	9.79	9.32
19145	.0938	3/32"	2.383	1-3/4"	3/4"	10.97	10.49	10.02	9.54
19150	.0960	#41	2.438	1-13/16"	13/16"	11.05	10.57	10.09	9.61
19155	.0980	#40	2.489	1-13/16"	13/16"	11.20	10.71	10.23	9.74
19160	.0984		2.500	46	21	11.28	10.79	10.30	9.81
19165	.0995	#39	2.527	1-13/16"	13/16"	11.33	10.84	10.34	9.85
19170	.1015	#38	2.578	1-13/16"	13/16"	11.43	10.93	10.44	9.94
19175	.1040	#37	2.642	1-13/16"	13/16"	11.53	11.03	10.53	10.03
19180	.1065	#36	2.705	1-13/16"	13/16"	11.62	11.11	10.61	10.10
19185	.1094	7/64"	2.779	1-13/16"	13/16"	11.66	11.15	10.65	10.14
19190	.1100	#35	2.794	1-7/8"	7/8"	11.74	11.23	10.72	10.21
19195	.1110	#34	2.819	1-7/8"	7/8"	11.88	11.36	10.85	10.33
19200	.1130	#33	2.870	1-7/8"	7/8"	11.97	11.45	10.93	10.41
19205	.1160	#32	2.946	1-7/8"	7/8"	12.05	11.53	11.00	10.48
19210	.1181		3.000	48	22	12.17	11.64	11.11	10.58
19215	.1200	#31	3.048	1-7/8"	7/8"	12.29	11.76	11.22	10.69
19220	.1250	1/8"	3.175	1-7/8"	7/8"	12.42	11.88	11.34	10.80
19225	.1285	#30	3.264	1-15/16"	15/16"	12.75	12.20	11.64	11.09
19230	.1360	#29	3.454	1-15/16"	15/16"	13.09	12.52	11.95	11.38
19235	.1378		3.500	49	24	13.50	12.91	12.33	11.74
19240	.1405	#28	3.569	1-15/16"	15/16"	13.67	13.08	12.48	11.89
19245	.1406	9/64"	3.571	1-15/16"	15/16"	13.82	13.22	12.62	12.02
19250	.1440	#27	3.658	2-1/16"	1"	15.04	14.39	13.73	13.08
19255	.1470	#26	3.734	2-1/16"	1"	15.20	14.54	13.88	13.22
19260	.1495	#25	3.797	2-1/16"	1"	15.39	14.72	14.05	13.38
19265	.1520	#24	3.861	2-1/16"	1"	15.42	14.75	14.08	13.41
19270	.1540	#23	3.912	2-1/16"	1"	15.53	14.85	14.18	13.50
19275	.1562	5/32"	3.967	2-1/16"	1"	15.62	14.94	14.26	13.58
19280	.1570	#22	3.988	2-1/8"	1-1/16"	16.58	15.86	15.14	14.42
19285	.1575		4.000	54	27	16.81	16.08	15.35	14.62

continued →

GENERAL PURPOSE DRILLS

Series 1510 (continued)

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

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"	17.02	16.28	15.54	14.80
19295	.1610	#20	4.089	2-1/8"	1-1/16"	17.15	16.40	15.66	14.91
19300	.1660	#19	4.216	2-1/8"	1-1/16"	17.85	17.07	16.30	15.52
19305	.1695	#18	4.305	2-1/8"	1-1/16"	18.06	17.27	16.49	15.70
19310	.1719	11/64"	4.366	2-1/8"	1-1/16"	18.41	17.61	16.81	16.01
19315	.1730	#17	4.394	2-3/16"	1-1/8"	18.68	17.86	17.05	16.24
19320	.1770	#16	4.496	2-3/16"	1-1/8"	18.88	18.06	17.24	16.42
19325	.1772		4.500	56	29	19.00	18.17	17.35	16.52
19330	.1800	#15	4.572	2-3/16"	1-1/8"	19.08	18.25	17.42	16.59
19335	.1820	#14	4.623	2-3/16"	1-1/8"	19.50	18.66	17.81	16.96
19340	.1850	#13	4.700	2-3/16"	1-1/8"	19.65	18.80	17.94	17.09
19345	.1875	3/16"	4.763	2-3/16"	1-1/8"	19.73	18.88	18.02	17.16
19350	.1890	#12	4.801	2-1/4"	1-3/16"	20.38	19.49	18.61	17.72
19355	.1910	#11	4.851	2-1/4"	1-3/16"	20.62	19.72	18.83	17.93
19360	.1935	#10	4.915	2-1/4"	1-3/16"	21.56	20.63	19.69	18.75
19365	.1960	#9	4.978	2-1/4"	1-3/16"	22.13	21.16	20.20	19.24
19370	.1969		5.000	57	30	22.24	21.27	20.31	19.34
19375	.1990	#8	5.055	2-1/4"	1-3/16"	22.41	21.44	20.46	19.49
19380	.2010	#7	5.105	2-1/4"	1-3/16"	23.07	22.07	21.06	20.06
19385	.2031	13/64"	5.159	2-1/4"	1-3/16"	23.24	22.23	21.22	20.21
19390	.2040	#6	5.182	2-3/8"	1-1/4"	23.70	22.67	21.64	20.61
19395	.2055	#5	5.220	2-3/8"	1-1/4"	24.18	23.13	22.08	21.03
19400	.2090	#4	5.309	2-3/8"	1-1/4"	24.63	23.56	22.49	21.42
19405	.2130	#3	5.410	2-3/8"	1-1/4"	25.07	23.98	22.89	21.80
19410	.2165		5.500	60	32	25.24	24.15	23.05	21.95
19415	.2188	7/32"	5.558	2-3/8"	1-1/4"	25.44	24.33	23.23	22.12
19420	.2210	#2	5.613	2-7/16"	1-5/16"	26.04	24.90	23.77	22.64
19425	.2280	#1	5.791	2-7/16"	1-5/16"	26.22	25.08	23.94	22.80
19430	.2340	A	5.944	2-7/16"	1-5/16"	26.28	25.14	23.99	22.85
19435	.2344	15/64"	5.954	2-7/16"	1-5/16"	26.32	25.18	24.03	22.89
19440	.2362		6.000	64	35	26.39	25.25	24.10	22.95
19445	.2380	B	6.045	2-1/2"	1-3/8"	26.52	25.37	24.21	23.06
19450	.2420	C	6.147	2-1/2"	1-3/8"	26.69	25.53	24.37	23.21
19455	.2460	D	6.248	2-1/2"	1-3/8"	26.92	25.75	24.58	23.41
19460	.2500	1/4" / E	6.350	2-1/2"	1-3/8"	27.08	25.91	24.73	23.55
19465	.2559		6.500	67	37	27.74	26.53	25.33	24.12
19470	.2570	F	6.528	2-5/8"	1-7/16"	28.32	27.09	25.86	24.63
19475	.2610	G	6.629	2-5/8"	1-7/16"	28.90	27.64	26.39	25.13
19480	.2656	17/64"	6.746	2-5/8"	1-7/16"	29.49	28.20	26.92	25.64
19485	.2660	H	6.756	2-11/16"	1-1/2"	30.33	29.01	27.69	26.37
19490	.2720	I	6.909	2-11/16"	1-1/2"	30.68	29.35	28.01	26.68
19495	.2756		7.000	68	38	30.92	29.58	28.23	26.89
19500	.2770	J	7.036	2-11/16"	1-1/2"	31.20	29.84	28.49	27.13
19505	.2810	K	7.137	2-11/16"	1-1/2"	31.48	30.11	28.74	27.37
19510	.2812	9/32"	7.142	2-11/16"	1-1/2"	31.65	30.27	28.90	27.52
19515	.2900	L	7.366	2-3/4"	1-9/16"	32.82	31.39	29.97	28.54
19520	.2950	M	7.493	2-3/4"	1-9/16"	35.12	33.59	32.07	30.54
19525	.2953		7.500	70	40	35.12	33.59	32.07	30.54
19530	.2969	19/64"	7.541	2-3/4"	1-9/16"	35.32	33.78	32.25	30.71
19535	.3020	N	7.671	2-15/16"	1-5/8"	37.19	35.57	33.96	32.34
19540	.3125	5/16"	7.938	2-15/16"	1-5/8"	37.34	35.72	34.09	32.47
19545	.3150		8.000	75	43	40.07	38.32	36.58	34.84
19550	.3160	O	8.026	2-15/16"	1-11/16"	40.07	38.32	36.58	34.84
19555	.3230	P	8.204	2-15/16"	1-11/16"	40.41	38.65	36.90	35.14
19560	.3281	21/64"	8.334	2-15/16"	1-11/16"	40.65	38.89	37.12	35.35
19565	.3320	Q	8.433	3"	1-11/16"	41.60	39.79	37.98	36.17
19570	.3346		8.500	76	43	41.99	40.16	38.34	36.51

EDP#	d^+ 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"	43.30	41.42	39.53	37.65
19580	.3438	11/32"	8.733	3"	1-11/16"	45.06	43.10	41.14	39.18
19585	.3480	S	8.839	3-1/16"	1-3/4"	45.68	43.69	41.71	39.72
19590	.3543		9.000	78	44	45.95	43.96	41.96	39.96
19595	.3580	T	9.093	3-1/16"	1-3/4"	46.13	44.12	42.12	40.11
19600	.3594	23/64"	9.129	3-1/16"	1-3/4"	46.44	44.42	42.40	40.38
19605	.3680	U	9.347	3-1/8"	1-13/16"	50.86	48.65	46.44	44.23
19615	.3750	3/8"	9.525	3-1/8"	1-13/16"	51.74	49.49	47.24	44.99
19620	.3770	V	9.576	3-1/4"	1-7/8"	52.74	50.45	48.15	45.86
19625	.3860	W	9.804	3-1/4"	1-7/8"	53.84	51.50	49.16	46.82
19630	.3906	25/64"	9.921	3-1/4"	1-7/8"	54.67	52.29	49.92	47.54
19635	.3937		10.000	84	49	56.61	54.15	51.69	49.23
19640	.3970	X	10.084	3-5/16"	1-15/16"	58.27	55.74	53.20	50.67
19645	.4040	Y	10.262	3-5/16"	1-15/16"	58.73	56.18	53.62	51.07
19650	.4062	13/32"	10.317	3-5/16"	1-15/16"	60.87	58.22	55.58	52.93
19655	.4130	Z	10.490	3-3/8"	2"	61.53	58.85	56.18	53.50
19660	.4134		10.500	86	51	61.53	58.85	56.18	53.50
19665	.4219	27/64"	10.716	3-3/8"	2"	62.20	59.50	56.79	54.09
19670	.4331		11.000	87	52	67.56	64.63	61.69	58.75
19675	.4375	7/16"	11.113	3-7/16"	2-1/16"	67.56	64.63	61.69	58.75
19685	.4531	29/64"	11.509	3-9/16"	2-1/8"	73.27	70.08	66.90	63.71
19690	.4688	15/32"	11.908	3-5/8"	2-1/8"	77.50	74.13	70.76	67.39
19695	.4724		12.000	94	56	77.77	74.39	71.01	67.63
19700	.4844	31/64"	12.304	3-11/16"	2-3/16"	78.38	74.98	71.57	68.16
19705	.4921		12.500	95	56	79.26	75.81	72.37	68.92
19710	.5000	1/2"	12.700	3-3/4"	2-1/4"	79.83	76.36	72.89	69.42
19720	.5156	33/64"	13.096	4-1/4"	2-3/8"	107.28	102.62	97.95	93.29
19725	.5312	17/32"	13.492	4-1/4"	2-3/8"	110.07	105.28	100.50	95.71
19730	.5315		13.500	107	60	112.91	108.00	103.09	98.18
19735	.5469	35/64"	13.891	4-1/4"	2-3/8"	115.69	110.66	105.63	100.60
19740	.5512		14.000	107	60	118.51	113.36	108.20	103.05
19745	.5625	9/16"	14.287	4-1/2"	2-1/2"	129.23	123.61	117.99	112.37
19755	.5781	37/64"	14.683	4-1/2"	2-1/2"	134.62	128.77	122.91	117.06
19760	.5906		15.000	115	65	137.36	131.38	125.41	119.44
19765	.5938	19/32"	15.082	4-1/2"	2-1/2"	138.15	132.14	126.14	120.13
19770	.6094	39/64"	15.478	4-1/2"	2-1/2"	138.92	132.88	126.84	120.80
19780	.6250	5/8"	15.875	4-1/2"	2-1/2"	140.48	134.38	128.27	122.16
19785	.6299		16.000	115	65	144.22	137.95	131.68	125.41

Series 1510H

NEW ITEMS

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



TECH PAGES
322-325

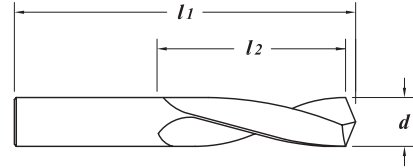
TOLERANCES

<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)

Recommended for titanium, inconel, hastelloy, waspaloy, and stainless steel

Slow Helix Hardlube Coating

- Solid submicron grain carbide drill
- Excellent heat resistance and lubricity
- Heavy web for extra rigidity and added strength
- Thinned point
- Live tooling recommended on lathe processes
- Uncoated - page 61



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"	9.89	9.46	9.03	8.60
19076	.0635	#52	1.613	1-3/4"	11/16"	10.03	9.59	9.16	8.72
19081	.0670	#51	1.702	1-3/4"	11/16"	10.13	9.69	9.25	8.81
19086	.0700	#50	1.778	1-3/4"	11/16"	10.34	9.89	9.44	8.99
19091	.0730	#49	1.854	1-3/4"	11/16"	10.55	10.09	9.63	9.17
19096	.0760	#48	1.930	1-3/4"	11/16"	10.81	10.34	9.87	9.40
19101	.0781	5/64"	1.984	1-3/4"	11/16"	11.14	10.66	10.17	9.69
19106	.0785	#47	1.994	1-3/4"	3/4"	11.44	10.95	10.45	9.95
19116	.0787		2.000	45	19	11.59	11.09	10.58	10.08
19121	.0810	#46	2.057	1-3/4"	3/4"	11.74	11.23	10.72	10.21
19126	.0820	#45	2.083	1-3/4"	3/4"	12.04	11.52	10.99	10.47
NEW	19128	.0827	2.100	45	19	12.13	11.61	11.08	10.55
19131	.0860	#44	2.184	1-3/4"	3/4"	12.35	11.81	11.28	10.74
19136	.0890	#43	2.261	1-3/4"	3/4"	12.66	12.11	11.56	11.01
NEW	19138	.0906	2.300	45	19	12.70	12.14	11.59	11.04
19141	.0935	#42	2.375	1-3/4"	3/4"	12.80	12.24	11.69	11.13
19146	.0938	3/32"	2.383	1-3/4"	3/4"	13.06	12.50	11.93	11.36
NEW	19148	.0945	2.400	46	21	13.11	12.54	11.97	11.40
19151	.0960	#41	2.438	1-13/16"	13/16"	13.14	12.57	12.00	11.43
19156	.0980	#40	2.489	1-13/16"	13/16"	13.29	12.72	12.14	11.56
19161	.0984		2.500	46	21	13.37	12.79	12.21	11.63
19166	.0995	#39	2.527	1-13/16"	13/16"	13.44	12.86	12.27	11.69
19171	.1015	#38	2.578	1-13/16"	13/16"	13.51	12.93	12.34	11.75
19176	.1040	#37	2.642	1-13/16"	13/16"	13.59	13.00	12.41	11.82
19181	.1065	#36	2.705	1-13/16"	13/16"	13.70	13.10	12.51	11.91
19186	.1094	7/64"	2.779	1-13/16"	13/16"	13.78	13.18	12.58	11.98
19191	.1100	#35	2.794	1-7/8"	7/8"	13.83	13.23	12.63	12.03
19196	.1110	#34	2.819	1-7/8"	7/8"	13.97	13.37	12.76	12.15
19201	.1130	#33	2.870	1-7/8"	7/8"	14.05	13.44	12.83	12.22
19206	.1160	#32	2.946	1-7/8"	7/8"	14.15	13.53	12.92	12.30
19211	.1181		3.000	48	22	14.27	13.65	13.03	12.41
19216	.1200	#31	3.048	1-7/8"	7/8"	14.36	13.74	13.11	12.49
NEW	19218	.1220	3.100	48	22	14.43	13.81	13.18	12.55
19221	.1250	1/8"	3.175	1-7/8"	7/8"	14.52	13.89	13.26	12.63
19226	.1285	#30	3.264	1-15/16"	15/16"	14.85	14.20	13.56	12.91
19231	.1360	#29	3.454	1-15/16"	15/16"	15.17	14.51	13.85	13.19
19236	.1378		3.500	49	24	15.59	14.92	14.24	13.56
19241	.1405	#28	3.569	1-15/16"	15/16"	15.78	15.09	14.41	13.72
19246	.1406	9/64"	3.571	1-15/16"	15/16"	15.89	15.20	14.51	13.82
19251	.1440	#27	3.658	2-1/16"	1"	17.14	16.39	15.65	14.90
19256	.1470	#26	3.734	2-1/16"	1"	17.30	16.54	15.79	15.04
19261	.1495	#25	3.797	2-1/16"	1"	17.50	16.74	15.98	15.22
19266	.1520	#24	3.861	2-1/16"	1"	17.53	16.76	16.00	15.24
19271	.1540	#23	3.912	2-1/16"	1"	17.62	16.85	16.09	15.32
19276	.1562	5/32"	3.967	2-1/16"	1"	17.71	16.94	16.17	15.40
19281	.1570	#22	3.988	2-1/8"	1-1/16"	18.68	17.86	17.05	16.24
19286	.1575		4.000	54	27	18.88	18.06	17.24	16.42

EDP#	d^+ 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"	19.10	18.27	17.44	16.61
19296	.1610	#20	4.089	2-1/8"	1-1/16"	19.24	18.40	17.57	16.73
19301	.1660	#19	4.216	2-1/8"	1-1/16"	19.93	19.06	18.20	17.33
19306	.1695	#18	4.305	2-1/8"	1-1/16"	20.14	19.26	18.39	17.51
19311	.1719	11/64"	4.366	2-1/8"	1-1/16"	20.52	19.62	18.73	17.84
19316	.1730	#17	4.394	2-3/16"	1-1/8"	20.77	19.87	18.96	18.06
19321	.1770	#16	4.496	2-3/16"	1-1/8"	20.99	20.08	19.16	18.25
19326	.1772		4.500	56	29	21.07	20.15	19.24	18.32
19331	.1800	#15	4.572	2-3/16"	1-1/8"	21.16	20.24	19.32	18.40
19336	.1820	#14	4.623	2-3/16"	1-1/8"	21.60	20.66	19.72	18.78
19341	.1850	#13	4.700	2-3/16"	1-1/8"	21.76	20.81	19.87	18.92
19346	.1875	3/16"	4.763	2-3/16"	1-1/8"	21.82	20.87	19.92	18.97
19351	.1890	#12	4.801	2-1/4"	1-3/16"	23.99	22.95	21.90	20.86
19356	.1910	#11	4.851	2-1/4"	1-3/16"	24.24	23.19	22.13	21.08
19361	.1935	#10	4.915	2-1/4"	1-3/16"	25.19	24.09	23.00	21.90
19366	.1960	#9	4.978	2-1/4"	1-3/16"	25.75	24.63	23.51	22.39
19371	.1969		5.000	57	30	25.88	24.75	23.63	22.50
19376	.1990	#8	5.055	2-1/4"	1-3/16"	26.01	24.88	23.75	22.62
19381	.2010	#7	5.105	2-1/4"	1-3/16"	26.68	25.52	24.36	23.20
19386	.2031	13/64"	5.159	2-1/4"	1-3/16"	26.84	25.67	24.51	23.34
19391	.2040	#6	5.182	2-3/8"	1-1/4"	27.32	26.14	24.95	23.76
19396	.2055	#5	5.220	2-3/8"	1-1/4"	27.82	26.61	25.40	24.19
19401	.2090	#4	5.309	2-3/8"	1-1/4"	28.22	26.99	25.77	24.54
19406	.2130	#3	5.410	2-3/8"	1-1/4"	28.67	27.42	26.18	24.93
19411	.2165		5.500	60	32	28.88	27.62	26.37	25.11
19416	.2188	7/32"	5.558	2-3/8"	1-1/4"	29.05	27.79	26.52	25.26
19421	.2210	#2	5.613	2-7/16"	1-5/16"	29.66	28.37	27.08	25.79
19426	.2280	#1	5.791	2-7/16"	1-5/16"	29.83	28.53	27.24	25.94
19431	.2340	A	5.944	2-7/16"	1-5/16"	29.90	28.60	27.30	26.00
19436	.2344	15/64"	5.954	2-7/16"	1-5/16"	29.93	28.63	27.33	26.03
19441	.2362		6.000	64	35	30.03	28.72	27.42	26.11
19446	.2380	B	6.045	2-1/2"	1-3/8"	30.13	28.82	27.51	26.20
19451	.2420	C	6.147	2-1/2"	1-3/8"	30.31	29.00	27.68	26.36
19456	.2460	D	6.248	2-1/2"	1-3/8"	30.52	29.19	27.87	26.54
19461	.2500	1/4" / E	6.350	2-1/2"	1-3/8"	30.71	29.37	28.04	26.70
19466	.2559		6.500	67	37	34.16	32.67	31.19	29.70
19471	.2570	F	6.528	2-5/8"	1-7/16"	34.74	33.23	31.72	30.21
19476	.2610	G	6.629	2-5/8"	1-7/16"	35.32	33.78	32.25	30.71
19481	.2656	17/64"	6.746	2-5/8"	1-7/16"	35.90	34.34	32.78	31.22
19486	.2660	H	6.756	2-11/16"	1-1/2"	36.74	35.15	33.55	31.95
19491	.2720	I	6.909	2-11/16"	1-1/2"	37.09	35.48	33.86	32.25
19496	.2756		7.000	68	38	37.34	35.72	34.09	32.47
19501	.2770	J	7.036	2-11/16"	1-1/2"	37.63	35.99	34.36	32.72
19506	.2810	K	7.137	2-11/16"	1-1/2"	37.90	36.26	34.61	32.96
19511	.2812	9/32"	7.142	2-11/16"	1-1/2"	38.03	36.38	34.72	33.07
19516	.2900	L	7.366	2-3/4"	1-9/16"	39.22	37.51	35.81	34.10
19521	.2950	M	7.493	2-3/4"	1-9/16"	41.53	39.72	37.92	36.11
19526	.2953		7.500	70	40	41.53	39.72	37.92	36.11
19531	.2969	19/64"	7.541	2-3/4"	1-9/16"	41.70	39.89	38.07	36.26
19536	.3020	N	7.671	2-15/16"	1-5/8"	43.62	41.72	39.83	37.93
19541	.3125	5/16"	7.938	2-15/16"	1-5/8"	43.76	41.86	39.95	38.05
19546	.3150		8.000	75	43	46.47	44.45	42.43	40.41
19551	.3160	O	8.026	2-15/16"	1-11/16"	46.47	44.45	42.43	40.41
19556	.3230	P	8.204	2-15/16"	1-11/16"	46.82	44.78	42.75	40.71
19561	.3281	21/64"	8.334	2-15/16"	1-11/16"	47.06	45.01	42.97	40.92
19566	.3320	Q	8.433	3"	1-11/16"	48.01	45.93	43.84	41.75
19571	.3346		8.500	76	43	48.40	46.30	44.19	42.09

continued →

Series 1510H (continued)

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

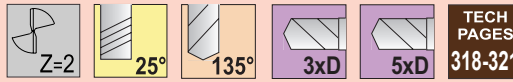
EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
19576	.3390	R	8.611	3"	1-11/16"	49.70	47.54	45.38	43.22
19581	.3438	11/32"	8.733	3"	1-11/16"	51.47	49.24	47.00	44.76
19586	.3480	S	8.839	3-1/16"	1-3/4"	54.36	52.00	49.63	47.27
19591	.3543		9.000	78	44	54.67	52.29	49.92	47.54
19596	.3580	T	9.093	3-1/16"	1-3/4"	54.80	52.42	50.03	47.65
19601	.3594	23/64"	9.129	3-1/16"	1-3/4"	55.14	52.75	50.35	47.95
19606	.3680	U	9.347	3-1/8"	1-13/16"	59.56	56.97	54.38	51.79
19611	.3740		9.500	79	46	60.04	57.43	54.82	52.21
19616	.3750	3/8"	9.525	3-1/8"	1-13/16"	60.44	57.82	55.19	52.56
19621	.3770	V	9.576	3-1/4"	1-7/8"	62.71	59.98	57.26	54.53
19626	.3860	W	9.804	3-1/4"	1-7/8"	63.80	61.03	58.25	55.48
19631	.3906	25/64"	9.921	3-1/4"	1-7/8"	64.60	61.79	58.98	56.17
19636	.3937		10.000	84	49	66.56	63.67	60.77	57.88
19641	.3970	X	10.084	3-5/16"	1-15/16"	68.24	65.27	62.31	59.34
19646	.4040	Y	10.262	3-5/16"	1-15/16"	68.71	65.73	62.74	59.75
19651	.4062	13/32"	10.317	3-5/16"	1-15/16"	70.81	67.73	64.65	61.57
19656	.4130	Z	10.490	3-3/8"	2"	71.47	68.37	65.26	62.15
19661	.4134		10.500	86	51	71.47	68.37	65.26	62.15
19666	.4219	27/64"	10.716	3-3/8"	2"	72.14	69.00	65.87	62.73
19671	.4331		11.000	87	52	77.50	74.13	70.76	67.39
19676	.4375	7/16"	11.113	3-7/16"	2-1/16"	77.50	74.13	70.76	67.39
19681	.4528		11.500	91	54	83.21	79.60	75.98	72.36
19686	.4531	29/64"	11.509	3-9/16"	2-1/8"	83.21	79.60	75.98	72.36
19691	.4688	15/32"	11.908	3-5/8"	2-1/8"	87.43	83.63	79.83	76.03
19696	.4724		12.000	94	56	87.72	83.91	80.09	76.28
19701	.4844	31/64"	12.304	3-11/16"	2-3/16"	88.32	84.48	80.64	76.80
19706	.4921		12.500	95	56	89.22	85.34	81.46	77.58
19711	.5000	1/2"	12.700	3-3/4"	2-1/4"	89.79	85.89	81.98	78.08
19716	.5118		13.000	107	60	118.91	113.74	108.57	103.40
19721	.5156	33/64"	13.096	4-1/4"	2-3/8"	121.70	116.41	111.12	105.83
19726	.5312	17/32"	13.492	4-1/4"	2-3/8"	124.50	119.09	113.67	108.26
19731	.5315		13.500	107	60	127.31	121.77	116.24	110.70
19736	.5469	35/64"	13.891	4-1/4"	2-3/8"	130.09	124.43	118.78	113.12
19741	.5512		14.000	107	60	132.93	127.15	121.37	115.59
19746	.5625	9/16"	14.287	4-1/2"	2-1/2"	143.65	137.40	131.16	124.91
19751	.5709		14.500	115	65	146.34	139.98	133.61	127.25
19756	.5781	37/64"	14.683	4-1/2"	2-1/2"	149.03	142.55	136.07	129.59
19761	.5906		15.000	115	65	151.77	145.17	138.57	131.97
19766	.5938	19/32"	15.082	4-1/2"	2-1/2"	152.56	145.93	139.29	132.66
19771	.6094	39/64"	15.478	4-1/2"	2-1/2"	153.34	146.67	140.01	133.34
19776	.6102		15.500	115	65	154.12	147.42	140.72	134.02
19781	.6250	5/8"	15.875	4-1/2"	2-1/2"	154.92	148.18	141.45	134.71
19786	.6299		16.000	115	65	158.67	151.77	144.87	137.97

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)

NEW ITEMS

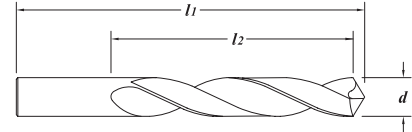
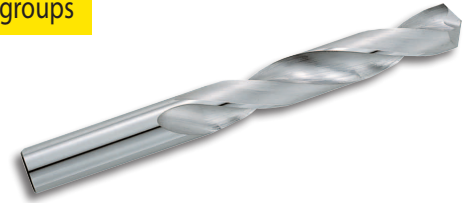
Series 1520, 1205



.0625" - .1015"
(1.588mm - 2.578mm)

General purpose for all material groups

- Solid submicron grain carbide drill
- No spotting required in most applications
- 4-facet self-centering point
- Live tooling recommended on lathe processes
- Hardlube Coating - page 73



GENERAL PURPOSE DRILLS

3xD (1520) EDP#	5xD (1205) 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							
		.0625	1/16"	1.588	1-3/4"	5/8"	7.42	7.10	6.77	6.45
	89165	.0625	1/16"	1.588	1-3/4"	3/4"	7.42	7.10	6.77	6.45
77170		.0635	#52	1.613	1-3/4"	11/16"	7.52	7.19	6.87	6.54
	89170	.0635	#52	1.613	1-3/4"	3/4"	7.52	7.19	6.87	6.54
77175		.0670	#51	1.702	1-3/4"	11/16"	7.64	7.30	6.97	6.64
	89175	.0670	#51	1.702	1-3/4"	3/4"	7.64	7.30	6.97	6.64
77180		.0700	#50	1.778	1-3/4"	11/16"	7.82	7.48	7.14	6.80
	89180	.0700	#50	1.778	1-3/4"	7/8"	7.82	7.48	7.14	6.80
77185		.0730	#49	1.854	1-3/4"	11/16"	8.03	7.68	7.33	6.98
	89185	.0730	#49	1.854	1-3/4"	7/8"	8.03	7.68	7.33	6.98
77190		.0760	#48	1.930	1-3/4"	11/16"	8.29	7.93	7.57	7.21
	89190	.0760	#48	1.930	1-3/4"	7/8"	8.29	7.93	7.57	7.21
77195		.0781	5/64"	1.984	1-3/4"	11/16"	8.60	8.23	7.85	7.48
	89195	.0781	5/64"	1.984	1-3/4"	7/8"	8.60	8.23	7.85	7.48
77200		.0785	#47	1.994	1-3/4"	3/4"	8.89	8.50	8.12	7.73
	89200	.0785	#47	1.994	1-3/4"	7/8"	8.89	8.50	8.12	7.73
77205		.0787		2.000	44	19	9.03	8.64	8.24	7.85
	89205	.0787		2.000	44	22	9.03	8.64	8.24	7.85
77210		.0810	#46	2.057	1-3/4"	3/4"	9.18	8.78	8.38	7.98
	89210	.0810	#46	2.057	1-3/4"	7/8"	9.18	8.78	8.38	7.98
77215		.0820	#45	2.083	1-3/4"	3/4"	9.45	9.04	8.63	8.22
	89215	.0820	#45	2.083	1-3/4"	7/8"	9.45	9.04	8.63	8.22
77220		.0860	#44	2.184	1-3/4"	3/4"	9.76	9.34	8.91	8.49
	89220	.0860	#44	2.184	2"	1"	9.76	9.34	8.91	8.49
77225		.0890	#43	2.261	1-3/4"	3/4"	10.04	9.60	9.17	8.73
	89225	.0890	#43	2.261	2"	1"	10.04	9.60	9.17	8.73
77230		.0935	#42	2.375	1-3/4"	3/4"	10.18	9.74	9.29	8.85
	89230	.0935	#42	2.375	2"	1"	10.18	9.74	9.29	8.85
77235		.0938	3/32"	2.383	1-3/4"	3/4"	10.41	9.96	9.50	9.05
	89235	.0938	3/32"	2.383	2"	1"	10.41	9.96	9.50	9.05
77240		.0960	#41	2.438	1-13/16"	13/16"	10.50	10.04	9.59	9.13
	89240	.0960	#41	2.438	2"	1"	10.50	10.04	9.59	9.13
77245		.0980	#40	2.489	1-13/16"	13/16"	10.66	10.20	9.73	9.27
	89245	.0980	#40	2.489	2"	1"	10.66	10.20	9.73	9.27
77250		.0984		2.500	46	21	10.72	10.25	9.79	9.32
	89250	.0984		2.500	57	32	10.72	10.25	9.79	9.32
77255		.0995	#39	2.527	1-13/16"	13/16"	10.76	10.30	9.83	9.36
	89255	.0995	#39	2.527	2-1/4"	1-1/4"	10.76	10.30	9.83	9.36
77260		.1015	#38	2.578	1-13/16"	13/16"	10.86	10.38	9.91	9.44
	89260	.1015	#38	2.578	2-1/4"	1-1/4"	10.89	10.42	9.94	9.47

continued →

Series 1520, 1205 (continued)

.1040" - .1719"
(2.642mm - 4.366mm)

3xD (1520) EDP#	5xD (1205) EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
77265		.1040	#37	2.642	1-13/16"	13/16"	10.95	10.47	10.00	9.52
	89265	.1040	#37	2.642	2-1/4"	1-1/4"	11.04	10.56	10.08	9.60
77270		.1065	#36	2.705	1-13/16"	13/16"	11.02	10.54	10.06	9.58
	89270	.1065	#36	2.705	2-1/4"	1-1/4"	11.18	10.69	10.21	9.72
77275		.1094	7/64"	2.779	1-13/16"	13/16"	11.09	10.60	10.12	9.64
	89275	.1094	7/64"	2.779	2-1/4"	1-1/4"	11.36	10.87	10.37	9.88
77280		.1100	#35	2.794	1-7/8"	7/8"	11.16	10.67	10.19	9.70
	89280	.1100	#35	2.794	2-1/4"	1-1/4"	11.49	10.99	10.49	9.99
77285		.1110	#34	2.819	1-7/8"	7/8"	11.29	10.80	10.31	9.82
	89285	.1110	#34	2.819	2-1/4"	1-1/4"	11.63	11.12	10.62	10.11
77290		.1130	#33	2.870	1-7/8"	7/8"	11.36	10.87	10.37	9.88
	89290	.1130	#33	2.870	2-1/4"	1-1/4"	11.85	11.33	10.82	10.30
77295		.1160	#32	2.946	1-7/8"	7/8"	11.44	10.95	10.45	9.95
	89295	.1160	#32	2.946	2-1/4"	1-1/4"	11.97	11.45	10.93	10.41
77300		.1181		3.000	48	22	11.58	11.08	10.57	10.07
	89300	.1181		3.000	57	32	12.09	11.56	11.04	10.51
77305		.1200	#31	3.048	1-7/8"	7/8"	11.65	11.14	10.64	10.13
	89305	.1200	#31	3.048	2-1/4"	1-1/4"	12.17	11.64	11.11	10.58
77310		.1250	1/8"	3.175	1-7/8"	7/8"	11.78	11.26	10.75	10.24
	89310	.1250	1/8"	3.175	2-1/4"	1-1/4"	12.32	11.78	11.25	10.71
77315		.1285	#30	3.264	1-15/16"	15/16"	12.10	11.57	11.05	10.52
	89315	.1285	#30	3.264	2-1/4"	1-1/4"	12.63	12.08	11.53	10.98
77320		.1360	#29	3.454	1-15/16"	15/16"	12.42	11.88	11.34	10.80
	89320	.1360	#29	3.454	2-1/2"	1-3/8"	13.03	12.46	11.90	11.33
77325		.1378		3.500	49	24	12.82	12.27	11.71	11.15
	89325	.1378		3.500	63	35	13.46	12.87	12.29	11.70
77330		.1405	#28	3.569	1-15/16"	15/16"	13.00	12.43	11.87	11.30
	89330	.1405	#28	3.569	2-1/2"	1-3/8"	13.58	12.99	12.40	11.81
77335		.1406	9/64"	3.571	1-15/16"	15/16"	13.12	12.55	11.98	11.41
	89335	.1406	9/64"	3.571	2-1/2"	1-3/8"	13.74	13.15	12.55	11.95
77340		.1440	#27	3.658	2-1/16"	1"	14.28	13.66	13.04	12.42
	89340	.1440	#27	3.658	2-1/2"	1-3/8"	14.28	13.66	13.04	12.42
77345		.1470	#26	3.734	2-1/16"	1"	14.42	13.79	13.17	12.54
	89345	.1470	#26	3.734	2-1/2"	1-3/8"	14.42	13.79	13.17	12.54
77350		.1495	#25	3.797	2-1/16"	1"	14.62	13.98	13.35	12.71
	89350	.1495	#25	3.797	2-1/2"	1-3/8"	14.62	13.98	13.35	12.71
77355		.1520	#24	3.861	2-1/16"	1"	14.64	14.00	13.37	12.73
	89355	.1520	#24	3.861	2-1/2"	1-3/8"	14.64	14.00	13.37	12.73
77360		.1540	#23	3.912	2-1/16"	1"	14.74	14.10	13.46	12.82
	89360	.1540	#23	3.912	2-1/2"	1-3/8"	14.74	14.10	13.46	12.82
77365		.1562	5/32"	3.967	2-1/16"	1"	14.85	14.20	13.56	12.91
	89365	.1562	5/32"	3.967	2-1/2"	1-3/8"	14.85	14.20	13.56	12.91
77370		.1570	#22	3.988	2-1/8"	1-1/16"	15.78	15.09	14.41	13.72
	89370	.1570	#22	3.988	2-1/2"	1-3/8"	15.78	15.09	14.41	13.72
77375		.1575		4.000	54	27	15.97	15.28	14.58	13.89
	89375	.1575		4.000	63	35	15.97	15.28	14.58	13.89
77380		.1590	#21	4.039	2-1/8"	1-1/16"	16.16	15.46	14.75	14.05
	89380	.1590	#21	4.039	2-1/2"	1-3/8"	16.16	15.46	14.75	14.05
77385		.1610	#20	4.089	2-1/8"	1-1/16"	16.27	15.57	14.86	14.15
	89385	.1610	#20	4.089	2-1/2"	1-3/8"	16.27	15.57	14.86	14.15
77390		.1660	#19	4.216	2-1/8"	1-1/16"	16.94	16.20	15.47	14.73
	89390	.1660	#19	4.216	2-3/4"	1-5/8"	16.94	16.20	15.47	14.73
77395		.1695	#18	4.305	2-1/8"	1-1/16"	17.15	16.40	15.66	14.91
	89395	.1695	#18	4.305	2-3/4"	1-5/8"	17.15	16.40	15.66	14.91
77400		.1719	11/64"	4.366	2-1/8"	1-1/16"	17.51	16.75	15.99	15.23
	89400	.1719	11/64"	4.366	2-3/4"	1-5/8"	17.51	16.75	15.99	15.23

3xD (1520) EDP#	5xD (1205) EDP#	d^+ Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
77405		.1730	#17	4.394	2-3/16"	1-1/8"	17.74	16.97	16.20	15.43
	89405	.1730	#17	4.394	2-3/4"	1-5/8"	17.74	16.97	16.20	15.43
77410		.1770	#16	4.496	2-3/16"	1-1/8"	17.94	17.16	16.38	15.60
	89410	.1770	#16	4.496	2-3/4"	1-5/8"	17.94	17.16	16.38	15.60
77415		.1772		4.500	56	29	18.03	17.25	16.46	15.68
	89415	.1772		4.500	70	41	18.03	17.25	16.46	15.68
77420		.1800	#15	4.572	2-3/16"	1-1/8"	18.11	17.33	16.54	15.75
	89420	.1800	#15	4.572	2-3/4"	1-5/8"	18.11	17.33	16.54	15.75
77425		.1820	#14	4.623	2-3/16"	1-1/8"	18.53	17.72	16.92	16.11
	89425	.1820	#14	4.623	2-3/4"	1-5/8"	18.53	17.72	16.92	16.11
77430		.1850	#13	4.700	2-3/16"	1-1/8"	18.66	17.85	17.04	16.23
	89430	.1850	#13	4.700	2-3/4"	1-5/8"	18.66	17.85	17.04	16.23
77435		.1875	3/16"	4.763	2-3/16"	1-1/8"	18.76	17.94	17.13	16.31
	89435	.1875	3/16"	4.763	2-3/4"	1-5/8"	18.76	17.94	17.13	16.31
77440		.1890	#12	4.801	2-1/4"	1-3/16"	19.37	18.52	17.68	16.84
	89440	.1890	#12	4.801	2-3/4"	1-5/8"	19.37	18.52	17.68	16.84
77445		.1910	#11	4.851	2-1/4"	1-3/16"	19.57	18.72	17.87	17.02
	89445	.1910	#11	4.851	2-3/4"	1-5/8"	19.57	18.72	17.87	17.02
77450		.1935	#10	4.915	2-1/4"	1-3/16"	20.52	19.62	18.73	17.84
	89450	.1935	#10	4.915	2-3/4"	1-5/8"	20.52	19.62	18.73	17.84
77455		.1960	#9	4.978	2-1/4"	1-3/16"	21.02	20.11	19.19	18.28
	89455	.1960	#9	4.978	3"	1-3/4"	21.02	20.11	19.19	18.28
77460		.1969		5.000	57	30	21.15	20.23	19.31	18.39
	89460	.1969		5.000	76	44	21.15	20.23	19.31	18.39
77465		.1990	#8	5.055	2-1/4"	1-3/16"	21.29	20.36	19.44	18.51
	89465	.1990	#8	5.055	3"	1-3/4"	21.29	20.36	19.44	18.51
77470		.2010	#7	5.105	2-1/4"	1-3/16"	21.91	20.96	20.00	19.05
	89470	.2010	#7	5.105	3"	1-3/4"	21.91	20.96	20.00	19.05
77475		.2031	13/64"	5.159	2-1/4"	1-3/16"	22.08	21.12	20.16	19.20
	89475	.2031	13/64"	5.159	3"	1-3/4"	22.08	21.12	20.16	19.20
77480		.2040	#6	5.182	2-3/8"	1-1/4"	22.53	21.55	20.57	19.59
	89480	.2040	#6	5.182	3"	1-3/4"	22.53	21.55	20.57	19.59
77485		.2055	#5	5.220	2-3/8"	1-1/4"	23.00	22.00	21.00	20.00
	89485	.2055	#5	5.220	3"	1-3/4"	23.00	22.00	21.00	20.00
77490		.2090	#4	5.309	2-3/8"	1-1/4"	23.39	22.37	21.36	20.34
	89490	.2090	#4	5.309	3"	1-3/4"	23.39	22.37	21.36	20.34
77495		.2130	#3	5.410	2-3/8"	1-1/4"	23.81	22.77	21.74	20.70
	89495	.2130	#3	5.410	3"	1-3/4"	23.81	22.77	21.74	20.70
77500		.2165		5.500	60	32	23.99	22.95	21.90	20.86
	89500	.2165		5.500	76	44	23.99	22.95	21.90	20.86
77505		.2188	7/32"	5.558	2-3/8"	1-1/4"	24.16	23.11	22.06	21.01
	89505	.2188	7/32"	5.558	3"	1-3/4"	24.16	23.11	22.06	21.01
77510		.2210	#2	5.613	2-7/16"	1-5/16"	24.76	23.68	22.61	21.53
	89510	.2210	#2	5.613	3"	1-3/4"	24.76	23.68	22.61	21.53
77515		.2280	#1	5.791	2-7/16"	1-5/16"	24.90	23.82	22.73	21.65
	89515	.2280	#1	5.791	3"	1-3/4"	24.90	23.82	22.73	21.65
77520		.2340	A	5.944	2-7/16"	1-5/16"	24.94	23.86	22.77	21.69
	89520	.2340	A	5.944	3-1/4"	2"	25.19	24.09	23.00	21.90
77525		.2344	15/64"	5.954	2-7/16"	1-5/16"	25.02	23.94	22.85	21.76
	89525	.2344	15/64"	5.954	3-1/4"	2"	25.25	24.16	23.06	21.96
77530		.2362		6.000	64	35	25.10	24.01	22.92	21.83
	89530	.2362		6.000	82	50	25.36	24.26	23.15	22.05
77535		.2380	B	6.045	2-1/2"	1-3/8"	25.19	24.09	23.00	21.90
	89535	.2380	B	6.045	3-1/4"	2"	25.44	24.33	23.23	22.12
77540		.2420	C	6.147	2-1/2"	1-3/8"	25.38	24.28	23.17	22.07
	89540	.2420	C	6.147	3-1/4"	2"	25.63	24.52	23.40	22.29

continued →

Series 1520, 1205 (continued)

.2460" - .3543"
(6.248mm - 9.000mm)

3xD (1520) EDP#	5xD (1205) EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
77545		.2460	D	6.248	2-1/2"	1-3/8"	25.58	24.46	23.35	22.24
	89545	.2460	D	6.248	3-1/4"	2"	25.82	24.70	23.57	22.45
77550		.2500	1/4" / E	6.350	2-1/2"	1-3/8"	25.75	24.63	23.51	22.39
	89550	.2500	1/4" / E	6.350	3-1/4"	2"	26.00	24.87	23.74	22.61
77555		.2559		6.500	67	37	26.36	25.21	24.07	22.92
	89555	.2559		6.500	82	50	26.63	25.48	24.32	23.16
77560		.2570	F	6.528	2-5/8"	1-7/16"	26.92	25.75	24.58	23.41
	89560	.2570	F	6.528	3-1/4"	2"	27.17	25.99	24.81	23.63
77565		.2610	G	6.629	2-5/8"	1-7/16"	27.44	26.25	25.05	23.86
	89565	.2610	G	6.629	3-1/2"	2-1/8"	27.74	26.53	25.33	24.12
77570		.2656	17/64"	6.746	2-5/8"	1-7/16"	28.03	26.81	25.59	24.37
	89570	.2656	17/64"	6.746	3-1/2"	2-1/8"	28.30	27.07	25.84	24.61
77575		.2660	H	6.756	2-11/16"	1-1/2"	28.81	27.56	26.30	25.05
	89575	.2660	H	6.756	3-1/2"	2-1/8"	29.11	27.84	26.58	25.31
77580		.2720	I	6.909	2-11/16"	1-1/2"	29.14	27.87	26.61	25.34
	89580	.2720	I	6.909	3-1/2"	2-1/8"	29.43	28.15	26.87	25.59
77585		.2756		7.000	68	38	29.37	28.09	26.82	25.54
	89585	.2756		7.000	88	54	29.67	28.38	27.09	25.80
77590		.2770	J	7.036	2-11/16"	1-1/2"	29.66	28.37	27.08	25.79
	89590	.2770	J	7.036	3-1/2"	2-1/8"	29.93	28.63	27.33	26.03
77595		.2810	K	7.137	2-11/16"	1-1/2"	29.92	28.62	27.32	26.02
	89595	.2810	K	7.137	3-1/2"	2-1/8"	30.20	28.89	27.57	26.26
77600		.2812	9/32"	7.142	2-11/16"	1-1/2"	30.07	28.77	27.46	26.15
	89600	.2812	9/32"	7.142	3-1/2"	2-1/8"	30.39	29.07	27.75	26.43
77605		.2900	L	7.366	2-3/4"	1-9/16"	31.18	29.82	28.47	27.11
	89605	.2900	L	7.366	3-1/2"	2-1/8"	31.48	30.11	28.74	27.37
77610		.2950	M	7.493	2-3/4"	1-9/16"	33.37	31.92	30.47	29.02
	89610	.2950	M	7.493	3-3/4"	2-3/8"	33.70	32.23	30.77	29.30
77615		.2953		7.500	70	40	33.37	31.92	30.47	29.02
	89615	.2953		7.500	95	60	33.70	32.23	30.77	29.30
77620		.2969	19/64"	7.541	2-3/4"	1-9/16"	33.53	32.08	30.62	29.16
	89620	.2969	19/64"	7.541	3-3/4"	2-3/8"	33.70	32.23	30.77	29.30
77625		.3020	N	7.671	2-15/16"	1-5/8"	35.34	33.80	32.27	30.73
	89625	.3020	N	7.671	3-3/4"	2-3/8"	35.70	34.14	32.59	31.04
77630		.3125	5/16"	7.938	2-15/16"	1-5/8"	35.47	33.92	32.38	30.84
	89630	.3125	5/16"	7.938	3-3/4"	2-3/8"	35.83	34.28	32.72	31.16
77635		.3150		8.000	75	43	38.03	36.38	34.72	33.07
	89635	.3150		8.000	95	60	38.44	36.77	35.10	33.43
77640		.3160	O	8.026	2-15/16"	1-11/16"	38.03	36.38	34.72	33.07
	89640	.3160	O	8.026	3-3/4"	2-3/8"	38.44	36.77	35.10	33.43
77645		.3230	P	8.204	2-15/16"	1-11/16"	38.38	36.71	35.04	33.37
	89645	.3230	P	8.204	3-3/4"	2-3/8"	38.44	36.77	35.10	33.43
77650		.3281	21/64"	8.334	2-15/16"	1-11/16"	38.62	36.94	35.26	33.58
	89650	.3281	21/64"	8.334	4"	2-1/2"	39.01	37.31	35.62	33.92
77655		.3320	Q	8.433	3"	1-11/16"	39.50	37.79	36.07	34.35
	89655	.3320	Q	8.433	4"	2-1/2"	39.93	38.19	36.46	34.72
77660		.3346		8.500	76	43	39.87	38.14	36.40	34.67
	89660	.3346		8.500	101	63	40.27	38.52	36.77	35.02
77665		.3390	R	8.611	3"	1-11/16"	41.15	39.36	37.57	35.78
	89665	.3390	R	8.611	4"	2-1/2"	41.57	39.77	37.96	36.15
77670		.3438	11/32"	8.733	3"	1-11/16"	42.83	40.96	39.10	37.24
	89670	.3438	11/32"	8.733	4"	2-1/2"	43.25	41.37	39.49	37.61
77675		.3480	S	8.839	3-1/16"	1-3/4"	43.40	41.51	39.63	37.74
	89675	.3480	S	8.839	4"	2-1/2"	43.40	41.51	39.63	37.74
77680		.3543		9.000	78	44	43.65	41.76	39.86	37.96
	89680	.3543		9.000	101	63	43.65	41.76	39.86	37.96

3xD (1520) EDP#	5xD (1205) EDP#	d^+ Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
77685		.3580	T	9.093	3-1/16"	1-3/4"	43.84	41.93	40.03	38.12
	89685	.3580	T	9.093	4-1/4"	2-3/4"	44.05	42.13	40.22	38.30
77690		.3594	23/64"	9.129	3-1/16"	1-3/4"	44.14	42.22	40.30	38.38
	89690	.3594	23/64"	9.129	4-1/4"	2-3/4"	44.36	42.43	40.50	38.57
77695		.3680	U	9.347	3-1/8"	1-13/16"	48.33	46.23	44.13	42.03
	89695	.3680	U	9.347	4-1/4"	2-3/4"	50.34	48.15	45.96	43.77
77700		.3740		9.500	79	46	48.78	46.66	44.54	42.42
	89700	.3740		9.500	107	70	50.81	48.60	46.39	44.18
77705		.3750	3/8"	9.525	3-1/8"	1-13/16"	49.16	47.03	44.89	42.75
	89705	.3750	3/8"	9.525	4-1/4"	2-3/4"	51.21	48.98	46.76	44.53
77710		.3770	V	9.576	3-1/4"	1-7/8"	50.09	47.92	45.74	43.56
	89710	.3770	V	9.576	4-1/4"	2-3/4"	52.19	49.92	47.65	45.38
77715		.3860	W	9.804	3-1/4"	1-7/8"	51.15	48.93	46.70	44.48
	89715	.3860	W	9.804	4-1/2"	2-7/8"	53.29	50.97	48.66	46.34
77720		.3906	25/64"	9.921	3-1/4"	1-7/8"	51.92	49.67	47.41	45.15
	89720	.3906	25/64"	9.921	4-1/2"	2-7/8"	54.08	51.73	49.38	47.03
77725		.3937		10.000	84	49	53.79	51.45	49.11	46.77
	89725	.3937		10.000	114	73	56.03	53.59	51.16	48.72
77730		.3970	X	10.084	3-5/16"	1-15/16"	55.35	52.94	50.54	48.13
	89730	.3970	X	10.084	4-1/2"	2-7/8"	57.68	55.18	52.67	50.16
	89735	.4040	Y	10.262	4-1/2"	2-7/8"	58.14	55.62	53.09	50.56
77740		.4062	13/32"	10.317	3-5/16"	1-15/16"	57.82	55.31	52.79	50.28
	89740	.4062	13/32"	10.317	4-1/2"	2-7/8"	60.24	57.62	55.00	52.38
77745		.4130	Z	10.490	3-3/8"	2"	58.47	55.92	53.38	50.84
	89745	.4130	Z	10.490	4-1/2"	2-7/8"	60.88	58.23	55.59	52.94
77750		.4134		10.500	86	51	58.47	55.92	53.38	50.84
	89750	.4134		10.500	114	73	60.88	58.23	55.59	52.94
77755		.4219	27/64"	10.716	3-3/8"	2"	59.09	56.52	53.95	51.38
	89755	.4219	27/64"	10.716	4-1/2"	2-7/8"	61.56	58.88	56.21	53.53
77760		.4331		11.000	87	52	64.16	61.37	58.58	55.79
	89760	.4331		11.000	114	73	66.85	63.94	61.04	58.13
77765		.4375	7/16"	11.113	3-7/16"	2-1/16"	64.16	61.37	58.58	55.79
	89765	.4375	7/16"	11.113	4-1/2"	2-7/8"	66.85	63.94	61.04	58.13
77770		.4528		11.500	91	54	69.61	66.58	63.56	60.53
	89770	.4528		11.500	120	76	72.52	69.37	66.21	63.06
77775		.4531	29/64"	11.509	3-9/16"	2-1/8"	69.61	66.58	63.56	60.53
	89775	.4531	29/64"	11.509	4-3/4"	3"	72.52	69.37	66.21	63.06
77780		.4688	15/32"	11.908	3-5/8"	2-1/8"	73.62	70.42	67.22	64.02
	89780	.4688	15/32"	11.908	4-3/4"	3"	76.71	73.37	70.04	66.70
77785		.4724		12.000	94	56	73.90	70.69	67.47	64.26
	89785	.4724		12.000	120	76	76.95	73.60	70.26	66.91
77790		.4844	31/64"	12.304	3-11/16"	2-3/16"	74.45	71.21	67.98	64.74
	89790	.4844	31/64"	12.304	4-3/4"	3"	76.95	73.60	70.26	66.91
77795		.4921		12.500	95	56	75.31	72.04	68.76	65.49
	89795	.4921		12.500	120	76	79.01	75.57	72.14	68.70
77800		.5000	1/2"	12.700	3-3/4"	2-1/4"	75.85	72.56	69.26	65.96
	89800	.5000	1/2"	12.700	4-3/4"	3"	79.01	75.57	72.14	68.70
NEW	77805	.5118		13.000	107	60	95.29	91.15	87.00	82.86
	89805	.5118		13.000	127	83	99.26	94.94	90.63	86.31
NEW	77810	.5156	33/64"	13.096	4-1/4"	2-3/8"	97.84	93.59	89.33	85.08
	89810	.5156	33/64"	13.096	5"	3-1/4"	101.92	97.49	93.06	88.63
NEW	77815	.5312	17/32"	13.492	4-1/4"	2-3/8"	100.40	96.03	91.67	87.30
	89815	.5312	17/32"	13.492	5"	3-1/4"	104.58	100.03	95.49	90.94
NEW	77820	.5315		13.500	107	60	102.95	98.47	94.00	89.52
	89820	.5315		13.500	127	83	107.25	102.59	97.92	93.26

continued →

Series 1520, 1205 (continued)

.5469" - .6299"
(13.891mm - 16.000mm)

	3xD (1520) EDP#	5xD (1205) EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric							
NEW	77825	89825	.5469	35/64"	13.891	4-1/4"	2-3/8"	105.51	100.93	96.34	91.75
			.5469	35/64"	13.891	5"	3-1/4"	109.92	105.14	100.36	95.58
NEW	77830	89830	.5512		14.000	107	60	108.07	103.37	98.67	93.97
			.5512		14.000	127	83	112.59	107.69	102.80	97.90
NEW	77835	89835	.5625	9/16"	14.287	4-1/2"	2-1/2"	117.85	112.73	107.60	102.48
			.5625	9/16"	14.287	5"	3-1/4"	122.77	117.44	112.10	106.76
NEW	77840	89840	.5709		14.500	115	65	120.31	115.08	109.85	104.62
			.5709		14.500	127	83	125.33	119.88	114.43	108.98
NEW	77845	89845	.5781	37/64"	14.683	4-1/2"	2-1/2"	122.77	117.44	112.10	106.76
			.5781	37/64"	14.683	5-1/4"	3-1/2"	127.89	122.33	116.77	111.21
NEW	77850	89850	.5906		15.000	115	65	125.28	119.83	114.39	108.94
			.5906		15.000	133	89	130.49	124.82	119.14	113.47
NEW	77855	89855	.5938	19/32"	15.082	4-1/2"	2-1/2"	125.99	120.52	115.04	109.56
			.5938	19/32"	15.082	5-1/4"	3-1/2"	131.25	125.54	119.84	114.13
NEW	77860	89860	.6094	39/64"	15.478	4-1/2"	2-1/2"	126.70	121.19	115.68	110.17
			.6094	39/64"	15.478	5-1/4"	3-1/2"	131.96	126.23	120.49	114.75
NEW	77865	89865	.6102		15.500	115	65	127.41	121.87	116.33	110.79
			.6102		15.500	133	89	132.72	126.95	121.18	115.41
NEW	77870	89870	.6250	5/8"	15.875	4-1/2"	2-1/2"	128.11	122.54	116.97	111.40
			.6250	5/8"	15.875	5-1/4"	3-1/2"	133.45	127.64	121.84	116.04
NEW	77875	89875	.6299		16.000	115	65	131.54	125.82	120.10	114.38
			.6299		16.000	133	89	137.02	131.07	125.11	119.15



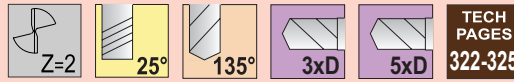
Drill and Reamer Manufacturing

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)

NEW ITEMS

Series 1520H, 1205H

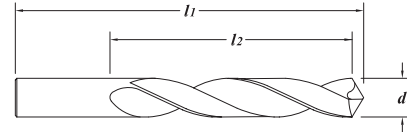
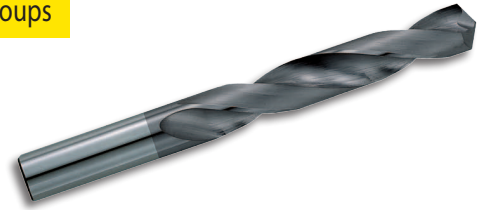


.0625" - .1015"
(1.588mm - 2.578mm)

General purpose for all material groups

Hardlube Coating

- Solid submicron grain carbide drill
- Excellent heat resistance and lubricity
- No spotting required in most applications
- 4-facet self-centering point
- Live tooling recommended on lathe processes
- Uncoated - page 67



GENERAL PURPOSE DRILLS

3xD (1520H) EDP#	5xD (1205H) 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"	9.51	9.10	8.68	8.27
	89166	.0625	1/16"	1.588	1-3/4"	3/4"	9.51	9.10	8.68	8.27
77171		.0635	#52	1.613	1-3/4"	11/16"	9.63	9.21	8.79	8.37
	89171	.0635	#52	1.613	1-3/4"	3/4"	9.63	9.21	8.79	8.37
77176		.0670	#51	1.702	1-3/4"	11/16"	9.75	9.33	8.90	8.48
	89176	.0670	#51	1.702	1-3/4"	3/4"	9.75	9.33	8.90	8.48
77181		.0700	#50	1.778	1-3/4"	11/16"	9.90	9.47	9.04	8.61
	89181	.0700	#50	1.778	1-3/4"	7/8"	9.90	9.47	9.04	8.61
77186		.0730	#49	1.854	1-3/4"	11/16"	10.12	9.68	9.24	8.80
	89186	.0730	#49	1.854	1-3/4"	7/8"	10.13	9.69	9.25	8.81
77191		.0760	#48	1.930	1-3/4"	11/16"	10.38	9.93	9.48	9.03
	89191	.0760	#48	1.930	1-3/4"	7/8"	10.38	9.93	9.48	9.03
77196		.0781	5/64"	1.984	1-3/4"	11/16"	10.70	10.23	9.77	9.30
	89196	.0781	5/64"	1.984	1-3/4"	7/8"	10.72	10.25	9.79	9.32
77201		.0785	#47	1.994	1-3/4"	3/4"	10.98	10.51	10.03	9.55
	89201	.0785	#47	1.994	1-3/4"	7/8"	11.01	10.53	10.05	9.57
77206		.0787		2.000	44	19	11.13	10.65	10.16	9.68
	89206	.0787		2.000	44	22	11.13	10.65	10.16	9.68
77211		.0810	#46	2.057	1-3/4"	3/4"	11.27	10.78	10.29	9.80
	89211	.0810	#46	2.057	1-3/4"	7/8"	11.28	10.79	10.30	9.81
77216		.0820	#45	2.083	1-3/4"	3/4"	11.55	11.04	10.54	10.04
	89216	.0820	#45	2.083	1-3/4"	7/8"	11.56	11.06	10.55	10.05
77221		.0860	#44	2.184	1-3/4"	3/4"	11.86	11.34	10.83	10.31
	89221	.0860	#44	2.184	2"	1"	11.87	11.35	10.84	10.32
77226		.0890	#43	2.261	1-3/4"	3/4"	12.12	11.59	11.07	10.54
	89226	.0890	#43	2.261	2"	1"	12.13	11.61	11.08	10.55
77231		.0935	#42	2.375	1-3/4"	3/4"	12.28	11.75	11.21	10.68
	89231	.0935	#42	2.375	2"	1"	12.28	11.75	11.21	10.68
77236		.0938	3/32"	2.383	1-3/4"	3/4"	12.51	11.97	11.42	10.88
	89236	.0938	3/32"	2.383	2"	1"	12.51	11.97	11.42	10.88
77241		.0960	#41	2.438	1-13/16"	13/16"	12.59	12.05	11.50	10.95
	89241	.0960	#41	2.438	2"	1"	12.62	12.07	11.52	10.97
77246		.0980	#40	2.489	1-13/16"	13/16"	12.75	12.20	11.64	11.09
	89246	.0980	#40	2.489	2"	1"	12.78	12.22	11.67	11.11
77251		.0984		2.500	46	21	12.80	12.24	11.69	11.13
	89251	.0984		2.500	57	32	12.80	12.24	11.69	11.13
77256		.0995	#39	2.527	1-13/16"	13/16"	12.86	12.30	11.74	11.18
	89256	.0995	#39	2.527	2-1/4"	1-1/4"	12.86	12.30	11.74	11.18
77261		.1015	#38	2.578	1-13/16"	13/16"	12.97	12.41	11.84	11.28
	89261	.1015	#38	2.578	2-1/4"	1-1/4"	13.02	12.45	11.89	11.32

Series 1520H, 1205H (continued)

.1040" - .1719"
(2.642mm - 4.366mm)

3xD (1520H) EDP#	5xD (1205H) EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
77266		.1040	#37	2.642	1-13/16"	13/16"	13.03	12.46	11.90	11.33
	89266	.1040	#37	2.642	2-1/4"	1-1/4"	13.12	12.55	11.98	11.41
77271		.1065	#36	2.705	1-13/16"	13/16"	13.11	12.54	11.97	11.40
	89271	.1065	#36	2.705	2-1/4"	1-1/4"	13.27	12.69	12.12	11.54
77276		.1094	7/64"	2.779	1-13/16"	13/16"	13.17	12.60	12.02	11.45
	89276	.1094	7/64"	2.779	2-1/4"	1-1/4"	13.48	12.89	12.31	11.72
77281		.1100	#35	2.794	1-7/8"	7/8"	13.25	12.67	12.10	11.52
	89281	.1100	#35	2.794	2-1/4"	1-1/4"	13.58	12.99	12.40	11.81
77286		.1110	#34	2.819	1-7/8"	7/8"	13.39	12.80	12.22	11.64
	89286	.1110	#34	2.819	2-1/4"	1-1/4"	13.73	13.13	12.54	11.94
77291		.1130	#33	2.870	1-7/8"	7/8"	13.47	12.88	12.30	11.71
	89291	.1130	#33	2.870	2-1/4"	1-1/4"	13.95	13.34	12.74	12.13
77296		.1160	#32	2.946	1-7/8"	7/8"	13.55	12.96	12.37	11.78
	89296	.1160	#32	2.946	2-1/4"	1-1/4"	14.05	13.44	12.83	12.22
77301		.1181		3.000	48	22	13.66	13.07	12.47	11.88
	89301	.1181		3.000	57	32	14.17	13.55	12.94	12.32
77306		.1200	#31	3.048	1-7/8"	7/8"	13.75	13.16	12.56	11.96
	89306	.1200	#31	3.048	2-1/4"	1-1/4"	14.28	13.66	13.04	12.42
77311		.1250	1/8"	3.175	1-7/8"	7/8"	13.88	13.28	12.67	12.07
	89311	.1250	1/8"	3.175	2-1/4"	1-1/4"	14.40	13.77	13.15	12.52
77316		.1285	#30	3.264	1-15/16"	15/16"	14.19	13.57	12.96	12.34
	89316	.1285	#30	3.264	2-1/4"	1-1/4"	14.73	14.09	13.45	12.81
77321		.1360	#29	3.454	1-15/16"	15/16"	14.52	13.89	13.26	12.63
	89321	.1360	#29	3.454	2-1/2"	1-3/8"	15.12	14.47	13.81	13.15
77326		.1378		3.500	49	24	14.93	14.28	13.63	12.98
	89326	.1378		3.500	63	35	15.54	14.86	14.19	13.51
77331		.1405	#28	3.569	1-15/16"	15/16"	15.08	14.42	13.77	13.11
	89331	.1405	#28	3.569	2-1/2"	1-3/8"	15.71	15.03	14.34	13.66
77336		.1406	9/64"	3.571	1-15/16"	15/16"	15.23	14.56	13.90	13.24
	89336	.1406	9/64"	3.571	2-1/2"	1-3/8"	15.85	15.16	14.47	13.78
77341		.1440	#27	3.658	2-1/16"	1"	16.38	15.66	14.95	14.24
	89341	.1440	#27	3.658	2-1/2"	1-3/8"	16.39	15.68	14.96	14.25
77346		.1470	#26	3.734	2-1/16"	1"	16.54	15.82	15.10	14.38
	89346	.1470	#26	3.734	2-1/2"	1-3/8"	16.54	15.82	15.10	14.38
77351		.1495	#25	3.797	2-1/16"	1"	16.69	15.96	15.24	14.51
	89351	.1495	#25	3.797	2-1/2"	1-3/8"	16.69	15.96	15.24	14.51
77356		.1520	#24	3.861	2-1/16"	1"	16.74	16.02	15.29	14.56
	89356	.1520	#24	3.861	2-1/2"	1-3/8"	16.77	16.04	15.31	14.58
77361		.1540	#23	3.912	2-1/16"	1"	16.84	16.10	15.37	14.64
	89361	.1540	#23	3.912	2-1/2"	1-3/8"	16.85	16.12	15.38	14.65
77366		.1562	5/32"	3.967	2-1/16"	1"	16.93	16.19	15.46	14.72
	89366	.1562	5/32"	3.967	2-1/2"	1-3/8"	16.93	16.19	15.46	14.72
77371		.1570	#22	3.988	2-1/8"	1-1/16"	17.87	17.09	16.32	15.54
	89371	.1570	#22	3.988	2-1/2"	1-3/8"	17.87	17.09	16.32	15.54
77376		.1575		4.000	54	27	18.06	17.27	16.49	15.70
	89376	.1575		4.000	63	35	18.07	17.28	16.50	15.71
77381		.1590	#21	4.039	2-1/8"	1-1/16"	18.27	17.48	16.68	15.89
	89381	.1590	#21	4.039	2-1/2"	1-3/8"	18.27	17.48	16.68	15.89
77386		.1610	#20	4.089	2-1/8"	1-1/16"	18.38	17.58	16.78	15.98
	89386	.1610	#20	4.089	2-1/2"	1-3/8"	18.38	17.58	16.78	15.98
77391		.1660	#19	4.216	2-1/8"	1-1/16"	19.04	18.22	17.39	16.56
	89391	.1660	#19	4.216	2-3/4"	1-5/8"	19.06	18.23	17.40	16.57
77396		.1695	#18	4.305	2-1/8"	1-1/16"	19.24	18.40	17.57	16.73
	89396	.1695	#18	4.305	2-3/4"	1-5/8"	19.24	18.40	17.57	16.73
77401		.1719	11/64"	4.366	2-1/8"	1-1/16"	19.57	18.72	17.87	17.02
	89401	.1719	11/64"	4.366	2-3/4"	1-5/8"	19.57	18.72	17.87	17.02

3xD (1520H) EDP#	5xD (1205H) EDP#	d^+ Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
77406		.1730	#17	4.394	2-3/16"	1-1/8"	19.84	18.98	18.11	17.25
	89406	.1730	#17	4.394	2-3/4"	1-5/8"	19.86	19.00	18.13	17.27
77411		.1770	#16	4.496	2-3/16"	1-1/8"	20.03	19.16	18.29	17.42
	89411	.1770	#16	4.496	2-3/4"	1-5/8"	20.03	19.16	18.29	17.42
77416		.1772		4.500	56	29	20.13	19.25	18.38	17.50
	89416	.1772		4.500	70	41	20.14	19.26	18.39	17.51
77421		.1800	#15	4.572	2-3/16"	1-1/8"	20.23	19.35	18.47	17.59
	89421	.1800	#15	4.572	2-3/4"	1-5/8"	20.23	19.35	18.47	17.59
77426		.1820	#14	4.623	2-3/16"	1-1/8"	20.62	19.72	18.83	17.93
	89426	.1820	#14	4.623	2-3/4"	1-5/8"	20.62	19.72	18.83	17.93
77431		.1850	#13	4.700	2-3/16"	1-1/8"	20.76	19.86	18.95	18.05
	89431	.1850	#13	4.700	2-3/4"	1-5/8"	20.77	19.87	18.96	18.06
77436		.1875	3/16"	4.763	2-3/16"	1-1/8"	20.83	19.92	19.02	18.11
	89436	.1875	3/16"	4.763	2-3/4"	1-5/8"	20.86	19.95	19.05	18.14
77441		.1890	#12	4.801	2-1/4"	1-3/16"	22.99	21.99	20.99	19.99
	89441	.1890	#12	4.801	2-3/4"	1-5/8"	22.99	21.99	20.99	19.99
77446		.1910	#11	4.851	2-1/4"	1-3/16"	23.20	22.19	21.18	20.17
	89446	.1910	#11	4.851	2-3/4"	1-5/8"	23.20	22.19	21.18	20.17
77451		.1935	#10	4.915	2-1/4"	1-3/16"	24.10	23.06	22.01	20.96
	89451	.1935	#10	4.915	2-3/4"	1-5/8"	24.10	23.06	22.01	20.96
77456		.1960	#9	4.978	2-1/4"	1-3/16"	24.63	23.56	22.49	21.42
	89456	.1960	#9	4.978	3"	1-3/4"	24.63	23.56	22.49	21.42
77461		.1969		5.000	57	30	24.76	23.68	22.61	21.53
	89461	.1969		5.000	76	44	24.76	23.68	22.61	21.53
77466		.1990	#8	5.055	2-1/4"	1-3/16"	24.87	23.79	22.71	21.63
	89466	.1990	#8	5.055	3"	1-3/4"	24.86	23.78	22.70	21.62
77471		.2010	#7	5.105	2-1/4"	1-3/16"	25.53	24.42	23.31	22.20
	89471	.2010	#7	5.105	3"	1-3/4"	25.52	24.41	23.30	22.19
77476		.2031	13/64"	5.159	2-1/4"	1-3/16"	25.68	24.56	23.45	22.33
	89476	.2031	13/64"	5.159	3"	1-3/4"	25.68	24.56	23.45	22.33
77481		.2040	#6	5.182	2-3/8"	1-1/4"	26.14	25.00	23.87	22.73
	89481	.2040	#6	5.182	3"	1-3/4"	26.14	25.00	23.87	22.73
77486		.2055	#5	5.220	2-3/8"	1-1/4"	26.60	25.44	24.29	23.13
	89486	.2055	#5	5.220	3"	1-3/4"	26.60	25.44	24.29	23.13
77491		.2090	#4	5.309	2-3/8"	1-1/4"	27.03	25.85	24.68	23.50
	89491	.2090	#4	5.309	3"	1-3/4"	27.03	25.85	24.68	23.50
77496		.2130	#3	5.410	2-3/8"	1-1/4"	27.42	26.22	25.03	23.84
	89496	.2130	#3	5.410	3"	1-3/4"	27.42	26.22	25.03	23.84
77501		.2165		5.500	60	32	27.61	26.41	25.21	24.01
	89501	.2165		5.500	76	44	27.59	26.39	25.19	23.99
77506		.2188	7/32"	5.558	2-3/8"	1-1/4"	27.77	26.57	25.36	24.15
	89506	.2188	7/32"	5.558	3"	1-3/4"	27.76	26.55	25.35	24.14
77511		.2210	#2	5.613	2-7/16"	1-5/16"	28.37	27.14	25.90	24.67
	89511	.2210	#2	5.613	3"	1-3/4"	28.34	27.10	25.87	24.64
77516		.2280	#1	5.791	2-7/16"	1-5/16"	28.52	27.28	26.04	24.80
	89516	.2280	#1	5.791	3"	1-3/4"	28.51	27.27	26.03	24.79
77521		.2340	A	5.944	2-7/16"	1-5/16"	28.58	27.34	26.09	24.85
	89521	.2340	A	5.944	3-1/4"	2"	28.91	27.65	26.40	25.14
77526		.2344	15/64"	5.954	2-7/16"	1-5/16"	28.62	27.38	26.13	24.89
	89526	.2344	15/64"	5.954	3-1/4"	2"	28.99	27.73	26.47	25.21
77531		.2362		6.000	64	35	28.69	27.45	26.20	24.95
	89531	.2362		6.000	82	50	29.08	27.82	26.55	25.29
77536		.2380	B	6.045	2-1/2"	1-3/8"	28.80	27.54	26.29	25.04
	89536	.2380	B	6.045	3-1/4"	2"	29.18	27.91	26.64	25.37
77541		.2420	C	6.147	2-1/2"	1-3/8"	28.98	27.72	26.46	25.20
	89541	.2420	C	6.147	3-1/4"	2"	29.36	28.08	26.81	25.53

continued →

Series 1520H, 1205H (continued)

.2460" - .3543"
(6.248mm - 9.000mm)

3xD (1520H) EDP#	5xD (1205H) EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
77546		.2460	D	6.248	2-1/2"	1-3/8"	29.18	27.91	26.64	25.37
	89546	.2460	D	6.248	3-1/4"	2"	29.57	28.28	27.00	25.71
77551		.2500	1/4" / E	6.350	2-1/2"	1-3/8"	29.35	28.07	26.80	25.52
	89551	.2500	1/4" / E	6.350	3-1/4"	2"	29.72	28.42	27.13	25.84
77556		.2559		6.500	67	37	32.76	31.34	29.91	28.49
	89556	.2559		6.500	82	50	33.47	32.01	30.56	29.10
77561		.2570	F	6.528	2-5/8"	1-7/16"	33.32	31.87	30.42	28.97
	89561	.2570	F	6.528	3-1/4"	2"	34.05	32.57	31.09	29.61
77566		.2610	G	6.629	2-5/8"	1-7/16"	33.86	32.38	30.91	29.44
	89566	.2610	G	6.629	3-1/2"	2-1/8"	34.57	33.07	31.56	30.06
77571		.2656	17/64"	6.746	2-5/8"	1-7/16"	34.43	32.93	31.44	29.94
	89571	.2656	17/64"	6.746	3-1/2"	2-1/8"	35.14	33.62	32.09	30.56
77576		.2660	H	6.756	2-11/16"	1-1/2"	35.22	33.69	32.16	30.63
	89576	.2660	H	6.756	3-1/2"	2-1/8"	35.94	34.38	32.81	31.25
77581		.2720	I	6.909	2-11/16"	1-1/2"	35.56	34.01	32.47	30.92
	89581	.2720	I	6.909	3-1/2"	2-1/8"	36.27	34.69	33.12	31.54
77586		.2756		7.000	68	38	35.80	34.24	32.69	31.13
	89586	.2756		7.000	88	54	36.50	34.91	33.33	31.74
77591		.2770	J	7.036	2-11/16"	1-1/2"	36.08	34.51	32.94	31.37
	89591	.2770	J	7.036	3-1/2"	2-1/8"	36.77	35.17	33.57	31.97
77596		.2810	K	7.137	2-11/16"	1-1/2"	36.32	34.74	33.16	31.58
	89596	.2810	K	7.137	3-1/2"	2-1/8"	37.05	35.44	33.83	32.22
77601		.2812	9/32"	7.142	2-11/16"	1-1/2"	36.48	34.89	33.31	31.72
	89601	.2812	9/32"	7.142	3-1/2"	2-1/8"	37.19	35.57	33.96	32.34
77606		.2900	L	7.366	2-3/4"	1-9/16"	37.58	35.95	34.31	32.68
	89606	.2900	L	7.366	3-1/2"	2-1/8"	38.33	36.66	35.00	33.33
77611		.2950	M	7.493	2-3/4"	1-9/16"	39.76	38.03	36.30	34.57
	89611	.2950	M	7.493	3-3/4"	2-3/8"	40.53	38.76	37.00	35.24
77616		.2953		7.500	70	40	39.76	38.03	36.30	34.57
	89616	.2953		7.500	95	60	40.53	38.76	37.00	35.24
77621		.2969	19/64"	7.541	2-3/4"	1-9/16"	39.95	38.21	36.48	34.74
	89621	.2969	19/64"	7.541	3-3/4"	2-3/8"	40.53	38.76	37.00	35.24
77626		.3020	N	7.671	2-15/16"	1-5/8"	41.76	39.94	38.13	36.31
	89626	.3020	N	7.671	3-3/4"	2-3/8"	42.53	40.68	38.83	36.98
77631		.3125	5/16"	7.938	2-15/16"	1-5/8"	41.89	40.07	38.25	36.43
	89631	.3125	5/16"	7.938	3-3/4"	2-3/8"	42.69	40.83	38.98	37.12
77636		.3150		8.000	75	43	44.46	42.53	40.59	38.66
	89636	.3150		8.000	95	60	45.26	43.30	41.33	39.36
77641		.3160	O	8.026	2-15/16"	1-11/16"	44.46	42.53	40.59	38.66
	89641	.3160	O	8.026	3-3/4"	2-3/8"	45.26	43.30	41.33	39.36
77646		.3230	P	8.204	2-15/16"	1-11/16"	44.78	42.83	40.89	38.94
	89646	.3230	P	8.204	3-3/4"	2-3/8"	45.26	43.30	41.33	39.36
77651		.3281	21/64"	8.334	2-15/16"	1-11/16"	45.03	43.08	41.12	39.16
	89651	.3281	21/64"	8.334	4"	2-1/2"	45.84	43.85	41.85	39.86
77656		.3320	Q	8.433	3"	1-11/16"	45.93	43.93	41.94	39.94
	89656	.3320	Q	8.433	4"	2-1/2"	46.76	44.73	42.69	40.66
77661		.3346		8.500	76	43	46.29	44.28	42.26	40.25
	89661	.3346		8.500	101	63	47.10	45.06	43.01	40.96
77666		.3390	R	8.611	3"	1-11/16"	47.55	45.49	43.42	41.35
	89666	.3390	R	8.611	4"	2-1/2"	48.39	46.29	44.18	42.08
77671		.3438	11/32"	8.733	3"	1-11/16"	49.23	47.09	44.95	42.81
	89671	.3438	11/32"	8.733	4"	2-1/2"	50.07	47.89	45.72	43.54
77676		.3480	S	8.839	3-1/16"	1-3/4"	52.07	49.81	47.54	45.28
	89676	.3480	S	8.839	4"	2-1/2"	52.06	49.80	47.53	45.27
77681		.3543		9.000	78	44	52.34	50.06	47.79	45.51
	89681	.3543		9.000	101	63	52.35	50.07	47.80	45.52

3xD (1520H) EDP#	5xD (1205H) EDP#	d^+ Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
77686		.3580	T	9.093	3-1/16"	1-3/4"	52.51	50.23	47.94	45.66
	89686	.3580	T	9.093	4-1/4"	2-3/4"	54.43	52.06	49.70	47.33
77691		.3594	23/64"	9.129	3-1/16"	1-3/4"	52.83	50.53	48.24	45.94
	89691	.3594	23/64"	9.129	4-1/4"	2-3/4"	54.76	52.38	50.00	47.62
77696		.3680	U	9.347	3-1/8"	1-13/16"	57.02	54.54	52.06	49.58
	89696	.3680	U	9.347	4-1/4"	2-3/4"	60.75	58.11	55.47	52.83
77701		.3740		9.500	79	46	57.47	54.97	52.47	49.97
	89701	.3740		9.500	107	70	61.20	58.54	55.88	53.22
77706		.3750	3/8"	9.525	3-1/8"	1-13/16"	57.83	55.32	52.80	50.29
	89706	.3750	3/8"	9.525	4-1/4"	2-3/4"	61.61	58.93	56.25	53.57
77711		.3770	V	9.576	3-1/4"	1-7/8"	60.06	57.45	54.84	52.23
	89711	.3770	V	9.576	4-1/4"	2-3/4"	63.11	60.37	57.62	54.88
77716		.3860	W	9.804	3-1/4"	1-7/8"	61.11	58.45	55.80	53.14
	89716	.3860	W	9.804	4-1/2"	2-7/8"	64.24	61.45	58.65	55.86
77721		.3906	25/64"	9.921	3-1/4"	1-7/8"	61.87	59.18	56.49	53.80
	89721	.3906	25/64"	9.921	4-1/2"	2-7/8"	65.01	62.18	59.36	56.53
77726		.3937		10.000	84	49	63.74	60.97	58.20	55.43
	89726	.3937		10.000	114	73	66.98	64.06	61.15	58.24
77731		.3970	X	10.084	3-5/16"	1-15/16"	65.30	62.46	59.62	56.78
	89731	.3970	X	10.084	4-1/2"	2-7/8"	68.60	65.62	62.63	59.65
77736		.4040	Y	10.262	3-5/16"	1-15/16"	65.76	62.90	60.04	57.18
	89736	.4040	Y	10.262	4-1/2"	2-7/8"	69.07	66.07	63.06	60.06
77741		.4062	13/32"	10.317	3-5/16"	1-15/16"	67.79	64.85	61.90	58.95
	89741	.4062	13/32"	10.317	4-1/2"	2-7/8"	71.17	68.08	64.98	61.89
77746		.4130	Z	10.490	3-3/8"	2"	68.39	65.42	62.44	59.47
	89746	.4130	Z	10.490	4-1/2"	2-7/8"	71.83	68.71	65.58	62.46
77751		.4134		10.500	86	51	68.39	65.42	62.44	59.47
	89751	.4134		10.500	114	73	71.83	68.71	65.58	62.46
77756		.4219	27/64"	10.716	3-3/8"	2"	69.05	66.04	63.04	60.04
	89756	.4219	27/64"	10.716	4-1/2"	2-7/8"	72.50	69.34	66.19	63.04
77761		.4331		11.000	87	52	74.12	70.90	67.67	64.45
	89761	.4331		11.000	114	73	77.77	74.39	71.01	67.63
77766		.4375	7/16"	11.113	3-7/16"	2-1/16"	74.12	70.90	67.67	64.45
	89766	.4375	7/16"	11.113	4-1/2"	2-7/8"	77.77	74.39	71.01	67.63
77771		.4528		11.500	91	54	79.56	76.10	72.64	69.18
	89771	.4528		11.500	120	76	83.44	79.82	76.19	72.56
77776		.4531	29/64"	11.509	3-9/16"	2-1/8"	79.56	76.10	72.64	69.18
	89776	.4531	29/64"	11.509	4-3/4"	3"	83.44	79.82	76.19	72.56
77781		.4688	15/32"	11.908	3-5/8"	2-1/8"	83.59	79.96	76.32	72.69
	89781	.4688	15/32"	11.908	4-3/4"	3"	87.63	83.82	80.01	76.20
77786		.4724		12.000	94	56	83.84	80.19	76.55	72.90
	89786	.4724		12.000	120	76	87.89	84.07	80.25	76.43
77791		.4844	31/64"	12.304	3-11/16"	2-3/16"	84.41	80.74	77.07	73.40
	89791	.4844	31/64"	12.304	4-3/4"	3"	87.89	84.07	80.25	76.43
77796		.4921		12.500	95	56	85.24	81.53	77.83	74.12
	89796	.4921		12.500	120	76	89.94	86.03	82.12	78.21
77801		.5000	1/2"	12.700	3-3/4"	2-1/4"	85.79	82.06	78.33	74.60
	89801	.5000	1/2"	12.700	4-3/4"	3"	89.94	86.03	82.12	78.21
77806		.5118		13.000	107	60	109.17	104.42	99.68	94.93
	89806	.5118		13.000	127	83	113.19	108.27	103.35	98.43
77811		.5156	33/64"	13.096	4-1/4"	2-3/8"	111.73	106.88	102.02	97.16
	89811	.5156	33/64"	13.096	5"	3-1/4"	115.84	110.80	105.77	100.73
77816		.5312	17/32"	13.492	4-1/4"	2-3/8"	114.28	109.31	104.34	99.37
	89816	.5312	17/32"	13.492	5"	3-1/4"	118.51	113.36	108.20	103.05
NEW 77821		.5315		13.500	107	60	116.84	111.76	106.68	101.60
	89821	.5315		13.500	127	83	121.16	115.90	110.63	105.36

continued →

Series 1520H, 1205H (continued)

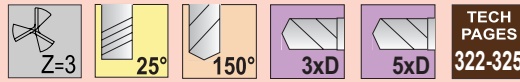
.5469" - .6299"
(13.891mm - 16.000mm)

	3xD (1520H) EDP#	5xD (1205H) EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric							
NEW	77826		.5469	35/64"	13.891	4-1/4"	2-3/8"	119.39	114.20	109.01	103.82
		89826	.5469	35/64"	13.891	5"	3-1/4"	123.82	118.44	113.05	107.67
NEW	77831		.5512		14.000	107	60	121.96	116.66	111.35	106.05
		89831	.5512		14.000	127	83	126.51	121.01	115.51	110.01
NEW	77836		.5625	9/16"	14.287	4-1/2"	2-1/2"	131.74	126.02	120.29	114.56
		89836	.5625	9/16"	14.287	5"	3-1/4"	136.69	130.75	124.80	118.86
NEW	77841		.5709		14.500	115	65	134.21	128.37	122.54	116.70
		89841	.5709		14.500	127	83	139.24	133.19	127.13	121.08
NEW	77846		.5781	37/64"	14.683	4-1/2"	2-1/2"	136.65	130.71	124.77	118.83
		89846	.5781	37/64"	14.683	5-1/4"	3-1/2"	141.82	135.65	129.49	123.32
NEW	77851		.5906		15.000	115	65	139.16	133.11	127.06	121.01
		89851	.5906		15.000	133	89	144.41	138.13	131.85	125.57
NEW	77856		.5938	19/32"	15.082	4-1/2"	2-1/2"	139.89	133.80	127.72	121.64
		89856	.5938	19/32"	15.082	5-1/4"	3-1/2"	145.19	138.88	132.56	126.25
NEW	77861		.6094	39/64"	15.478	4-1/2"	2-1/2"	140.58	134.46	128.35	122.24
		89861	.6094	39/64"	15.478	5-1/4"	3-1/2"	145.90	139.56	133.21	126.87
NEW	77866		.6102		15.500	115	65	141.30	135.16	129.01	122.87
		89866	.6102		15.500	133	89	146.65	140.27	133.90	127.52
NEW	77871		.6250	5/8"	15.875	4-1/2"	2-1/2"	142.00	135.83	129.65	123.48
		89871	.6250	5/8"	15.875	5-1/4"	3-1/2"	147.40	140.99	134.58	128.17
NEW	77876		.6299		16.000	115	65	145.42	139.10	132.77	126.45
		89876	.6299		16.000	133	89	150.95	144.39	137.82	131.26



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)



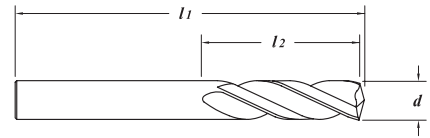
Series 1120H, 1100H

.1094" - .1575"
(2.779mm - 4.000mm)

Recommended for cast iron, tungsten, and materials with high silicon content

Hardlube Coating

- Solid submicron grain carbide drill
 - Self-centering drill point
 - Near reamer finishes
 - Can be used as a core drill
 - Excellent heat resistance and lubricity
 - Stub length reduces deflection and vibration
 - Tighter tolerance holes
 - Improved roundness and straightness
 - Live tooling recommended on lathe processes
- Series 1100 Uncoated - page 88



GENERAL PURPOSE DRILLS

3xD (1120H) EDP#	5xD (1100H) 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"	15.38	14.71	14.04	13.37
	90276	.1094	7/64"	2.779	2-1/4"	1-1/4"	15.88	15.19	14.50	13.81
78281		.1100	#35	2.794	1-7/8"	7/8"	15.51	14.84	14.16	13.49
	90281	.1100	#35	2.794	2-1/4"	1-1/4"	16.05	15.36	14.66	13.96
78286		.1110	#34	2.819	1-7/8"	7/8"	15.67	14.99	14.31	13.63
78291		.1130	#33	2.870	1-7/8"	7/8"	15.90	15.21	14.52	13.83
	90291	.1130	#33	2.870	2-1/4"	1-1/4"	16.47	15.75	15.04	14.32
78296		.1160	#32	2.946	1-7/8"	7/8"	16.11	15.41	14.71	14.01
	90296	.1160	#32	2.946	2-1/4"	1-1/4"	16.63	15.91	15.18	14.46
78301		.1181		3.000	48	22	16.24	15.53	14.83	14.12
	90301	.1181		3.000	57	32	16.77	16.04	15.31	14.58
78306		.1200	#31	3.048	1-7/8"	7/8"	16.35	15.64	14.93	14.22
	90306	.1200	#31	3.048	2-1/4"	1-1/4"	16.87	16.14	15.40	14.67
78311		.1250	1/8"	3.175	1-7/8"	7/8"	16.54	15.82	15.10	14.38
	90311	.1250	1/8"	3.175	2-1/4"	1-1/4"	17.04	16.30	15.56	14.82
78316		.1285	#30	3.264	1-15/16"	15/16"	16.91	16.17	15.44	14.70
	90316	.1285	#30	3.264	2-1/4"	1-1/4"	17.41	16.65	15.90	15.14
78321		.1360	#29	3.454	1-15/16"	15/16"	17.30	16.54	15.79	15.04
	90321	.1360	#29	3.454	2-1/2"	1-3/8"	17.92	17.14	16.36	15.58
78326		.1378		3.500	49	24	17.80	17.03	16.25	15.48
	90326	.1378		3.500	63	35	18.41	17.61	16.81	16.01
78331		.1405	#28	3.569	1-15/16"	15/16"	17.99	17.20	16.42	15.64
	90331	.1405	#28	3.569	2-1/2"	1-3/8"	18.61	17.80	16.99	16.18
78336		.1406	9/64"	3.571	1-15/16"	15/16"	18.17	17.38	16.59	15.80
	90336	.1406	9/64"	3.571	2-1/2"	1-3/8"	18.78	17.96	17.15	16.33
78341		.1440	#27	3.658	2-1/16"	1"	19.44	18.59	17.75	16.90
	90341	.1440	#27	3.658	2-1/2"	1-3/8"	19.45	18.60	17.76	16.91
78346		.1470	#26	3.734	2-1/16"	1"	19.65	18.80	17.94	17.09
	90346	.1470	#26	3.734	2-1/2"	1-3/8"	19.67	18.81	17.96	17.10
78351		.1495	#25	3.797	2-1/16"	1"	19.83	18.96	18.10	17.24
	90351	.1495	#25	3.797	2-1/2"	1-3/8"	19.84	18.98	18.11	17.25
78356		.1520	#24	3.861	2-1/16"	1"	19.86	19.00	18.13	17.27
	90356	.1520	#24	3.861	2-1/2"	1-3/8"	19.86	19.00	18.13	17.27
78361		.1540	#23	3.912	2-1/16"	1"	20.02	19.15	18.28	17.41
	90361	.1540	#23	3.912	2-1/2"	1-3/8"	20.03	19.16	18.29	17.42
78366		.1562	5/32"	3.967	2-1/16"	1"	20.11	19.24	18.36	17.49
	90366	.1562	5/32"	3.967	2-1/2"	1-3/8"	20.11	19.24	18.36	17.49
78371		.1570	#22	3.988	2-1/8"	1-1/16"	21.26	20.34	19.41	18.49
	90371	.1570	#22	3.988	2-1/2"	1-3/8"	21.26	20.34	19.41	18.49
78376		.1575		4.000	54	27	21.26	20.34	19.41	18.49
	90376	.1575		4.000	63	35	21.26	20.34	19.41	18.49

continued →

Series 1120H, 1100H (continued)

.1590" - .2362"
(4.039mm - 6.000mm)

3xD (1120H) EDP#	5xD (1100H) EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
78381		.1590	#21	4.039	2-1/8"	1-1/16"	21.69	20.75	19.80	18.86
	90381	.1590	#21	4.039	2-1/2"	1-3/8"	21.74	20.79	19.85	18.90
78386		.1610	#20	4.089	2-1/8"	1-1/16"	21.69	20.75	19.80	18.86
	90386	.1610	#20	4.089	2-1/2"	1-3/8"	21.74	20.79	19.85	18.90
78391		.1660	#19	4.216	2-1/8"	1-1/16"	21.85	20.90	19.95	19.00
	90391	.1660	#19	4.216	2-3/4"	1-5/8"	21.86	20.91	19.96	19.01
78396		.1695	#18	4.305	2-1/8"	1-1/16"	21.99	21.03	20.08	19.12
	90396	.1695	#18	4.305	2-3/4"	1-5/8"	22.00	21.04	20.09	19.13
78401		.1719	11/64"	4.366	2-1/8"	1-1/16"	22.11	21.15	20.19	19.23
	90401	.1719	11/64"	4.366	2-3/4"	1-5/8"	22.11	21.15	20.19	19.23
78406		.1730	#17	4.394	2-3/16"	1-1/8"	23.02	22.02	21.02	20.02
	90406	.1730	#17	4.394	2-3/4"	1-5/8"	23.02	22.02	21.02	20.02
78411		.1770	#16	4.496	2-3/16"	1-1/8"	23.26	22.25	21.24	20.23
	90411	.1770	#16	4.496	2-3/4"	1-5/8"	23.28	22.26	21.25	20.24
78416		.1772		4.500	56	29	23.36	22.34	21.33	20.31
	90416	.1772		4.500	70	41	23.37	22.35	21.34	20.32
78421		.1800	#15	4.572	2-3/16"	1-1/8"	23.45	22.43	21.41	20.39
	90421	.1800	#15	4.572	2-3/4"	1-5/8"	23.49	22.47	21.45	20.43
78426		.1820	#14	4.623	2-3/16"	1-1/8"	23.94	22.90	21.86	20.82
	90426	.1820	#14	4.623	2-3/4"	1-5/8"	23.95	22.91	21.87	20.83
78431		.1850	#13	4.700	2-3/16"	1-1/8"	24.06	23.01	21.97	20.92
	90431	.1850	#13	4.700	2-3/4"	1-5/8"	24.06	23.01	21.97	20.92
78436		.1875	3/16"	4.763	2-3/16"	1-1/8"	24.06	23.01	21.97	20.92
	90436	.1875	3/16"	4.763	2-3/4"	1-5/8"	24.06	23.01	21.97	20.92
78441		.1890	#12	4.801	2-1/4"	1-3/16"	25.77	24.65	23.53	22.41
	90441	.1890	#12	4.801	2-3/4"	1-5/8"	25.75	24.63	23.51	22.39
78446		.1910	#11	4.851	2-1/4"	1-3/16"	26.00	24.87	23.74	22.61
	90446	.1910	#11	4.851	2-3/4"	1-5/8"	25.98	24.85	23.72	22.59
78451		.1935	#10	4.915	2-1/4"	1-3/16"	27.05	25.87	24.70	23.52
	90451	.1935	#10	4.915	2-3/4"	1-5/8"	27.05	25.87	24.70	23.52
78456		.1960	#9	4.978	2-1/4"	1-3/16"	27.62	26.42	25.22	24.02
	90456	.1960	#9	4.978	3"	1-3/4"	27.62	26.42	25.22	24.02
78461		.1969		5.000	57	30	27.77	26.57	25.36	24.15
	90461	.1969		5.000	76	44	27.76	26.55	25.35	24.14
78466		.1990	#8	5.055	2-1/4"	1-3/16"	27.93	26.72	25.50	24.29
	90466	.1990	#8	5.055	3"	1-3/4"	27.92	26.71	25.49	24.28
78471		.2010	#7	5.105	2-1/4"	1-3/16"	28.67	27.42	26.18	24.93
	90471	.2010	#7	5.105	3"	1-3/4"	28.67	27.42	26.18	24.93
78476		.2031	13/64"	5.159	2-1/4"	1-3/16"	29.62	28.34	27.05	25.76
	90476	.2031	13/64"	5.159	3"	1-3/4"	29.61	28.33	27.04	25.75
	90481	.2040	#6	5.182	3"	1-3/4"	29.79	28.49	27.20	25.90
78486		.2055	#5	5.220	2-3/8"	1-1/4"	29.91	28.61	27.31	26.01
	90486	.2055	#5	5.220	3"	1-3/4"	29.90	28.60	27.30	26.00
78491		.2090	#4	5.309	2-3/8"	1-1/4"	30.36	29.04	27.72	26.40
	90491	.2090	#4	5.309	3"	1-3/4"	30.36	29.04	27.72	26.40
78496		.2130	#3	5.410	2-3/8"	1-1/4"	30.82	29.48	28.14	26.80
	90496	.2130	#3	5.410	3"	1-3/4"	30.82	29.48	28.14	26.80
78501		.2165		5.500	60	32	31.03	29.68	28.33	26.98
	90501	.2165		5.500	76	44	31.03	29.68	28.33	26.98
78506		.2188	7/32"	5.558	2-3/8"	1-1/4"	31.22	29.87	28.51	27.15
	90506	.2188	7/32"	5.558	3"	1-3/4"	31.22	29.87	28.51	27.15
78511		.2210	#2	5.613	2-7/16"	1-5/16"	31.92	30.54	29.15	27.76
	90511	.2210	#2	5.613	3"	1-3/4"	31.90	30.51	29.13	27.74
78516		.2280	#1	5.791	2-7/16"	1-5/16"	32.05	30.66	29.26	27.87
	90516	.2280	#1	5.791	3"	1-3/4"	32.05	30.66	29.26	27.87
78521		.2340	A	5.944	2-7/16"	1-5/16"	32.22	30.82	29.42	28.02
	90521	.2340	A	5.944	3-1/4"	2"	32.50	31.09	29.67	28.26
78526		.2344	15/64"	5.954	2-7/16"	1-5/16"	32.35	30.94	29.54	28.13
	90526	.2344	15/64"	5.954	3-1/4"	2"	32.60	31.19	29.77	28.35
78531		.2362		6.000	64	35	32.43	31.02	29.61	28.20
	90531	.2362		6.000	82	50	32.69	31.27	29.85	28.43

3xD (1120H) EDP#	5xD (1100H) EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
78536		.2380	B	6.045	2-1/2"	1-3/8"	32.56	31.14	29.73	28.31
	90536	.2380	B	6.045	3-1/4"	2"	32.82	31.39	29.97	28.54
78541		.2420	C	6.147	2-1/2"	1-3/8"	32.76	31.34	29.91	28.49
	90541	.2420	C	6.147	3-1/4"	2"	33.01	31.57	30.14	28.70
78546		.2460	D	6.248	2-1/2"	1-3/8"	32.95	31.52	30.08	28.65
	90546	.2460	D	6.248	3-1/4"	2"	33.24	31.79	30.35	28.90
78551		.2500	1/4" / E	6.350	2-1/2"	1-3/8"	33.15	31.71	30.27	28.83
	90551	.2500	1/4" / E	6.350	3-1/4"	2"	33.43	31.98	30.52	29.07
78556		.2559		6.500	67	37	36.71	35.11	33.52	31.92
	90556	.2559		6.500	82	50	37.28	35.66	34.04	32.42
78561		.2570	F	6.528	2-5/8"	1-7/16"	37.33	35.71	34.08	32.46
	90561	.2570	F	6.528	3-1/4"	2"	37.90	36.26	34.61	32.96
78566		.2610	G	6.629	2-5/8"	1-7/16"	37.80	36.16	34.51	32.87
	90566	.2610	G	6.629	3-1/2"	2-1/8"	39.53	37.81	36.09	34.37
78571		.2656	17/64"	6.746	2-5/8"	1-7/16"	38.41	36.74	35.07	33.40
	90571	.2656	17/64"	6.746	3-1/2"	2-1/8"	40.17	38.42	36.68	34.93
78576		.2660	H	6.756	2-11/16"	1-1/2"	39.36	37.65	35.94	34.23
	90576	.2660	H	6.756	3-1/2"	2-1/8"	41.14	39.35	37.56	35.77
78581		.2720	I	6.909	2-11/16"	1-1/2"	39.74	38.02	36.29	34.56
	90581	.2720	I	6.909	3-1/2"	2-1/8"	41.57	39.77	37.96	36.15
78586		.2756		7.000	68	38	39.97	38.24	36.50	34.76
	90586	.2756		7.000	88	54	41.80	39.99	38.17	36.35
78591		.2770	J	7.036	2-11/16"	1-1/2"	40.27	38.52	36.77	35.02
	90591	.2770	J	7.036	3-1/2"	2-1/8"	42.14	40.30	38.47	36.64
78596		.2810	K	7.137	2-11/16"	1-1/2"	40.61	38.84	37.08	35.31
	90596	.2810	K	7.137	3-1/2"	2-1/8"	42.45	40.60	38.76	36.91
78601		.2812	9/32"	7.142	2-11/16"	1-1/2"	41.79	39.97	38.16	36.34
	90601	.2812	9/32"	7.142	3-1/2"	2-1/8"	43.71	41.81	39.91	38.01
78606		.2900	L	7.366	2-3/4"	1-9/16"	43.11	41.24	39.36	37.49
	90606	.2900	L	7.366	3-1/2"	2-1/8"	45.09	43.13	41.17	39.21
78611		.2950	M	7.493	2-3/4"	1-9/16"	44.18	42.26	40.34	38.42
	90611	.2950	M	7.493	3-3/4"	2-3/8"	47.44	45.38	43.31	41.25
78616		.2953		7.500	70	40	44.18	42.26	40.34	38.42
	90616	.2953		7.500	95	60	47.44	45.38	43.31	41.25
78621		.2969	19/64"	7.541	2-3/4"	1-9/16"	44.18	42.26	40.34	38.42
	90621	.2969	19/64"	7.541	3-3/4"	2-3/8"	47.44	45.38	43.31	41.25
78626		.3020	N	7.671	2-15/16"	1-5/8"	45.68	43.69	41.71	39.72
	90626	.3020	N	7.671	3-3/4"	2-3/8"	47.75	45.67	43.60	41.52
78631		.3125	5/16"	7.938	2-15/16"	1-5/8"	45.84	43.85	41.85	39.86
	90631	.3125	5/16"	7.938	3-3/4"	2-3/8"	47.78	45.71	43.63	41.55
78636		.3150		8.000	75	43	48.70	46.59	44.47	42.35
	90636	.3150		8.000	95	60	50.77	48.57	46.36	44.15
78641		.3160	O	8.026	2-15/16"	1-11/16"	48.70	46.59	44.47	42.35
	90641	.3160	O	8.026	3-3/4"	2-3/8"	50.77	48.57	46.36	44.15
78646		.3230	P	8.204	2-15/16"	1-11/16"	48.70	46.59	44.47	42.35
	90646	.3230	P	8.204	3-3/4"	2-3/8"	50.77	48.57	46.36	44.15
78651		.3281	21/64"	8.334	2-15/16"	1-11/16"	50.54	48.35	46.15	43.95
	90651	.3281	21/64"	8.334	4"	2-1/2"	52.82	50.52	48.23	45.93
78656		.3320	Q	8.433	3"	1-11/16"	51.57	49.32	47.08	44.84
	90656	.3320	Q	8.433	4"	2-1/2"	53.90	51.56	49.21	46.87
78661		.3346		8.500	76	43	51.99	49.73	47.47	45.21
	90661	.3346		8.500	101	63	54.31	51.95	49.59	47.23
78666		.3390	R	8.611	3"	1-11/16"	53.41	51.08	48.76	46.44
	90666	.3390	R	8.611	4"	2-1/2"	55.81	53.38	50.96	48.53
78671		.3438	11/32"	8.733	3"	1-11/16"	55.34	52.93	50.53	48.12
	90671	.3438	11/32"	8.733	4"	2-1/2"	57.80	55.29	52.77	50.26
78676		.3480	S	8.839	3-1/16"	1-3/4"	62.63	59.91	57.18	54.46
	90676	.3480	S	8.839	4"	2-1/2"	61.35	58.69	56.02	53.35
78681		.3543		9.000	78	44	62.99	60.25	57.51	54.77
	90681	.3543		9.000	101	63	61.71	59.03	56.34	53.66

continued →

Series 1120H, 1100H (continued)

.3580" - .5000"
(9.093mm - 12.700mm)

3xD (1120H) EDP#	5xD (1100H) EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric							
78686		.3580	T	9.093	3-1/16"	1-3/4"	63.14	60.39	57.65	54.90
78691		.3594	23/64"	9.129	3-1/16"	1-3/4"	63.57	60.81	58.04	55.28
	90691	.3594	23/64"	9.129	4-1/4"	2-3/4"	64.27	61.48	58.68	55.89
78696		.3680	U	9.347	3-1/8"	1-13/16"	67.22	64.30	61.37	58.45
	90696	.3680	U	9.347	4-1/4"	2-3/4"	67.94	64.99	62.03	59.08
78701		.3740		9.500	79	46	68.20	65.23	62.27	59.30
	90701	.3740		9.500	107	70	68.93	65.93	62.94	59.94
78706		.3750	3/8"	9.525	3-1/8"	1-13/16"	68.20	65.23	62.27	59.30
	90706	.3750	3/8"	9.525	4-1/4"	2-3/4"	68.93	65.93	62.94	59.94
78711		.3770	V	9.576	3-1/4"	1-7/8"	68.86	65.87	62.87	59.88
	90711	.3770	V	9.576	4-1/4"	2-3/4"	71.71	68.60	65.48	62.36
78716		.3860	W	9.804	3-1/4"	1-7/8"	72.73	69.56	66.40	63.24
	90716	.3860	W	9.804	4-1/2"	2-7/8"	75.64	72.35	69.06	65.77
78721		.3906	25/64"	9.921	3-1/4"	1-7/8"	73.62	70.42	67.22	64.02
	90721	.3906	25/64"	9.921	4-1/2"	2-7/8"	76.58	73.25	69.92	66.59
78726		.3937		10.000	84	49	75.92	72.62	69.32	66.02
	90726	.3937		10.000	114	73	78.95	75.52	72.08	68.65
78736		.4040	Y	10.262	3-5/16"	1-15/16"	78.42	75.01	71.60	68.19
	90736	.4040	Y	10.262	4-1/2"	2-7/8"	81.54	77.99	74.45	70.90
78741		.4062	13/32"	10.317	3-5/16"	1-15/16"	80.90	77.39	73.87	70.35
	90741	.4062	13/32"	10.317	4-1/2"	2-7/8"	84.09	80.43	76.78	73.12
78746		.4130	Z	10.490	3-3/8"	2"	81.63	78.08	74.53	70.98
	90746	.4130	Z	10.490	4-1/2"	2-7/8"	84.84	81.15	77.46	73.77
78751		.4134		10.500	86	51	81.63	78.08	74.53	70.98
	90751	.4134		10.500	114	73	84.84	81.15	77.46	73.77
78756		.4219	27/64"	10.716	3-3/8"	2"	82.47	78.88	75.30	71.71
	90756	.4219	27/64"	10.716	4-1/2"	2-7/8"	85.69	81.96	78.24	74.51
78761		.4331		11.000	87	52	87.87	84.05	80.23	76.41
	90761	.4331		11.000	114	73	92.08	88.08	84.07	80.07
78766		.4375	7/16"	11.113	3-7/16"	2-1/16"	87.87	84.05	80.23	76.41
	90766	.4375	7/16"	11.113	4-1/2"	2-7/8"	92.08	88.08	84.07	80.07
	90771	.4528		11.500	120	76	98.99	94.69	90.38	86.08
78776		.4531	29/64"	11.509	3-9/16"	2-1/8"	94.48	90.38	86.27	82.16
	90776	.4531	29/64"	11.509	4-3/4"	3"	98.99	94.69	90.38	86.08
78781		.4688	15/32"	11.908	3-5/8"	2-1/8"	99.38	95.06	90.74	86.42
	90781	.4688	15/32"	11.908	4-3/4"	3"	104.09	99.56	95.04	90.51
78786		.4724		12.000	94	56	99.66	95.33	90.99	86.66
	90786	.4724		12.000	120	76	104.37	99.84	95.30	90.76
78791		.4844	31/64"	12.304	3-11/16"	2-3/16"	99.96	95.61	91.27	86.92
	90791	.4844	31/64"	12.304	4-3/4"	3"	104.37	99.84	95.30	90.76
78796		.4921		12.500	95	56	101.50	97.09	92.67	88.26
	90796	.4921		12.500	120	76	106.87	102.22	97.58	92.93
78801		.5000	1/2"	12.700	3-3/4"	2-1/4"	102.03	97.59	93.16	88.72
	90801	.5000	1/2"	12.700	4-3/4"	3"	106.87	102.22	97.58	92.93

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)

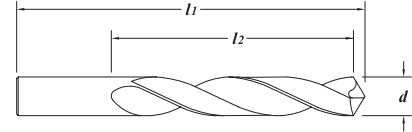


Series 1200

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

**GENERAL PURPOSE
DRILLS**

Solid submicron grain carbide drill
General purpose jobber style
Cam point (≤1/8" diameter - 4-facet point)
Live tooling recommended on lathe processes
Hardlube Coating - page 86



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							
56165	.0625	1/16"	1.588	1-3/4"	3/4"	7.42	7.10	6.77	6.45
56170	.0635	#52	1.613	1-3/4"	3/4"	7.52	7.19	6.87	6.54
56175	.0670	#51	1.702	1-3/4"	3/4"	7.64	7.30	6.97	6.64
56180	.0700	#50	1.778	1-3/4"	7/8"	7.82	7.48	7.14	6.80
56185	.0730	#49	1.854	1-3/4"	7/8"	8.03	7.68	7.33	6.98
56190	.0760	#48	1.930	1-3/4"	7/8"	8.29	7.93	7.57	7.21
56195	.0781	5/64"	1.984	1-3/4"	7/8"	8.60	8.23	7.85	7.48
56200	.0785	#47	1.994	1-3/4"	7/8"	8.89	8.50	8.12	7.73
56205	.0787		2.000	44	22	9.03	8.64	8.24	7.85
56210	.0810	#46	2.057	1-3/4"	7/8"	9.18	8.78	8.38	7.98
56215	.0820	#45	2.083	1-3/4"	7/8"	9.45	9.04	8.63	8.22
56220	.0860	#44	2.184	2"	1"	9.76	9.34	8.91	8.49
56225	.0890	#43	2.261	2"	1"	10.04	9.60	9.17	8.73
56230	.0935	#42	2.375	2"	1"	10.18	9.74	9.29	8.85
56235	.0938	3/32"	2.383	2"	1"	10.41	9.96	9.50	9.05
56240	.0960	#41	2.438	2"	1"	10.50	10.04	9.59	9.13
56245	.0980	#40	2.489	2"	1"	10.66	10.20	9.73	9.27
56250	.0984		2.500	57	32	10.72	10.25	9.79	9.32
56255	.0995	#39	2.527	2-1/4"	1-1/4"	10.76	10.30	9.83	9.36
56260	.1015	#38	2.578	2-1/4"	1-1/4"	10.89	10.42	9.94	9.47
56265	.1040	#37	2.642	2-1/4"	1-1/4"	11.04	10.56	10.08	9.60
56270	.1065	#36	2.705	2-1/4"	1-1/4"	11.18	10.69	10.21	9.72
56275	.1094	7/64"	2.779	2-1/4"	1-1/4"	11.36	10.87	10.37	9.88
56280	.1100	#35	2.794	2-1/4"	1-1/4"	11.49	10.99	10.49	9.99
56285	.1110	#34	2.819	2-1/4"	1-1/4"	11.63	11.12	10.62	10.11
56290	.1130	#33	2.870	2-1/4"	1-1/4"	11.85	11.33	10.82	10.30
56295	.1160	#32	2.946	2-1/4"	1-1/4"	11.97	11.45	10.93	10.41
56300	.1181		3.000	57	32	12.09	11.56	11.04	10.51
56305	.1200	#31	3.048	2-1/4"	1-1/4"	12.17	11.64	11.11	10.58
56310	.1250	1/8"	3.175	2-1/4"	1-1/4"	12.32	11.78	11.25	10.71
56315	.1285	#30	3.264	2-1/4"	1-1/4"	12.63	12.08	11.53	10.98
56320	.1360	#29	3.454	2-1/2"	1-3/8"	13.03	12.46	11.90	11.33
56325	.1378		3.500	63	35	13.46	12.87	12.29	11.70
56330	.1405	#28	3.569	2-1/2"	1-3/8"	13.58	12.99	12.40	11.81
56335	.1406	9/64"	3.571	2-1/2"	1-3/8"	13.74	13.15	12.55	11.95
56340	.1440	#27	3.658	2-1/2"	1-3/8"	14.28	13.66	13.04	12.42
56345	.1470	#26	3.734	2-1/2"	1-3/8"	14.42	13.79	13.17	12.54
56350	.1495	#25	3.797	2-1/2"	1-3/8"	14.62	13.98	13.35	12.71
56355	.1520	#24	3.861	2-1/2"	1-3/8"	14.64	14.00	13.37	12.73
56360	.1540	#23	3.912	2-1/2"	1-3/8"	14.74	14.10	13.46	12.82
56365	.1562	5/32"	3.967	2-1/2"	1-3/8"	14.85	14.20	13.56	12.91
56370	.1570	#22	3.988	2-1/2"	1-3/8"	15.78	15.09	14.41	13.72
56375	.1575		4.000	63	35	15.97	15.28	14.58	13.89

continued →

Series 1200 (continued)

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

EDP#	d^{\dagger} 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"	16.16	15.46	14.75	14.05
56385	.1610	#20	4.089	2-1/2"	1-3/8"	16.27	15.57	14.86	14.15
56390	.1660	#19	4.216	2-3/4"	1-5/8"	16.94	16.20	15.47	14.73
56395	.1695	#18	4.305	2-3/4"	1-5/8"	17.15	16.40	15.66	14.91
56400	.1719	11/64"	4.366	2-3/4"	1-5/8"	17.51	16.75	15.99	15.23
56405	.1730	#17	4.394	2-3/4"	1-5/8"	17.74	16.97	16.20	15.43
56410	.1770	#16	4.496	2-3/4"	1-5/8"	17.94	17.16	16.38	15.60
56415	.1772		4.500	70	41	18.03	17.25	16.46	15.68
56420	.1800	#15	4.572	2-3/4"	1-5/8"	18.11	17.33	16.54	15.75
56425	.1820	#14	4.623	2-3/4"	1-5/8"	18.53	17.72	16.92	16.11
56430	.1850	#13	4.700	2-3/4"	1-5/8"	18.66	17.85	17.04	16.23
56435	.1875	3/16"	4.763	2-3/4"	1-5/8"	18.76	17.94	17.13	16.31
56440	.1890	#12	4.801	2-3/4"	1-5/8"	19.37	18.52	17.68	16.84
56445	.1910	#11	4.851	2-3/4"	1-5/8"	19.57	18.72	17.87	17.02
56450	.1935	#10	4.915	2-3/4"	1-5/8"	20.52	19.62	18.73	17.84
56455	.1960	#9	4.978	3"	1-3/4"	21.02	20.11	19.19	18.28
56460	.1969		5.000	76	44	21.15	20.23	19.31	18.39
56465	.1990	#8	5.055	3"	1-3/4"	21.29	20.36	19.44	18.51
56470	.2010	#7	5.105	3"	1-3/4"	21.91	20.96	20.00	19.05
56475	.2031	13/64"	5.159	3"	1-3/4"	22.08	21.12	20.16	19.20
56480	.2040	#6	5.182	3"	1-3/4"	22.53	21.55	20.57	19.59
56485	.2055	#5	5.220	3"	1-3/4"	23.00	22.00	21.00	20.00
56490	.2090	#4	5.309	3"	1-3/4"	23.39	22.37	21.36	20.34
56495	.2130	#3	5.410	3"	1-3/4"	23.81	22.77	21.74	20.70
56500	.2165		5.500	76	44	23.99	22.95	21.90	20.86
56505	.2188	7/32"	5.558	3"	1-3/4"	24.16	23.11	22.06	21.01
56510	.2210	#2	5.613	3"	1-3/4"	24.76	23.68	22.61	21.53
56515	.2280	#1	5.791	3"	1-3/4"	24.90	23.82	22.73	21.65
56520	.2340	A	5.944	3-1/4"	2"	25.19	24.09	23.00	21.90
56525	.2344	15/64"	5.954	3-1/4"	2"	25.25	24.16	23.06	21.96
56530	.2362		6.000	82	50	25.36	24.26	23.15	22.05
56535	.2380	B	6.045	3-1/4"	2"	25.44	24.33	23.23	22.12
56540	.2420	C	6.147	3-1/4"	2"	25.63	24.52	23.40	22.29
56545	.2460	D	6.248	3-1/4"	2"	25.82	24.70	23.57	22.45
56550	.2500	1/4" / E	6.350	3-1/4"	2"	26.00	24.87	23.74	22.61
56555	.2559		6.500	82	50	26.63	25.48	24.32	23.16
56560	.2570	F	6.528	3-1/4"	2"	27.17	25.99	24.81	23.63
56565	.2610	G	6.629	3-1/2"	2-1/8"	27.74	26.53	25.33	24.12
56570	.2656	17/64"	6.746	3-1/2"	2-1/8"	28.30	27.07	25.84	24.61
56575	.2660	H	6.756	3-1/2"	2-1/8"	29.11	27.84	26.58	25.31
56580	.2720	I	6.909	3-1/2"	2-1/8"	29.43	28.15	26.87	25.59
56585	.2756		7.000	88	54	29.67	28.38	27.09	25.80
56590	.2770	J	7.036	3-1/2"	2-1/8"	29.93	28.63	27.33	26.03
56595	.2810	K	7.137	3-1/2"	2-1/8"	30.20	28.89	27.57	26.26
56600	.2812	9/32"	7.142	3-1/2"	2-1/8"	30.39	29.07	27.75	26.43
56605	.2900	L	7.366	3-1/2"	2-1/8"	31.48	30.11	28.74	27.37
56610	.2950	M	7.493	3-3/4"	2-3/8"	33.70	32.23	30.77	29.30
56615	.2953		7.500	95	60	33.70	32.23	30.77	29.30
56620	.2969	19/64"	7.541	3-3/4"	2-3/8"	33.70	32.23	30.77	29.30
56625	.3020	N	7.671	3-3/4"	2-3/8"	35.70	34.14	32.59	31.04
56630	.3125	5/16"	7.938	3-3/4"	2-3/8"	35.83	34.28	32.72	31.16
56635	.3150		8.000	95	60	38.44	36.77	35.10	33.43
56640	.3160	O	8.026	3-3/4"	2-3/8"	38.44	36.77	35.10	33.43
56645	.3230	P	8.204	3-3/4"	2-3/8"	38.44	36.77	35.10	33.43
56650	.3281	21/64"	8.334	4"	2-1/2"	39.01	37.31	35.62	33.92
56655	.3320	Q	8.433	4"	2-1/2"	39.93	38.19	36.46	34.72
56660	.3346		8.500	101	63	40.27	38.52	36.77	35.02

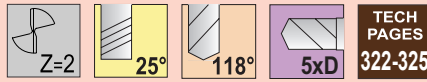
EDP#	d^+ Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
56665	.3390	R	8.611	4"	2-1/2"	41.57	39.77	37.96	36.15
56670	.3438	11/32"	8.733	4"	2-1/2"	43.25	41.37	39.49	37.61
56675	.3480	S	8.839	4"	2-1/2"	43.40	41.51	39.63	37.74
56680	.3543		9.000	101	63	43.65	41.76	39.86	37.96
56685	.3580	T	9.093	4-1/4"	2-3/4"	44.05	42.13	40.22	38.30
56690	.3594	23/64"	9.129	4-1/4"	2-3/4"	44.36	42.43	40.50	38.57
56695	.3680	U	9.347	4-1/4"	2-3/4"	50.34	48.15	45.96	43.77
56700	.3740		9.500	107	70	50.81	48.60	46.39	44.18
56705	.3750	3/8"	9.525	4-1/4"	2-3/4"	51.21	48.98	46.76	44.53
56710	.3770	V	9.576	4-1/4"	2-3/4"	52.19	49.92	47.65	45.38
56715	.3860	W	9.804	4-1/2"	2-7/8"	53.29	50.97	48.66	46.34
56720	.3906	25/64"	9.921	4-1/2"	2-7/8"	54.08	51.73	49.38	47.03
56725	.3937		10.000	114	73	56.03	53.59	51.16	48.72
56730	.3970	X	10.084	4-1/2"	2-7/8"	57.68	55.18	52.67	50.16
56735	.4040	Y	10.262	4-1/2"	2-7/8"	58.14	55.62	53.09	50.56
56740	.4062	13/32"	10.317	4-1/2"	2-7/8"	60.24	57.62	55.00	52.38
56745	.4130	Z	10.490	4-1/2"	2-7/8"	60.88	58.23	55.59	52.94
56750	.4134		10.500	114	73	60.88	58.23	55.59	52.94
56755	.4219	27/64"	10.716	4-1/2"	2-7/8"	61.56	58.88	56.21	53.53
56760	.4331		11.000	114	73	66.85	63.94	61.04	58.13
56765	.4375	7/16"	11.113	4-1/2"	2-7/8"	66.85	63.94	61.04	58.13
56770	.4528		11.500	120	76	72.52	69.37	66.21	63.06
56775	.4531	29/64"	11.509	4-3/4"	3"	72.52	69.37	66.21	63.06
56780	.4688	15/32"	11.908	4-3/4"	3"	76.71	73.37	70.04	66.70
56785	.4724		12.000	120	76	76.95	73.60	70.26	66.91
56790	.4844	31/64"	12.304	4-3/4"	3"	76.95	73.60	70.26	66.91
56795	.4921		12.500	120	76	79.01	75.57	72.14	68.70
56800	.5000	1/2"	12.700	4-3/4"	3"	79.01	75.57	72.14	68.70



Drill Manufacturing

Series 1200H

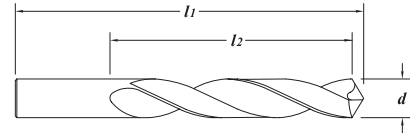
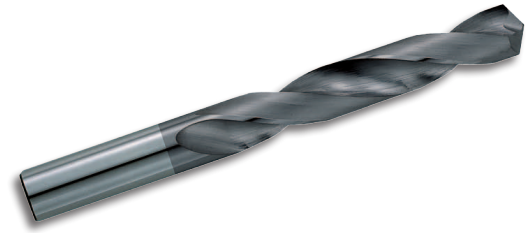
.0625" - .1575"
(1.588mm - 4.000mm)



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)

Hardlube Coating

- Solid submicron grain carbide drill
- General purpose jobber style
- Excellent heat resistance and lubricity
- Cam point ($\leq 1/8"$ diameter is with 4-facet point)
- Live tooling recommended on lathe processes
- Uncoated - page 83

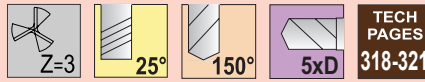


EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
56166	.0625	1/16"	1.588	1-3/4"	3/4"	9.51	9.10	8.68	8.27
56171	.0635	#52	1.613	1-3/4"	3/4"	9.63	9.21	8.79	8.37
56181	.0700	#50	1.778	1-3/4"	7/8"	9.90	9.47	9.04	8.61
56186	.0730	#49	1.854	1-3/4"	7/8"	10.13	9.69	9.25	8.81
56191	.0760	#48	1.930	1-3/4"	7/8"	10.38	9.93	9.48	9.03
56196	.0781	5/64"	1.984	1-3/4"	7/8"	10.72	10.25	9.79	9.32
56206	.0787		2.000	44	22	11.13	10.65	10.16	9.68
56216	.0820	#45	2.083	1-3/4"	7/8"	11.56	11.06	10.55	10.05
56221	.0860	#44	2.184	2"	1"	11.87	11.35	10.84	10.32
56226	.0890	#43	2.261	2"	1"	12.13	11.61	11.08	10.55
56231	.0935	#42	2.375	2"	1"	12.28	11.75	11.21	10.68
56236	.0938	3/32"	2.383	2"	1"	12.51	11.97	11.42	10.88
56241	.0960	#41	2.438	2"	1"	12.62	12.07	11.52	10.97
56246	.0980	#40	2.489	2"	1"	12.78	12.22	11.67	11.11
56251	.0984		2.500	57	32	12.80	12.24	11.69	11.13
56256	.0995	#39	2.527	2-1/4"	1-1/4"	12.86	12.30	11.74	11.18
56261	.1015	#38	2.578	2-1/4"	1-1/4"	13.02	12.45	11.89	11.32
56266	.1040	#37	2.642	2-1/4"	1-1/4"	13.12	12.55	11.98	11.41
56271	.1065	#36	2.705	2-1/4"	1-1/4"	13.27	12.69	12.12	11.54
56276	.1094	7/64"	2.779	2-1/4"	1-1/4"	13.48	12.89	12.31	11.72
56281	.1100	#35	2.794	2-1/4"	1-1/4"	13.58	12.99	12.40	11.81
56286	.1110	#34	2.819	2-1/4"	1-1/4"	13.73	13.13	12.54	11.94
56291	.1130	#33	2.870	2-1/4"	1-1/4"	13.95	13.34	12.74	12.13
56296	.1160	#32	2.946	2-1/4"	1-1/4"	14.05	13.44	12.83	12.22
56301	.1181		3.000	57	32	14.17	13.55	12.94	12.32
56306	.1200	#31	3.048	2-1/4"	1-1/4"	14.28	13.66	13.04	12.42
56311	.1250	1/8"	3.175	2-1/4"	1-1/4"	14.40	13.77	13.15	12.52
56316	.1285	#30	3.264	2-1/4"	1-1/4"	14.73	14.09	13.45	12.81
56321	.1360	#29	3.454	2-1/2"	1-3/8"	15.12	14.47	13.81	13.15
56331	.1405	#28	3.569	2-1/2"	1-3/8"	15.71	15.03	14.34	13.66
56336	.1406	9/64"	3.571	2-1/2"	1-3/8"	15.85	15.16	14.47	13.78
56341	.1440	#27	3.658	2-1/2"	1-3/8"	16.39	15.68	14.96	14.25
56346	.1470	#26	3.734	2-1/2"	1-3/8"	16.54	15.82	15.10	14.38
56351	.1495	#25	3.797	2-1/2"	1-3/8"	16.69	15.96	15.24	14.51
56356	.1520	#24	3.861	2-1/2"	1-3/8"	16.77	16.04	15.31	14.58
56361	.1540	#23	3.912	2-1/2"	1-3/8"	16.85	16.12	15.38	14.65
56366	.1562	5/32"	3.967	2-1/2"	1-3/8"	16.93	16.19	15.46	14.72
56371	.1570	#22	3.988	2-1/2"	1-3/8"	17.87	17.09	16.32	15.54

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"	18.27	17.48	16.68	15.89
56386	.1610	#20	4.089	2-1/2"	1-3/8"	18.38	17.58	16.78	15.98
56391	.1660	#19	4.216	2-3/4"	1-5/8"	19.06	18.23	17.40	16.57
56396	.1695	#18	4.305	2-3/4"	1-5/8"	19.24	18.40	17.57	16.73
56401	.1719	11/64"	4.366	2-3/4"	1-5/8"	19.57	18.72	17.87	17.02
56411	.1770	#16	4.496	2-3/4"	1-5/8"	20.03	19.16	18.29	17.42
56421	.1800	#15	4.572	2-3/4"	1-5/8"	20.23	19.35	18.47	17.59
56426	.1820	#14	4.623	2-3/4"	1-5/8"	20.62	19.72	18.83	17.93
56436	.1875	3/16"	4.763	2-3/4"	1-5/8"	20.86	19.95	19.05	18.14
56441	.1890	#12	4.801	2-3/4"	1-5/8"	22.99	21.99	20.99	19.99
56446	.1910	#11	4.851	2-3/4"	1-5/8"	23.20	22.19	21.18	20.17
56451	.1935	#10	4.915	2-3/4"	1-5/8"	24.10	23.06	22.01	20.96
56471	.2010	#7	5.105	3"	1-3/4"	25.52	24.41	23.30	22.19
56481	.2040	#6	5.182	3"	1-3/4"	26.14	25.00	23.87	22.73
56486	.2055	#5	5.220	3"	1-3/4"	26.60	25.44	24.29	23.13
56491	.2090	#4	5.309	3"	1-3/4"	27.03	25.85	24.68	23.50
56496	.2130	#3	5.410	3"	1-3/4"	27.42	26.22	25.03	23.84
56506	.2188	7/32"	5.558	3"	1-3/4"	27.76	26.55	25.35	24.14
56516	.2280	#1	5.791	3"	1-3/4"	28.51	27.27	26.03	24.79
56526	.2344	15/64"	5.954	3-1/4"	2"	28.99	27.73	26.47	25.21
56541	.2420	C	6.147	3-1/4"	2"	29.36	28.08	26.81	25.53
56551	.2500	1/4" / E	6.350	3-1/4"	2"	29.72	28.42	27.13	25.84
56561	.2570	F	6.528	3-1/4"	2"	34.05	32.57	31.09	29.61
56566	.2610	G	6.629	3-1/2"	2-1/8"	34.57	33.07	31.56	30.06
56571	.2656	17/64"	6.746	3-1/2"	2-1/8"	35.14	33.62	32.09	30.56
56601	.2812	9/32"	7.142	3-1/2"	2-1/8"	37.19	35.57	33.96	32.34
56606	.2900	L	7.366	3-1/2"	2-1/8"	38.33	36.66	35.00	33.33
56626	.3020	N	7.671	3-3/4"	2-3/8"	42.53	40.68	38.83	36.98
56631	.3125	5/16"	7.938	3-3/4"	2-3/8"	42.69	40.83	38.98	37.12
56646	.3230	P	8.204	3-3/4"	2-3/8"	45.26	43.30	41.33	39.36
56651	.3281	21/64"	8.334	4"	2-1/2"	45.84	43.85	41.85	39.86
56671	.3438	11/32"	8.733	4"	2-1/2"	50.07	47.89	45.72	43.54
56696	.3680	U	9.347	4-1/4"	2-3/4"	60.75	58.11	55.47	52.83
56706	.3750	3/8"	9.525	4-1/4"	2-3/4"	61.61	58.93	56.25	53.57
56731	.3970	X	10.084	4-1/2"	2-7/8"	68.60	65.62	62.63	59.65
56741	.4062	13/32"	10.317	4-1/2"	2-7/8"	71.17	68.08	64.98	61.89
56756	.4219	27/64"	10.716	4-1/2"	2-7/8"	72.50	69.34	66.19	63.04
56766	.4375	7/16"	11.113	4-1/2"	2-7/8"	77.77	74.39	71.01	67.63
56801	.5000	1/2"	12.700	4-3/4"	3"	89.94	86.03	82.12	78.21

Series 1100

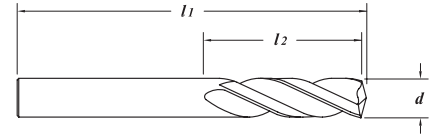
.1094" - .2040"
(2.779mm - 5.182mm)



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)

Recommended for cast iron, tungsten, and materials with high silicon content

- Solid submicron grain carbide drill
- Self-centering drill point
- Near reamer finishes
- Can be used as a core drill
- Tighter tolerance holes
- Improved roundness and straightness
- Live tooling recommended on lathe processes
- Hardlube Coating - page 79

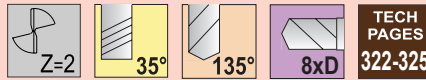


EDP#	d †		l_1	l_2	1-11	12-24	25-49	50-100	
	Decimal	Diameter Metric							
90275	.1094	7/64"	2.779	2-1/4"	1-1/4"	13.80	13.20	12.60	12.00
90280	.1100	#35	2.794	2-1/4"	1-1/4"	13.95	13.34	12.74	12.13
90285	.1110	#34	2.819	2-1/4"	1-1/4"	14.12	13.51	12.89	12.28
90290	.1130	#33	2.870	2-1/4"	1-1/4"	14.35	13.73	13.10	12.48
90295	.1160	#32	2.946	2-1/4"	1-1/4"	14.55	13.92	13.28	12.65
90300	.1181		3.000	57	32	14.65	14.01	13.38	12.74
90305	.1200	#31	3.048	2-1/4"	1-1/4"	14.75	14.11	13.47	12.83
90310	.1250	1/8"	3.175	2-1/4"	1-1/4"	14.96	14.31	13.66	13.01
90315	.1285	#30	3.264	2-1/4"	1-1/4"	15.32	14.65	13.99	13.32
90320	.1360	#29	3.454	2-1/2"	1-3/8"	15.80	15.11	14.43	13.74
90325	.1378		3.500	63	35	16.31	15.60	14.89	14.18
90330	.1405	#28	3.569	2-1/2"	1-3/8"	16.49	15.77	15.06	14.34
90335	.1406	9/64"	3.571	2-1/2"	1-3/8"	16.68	15.95	15.23	14.50
90340	.1440	#27	3.658	2-1/2"	1-3/8"	17.34	16.59	15.83	15.08
90345	.1470	#26	3.734	2-1/2"	1-3/8"	17.58	16.82	16.05	15.29
90350	.1495	#25	3.797	2-1/2"	1-3/8"	17.73	16.96	16.19	15.42
90355	.1520	#24	3.861	2-1/2"	1-3/8"	17.77	17.00	16.22	15.45
90365	.1562	5/32"	3.967	2-1/2"	1-3/8"	18.01	17.23	16.44	15.66
90375	.1575		4.000	63	35	19.15	18.32	17.48	16.65
90380	.1590	#21	4.039	2-1/2"	1-3/8"	19.61	18.76	17.90	17.05
90385	.1610	#20	4.089	2-1/2"	1-3/8"	19.61	18.76	17.90	17.05
90390	.1660	#19	4.216	2-3/4"	1-5/8"	19.77	18.91	18.05	17.19
90395	.1695	#18	4.305	2-3/4"	1-5/8"	19.90	19.03	18.17	17.30
90400	.1719	11/64"	4.366	2-3/4"	1-5/8"	20.02	19.15	18.28	17.41
90420	.1800	#15	4.572	2-3/4"	1-5/8"	21.37	20.44	19.51	18.58
90425	.1820	#14	4.623	2-3/4"	1-5/8"	21.85	20.90	19.95	19.00
90435	.1875	3/16"	4.763	2-3/4"	1-5/8"	21.99	21.03	20.08	19.12
90440	.1890	#12	4.801	2-3/4"	1-5/8"	22.14	21.18	20.21	19.25
90455	.1960	#9	4.978	3"	1-3/4"	24.01	22.97	21.92	20.88
90460	.1969		5.000	76	44	24.16	23.11	22.06	21.01
90470	.2010	#7	5.105	3"	1-3/4"	25.07	23.98	22.89	21.80
90475	.2031	13/64"	5.159	3"	1-3/4"	26.01	24.88	23.75	22.62
90480	.2040	#6	5.182	3"	1-3/4"	26.17	25.04	23.90	22.76

EDP#	d^{\dagger} Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric							
90485	.2055	#5	5.220	3"	1-3/4"	26.29	25.15	24.00	22.86
90500	.2165		5.500	76	44	27.42	26.22	25.03	23.84
90505	.2188	7/32"	5.558	3"	1-3/4"	27.63	26.43	25.23	24.03
90510	.2210	#2	5.613	3"	1-3/4"	28.31	27.08	25.85	24.62
90515	.2280	#1	5.791	3"	1-3/4"	28.45	27.21	25.98	24.74
90525	.2344	15/64"	5.954	3-1/4"	2"	28.89	27.63	26.38	25.12
90530	.2362		6.000	82	50	28.97	27.71	26.45	25.19
90550	.2500	1/4" / E	6.350	3-1/4"	2"	29.70	28.41	27.12	25.83
90555	.2559		6.500	82	50	30.44	29.12	27.79	26.47
90560	.2570	F	6.528	3-1/4"	2"	31.08	29.73	28.38	27.03
90565	.2610	G	6.629	3-1/2"	2-1/8"	32.69	31.27	29.85	28.43
90570	.2656	17/64"	6.746	3-1/2"	2-1/8"	33.35	31.90	30.45	29.00
90575	.2660	H	6.756	3-1/2"	2-1/8"	34.30	32.81	31.32	29.83
90580	.2720	I	6.909	3-1/2"	2-1/8"	34.72	33.21	31.70	30.19
90585	.2756		7.000	88	54	34.97	33.45	31.93	30.41
90600	.2812	9/32"	7.142	3-1/2"	2-1/8"	36.87	35.27	33.66	32.06
90605	.2900	L	7.366	3-1/2"	2-1/8"	38.24	36.58	34.91	33.25
90620	.2969	19/64"	7.541	3-3/4"	2-3/8"	40.61	38.84	37.08	35.31
90625	.3020	N	7.671	3-3/4"	2-3/8"	40.91	39.13	37.35	35.57
90630	.3125	5/16"	7.938	3-3/4"	2-3/8"	40.95	39.17	37.39	35.61
90635	.3150		8.000	95	60	43.94	42.03	40.12	38.21
90640	.3160	O	8.026	3-3/4"	2-3/8"	43.94	42.03	40.12	38.21
90650	.3281	21/64"	8.334	4"	2-1/2"	45.97	43.97	41.97	39.97
90655	.3320	Q	8.433	4"	2-1/2"	47.05	45.00	42.96	40.91
90660	.3346		8.500	101	63	47.47	45.41	43.34	41.28
90665	.3390	R	8.611	4"	2-1/2"	48.94	46.82	44.69	42.56
90670	.3438	11/32"	8.733	4"	2-1/2"	50.99	48.77	46.56	44.34
90680	.3543		9.000	101	63	53.03	50.72	48.42	46.11
90690	.3594	23/64"	9.129	4-1/4"	2-3/4"	53.90	51.56	49.21	46.87
90705	.3750	3/8"	9.525	4-1/4"	2-3/4"	58.54	55.99	53.45	50.90
90725	.3937		10.000	114	73	68.05	65.09	62.13	59.17
90745	.4130	Z	10.490	4-1/2"	2-7/8"	73.91	70.70	67.48	64.27
90755	.4219	27/64"	10.716	4-1/2"	2-7/8"	74.75	71.50	68.25	65.00
90760	.4331		11.000	114	73	81.16	77.63	74.10	70.57
90765	.4375	7/16"	11.113	4-1/2"	2-7/8"	81.16	77.63	74.10	70.57
90775	.4531	29/64"	11.509	4-3/4"	3"	88.08	84.25	80.42	76.59
90780	.4688	15/32"	11.908	4-3/4"	3"	93.17	89.12	85.07	81.02
90790	.4844	31/64"	12.304	4-3/4"	3"	93.46	89.40	85.33	81.27
90800	.5000	1/2"	12.700	4-3/4"	3"	95.92	91.75	87.58	83.41

Series 1800H

.1875" - .3125"
(4.763mm - 7.938mm)



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)

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

Parabolic

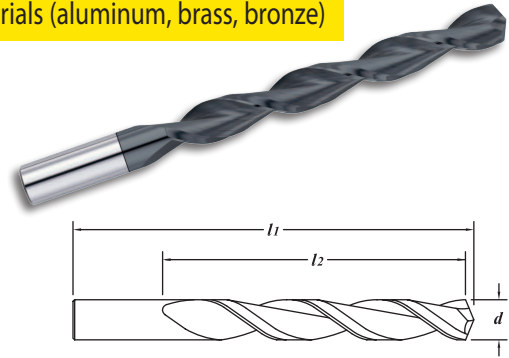
Hardlube Coating

Solid submicron grain carbide drill

Wide open flutes and high helix remove chips quickly

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"	25.88	24.75	23.63	22.50
22441	.1890	#12	4.801	3-13/16"	2-5/16"	26.45	25.30	24.15	23.00
22456	.1960	#9	4.978	3-15/16"	2-7/16"	28.29	27.06	25.83	24.60
22461	.1969		5.000	100	62	28.89	27.63	26.38	25.12
22466	.1990	#8	5.055	3-15/16"	2-7/16"	29.37	28.09	26.82	25.54
22471	.2010	#7	5.105	3-15/16"	2-7/16"	29.90	28.60	27.30	26.00
22476	.2031	13/64"	5.159	3-15/16"	2-7/16"	29.22	27.95	26.68	25.41
22486	.2055	#5	5.220	4"	2-1/2"	31.40	30.03	28.67	27.30
22496	.2130	#3	5.410	4"	2-1/2"	32.37	30.97	29.56	28.15
22501	.2165		5.500	102	64	32.90	31.47	30.04	28.61
22506	.2188	7/32"	5.558	4"	2-1/2"	33.40	31.94	30.49	29.04
22511	.2210	#2	5.613	4"	2-1/2"	33.88	32.41	30.93	29.46
22516	.2280	#1	5.791	4-1/8"	2-5/8"	34.40	32.90	31.41	29.91
22531	.2362		6.000	105	67	35.96	34.40	32.83	31.27
22541	.2420	C	6.147	4-1/4"	2-3/4"	36.36	34.78	33.20	31.62
22546	.2460	D	6.248	4-1/4"	2-3/4"	36.51	34.93	33.34	31.75
22551	.2500	1/4" / E	6.350	4-1/4"	2-3/4"	36.71	35.11	33.52	31.92
22556	.2559		6.500	108	70	37.93	36.28	34.63	32.98
22561	.2570	F	6.528	4-3/8"	2-7/8"	39.53	37.81	36.09	34.37
22566	.2610	G	6.629	4-3/8"	2-7/8"	40.61	38.84	37.08	35.31
22571	.2656	17/64"	6.746	4-3/8"	2-7/8"	41.78	39.96	38.15	36.33
22576	.2660	H	6.756	4-3/8"	2-7/8"	43.15	41.27	39.40	37.52
22581	.2720	I	6.909	4-3/8"	2-7/8"	44.45	42.52	40.58	38.65
22586	.2756		7.000	111	73	45.78	43.79	41.80	39.81
22596	.2810	K	7.137	4-7/16"	2-15/16"	47.78	45.71	43.63	41.55
22606	.2900	L	7.366	4-7/16"	2-15/16"	49.90	47.73	45.56	43.39
22631	.3125	5/16"	7.938	4-11/16"	3-3/16"	52.16	49.90	47.63	45.36

EDP#	d^+ Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
	Decimal	Metric						
22636	.3150	8.000	119	81	55.15	52.76	50.36	47.96
22646	.3230	P 8.204	4-11/16"	3-3/16"	57.68	55.18	52.67	50.16
22656	.3320	Q 8.433	4-15/16"	3-7/16"	60.24	57.62	55.00	52.38
22661	.3346	8.500	125	87	61.50	58.83	56.15	53.48
22666	.3390	R 8.611	4-15/16"	3-7/16"	63.43	60.68	57.92	55.16
22696	.3680	U 9.347	5"	3-1/2"	70.06	67.01	63.97	60.92
22706	.3750	3/8" 9.525	5-1/8"	3-5/8"	70.64	67.57	64.50	61.43
22721	.3906	25/64" 9.921	5-1/4"	3-3/4"	77.69	74.32	70.94	67.56
22726	.3937	10.000	133	95	80.02	76.54	73.06	69.58
22751	.4134	10.500	137	98	93.86	89.78	85.70	81.62
22761	.4331	11.000	138	100	101.17	96.77	92.37	87.97
22766	.4375	7/16" 11.113	5-7/16"	3-15/16"	101.17	96.77	92.37	87.97
22776	.4531	29/64" 11.509	5-9/16"	4-5/16"	102.60	98.14	93.68	89.22
22801	.5000	1/2" 12.700	6"	4-1/2"	107.92	103.22	98.53	93.84
22811	.5156	33/64" 13.096	6"	4-1/2"	136.40	130.47	124.54	118.61
22831	.5512	14.000	156	117	159.93	152.98	146.02	139.07



Series 4100

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

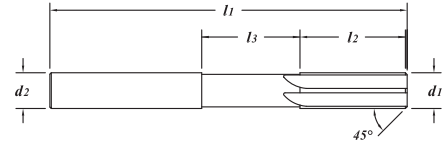


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312-313

TOLERANCES

<i>d1</i>	.0590" - .2509" (1.498 - 6.372mm)	+ .0002" - .0000" (+.0050 - .0000mm)
	.2510" - .5020" (6.375 - 12.750mm)	+ .0003" - .0000" (+.0075 - .0000mm)
<i>d2</i>	.0590" - .2509" (1.498 - 6.372mm)	+ .0002" - .0000" (+.0050 - .0000mm)
	.2510" - .5020" (6.375 - 12.750mm)	+ .0003" - .0000" (+.0075 - .0000mm)

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	14.81	14.17	13.52	12.88
95069	.0591	1.500	.0591"	1-1/2"	3/8"	.250"	4	14.81	14.17	13.52	12.88
95072	.0595	#53 1.511	.0595"	1-1/2"	3/8"	.250"	4	14.81	14.17	13.52	12.88
95075	.0600	1.524	.0600"	1-1/2"	3/8"	.250"	4	14.81	14.17	13.52	12.88
95078	.0605	1.537	.0605"	1-1/2"	3/8"	.250"	4	14.81	14.17	13.52	12.88
95081	.0610	1.549	.0610"	1-1/2"	3/8"	.250"	4	14.81	14.17	13.52	12.88
95084	.0615	1.562	.0615"	1-1/2"	3/8"	.250"	4	14.81	14.17	13.52	12.88
95087	.0620	1.575	.0620"	1-1/2"	3/8"	.250"	4	14.81	14.17	13.52	12.88
95090	.0625	1/16" 1.588	.0625"	1-1/2"	3/8"	.250"	4	14.81	14.17	13.52	12.88
95093	.0630	1.600	.0630"	1-1/2"	3/8"	.250"	4	14.81	14.17	13.52	12.88
95096	.0635	#52 1.613	.0635"	1-1/2"	3/8"	.250"	4	14.81	14.17	13.52	12.88
95099	.0640	1.626	.0640"	1-1/2"	3/8"	.250"	4	14.81	14.17	13.52	12.88
95102	.0645	1.638	.0645"	1-1/2"	3/8"	.250"	4	14.81	14.17	13.52	12.88
95105	.0650	1.651	.0650"	1-1/2"	3/8"	.250"	4	14.81	14.17	13.52	12.88
95108	.0660	1.676	.0660"	1-3/4"	1/2"	.250"	4	14.81	14.17	13.52	12.88
95111	.0670	#51 1.702	.0670"	1-3/4"	1/2"	.250"	4	14.81	14.17	13.52	12.88
95114	.0680	1.727	.0680"	1-3/4"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95117	.0690	1.753	.0690"	1-3/4"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95120	.0700	#50 1.778	.0700"	1-3/4"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95123	.0710	1.803	.0710"	1-3/4"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95126	.0720	1.829	.0720"	1-3/4"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95129	.0730	#49 1.854	.0730"	1-3/4"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95132	.0740	1.880	.0740"	1-3/4"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95135	.0750	1.905	.0750"	1-3/4"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95138	.0760	#48 1.930	.0760"	1-3/4"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95141	.0770	1.956	.0770"	1-3/4"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95144	.0780	1.981	.0780"	1-3/4"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95147	.0781	5/64" 1.984	.0781"	1-3/4"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95150	.0785	#47 1.994	.0785"	1-3/4"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95153	.0787	2.000	.0787"	1-3/4"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95156	.0790	2.007	.0790"	1-3/4"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95159	.0800	2.032	.0800"	1-3/4"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95162	.0810	#46 2.057	.0810"	2"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95165	.0820	#45 2.083	.0820"	2"	1/2"	.375"	4	14.81	14.17	13.52	12.88

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	14.81	14.17	13.52	12.88
95171	.0840	2.134	.0840"	2"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95174	.0850	2.159	.0850"	2"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95177	.0860	#44 2.184	.0860"	2"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95180	.0870	2.210	.0870"	2"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95183	.0880	2.235	.0880"	2"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95186	.0890	#43 2.261	.0890"	2"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95189	.0900	2.286	.0900"	2"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95192	.0910	2.311	.0910"	2"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95195	.0915	2.324	.0915"	2"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95198	.0920	2.337	.0920"	2"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95201	.0925	2.350	.0925"	2"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95204	.0930	2.362	.0930"	2"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95207	.0935	#42 2.375	.0935"	2"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95210	.0938	3/32" 2.383	.0938"	2"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95213	.0940	2.388	.0940"	2"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95216	.0945	2.400	.0945"	2"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95219	.0950	2.413	.0950"	2"	1/2"	.375"	4	14.81	14.17	13.52	12.88
95222	.0960	#41 2.438	.0960"	2-1/4"	5/8"	.375"	4	16.65	15.93	15.20	14.48
95225	.0970	2.464	.0970"	2-1/4"	5/8"	.375"	4	16.65	15.93	15.20	14.48
95228	.0980	#40 2.489	.0980"	2-1/4"	5/8"	.375"	4	16.65	15.93	15.20	14.48
95231	.0984	2.500	.0984"	2-1/4"	5/8"	.375"	4	16.65	15.93	15.20	14.48
95234	.0990	2.515	.0990"	2-1/4"	5/8"	.500"	4	16.65	15.93	15.20	14.48
95237	.0995	#39 2.527	.0995"	2-1/4"	5/8"	.500"	4	16.65	15.93	15.20	14.48
95240	.1000	2.540	.1000"	2-1/4"	5/8"	.500"	4	16.65	15.93	15.20	14.48
95243	.1010	2.565	.1010"	2-1/4"	5/8"	.500"	4	16.65	15.93	15.20	14.48
95246	.1015	#38 2.578	.1015"	2-1/4"	5/8"	.500"	4	16.65	15.93	15.20	14.48
95249	.1020	2.591	.1020"	2-1/4"	5/8"	.500"	4	16.65	15.93	15.20	14.48
95252	.1030	2.616	.1030"	2-1/4"	5/8"	.500"	4	16.65	15.93	15.20	14.48
95255	.1040	#37 2.642	.1040"	2-1/4"	5/8"	.500"	4	16.65	15.93	15.20	14.48
95258	.1050	2.667	.1050"	2-1/4"	5/8"	.500"	4	16.65	15.93	15.20	14.48
95261	.1060	2.692	.1060"	2-1/4"	5/8"	.500"	4	16.65	15.93	15.20	14.48
95264	.1065	#36 2.705	.1065"	2-1/4"	5/8"	.500"	4	16.65	15.93	15.20	14.48
95267	.1070	2.718	.1070"	2-1/4"	5/8"	.500"	4	16.65	15.93	15.20	14.48
95270	.1080	2.743	.1080"	2-1/4"	5/8"	.500"	4	16.65	15.93	15.20	14.48
95273	.1090	2.769	.1090"	2-1/4"	5/8"	.500"	4	16.65	15.93	15.20	14.48
95276	.1094	7/64" 2.779	.1094"	2-1/4"	5/8"	.500"	4	16.65	15.93	15.20	14.48
95279	.1100	#35 2.794	.1100"	2-1/4"	5/8"	.500"	4	16.78	16.05	15.32	14.59
95282	.1110	#34 2.819	.1110"	2-1/4"	5/8"	.500"	4	16.78	16.05	15.32	14.59
95285	.1120	2.845	.1120"	2-1/4"	5/8"	.500"	4	16.78	16.05	15.32	14.59
95288	.1130	#33 2.870	.1130"	2-1/4"	5/8"	.500"	4	16.78	16.05	15.32	14.59
95291	.1140	2.896	.1140"	2-1/4"	5/8"	.500"	4	16.78	16.05	15.32	14.59
95294	.1150	2.921	.1150"	2-1/4"	5/8"	.500"	4	16.78	16.05	15.32	14.59
95297	.1160	#32 2.946	.1160"	2-1/4"	5/8"	.500"	4	16.78	16.05	15.32	14.59
95300	.1170	2.972	.1170"	2-1/4"	5/8"	.500"	4	16.78	16.05	15.32	14.59
95303	.1180	2.997	.1180"	2-1/4"	5/8"	.500"	4	16.78	16.05	15.32	14.59
95306	.1181	3.000	.1181"	2-1/4"	5/8"	.500"	4	16.78	16.05	15.32	14.59
95309	.1190	3.023	.1190"	2-1/4"	5/8"	.500"	4	16.78	16.05	15.32	14.59

continued →

Series 4100 (continued)

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

REAMERS

EDP#	$d1$ † 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										
95312	.1200	#31	3.048	.1200"	2-1/4"	5/8"	.500"	4	16.78	16.05	15.32	14.59
95315	.1210		3.073	.1210"	2-1/4"	5/8"	.500"	4	16.78	16.05	15.32	14.59
95318	.1220		3.099	.1220"	2-1/4"	5/8"	.500"	4	16.78	16.05	15.32	14.59
95321	.1230		3.124	.1230"	2-1/4"	5/8"	.500"	4	16.78	16.05	15.32	14.59
95324	.1235		3.137	.1235"	2-1/4"	5/8"	.500"	4	16.78	16.05	15.32	14.59
95327	.1240		3.150	.1240"	2-1/4"	5/8"	.500"	4	16.78	16.05	15.32	14.59
95330	.1245		3.162	.1245"	2-1/4"	5/8"	.500"	4	16.78	16.05	15.32	14.59
95333	.1248		3.170	.1248"	2-1/4"	5/8"	.500"	4	16.78	16.05	15.32	14.59
95336	.1250	1/8"	3.175	.1250"	2-1/4"	5/8"	.500"	4	16.78	16.05	15.32	14.59
95339	.1255		3.188	.1255"	2-1/4"	5/8"	.500"	4	17.46	16.70	15.94	15.18
95342	.1260		3.200	.1260"	2-1/4"	5/8"	.500"	4	17.46	16.70	15.94	15.18
95345	.1265		3.213	.1265"	2-1/4"	5/8"	.500"	4	17.46	16.70	15.94	15.18
95348	.1270		3.226	.1270"	2-1/4"	5/8"	.500"	4	17.46	16.70	15.94	15.18
95351	.1275		3.239	.1275"	2-1/4"	5/8"	.500"	4	17.46	16.70	15.94	15.18
95354	.1280		3.251	.1280"	2-1/4"	5/8"	.500"	4	17.46	16.70	15.94	15.18
95357	.1285	#30	3.264	.1285"	2-1/4"	5/8"	.500"	4	17.46	16.70	15.94	15.18
95360	.1290		3.277	.1290"	2-1/4"	5/8"	.500"	4	17.46	16.70	15.94	15.18
95363	.1300		3.302	.1300"	2-1/4"	5/8"	.500"	4	17.46	16.70	15.94	15.18
95366	.1310		3.327	.1310"	2-1/2"	3/4"	.500"	4	19.38	18.54	17.69	16.85
95369	.1320		3.353	.1320"	2-1/2"	3/4"	.500"	4	19.38	18.54	17.69	16.85
95372	.1330		3.378	.1330"	2-1/2"	3/4"	.500"	4	19.38	18.54	17.69	16.85
95375	.1340		3.404	.1340"	2-1/2"	3/4"	.500"	4	19.38	18.54	17.69	16.85
95378	.1350		3.429	.1350"	2-1/2"	3/4"	.500"	4	19.38	18.54	17.69	16.85
95381	.1360	#29	3.454	.1360"	2-1/2"	3/4"	.500"	4	19.38	18.54	17.69	16.85
95384	.1370		3.480	.1370"	2-1/2"	3/4"	.500"	4	19.38	18.54	17.69	16.85
95387	.1378		3.500	.1378"	2-1/2"	3/4"	.500"	4	19.38	18.54	17.69	16.85
95390	.1380		3.505	.1380"	2-1/2"	3/4"	.500"	4	19.38	18.54	17.69	16.85
95393	.1390		3.531	.1390"	2-1/2"	3/4"	.500"	4	19.38	18.54	17.69	16.85
95396	.1400		3.556	.1400"	2-1/2"	3/4"	.500"	4	19.38	18.54	17.69	16.85
95399	.1405	#28	3.569	.1405"	2-1/2"	3/4"	.500"	4	19.38	18.54	17.69	16.85
95402	.1406	9/64"	3.571	.1406"	2-1/2"	3/4"	.500"	4	19.38	18.54	17.69	16.85
95405	.1410		3.581	.1410"	2-1/2"	3/4"	.500"	4	20.98	20.06	19.15	18.24
95408	.1420		3.607	.1420"	2-1/2"	3/4"	.500"	4	20.98	20.06	19.15	18.24
95411	.1430		3.632	.1430"	2-1/2"	3/4"	.500"	4	20.98	20.06	19.15	18.24
95414	.1440	#27	3.658	.1440"	2-1/2"	3/4"	.500"	4	20.98	20.06	19.15	18.24
95417	.1450		3.683	.1450"	2-1/2"	3/4"	.500"	4	20.98	20.06	19.15	18.24
95420	.1460		3.708	.1460"	2-1/2"	3/4"	.500"	4	20.98	20.06	19.15	18.24
95423	.1470	#26	3.734	.1470"	2-1/2"	3/4"	.500"	4	20.98	20.06	19.15	18.24
95426	.1480		3.759	.1480"	2-1/2"	3/4"	.500"	4	20.98	20.06	19.15	18.24
95429	.1490		3.785	.1490"	2-1/2"	3/4"	.500"	4	20.98	20.06	19.15	18.24
95432	.1495	#25	3.797	.1495"	2-1/2"	3/4"	.500"	4	20.98	20.06	19.15	18.24
95435	.1500		3.810	.1500"	2-1/2"	3/4"	.500"	4	20.98	20.06	19.15	18.24
95438	.1510		3.835	.1510"	2-1/2"	3/4"	.500"	4	20.98	20.06	19.15	18.24
95441	.1520	#24	3.861	.1520"	2-1/2"	3/4"	.500"	4	20.98	20.06	19.15	18.24
95444	.1530		3.886	.1530"	2-1/2"	3/4"	.500"	4	20.98	20.06	19.15	18.24
95447	.1540	#23	3.912	.1540"	2-1/2"	3/4"	.500"	4	20.98	20.06	19.15	18.24
95450	.1545		3.924	.1545"	2-1/2"	3/4"	.500"	4	20.98	20.06	19.15	18.24
95453	.1550		3.937	.1550"	2-1/2"	3/4"	.500"	4	20.98	20.06	19.15	18.24

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	20.98	20.06	19.15	18.24
95459	.1560		3.962	.1560"	2-1/2"	3/4"	.500"	4	20.98	20.06	19.15	18.24
95462	.1562	5/32"	3.967	.1562"	2-1/2"	3/4"	.500"	4	20.98	20.06	19.15	18.24
95465	.1565		3.975	.1565"	2-1/2"	3/4"	.500"	4	20.98	20.06	19.15	18.24
95468	.1570	#22	3.988	.1570"	2-1/2"	3/4"	.500"	4	23.32	22.31	21.29	20.28
95471	.1575		4.000	.1575"	2-1/2"	3/4"	.500"	4	23.32	22.31	21.29	20.28
95474	.1580		4.013	.1580"	2-1/2"	3/4"	.500"	4	23.32	22.31	21.29	20.28
95477	.1590	#21	4.039	.1590"	2-1/2"	3/4"	.500"	4	23.32	22.31	21.29	20.28
95480	.1600		4.064	.1600"	2-3/4"	7/8"	.625"	4	23.32	22.31	21.29	20.28
95483	.1610	#20	4.089	.1610"	2-3/4"	7/8"	.625"	4	23.32	22.31	21.29	20.28
95486	.1620		4.115	.1620"	2-3/4"	7/8"	.625"	4	23.32	22.31	21.29	20.28
95489	.1630		4.140	.1630"	2-3/4"	7/8"	.625"	4	23.32	22.31	21.29	20.28
95492	.1640		4.166	.1640"	2-3/4"	7/8"	.625"	4	23.32	22.31	21.29	20.28
95495	.1650		4.191	.1650"	2-3/4"	7/8"	.625"	4	23.32	22.31	21.29	20.28
95498	.1660	#19	4.216	.1660"	2-3/4"	7/8"	.625"	4	23.32	22.31	21.29	20.28
95501	.1670		4.242	.1670"	2-3/4"	7/8"	.625"	4	23.32	22.31	21.29	20.28
95504	.1680		4.267	.1680"	2-3/4"	7/8"	.625"	4	23.32	22.31	21.29	20.28
95507	.1690		4.293	.1690"	2-3/4"	7/8"	.625"	4	23.32	22.31	21.29	20.28
95510	.1695	#18	4.305	.1695"	2-3/4"	7/8"	.625"	4	23.32	22.31	21.29	20.28
95513	.1700		4.318	.1700"	2-3/4"	7/8"	.625"	4	23.32	22.31	21.29	20.28
95516	.1710		4.343	.1710"	2-3/4"	7/8"	.625"	4	23.32	22.31	21.29	20.28
95519	.1719	11/64"	4.366	.1719"	2-3/4"	7/8"	.625"	4	23.32	22.31	21.29	20.28
95522	.1720		4.369	.1720"	2-3/4"	7/8"	.625"	4	23.32	22.31	21.29	20.28
95525	.1730	#17	4.394	.1730"	2-3/4"	7/8"	.625"	4	24.27	23.21	22.16	21.10
95528	.1740		4.420	.1740"	2-3/4"	7/8"	.625"	4	24.27	23.21	22.16	21.10
95531	.1750		4.445	.1750"	2-3/4"	7/8"	.625"	4	24.27	23.21	22.16	21.10
95534	.1760		4.470	.1760"	2-3/4"	7/8"	.625"	4	24.27	23.21	22.16	21.10
95537	.1770	#16	4.496	.1770"	2-3/4"	7/8"	.625"	4	24.27	23.21	22.16	21.10
95540	.1772		4.500	.1772"	2-3/4"	7/8"	.625"	4	24.27	23.21	22.16	21.10
95543	.1780		4.521	.1780"	2-3/4"	7/8"	.625"	4	24.27	23.21	22.16	21.10
95546	.1790		4.547	.1790"	2-3/4"	7/8"	.625"	4	24.27	23.21	22.16	21.10
95549	.1800	#15	4.572	.1800"	2-3/4"	7/8"	.625"	4	24.27	23.21	22.16	21.10
95552	.1810		4.597	.1810"	2-3/4"	7/8"	.625"	4	24.27	23.21	22.16	21.10
95555	.1820	#14	4.623	.1820"	2-3/4"	7/8"	.625"	4	24.27	23.21	22.16	21.10
95558	.1830		4.648	.1830"	2-3/4"	7/8"	.625"	4	24.27	23.21	22.16	21.10
95561	.1840		4.674	.1840"	2-3/4"	7/8"	.625"	4	24.27	23.21	22.16	21.10
95564	.1850	#13	4.699	.1850"	2-3/4"	7/8"	.625"	4	24.27	23.21	22.16	21.10
95567	.1855		4.712	.1855"	2-3/4"	7/8"	.625"	4	24.27	23.21	22.16	21.10
95570	.1860		4.724	.1860"	2-3/4"	7/8"	.625"	4	24.27	23.21	22.16	21.10
95573	.1865		4.737	.1865"	2-3/4"	7/8"	.625"	4	24.27	23.21	22.16	21.10
95576	.1870		4.750	.1870"	2-3/4"	7/8"	.625"	4	24.27	23.21	22.16	21.10
95577	.1873		4.757	.1873"	2-3/4"	7/8"	.625"	4	24.27	23.21	22.16	21.10
95579	.1875	3/16"	4.763	.1875"	2-3/4"	7/8"	.625"	4	24.27	23.21	22.16	21.10
95582	.1880		4.775	.1880"	2-3/4"	7/8"	.625"	4	24.78	23.71	22.63	21.55
95585	.1885		4.788	.1885"	2-3/4"	7/8"	.625"	4	24.78	23.71	22.63	21.55
95588	.1890	#12	4.801	.1890"	2-3/4"	7/8"	.625"	4	24.78	23.71	22.63	21.55
95591	.1900		4.826	.1900"	2-3/4"	7/8"	.625"	4	24.78	23.71	22.63	21.55
95594	.1910	#11	4.851	.1910"	2-3/4"	7/8"	.625"	4	24.78	23.71	22.63	21.55

continued →

Series 4100 (continued)

.1920" - .2250"
(4.877mm - 5.715mm)



TECH
PAGES
312-313

TOLERANCES

<i>d1</i>	.0590" - .2509" (1.498 - 6.372mm)	+ .0002" - .0000" (+.0050 - .0000mm)
	.2510" - .5020" (6.375 - 12.750mm)	+ .0003" - .0000" (+.0075 - .0000mm)
<i>d2</i>	.0590" - .2509" (1.498 - 6.372mm)	+ .0002" - .0000" (+.0050 - .0000mm)
	.2510" - .5020" (6.375 - 12.750mm)	+ .0003" - .0000" (+.0075 - .0000mm)



Solid Carbide Submicron Grain
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									
95597	.1920	4.877	.1920"	2-3/4"	7/8"	.625"	4	24.78	23.71	22.63	21.55
95600	.1930	4.902	.1930"	2-3/4"	7/8"	.625"	4	24.78	23.71	22.63	21.55
95603	.1935	#10 4.915	.1935"	2-3/4"	7/8"	.625"	4	24.78	23.71	22.63	21.55
95606	.1940	4.928	.1940"	2-3/4"	7/8"	.625"	4	24.78	23.71	22.63	21.55
95609	.1950	4.953	.1950"	2-3/4"	7/8"	.625"	4	24.78	23.71	22.63	21.55
95612	.1960	#9 4.978	.1960"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95615	.1969	5.000	.1969"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95618	.1970	5.004	.1970"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95621	.1980	5.029	.1980"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95624	.1990	#8 5.055	.1990"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95627	.2000	5.080	.2000"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95630	.2010	#7 5.105	.2010"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95633	.2020	5.131	.2020"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95636	.2030	5.156	.2030"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95639	.2031	13/64" 5.159	.2031"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95642	.2040	#6 5.182	.2040"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95645	.2050	5.207	.2050"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95648	.2055	#5 5.220	.2055"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95651	.2060	5.232	.2060"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95654	.2070	5.258	.2070"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95657	.2080	5.283	.2080"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95660	.2090	#4 5.309	.2090"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95663	.2100	5.334	.2100"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95666	.2110	5.359	.2110"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95669	.2120	5.385	.2120"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95672	.2130	#3 5.410	.2130"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95675	.2140	5.436	.2140"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95678	.2150	5.461	.2150"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95681	.2160	5.486	.2160"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95684	.2165	5.500	.2165"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95687	.2170	5.512	.2170"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95690	.2180	5.537	.2180"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95693	.2188	7/32" 5.558	.2188"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95696	.2190	5.563	.2190"	3"	1"	.625"	4	28.03	26.81	25.59	24.37
95699	.2200	5.588	.2200"	3"	1"	.625"	4	32.69	31.27	29.85	28.43
95702	.2210	#2 5.613	.2210"	3"	1"	.625"	4	32.69	31.27	29.85	28.43
95705	.2220	5.639	.2220"	3"	1"	.625"	4	32.69	31.27	29.85	28.43
95708	.2230	5.664	.2230"	3"	1"	.625"	4	32.69	31.27	29.85	28.43
95711	.2240	5.690	.2240"	3"	1"	.625"	4	32.69	31.27	29.85	28.43
95714	.2250	5.715	.2250"	3"	1"	.625"	4	32.69	31.27	29.85	28.43

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									
95717	.2260	5.740	.2260"	3"	1"	.625"	4	32.69	31.27	29.85	28.43
95720	.2270	5.766	.2270"	3"	1"	.625"	4	32.69	31.27	29.85	28.43
95723	.2280	#1 5.791	.2280"	3"	1"	.625"	4	32.69	31.27	29.85	28.43
95726	.2290	5.817	.2290"	3"	1"	.625"	4	32.69	31.27	29.85	28.43
95729	.2300	5.842	.2300"	3"	1"	.625"	4	32.69	31.27	29.85	28.43
95732	.2310	5.867	.2310"	3"	1"	.625"	4	32.69	31.27	29.85	28.43
95735	.2320	5.893	.2320"	3"	1"	.625"	4	32.69	31.27	29.85	28.43
95738	.2330	5.918	.2330"	3"	1"	.625"	4	32.69	31.27	29.85	28.43
95741	.2340	A 5.944	.2340"	3"	1"	.625"	4	32.69	31.27	29.85	28.43
95744	.2344	15/64" 5.954	.2344"	3"	1"	.625"	4	32.69	31.27	29.85	28.43
95747	.2350	5.969	.2350"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95750	.2360	5.994	.2360"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95753	.2362	6.000	.2362"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95756	.2370	6.020	.2370"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95759	.2380	B 6.045	.2380"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95762	.2390	6.071	.2390"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95765	.2400	6.096	.2400"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95768	.2410	6.121	.2410"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95771	.2420	C 6.147	.2420"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95774	.2430	6.172	.2430"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95777	.2440	6.198	.2440"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95780	.2450	6.223	.2450"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95783	.2460	D 6.248	.2460"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95786	.2470	6.274	.2470"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95789	.2480	6.299	.2480"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95792	.2485	6.312	.2485"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95795	.2490	6.325	.2490"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95798	.2495	6.337	.2495"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95799	.2498	6.345	.2498"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95801	.2500	1/4" / E 6.350	.2500"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95802	.2502	6.355	.2502"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95804	.2505	6.363	.2505"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95807	.2510	6.375	.2510"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95810	.2515	6.388	.2515"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95813	.2520	6.401	.2520"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95816	.2530	6.426	.2530"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95819	.2540	6.452	.2540"	3"	1"	.625"	4	33.91	32.44	30.96	29.49
95822	.2550	6.477	.2550"	3-1/4"	1-1/8"	.625"	6	39.10	37.40	35.70	34.00
95825	.2559	6.500	.2559"	3-1/4"	1-1/8"	.625"	6	39.10	37.40	35.70	34.00
95828	.2560	6.502	.2560"	3-1/4"	1-1/8"	.625"	6	39.10	37.40	35.70	34.00
95831	.2570	F 6.528	.2570"	3-1/4"	1-1/8"	.625"	6	39.10	37.40	35.70	34.00
95834	.2580	6.553	.2580"	3-1/4"	1-1/8"	.625"	6	39.10	37.40	35.70	34.00
95837	.2590	6.579	.2590"	3-1/4"	1-1/8"	.625"	6	39.10	37.40	35.70	34.00
95840	.2600	6.604	.2600"	3-1/4"	1-1/8"	.625"	6	39.10	37.40	35.70	34.00
95843	.2610	G 6.629	.2610"	3-1/4"	1-1/8"	.625"	6	39.10	37.40	35.70	34.00
95846	.2620	6.655	.2620"	3-1/4"	1-1/8"	.625"	6	39.10	37.40	35.70	34.00
95849	.2630	6.680	.2630"	3-1/4"	1-1/8"	.625"	6	39.10	37.40	35.70	34.00
95852	.2640	6.706	.2640"	3-1/4"	1-1/8"	.625"	6	39.10	37.40	35.70	34.00

continued →

Series 4100 (continued)

.2650" - .3070"
(6.731mm - 7.798mm)

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									
95855	.2650		.2650"	3-1/4"	1-1/8"	.625"	6	39.10	37.40	35.70	34.00
95858	.2656	17/64"	.2656"	3-1/4"	1-1/8"	.625"	6	39.10	37.40	35.70	34.00
95861	.2660	H	.2660"	3-1/4"	1-1/8"	.625"	6	39.10	37.40	35.70	34.00
95864	.2670		.2670"	3-1/4"	1-1/8"	.625"	6	39.10	37.40	35.70	34.00
95867	.2680		.2680"	3-1/4"	1-1/8"	.625"	6	39.10	37.40	35.70	34.00
95870	.2690		.2690"	3-1/4"	1-1/8"	.625"	6	39.10	37.40	35.70	34.00
95873	.2700		.2700"	3-1/4"	1-1/8"	.625"	6	39.10	37.40	35.70	34.00
95876	.2710		.2710"	3-1/4"	1-1/8"	.625"	6	39.10	37.40	35.70	34.00
95879	.2720	I	.2720"	3-1/4"	1-1/8"	.750"	6	39.48	37.76	36.05	34.33
95882	.2730		.2730"	3-1/4"	1-1/8"	.750"	6	39.48	37.76	36.05	34.33
95885	.2740		.2740"	3-1/4"	1-1/8"	.750"	6	39.48	37.76	36.05	34.33
95888	.2750		.2750"	3-1/4"	1-1/8"	.750"	6	39.48	37.76	36.05	34.33
95891	.2756		.2756"	3-1/4"	1-1/8"	.750"	6	39.48	37.76	36.05	34.33
95894	.2760		.2760"	3-1/4"	1-1/8"	.750"	6	39.48	37.76	36.05	34.33
95897	.2770	J	.2770"	3-1/4"	1-1/8"	.750"	6	39.48	37.76	36.05	34.33
95900	.2780		.2780"	3-1/4"	1-1/8"	.750"	6	39.48	37.76	36.05	34.33
95903	.2790		.2790"	3-1/4"	1-1/8"	.750"	6	39.48	37.76	36.05	34.33
95906	.2800		.2800"	3-1/4"	1-1/8"	.750"	6	39.48	37.76	36.05	34.33
95909	.2810	K	.2810"	3-1/4"	1-1/8"	.750"	6	39.48	37.76	36.05	34.33
95912	.2812	9/32"	.2812"	3-1/4"	1-1/8"	.750"	6	39.48	37.76	36.05	34.33
95915	.2820		.2820"	3-1/4"	1-1/8"	.750"	6	42.73	40.88	39.02	37.16
95918	.2830		.2830"	3-1/4"	1-1/8"	.750"	6	42.73	40.88	39.02	37.16
95921	.2840		.2840"	3-1/4"	1-1/8"	.750"	6	42.73	40.88	39.02	37.16
95924	.2850		.2850"	3-1/4"	1-1/8"	.750"	6	42.73	40.88	39.02	37.16
95927	.2860		.2860"	3-1/4"	1-1/8"	.750"	6	42.73	40.88	39.02	37.16
95930	.2870		.2870"	3-1/4"	1-1/8"	.750"	6	42.73	40.88	39.02	37.16
95933	.2880		.2880"	3-1/4"	1-1/8"	.750"	6	42.73	40.88	39.02	37.16
95936	.2890		.2890"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
95939	.2900	L	.2900"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
95942	.2910		.2910"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
95945	.2920		.2920"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
95948	.2930		.2930"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
95951	.2940		.2940"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
95954	.2950	M	.2950"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
95957	.2953		.2953"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
95960	.2960		.2960"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
95963	.2969	19/64"	.2969"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
95966	.2970		.2970"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
95969	.2980		.2980"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
95972	.2990		.2990"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
95975	.3000		.3000"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
95978	.3010		.3010"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
95981	.3020	N	.3020"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
95984	.3030		.3030"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
95987	.3040		.3040"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
95990	.3050		.3050"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
95993	.3060		.3060"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
95996	.3070		.3070"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44

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										
95999	.3080	7.823	.3080"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44	
96002	.3090	7.849	.3090"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44	
96005	.3100	7.874	.3100"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44	
96006	.3105	7.887	.3105"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44	
96008	.3110	7.899	.3110"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44	
96011	.3115	7.912	.3115"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44	
96014	.3120	7.925	.3120"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44	
96015	.3123	7.932	.3123"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44	
96017	.3125	5/16"	7.938	.3125"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
96021	.3130	7.950	.3130"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44	
96023	.3135	7.963	.3135"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44	
96026	.3140	7.976	.3140"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44	
96029	.3150	8.000	.3150"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44	
96032	.3160	O	8.026	.3160"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44
96035	.3170	8.052	.3170"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44	
96038	.3180	8.077	.3180"	3-1/4"	1-1/8"	.750"	6	43.06	41.18	39.31	37.44	
96041	.3190	8.103	.3190"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96044	.3200	8.128	.3200"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96047	.3210	8.153	.3210"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96050	.3220	8.179	.3220"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96053	.3230	P	8.204	.3230"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13
96056	.3240	8.230	.3240"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96059	.3250	8.255	.3250"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96062	.3260	8.280	.3260"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96065	.3270	8.306	.3270"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96068	.3280	8.331	.3280"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96071	.3281	21/64"	8.334	.3281"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13
96074	.3290	8.357	.3290"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96077	.3300	8.382	.3300"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96079	.3310	8.407	.3310"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96083	.3320	Q	8.433	.3320"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13
96086	.3330	8.458	.3330"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96089	.3340	8.484	.3340"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96092	.3346	8.500	.3346"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96095	.3350	8.509	.3350"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96098	.3360	8.534	.3360"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96101	.3370	8.560	.3370"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96104	.3380	8.585	.3380"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96107	.3390	R	8.611	.3390"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13
96110	.3400	8.636	.3400"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96113	.3410	8.661	.3410"	3-1/2"	1-1/4"	.750"	6	53.05	50.74	48.44	46.13	
96116	.3420	8.687	.3420"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84	
96119	.3430	8.712	.3430"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84	
96122	.3438	11/32"	8.733	.3438"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84
96125	.3440	8.738	.3440"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84	
96128	.3450	8.763	.3450"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84	
96131	.3460	8.788	.3460"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84	
96134	.3470	8.814	.3470"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84	

continued →

Series 4100 (continued)

.3480" - .3810"
(8.839mm - 9.677mm)



TECH
PAGES
312-313

TOLERANCES

<i>d1</i>	.0590" - .2509" (1.498 - 6.372mm)	+ .0002" - .0000" (+.0050 - .0000mm)
	.2510" - .5020" (6.375 - 12.750mm)	+ .0003" - .0000" (+.0075 - .0000mm)
<i>d2</i>	.0590" - .2509" (1.498 - 6.372mm)	+ .0002" - .0000" (+.0050 - .0000mm)
	.2510" - .5020" (6.375 - 12.750mm)	+ .0003" - .0000" (+.0075 - .0000mm)



Solid Carbide Submicron Grain
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										
96137	.3480	S	8.839	.3480"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84
96141	.3490		8.865	.3490"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84
96143	.3500		8.890	.3500"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84
96146	.3510		8.915	.3510"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84
96149	.3520		8.941	.3520"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84
96152	.3530		8.966	.3530"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84
96155	.3540		8.992	.3540"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84
96158	.3543		9.000	.3543"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84
96161	.3550		9.017	.3550"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84
96164	.3560		9.042	.3560"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84
96167	.3570		9.068	.3570"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84
96170	.3580	T	9.093	.3580"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84
96173	.3590		9.119	.3590"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84
96176	.3594	23/64"	9.129	.3594"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84
96179	.3600		9.144	.3600"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84
96182	.3610		9.169	.3610"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84
96185	.3620		9.195	.3620"	3-1/2"	1-1/4"	.750"	6	56.17	53.72	51.28	48.84
96191	.3640		9.246	.3640"	3-1/2"	1-1/4"	.750"	6	57.87	55.35	52.84	50.32
96194	.3650		9.271	.3650"	3-1/2"	1-1/4"	.750"	6	57.87	55.35	52.84	50.32
96197	.3660		9.296	.3660"	3-1/2"	1-1/4"	.750"	6	57.87	55.35	52.84	50.32
96199	.3670		9.322	.3670"	3-1/2"	1-1/4"	.750"	6	57.87	55.35	52.84	50.32
96203	.3680	U	9.347	.3680"	3-1/2"	1-1/4"	.750"	6	57.87	55.35	52.84	50.32
96206	.3690		9.373	.3690"	3-1/2"	1-1/4"	.750"	6	57.87	55.35	52.84	50.32
96209	.3700		9.398	.3700"	3-1/2"	1-1/4"	.750"	6	57.87	55.35	52.84	50.32
96212	.3710		9.423	.3710"	3-1/2"	1-1/4"	.750"	6	57.87	55.35	52.84	50.32
96215	.3720		9.449	.3720"	3-1/2"	1-1/4"	.750"	6	57.87	55.35	52.84	50.32
96218	.3730		9.474	.3730"	3-1/2"	1-1/4"	.750"	6	57.87	55.35	52.84	50.32
96221	.3740		9.500	.3740"	3-1/2"	1-1/4"	.750"	6	57.87	55.35	52.84	50.32
96224	.3745		9.512	.3745"	3-1/2"	1-1/4"	.750"	6	57.87	55.35	52.84	50.32
96225	.3748		9.520	.3748"	3-1/2"	1-1/4"	.750"	6	57.87	55.35	52.84	50.32
96227	.3750	3/8"	9.525	.3750"	3-1/2"	1-1/4"	.750"	6	57.87	55.35	52.84	50.32
96230	.3755		9.538	.3755"	3-1/2"	1-1/4"	.750"	6	57.87	55.35	52.84	50.32
96233	.3760		9.550	.3760"	3-1/2"	1-1/4"	.750"	6	57.87	55.35	52.84	50.32
96236	.3765		9.563	.3765"	3-1/2"	1-1/4"	.750"	6	57.87	55.35	52.84	50.32
96239	.3770	V	9.576	.3770"	3-1/2"	1-1/4"	.750"	6	57.87	55.35	52.84	50.32
96242	.3780		9.601	.3780"	3-1/2"	1-1/4"	.750"	6	67.86	64.91	61.96	59.01
96245	.3790		9.627	.3790"	3-1/2"	1-1/4"	.750"	6	67.86	64.91	61.96	59.01
96248	.3800		9.652	.3800"	3-1/2"	1-1/4"	.750"	6	67.86	64.91	61.96	59.01
96251	.3810		9.677	.3810"	3-1/2"	1-1/4"	.750"	6	67.86	64.91	61.96	59.01

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									
96254	.3820	9.703	.3820"	3-1/2"	1-1/4"	.750"	6	67.86	64.91	61.96	59.01
96257	.3830	9.728	.3830"	3-1/2"	1-1/4"	.750"	6	67.86	64.91	61.96	59.01
96260	.3840	9.754	.3840"	3-1/2"	1-1/4"	.750"	6	67.86	64.91	61.96	59.01
96263	.3850	9.779	.3850"	3-1/2"	1-1/4"	.750"	6	67.86	64.91	61.96	59.01
96266	.3860	W 9.804	.3860"	3-1/2"	1-1/4"	.750"	6	67.86	64.91	61.96	59.01
96269	.3870	9.830	.3870"	3-1/2"	1-1/4"	.750"	6	67.86	64.91	61.96	59.01
96272	.3880	9.855	.3880"	3-1/2"	1-1/4"	.750"	6	67.86	64.91	61.96	59.01
96275	.3890	9.881	.3890"	3-1/2"	1-1/4"	.750"	6	67.86	64.91	61.96	59.01
96278	.3900	9.906	.3900"	3-1/2"	1-1/4"	.750"	6	67.86	64.91	61.96	59.01
96281	.3906	25/64" 9.921	.3906"	3-1/2"	1-1/4"	.750"	6	67.86	64.91	61.96	59.01
96284	.3910	9.931	.3910"	3-1/2"	1-1/4"	.750"	6	67.86	64.91	61.96	59.01
96287	.3920	9.957	.3920"	3-1/2"	1-1/4"	.750"	6	67.86	64.91	61.96	59.01
96290	.3930	9.982	.3930"	3-1/2"	1-1/4"	.750"	6	67.86	64.91	61.96	59.01
96293	.3937	10.000	.3937"	3-1/2"	1-1/4"	.750"	6	70.27	67.21	64.16	61.10
96296	.3940	10.008	.3940"	3-1/2"	1-1/4"	.750"	6	70.27	67.21	64.16	61.10
96299	.3950	10.033	.3950"	3-1/2"	1-1/4"	.750"	6	70.27	67.21	64.16	61.10
96302	.3960	10.058	.3960"	3-1/2"	1-1/4"	.750"	6	70.27	67.21	64.16	61.10
96305	.3970	X 10.084	.3970"	3-1/2"	1-1/4"	.750"	6	70.27	67.21	64.16	61.10
96308	.3980	10.109	.3980"	3-1/2"	1-1/4"	.750"	6	70.27	67.21	64.16	61.10
96311	.3990	10.135	.3990"	3-1/2"	1-1/4"	.750"	6	70.27	67.21	64.16	61.10
96314	.4000	10.160	.4000"	3-1/2"	1-1/4"	.750"	6	70.27	67.21	64.16	61.10
96317	.4010	10.185	.4010"	3-1/2"	1-1/4"	.750"	6	70.27	67.21	64.16	61.10
96319	.4020	10.211	.4020"	3-1/2"	1-1/4"	.750"	6	70.27	67.21	64.16	61.10
96323	.4030	10.236	.4030"	3-1/2"	1-1/4"	.750"	6	70.27	67.21	64.16	61.10
96326	.4040	Y 10.262	.4040"	3-1/2"	1-1/4"	.750"	6	70.27	67.21	64.16	61.10
96329	.4050	10.287	.4050"	3-1/2"	1-1/4"	.750"	6	70.27	67.21	64.16	61.10
96332	.4060	10.312	.4060"	3-1/2"	1-1/4"	.750"	6	70.27	67.21	64.16	61.10
96335	.4062	13/32" 10.317	.4062"	3-1/2"	1-1/4"	.750"	6	70.27	67.21	64.16	61.10
96338	.4070	10.338	.4070"	3-1/2"	1-1/4"	.750"	6	70.27	67.21	64.16	61.10
96341	.4080	10.363	.4080"	3-1/2"	1-1/4"	.750"	6	70.27	67.21	64.16	61.10
96344	.4090	10.389	.4090"	3-1/2"	1-1/4"	.750"	6	70.27	67.21	64.16	61.10
96347	.4100	10.414	.4100"	3-1/2"	1-1/4"	.750"	6	70.27	67.21	64.16	61.10
96350	.4110	10.439	.4110"	3-1/2"	1-1/4"	.750"	6	72.73	69.56	66.40	63.24
96353	.4120	10.465	.4120"	3-1/2"	1-1/4"	.750"	6	72.73	69.56	66.40	63.24
96356	.4130	Z 10.490	.4130"	3-1/2"	1-1/4"	.750"	6	72.73	69.56	66.40	63.24
96359	.4134	10.500	.4134"	3-1/2"	1-1/4"	.750"	6	72.73	69.56	66.40	63.24
96362	.4140	10.516	.4140"	3-1/2"	1-1/4"	.750"	6	72.73	69.56	66.40	63.24
96365	.4150	10.541	.4150"	3-1/2"	1-1/4"	.750"	6	72.73	69.56	66.40	63.24
96366	.4160	10.566	.4160"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24
96367	.4170	10.592	.4170"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24
96369	.4190	10.643	.4190"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24
96374	.4210	10.693	.4210"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24
96377	.4219	27/64" 10.716	.4219"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24
96380	.4220	10.719	.4220"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24
96383	.4230	10.744	.4230"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24
96386	.4240	10.770	.4240"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24

continued →

Series 4100 (continued)

.4250" - .4724"
(10.795mm - 12.000mm)

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										
96389	.4250	10.795	.4250"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24	
96392	.4260	10.820	.4260"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24	
96395	.4270	10.846	.4270"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24	
96398	.4280	10.871	.4280"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24	
96404	.4300	10.922	.4300"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24	
96407	.4310	10.947	.4310"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24	
96410	.4320	10.973	.4320"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24	
96413	.4330	10.998	.4330"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24	
96416	.4331	11.000	.4331"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24	
96419	.4340	11.024	.4340"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24	
96422	.4350	11.049	.4350"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24	
96425	.4360	11.074	.4360"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24	
96428	.4365	11.087	.4365"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24	
96431	.4370	11.100	.4370"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24	
96432	.4373	11.107	.4373"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24	
96434	.4375	7/16"	11.113	.4375"	4"	1-3/8"	.750"	6	72.73	69.56	66.40	63.24
96437	.4380	11.125	.4380"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96440	.4385	11.138	.4385"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96443	.4390	11.151	.4390"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96446	.4400	11.176	.4400"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96449	.4410	11.201	.4410"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96455	.4430	11.252	.4430"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96458	.4440	11.278	.4440"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96461	.4450	11.303	.4450"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96467	.4470	11.354	.4470"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96470	.4480	11.379	.4480"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96473	.4490	11.405	.4490"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96476	.4500	11.430	.4500"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96479	.4510	11.455	.4510"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96485	.4528	11.500	.4528"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96488	.4530	11.506	.4530"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96491	.4531	29/64"	11.509	.4531"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79
96494	.4540	11.532	.4540"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96497	.4550	11.557	.4550"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96500	.4560	11.582	.4560"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96503	.4570	11.608	.4570"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96506	.4580	11.633	.4580"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96512	.4600	11.684	.4600"	4"	1-3/8"	.750"	6	77.96	74.57	71.18	67.79	
96515	.4610	11.709	.4610"	4"	1-3/8"	.750"	6	80.30	76.81	73.32	69.83	
96527	.4650	11.811	.4650"	4"	1-3/8"	.750"	6	80.30	76.81	73.32	69.83	
96530	.4660	11.836	.4660"	4"	1-3/8"	.750"	6	80.30	76.81	73.32	69.83	
96533	.4670	11.862	.4670"	4"	1-3/8"	.750"	6	80.30	76.81	73.32	69.83	
96539	.4688	15/32"	11.908	.4688"	4"	1-3/8"	.750"	6	80.30	76.81	73.32	69.83
96542	.4690	11.913	.4690"	4"	1-3/8"	.750"	6	80.30	76.81	73.32	69.83	
96545	.4700	11.938	.4700"	4"	1-1/2"	.750"	6	80.30	76.81	73.32	69.83	
96548	.4710	11.963	.4710"	4"	1-1/2"	.750"	6	80.30	76.81	73.32	69.83	
96551	.4720	11.989	.4720"	4"	1-1/2"	.750"	6	80.30	76.81	73.32	69.83	
96554	.4724	12.000	.4724"	4"	1-1/2"	.750"	6	80.30	76.81	73.32	69.83	

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										
96557	.4730	12.014	.4730"	4"	1-1/2"	.750"	6	80.30	76.81	73.32	69.83	
96561	.4740	12.040	.4740"	4"	1-1/2"	.750"	6	80.30	76.81	73.32	69.83	
96563	.4750	12.065	.4750"	4"	1-1/2"	.750"	6	80.30	76.81	73.32	69.83	
96566	.4760	12.090	.4760"	4"	1-1/2"	.750"	6	80.30	76.81	73.32	69.83	
96569	.4770	12.116	.4770"	4"	1-1/2"	.750"	6	80.30	76.81	73.32	69.83	
96572	.4780	12.141	.4780"	4"	1-1/2"	.750"	6	80.30	76.81	73.32	69.83	
96578	.4800	12.192	.4800"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35	
96581	.4810	12.217	.4810"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35	
96584	.4820	12.243	.4820"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35	
96590	.4840	12.294	.4840"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35	
96593	.4844	31/64"	12.304	.4844"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35
96596	.4850	12.319	.4850"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35	
96602	.4870	12.370	.4870"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35	
96608	.4890	12.421	.4890"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35	
96617	.4920	12.497	.4920"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35	
96620	.4921	12.500	.4921"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35	
96623	.4930	12.522	.4930"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35	
96629	.4950	12.573	.4950"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35	
96632	.4960	12.598	.4960"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35	
96635	.4970	12.624	.4970"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35	
96638	.4980	12.649	.4980"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35	
96641	.4990	12.675	.4990"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35	
96644	.4995	12.687	.4995"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35	
96645	.4998	12.695	.4998"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35	
96647	.5000	1/2"	12.700	.5000"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35
96650	.5005	12.713	.5005"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35	
96653	.5010	12.725	.5010"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35	
96656	.5020	12.751	.5020"	4"	1-1/2"	.750"	6	82.05	78.49	74.92	71.35	

Series 4100 (Metric)

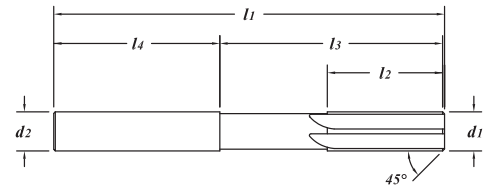
1.990mm - 10.040mm
(.07835" - .39528")



TOLERANCES		
d_1	1.500 - 6.372mm	+0.005mm -0.000
	6.375 - 12.750mm	+0.0075mm -0.0000
d_2	1.500 - 6.372mm	+0.005mm -0.000
	6.375 - 12.750mm	+0.0075mm -0.0000

REAMERS

Solid Carbide Submicron Grain
Straight - RHC Flutes
Standard 45° Lead Chamfer
Neck diameter is 0.25mm ±0.05 less than (d_1) fluted diameter



EDP#	d_1		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Reach Length	l_4 Shank Length	Number Flutes	1-11	12-24	25-49	50-100
	Decimal	Metric										
96659	.07835	1.990	1.990	50	12	32	18	4	15.27	14.61	13.94	13.28
96662	.07874	2.000	2.000	50	12	32	18	4	15.27	14.61	13.94	13.28
96665	.07913	2.010	2.010	50	12	32	18	4	15.27	14.61	13.94	13.28
96668	.07953	2.020	2.020	50	12	32	18	4	15.27	14.61	13.94	13.28
96671	.11772	2.990	2.990	65	16	36	29	4	18.76	17.94	17.13	16.31
96674	.11811	3.000	3.000	65	16	36	29	4	18.76	17.94	17.13	16.31
96677	.11850	3.010	3.010	65	16	36	29	4	18.76	17.94	17.13	16.31
96680	.11890	3.020	3.020	65	16	36	29	4	18.76	17.94	17.13	16.31
96683	.15709	3.990	3.990	75	20	45	30	4	25.35	24.24	23.14	22.04
96686	.15748	4.000	4.000	75	20	45	30	4	25.35	24.24	23.14	22.04
96689	.15787	4.010	4.010	75	20	45	30	4	25.35	24.24	23.14	22.04
96692	.15827	4.020	4.020	75	20	45	30	4	25.35	24.24	23.14	22.04
96695	.15866	4.030	4.030	75	20	45	30	4	25.35	24.24	23.14	22.04
96698	.19646	4.990	4.990	100	25	60	40	4	32.45	31.04	29.63	28.22
96701	.19685	5.000	5.000	100	25	60	40	4	32.45	31.04	29.63	28.22
96704	.19724	5.010	5.010	100	25	60	40	4	32.45	31.04	29.63	28.22
96707	.19764	5.020	5.020	100	25	60	40	4	32.45	31.04	29.63	28.22
96710	.19803	5.030	5.030	100	25	60	40	4	32.45	31.04	29.63	28.22
96713	.23583	5.990	5.990	100	25	60	40	4	39.41	37.70	35.98	34.27
96716	.23622	6.000	6.000	100	25	60	40	4	39.41	37.70	35.98	34.27
96719	.23661	6.010	6.010	100	25	60	40	4	39.41	37.70	35.98	34.27
96722	.23701	6.020	6.020	100	25	60	40	4	39.41	37.70	35.98	34.27
96725	.27559	7.000	7.000	100	25	60	40	6	45.47	43.49	41.52	39.54
96728	.31457	7.990	7.990	120	32	75	45	6	54.68	52.31	49.93	47.55
96731	.31496	8.000	8.000	120	32	75	45	6	54.68	52.31	49.93	47.55
96734	.31535	8.010	8.010	120	32	75	45	6	54.68	52.31	49.93	47.55
96737	.31575	8.020	8.020	120	32	75	45	6	54.68	52.31	49.93	47.55
96740	.31614	8.030	8.030	120	32	75	45	6	54.68	52.31	49.93	47.55
96743	.35433	9.000	9.000	120	32	75	45	6	68.84	65.85	62.85	59.86
96746	.39291	9.980	9.980	130	32	75	55	6	80.83	77.32	73.80	70.29
96749	.39331	9.990	9.990	130	32	75	55	6	80.83	77.32	73.80	70.29
96752	.39370	10.000	10.000	130	32	75	55	6	85.05	81.36	77.66	73.96
96755	.39409	10.010	10.010	130	32	75	55	6	85.05	81.36	77.66	73.96
96758	.39449	10.020	10.020	130	32	75	55	6	85.05	81.36	77.66	73.96
96761	.39488	10.030	10.030	130	32	75	55	6	85.05	81.36	77.66	73.96
96764	.39528	10.040	10.040	130	32	75	55	6	85.05	81.36	77.66	73.96

EDP#	<i>d1</i>		<i>d2</i>	<i>l1</i>	<i>l2</i>	<i>l3</i>	<i>l4</i>	Number Flutes	1-11	12-24	25-49	50-100
	Decimal	Metric	Shank Diameter	Overall Length	Flute Length	Reach Length	Shank Length					
96767	.47165	11.980	11.980	150	40	100	50	6	97.38	93.15	88.91	84.68
96770	.47205	11.990	11.990	150	40	100	50	6	97.38	93.15	88.91	84.68
96773	.47244	12.000	12.000	150	40	100	50	6	97.38	93.15	88.91	84.68
96776	.47283	12.010	12.010	150	40	100	50	6	97.38	93.15	88.91	84.68
96779	.47323	12.020	12.020	150	40	100	50	6	97.38	93.15	88.91	84.68
96782	.47362	12.030	12.030	150	40	100	50	6	97.38	93.15	88.91	84.68



Reamer Manufacturing



LHS / RHC

STR / RHC

RHS / RHC

Special Reamers - Solid Carbide - 2 Week Delivery

Solid Carbide Submicron Grain

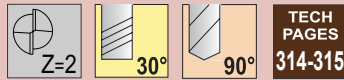
All reamers furnished with a standard 45° Lead Chamfer

All reamers furnished with a standard neck for reach

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

TOLERANCES	
d_1	+0.000° -0.002° (+0.000 / -0.050mm)
d_2	h6



Drill/End Mill

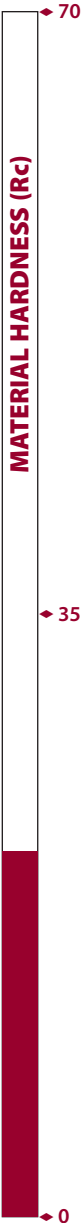
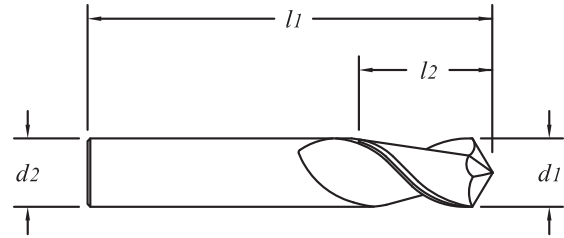
Solid submicron grain carbide

Included angle to a point - center cutting

Tools do not have drill point geometry

Extremely versatile

Point tolerance ±0°30'



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"	11.63	11.12	10.62	10.11
57210	.1875	3/16"	4.763	3/16"	2"	5/8"	15.32	14.65	13.99	13.32
57220	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	19.03	18.21	17.38	16.55
57230	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	24.94	23.86	22.77	21.69
57240	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	30.53	29.21	27.88	26.55
57250	.4375	7/16"	11.113	7/16"	2-3/4"	1"	37.58	35.95	34.31	32.68
57260	.5000	1/2"	12.700	1/2"	3"	1"	56.83	54.36	51.89	49.42
57270	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	91.92	87.92	83.93	79.93
57280	.7500	3/4"	19.050	3/4"	4"	1-1/2"	135.27	129.39	123.51	117.63

TOLERANCES

d_1	$+0.000^{\circ} -0.002^{\circ}$ (+.000 / -.050mm)
d_2	h6



TECH
PAGES
314-315

Drill/End Mill

TiALN Coating

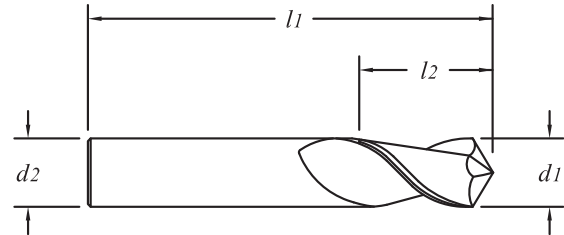
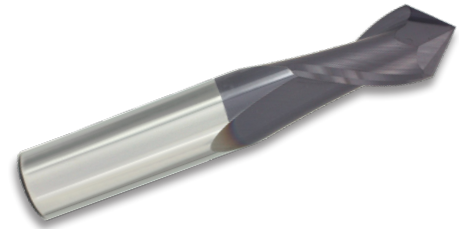
Solid submicron grain carbide

Included angle to a point - center cutting

Tools do not have drill point geometry

Extremely versatile

Point tolerance $\pm 0^{\circ}30'$



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								
57207	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	14.32	13.70	13.07	12.45
57217	.1875	3/16"	4.763	3/16"	2"	5/8"	18.01	17.23	16.44	15.66
57227	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	24.56	23.50	22.43	21.36
57237	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	33.29	31.85	30.40	28.95
57247	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	38.88	37.19	35.50	33.81
57257	.4375	7/16"	11.113	7/16"	2-3/4"	1"	47.01	44.97	42.92	40.88
57267	.5000	1/2"	12.700	1/2"	3"	1"	66.32	63.44	60.55	57.67
57277	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	105.58	100.99	96.40	91.81
57287	.7500	3/4"	19.050	3/4"	4"	1-1/2"	151.41	144.83	138.24	131.66

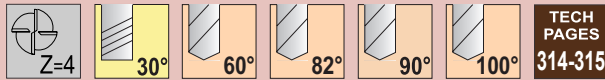
70

MATERIAL HARDNESS (Rc)

35

0

TOLERANCES	
d_1	+0.000° -0.002° (+0.000 / -0.050mm)
d_2	h6



DRILL MILLS

Drill/End Mill

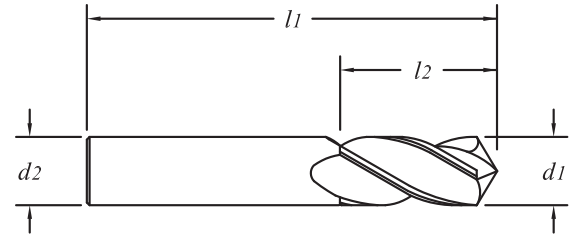
Solid submicron grain carbide

Included angle to a point - center cutting

Tools do not have drill point geometry

Extremely versatile

Point tolerance $\pm 0^\circ 30'$

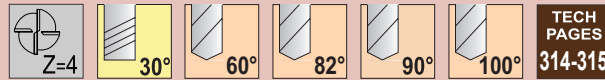


MATERIAL HARDNESS (RC) 70 35 0

60° EDP#	82° EDP#	90° EDP#	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								
-	-	58198	-	.1181	3.000	3.0	38	12	12.22	11.69	11.16	10.63	
-	57346	58200	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	11.63	11.12	10.62	10.11
-	-	58202	-	.1575		4.000	4.0	50	14	16.09	15.39	14.69	13.99
-	57350	58210	57390	.1875	3/16"	4.763	3/16"	2"	5/8"	15.32	14.65	13.99	13.32
-	57352	58212	57392	.1969		5.000	5.0	65	16	19.50	18.66	17.81	16.96
57314	57354	58214	-	.2362		6.000	6.0	65	19	20.00	19.13	18.26	17.39
57316	57356	58220	57396	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	19.03	18.21	17.38	16.55
57318	57358	58230	57398	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	24.94	23.86	22.77	21.69
57320	-	58232	57400	.3150		8.000	8.0	65	22	26.25	25.11	23.97	22.83
57322	57362	58240	57402	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	30.53	29.21	27.88	26.55
57324	-	58242	57404	.3937		10.000	10.0	70	25	37.48	35.85	34.22	32.59
-	-	58252	57408	.4724		12.000	12.0	75	25	59.70	57.10	54.51	51.91
57330	57370	58260	57410	.5000	1/2"	12.700	1/2"	3"	1"	56.83	54.36	51.89	49.42
57332	57372	58270	57412	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	91.92	87.92	83.93	79.93
-	-	58272	57414	.6299		16.000	16.0	88	32	96.50	92.30	88.11	83.91
57336	57376	58280	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	135.27	129.39	123.51	117.63

TOLERANCES

<i>d1</i>	+0.000° -0.002" (+.000 / -.050mm)
<i>d2</i>	h6



Drill/End Mill

TiAlN Coating

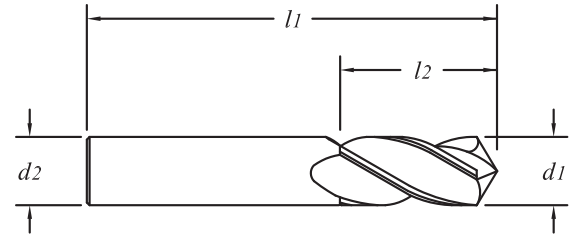
Solid submicron grain carbide

Included angle to a point - center cutting

Tools do not have drill point geometry

Extremely versatile

Point tolerance ±0°30'



60° EDP#	82° EDP#	90° EDP#	100° 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								
-	-	58205	-	.1181	3.000	3.0	38	12	14.90	14.26	13.61	12.96	
-	58346	58207	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	14.32	13.70	13.07	12.45
-	58348	58209	58388	.1575		4.000	4.0	50	14	18.78	17.96	17.15	16.33
-	58350	58217	58390	.1875	3/16"	4.763	3/16"	2"	5/8"	18.01	17.23	16.44	15.66
-	-	58219	-	.1969		5.000	5.0	65	16	16.09	15.39	14.69	13.99
58314	58354	58221	58394	.2362		6.000	6.0	65	19	25.54	24.43	23.32	22.21
58316	58356	58227	58396	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	24.56	23.50	22.43	21.36
58318	58358	58237	58398	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	33.29	31.85	30.40	28.95
58320	-	58239	58400	.3150		8.000	8.0	65	22	34.55	33.04	31.54	30.04
58322	58362	58247	58402	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	38.88	37.19	35.50	33.81
58324	58364	58249	58404	.3937		10.000	10.0	70	25	46.94	44.90	42.86	40.82
58326	58366	58257	-	.4375	7/16"	11.113	7/16"	2-3/4"	1"	47.01	44.97	42.92	40.88
58328	-	58259	58408	.4724		12.000	12.0	75	25	69.13	66.12	63.12	60.11
58330	58370	58267	58410	.5000	1/2"	12.700	1/2"	3"	1"	66.32	63.44	60.55	57.67
58332	58372	58277	58412	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	105.58	100.99	96.40	91.81
-	58374	58279	-	.6299		16.000	16.0	88	32	110.17	105.38	100.59	95.80
58336	58376	58287	58416	.7500	3/4"	19.050	3/4"	4"	1-1/2"	151.41	144.83	138.24	131.66
-	58378	58289	-	.7874		20.000	20.0	100	38	214.29	204.97	195.66	186.34

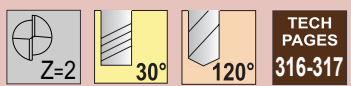
MATERIAL HARDNESS (Rc)

70

35

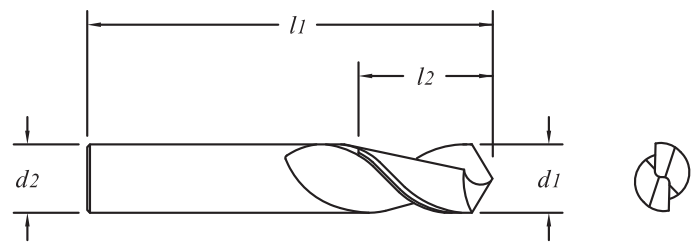
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TOLERANCES	
d_1	+0.00° -0.002° (+.000 / -.050mm)
d_2	h6



Recommended for drilling and milling in mild steels and non-ferrous materials

Drill/End Mill
TiALN Coating
 Solid submicron grain carbide
 Four-facet drill point geometry
 Extremely versatile
 Point tolerance ±1°



MATERIAL HARDNESS (Rc)

70

35

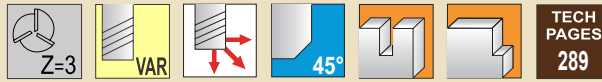
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EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
	Decimal	Metric							
57421	.1181	3.000	3.0	38	12	14.90	14.26	13.61	12.96
57423	.1250	1/8"	3.175	1-1/2"	1/2"	14.32	13.70	13.07	12.45
57425	.1575	4.000	4.0	50	14	18.78	17.96	17.15	16.33
57427	.1875	3/16"	4.762	3/16"	5/8"	18.01	17.23	16.44	15.66
57429	.1969	5.000	5.0	65	16	25.06	23.97	22.88	21.79
57431	.2362	6.000	6.0	65	19	25.54	24.43	23.32	22.21
57433	.2500	1/4"	6.350	1/4"	3/4"	24.56	23.50	22.43	21.36
57435	.3125	5/16"	7.937	5/16"	7/8"	33.29	31.85	30.40	28.95
57437	.3150	8.000	8.0	65	22	34.55	33.04	31.54	30.04
57439	.3750	3/8"	9.525	3/8"	7/8"	38.88	37.19	35.50	33.81
57441	.3937	10.000	10.0	70	25	46.94	44.90	42.86	40.82
57443	.4375	7/16"	11.112	7/16"	1"	47.01	44.97	42.92	40.88
57445	.4724	12.000	12.0	75	25	69.13	66.12	63.12	60.11
57447	.5000	1/2"	12.700	1/2"	3"	66.32	63.44	60.55	57.67
57449	.6250	5/8"	15.875	5/8"	3-1/2"	105.58	100.99	96.40	91.81
57451	.6299	16.000	16.0	88	32	110.17	105.38	100.59	95.80
57453	.7500	3/4"	19.050	3/4"	4"	151.41	144.83	138.24	131.66
57455	.7874	20.000	20.0	100	38	214.29	204.97	195.66	186.34



Series ARC

.1575" - .3750"
(4.000mm - 9.525mm)



TOLERANCES	
d1	+0.000" - .002" (+0.000 - .050mm)
d2	h6
d3	+0.000" - .005" (+0.000 - .127mm)

Recommended for aluminum and non-ferrous materials

Aluminum Knuckle Rougher / Ripper

Bright finish - Uncoated

Solid submicron grain carbide end mill - center cutting

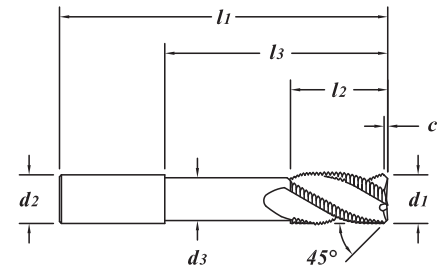
Wave knuckle design to break up chips

Each flute has individual helix angle to break up harmonics

Reduces tool pressure requiring less machine power

Designed for roughing Aluminum Alloys

Ideal for use in extruded Aluminum



MATERIAL HARDNESS (Rc) 70
35
0

EDP#	d1 † Diameter		d2 Shank Diameter	l1 Overall Length	l2 Flute Length	c Chamfer Length	l3 Reach Length	d3 Neck Diameter	1-11	12-24	25-49	50-100	
	Decimal	Metric											
46219	.1575	4.000	6.0	50	8	0.30	-	-	34.17	32.68	31.20	29.71	
46222	.1575	4.000	6.0	50	12	0.30	-	-	34.17	32.68	31.20	29.71	
46225	.1575	4.000	6.0	65	10	0.30	30	3.2	39.11	37.41	35.71	34.01	
46228	.1575	4.000	6.0	75	15	0.30	40	3.2	51.47	49.24	47.00	44.76	
46231	.1875	3/16"	4.763	2"	5/16"	.015"	-	-	28.99	27.73	26.47	25.21	
46234	.1875	3/16"	4.763	3/16"	2"	9/16"	.015"	-	28.99	27.73	26.47	25.21	
46237	.1875	3/16"	4.763	3/16"	3"	1"	.015"	-	40.57	38.81	37.04	35.28	
46240	.1875	3/16"	4.763	3/16"	3"	1/2"	.015"	1-1/2"	.160"	44.15	42.23	40.31	38.39
46243	.2362	6.000	6.0	50	12	0.50	-	-	33.90	32.43	30.95	29.48	
46246	.2362	6.000	6.0	65	19	0.50	-	-	36.72	35.12	33.53	31.93	
46249	.2362	6.000	6.0	100	20	0.50	60	5.2	52.07	49.81	47.54	45.28	
46252	.2500	1/4"	6.350	1/4"	2"	3/8"	.020"	-	32.41	31.00	29.59	28.18	
46255	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"	-	36.27	34.69	33.12	31.54	
46258	.2500	1/4"	6.350	1/4"	4"	1-1/2"	.020"	-	46.83	44.79	42.76	40.72	
46261	.2500	1/4"	6.350	1/4"	4"	1"	.020"	2"	.220"	50.42	48.22	46.03	43.84
46264	.3125	5/16"	7.938	5/16"	2"	7/16"	.020"	-	38.67	36.99	35.31	33.63	
46267	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.020"	-	40.15	38.40	36.66	34.91	
46270	.3125	5/16"	7.938	5/16"	4"	1-1/2"	.020"	-	57.51	55.01	52.51	50.01	
46273	.3125	5/16"	7.938	5/16"	4"	1"	.020"	2"	.285"	61.09	58.43	55.78	53.12
46276	.3150	8.000	8.0	50	12	0.50	-	-	39.61	37.88	36.16	34.44	
46279	.3150	8.000	8.0	65	22	0.50	-	-	41.16	39.37	37.58	35.79	
46282	.3150	8.000	8.0	100	40	0.50	-	-	59.54	56.95	54.36	51.77	
46285	.3150	8.000	8.0	100	20	0.50	60	7.2	63.11	60.37	57.62	54.88	
46288	.3150	8.000	8.0	150	40	0.50	100	7.2	83.77	80.12	76.48	72.84	
46291	.3750	3/8"	9.525	3/8"	2"	1/2"	.025"	-	45.14	43.18	41.21	39.25	
46294	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.025"	-	50.15	47.97	45.79	43.61	
46297	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.025"	-	58.60	56.06	53.51	50.96	
46300	.3750	3/8"	9.525	3/8"	4"	1-5/8"	.025"	-	63.01	60.27	57.53	54.79	
46303	.3750	3/8"	9.525	3/8"	4"	1"	.025"	2"	.345"	66.59	63.69	60.80	57.90
46306	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.025"	4"	.345"	85.50	81.79	78.07	74.35

EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	c Chamfer Length	$l3$ Reach Length	$d3$ Neck Diameter	1-11	12-24	25-49	50-100
	Decimal	Metric										
46309	.3937	10.000	10.0	50	16	0.50	-	-	55.81	53.38	50.96	48.53
46312	.3937	10.000	10.0	70	22	0.50	-	-	58.85	56.29	53.73	51.17
46315	.3937	10.000	10.0	100	40	0.50	-	-	73.30	70.11	66.93	63.74
46318	.3937	10.000	10.0	100	20	0.50	60	9.2	76.88	73.54	70.19	66.85
46321	.3937	10.000	10.0	150	40	0.50	100	9.2	96.42	92.22	88.03	83.84
46324	.4724	12.000	12.0	65	19	0.80	-	-	64.16	61.37	58.58	55.79
46327	.4724	12.000	12.0	75	32	0.80	-	-	72.54	69.39	66.23	63.08
46330	.4724	12.000	12.0	100	50	0.80	-	-	85.03	81.33	77.64	73.94
46333	.4724	12.000	12.0	100	25	0.80	60	11.2	88.61	84.76	80.90	77.05
46336	.4724	12.000	12.0	150	40	0.80	100	11.2	120.01	114.80	109.58	104.36
46339	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"	-	61.07	58.41	55.76	53.10
46342	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	69.21	66.20	63.19	60.18
46345	.5000	1/2"	12.700	1/2"	4"	2"	.030"	-	80.93	77.41	73.89	70.37
46348	.5000	1/2"	12.700	1/2"	4"	1"	.030"	2"	84.50	80.83	77.15	73.48
46351	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.030"	4"	118.17	113.04	107.90	102.76
46354	.6250	5/8"	15.875	5/8"	3"	3/4"	.035"	-	108.33	103.62	98.91	94.20
46357	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.035"	-	111.52	106.67	101.82	96.97
46360	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.035"	-	118.13	112.99	107.86	102.72
46363	.6250	5/8"	15.875	5/8"	4"	1"	.035"	2"	121.72	116.42	111.13	105.84
46366	.6250	5/8"	15.875	5/8"	6"	1-1/2"	.035"	3"	170.97	163.54	156.10	148.67
46369	.6250	5/8"	15.875	5/8"	6"	1-1/2"	.035"	4"	170.97	163.54	156.10	148.67
46372	.6299	16.000	16.0	75	19	1.00	-	-	114.01	109.05	104.10	99.14
46375	.6299	16.000	16.0	88	32	1.00	-	-	116.96	111.87	106.79	101.70
46378	.6299	16.000	16.0	100	50	1.00	-	-	125.21	119.77	114.32	108.88
46381	.6299	16.000	16.0	100	20	1.00	50	15.2	128.79	123.19	117.59	111.99
46384	.6299	16.000	16.0	150	40	1.00	100	15.2	172.80	165.29	157.77	150.26
46387	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.040"	-	163.08	155.99	148.90	141.81
46390	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.040"	-	228.54	218.60	208.67	198.73
46393	.7500	3/4"	19.050	3/4"	4"	7/8"	.040"	2"	166.67	159.42	152.18	144.93
46396	.7500	3/4"	19.050	3/4"	6"	1-1/2"	.040"	3"	275.16	263.20	251.23	239.27
46399	.7500	3/4"	19.050	3/4"	6"	1-1/2"	.040"	4"	275.16	263.20	251.23	239.27
46402	.7874	20.000	20.0	100	22	1.00	-	-	230.12	220.11	210.11	200.10
46405	.7874	20.000	20.0	100	40	1.00	-	-	230.12	220.11	210.11	200.10
46408	.7874	20.000	20.0	100	30	1.00	50	19.2	233.69	223.53	213.37	203.21
46411	.7874	20.000	20.0	150	40	1.00	100	19.2	285.43	273.02	260.61	248.20
46414	1.000	1"	25.400	1"	4"	1-1/2"	.040"	-	276.92	264.88	252.84	240.80
46417	1.000	1"	25.400	1"	5"	2"	.040"	-	342.67	327.77	312.87	297.97
46420	1.000	1"	25.400	1"	6"	2"	.040"	3-1/2"	460.44	440.42	420.40	400.38
46423	1.000	1"	25.400	1"	7"	2"	.040"	4-1/2"	605.50	579.17	552.85	526.52

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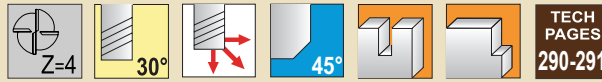
MATERIAL HARDNESS (Rc)

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Series VHM

.1575" - .3543"
(4.000mm - 9.000mm)

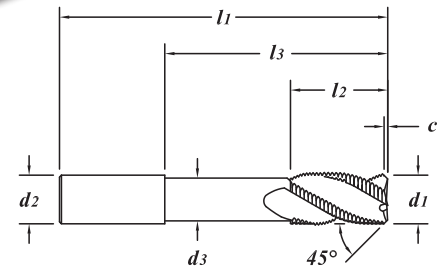
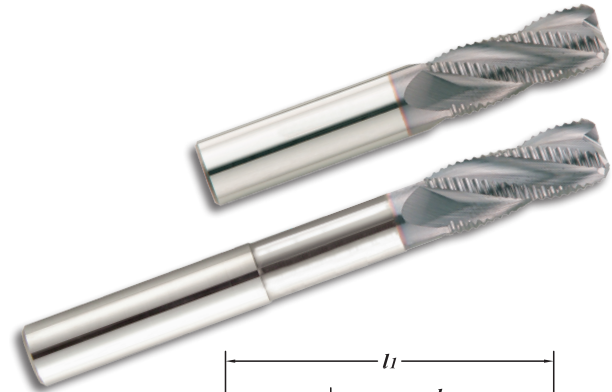


TOLERANCES	
d1	+0.000" - .002" (+.000 - .050mm)
d2	h6
d3	+0.000" - .005" (+.000 - .127mm)

Recommended for stainless steel, inconel, pH materials, cold rolled steel, titanium, cast iron and tool steels under 40Rc

Staggered Flute Knuckle Rougher / Ripper
AlTiN Coating

- 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 pocket milling
- Variable flute geometry



MATERIAL HARDNESS (Rc)

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EDP#	d1 † Diameter		d2 Shank Diameter	l1 Overall Length	l2 Flute Length	c Chamfer Length	l3 Reach Length	d3 Neck Diameter	1-11	12-24	25-49	50-100	
	Decimal	Metric											
49450	.1575	4.000	6.0	50	8	0.30	-	-	37.81	36.17	34.52	32.88	
49455	.1575	4.000	6.0	50	12	0.30	-	-	37.81	36.17	34.52	32.88	
49460	.1575	4.000	6.0	65	10	0.30	30	3.4	43.96	42.05	40.14	38.23	
49465	.1575	4.000	6.0	75	15	0.30	40	3.4	56.34	53.89	51.44	48.99	
49470	.1875	3/16"	4.763	2"	5/16"	.015"	-	-	31.52	30.15	28.78	27.41	
49475	.1875	3/16"	4.763	2"	9/16"	.015"	-	-	31.52	30.15	28.78	27.41	
49480	.1875	3/16"	4.763	3"	1"	.015"	-	-	44.21	42.28	40.36	38.44	
49485	.1875	3/16"	4.763	3"	1/2"	.015"	1-1/2"	.165"	47.78	45.71	43.63	41.55	
49490	.2362	6.000	6.0	50	12	0.50	-	-	37.56	35.93	34.29	32.66	
49500	.2362	6.000	6.0	65	19	0.50	-	-	41.58	39.78	37.97	36.16	
49505	.2362	6.000	6.0	100	15	0.50	40	5.4	57.73	55.22	52.71	50.20	
49510	.2362	6.000	6.0	100	20	0.50	60	5.4	57.73	55.22	52.71	50.20	
49520	.2500	1/4"	6.350	2"	3/8"	.020"	-	-	36.08	34.51	32.94	31.37	
49540	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"	-	41.15	39.36	37.57	35.78	
49543	.2500	1/4"	6.350	1/4"	4"	1-1/2"	.020"	-	52.49	50.20	47.92	45.64	
49547	.2500	1/4"	6.350	1/4"	4"	1"	.020"	2"	.225"	56.05	53.61	51.18	48.74
49550	.2756	7.000	8.0	50	12	0.50	-	-	51.08	48.86	46.64	44.42	
49555	.2756	7.000	8.0	65	22	0.50	-	-	55.23	52.83	50.43	48.03	
49570	.2812	9/32"	7.142	5/16"	2"	7/16"	.020"	-	50.17	47.99	45.81	43.63	
49575	.2812	9/32"	7.142	5/16"	2-1/2"	13/16"	.020"	-	54.04	51.69	49.34	46.99	
49580	.3125	5/16"	7.938	5/16"	2"	7/16"	.020"	-	43.84	41.93	40.03	38.12	
49600	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.020"	-	47.24	45.19	43.13	41.08	
49603	.3125	5/16"	7.938	5/16"	4"	1-1/2"	.020"	-	66.61	63.71	60.82	57.92	
49605	.3125	5/16"	7.938	5/16"	4"	1"	.020"	2"	.285"	70.18	67.13	64.08	61.03
49610	.3150	8.000	8.0	50	12	0.50	-	-	44.76	42.81	40.87	38.92	
49620	.3150	8.000	8.0	65	22	0.50	-	-	48.23	46.13	44.04	41.94	
49622	.3150	8.000	8.0	100	40	0.50	-	-	68.63	65.65	62.66	59.68	
49623	.3150	8.000	8.0	100	20	0.50	60	7.4	72.22	69.08	65.94	62.80	
49624	.3150	8.000	8.0	150	40	0.50	100	7.4	96.08	91.91	87.73	83.55	
49625	.3438	11/32"	8.733	3/8"	2"	1/2"	.025"	-	56.90	54.43	51.95	49.48	
49630	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	.025"	-	64.75	61.93	59.12	56.30	
49635	.3543	9.000	10.0	50	14	0.50	-	-	69.78	66.75	63.71	60.68	
49637	.3543	9.000	10.0	65	22	0.50	-	-	75.85	72.56	69.26	65.96	

EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	c Chamfer Length	$l3$ Reach Length	$d3$ Neck Diameter	1-11	12-24	25-49	50-100	
	Decimal	Metric											
49640	.3750	3/8"	9.525	3/8"	2"	1/2"	.025"	-	-	50.28	48.09	45.91	43.72
49660	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.025"	-	-	57.22	54.74	52.25	49.76
49662	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.025"	-	-	65.70	62.84	59.99	57.13
49664	.3750	3/8"	9.525	3/8"	4"	1-5/8"	.025"	-	-	72.11	68.97	65.84	62.70
49667	.3750	3/8"	9.525	3/8"	4"	1"	.025"	2"	.355"	75.68	72.39	69.10	65.81
49670	.3937		10.000	10.0	50	16	0.50	-	-	61.67	58.99	56.31	53.63
49680	.3937		10.000	10.0	70	22	0.50	-	-	67.01	64.10	61.18	58.27
49682	.3937		10.000	10.0	100	40	0.50	-	-	83.82	80.18	76.53	72.89
49684	.3937		10.000	10.0	100	20	0.50	40	9.4	87.40	83.60	79.80	76.00
49686	.3937		10.000	10.0	100	30	0.50	60	9.4	87.40	83.60	79.80	76.00
49690	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.025"	-	-	67.33	64.41	61.48	58.55
49700	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.025"	-	-	67.33	64.41	61.48	58.55
49710	.4724		12.000	12.0	65	19	0.80	-	-	72.31	69.17	66.02	62.88
49720	.4724		12.000	12.0	75	32	0.80	-	-	80.68	77.18	73.67	70.16
49725	.4724		12.000	12.0	100	50	0.80	-	-	95.58	91.42	87.27	83.11
49730	.4724		12.000	12.0	100	25	0.80	60	11.4	99.15	94.84	90.53	86.22
49735	.4724		12.000	12.0	150	40	0.80	100	11.4	134.79	128.93	123.07	117.21
* 49740	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"	-	-	69.24	66.23	63.22	60.21
* 49760	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	-	77.37	74.01	70.64	67.28
* 49761	.5000	1/2"	12.700	1/2"	4"	2"	.030"	-	-	91.46	87.48	83.51	79.53
* 49762	.5000	1/2"	12.700	1/2"	4"	1"	.030"	2"	.480"	95.04	90.90	86.77	82.64
* 49764	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.030"	4"	.480"	132.93	127.15	121.37	115.59
* 49765	.5512		14.000	14.0	75	19	0.80	-	-	114.46	109.48	104.51	99.53
* 49770	.5512		14.000	14.0	88	32	0.80	-	-	117.63	112.52	107.40	102.29
* 49780	.6250	5/8"	15.875	5/8"	3"	3/4"	.035"	-	-	120.09	114.87	109.65	104.43
* 49800	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.035"	-	-	123.27	117.91	112.55	107.19
* 49820	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.035"	-	-	129.88	124.23	118.59	112.94
* 49824	.6250	5/8"	15.875	5/8"	4"	1"	.035"	2"	.605"	133.46	127.66	121.85	116.05
* 49826	.6250	5/8"	15.875	5/8"	6"	1-1/2"	.035"	3"	.605"	188.31	180.13	171.94	163.75
* 49828	.6250	5/8"	15.875	5/8"	6"	1-1/2"	.035"	4"	.605"	188.31	180.13	171.94	163.75
* 49830	.6299		16.000	16.0	75	19	1.00	-	-	125.38	119.93	114.48	109.03
* 49840	.6299		16.000	16.0	88	32	1.00	-	-	128.69	123.09	117.50	111.90
* 49842	.6299		16.000	16.0	100	50	1.00	-	-	136.94	130.99	125.03	119.08
* 49843	.6299		16.000	16.0	100	20	1.00	50	15.4	140.53	134.42	128.31	122.20
* 49844	.6299		16.000	16.0	150	40	1.00	100	15.4	190.14	181.87	173.61	165.34
* 49850	.7087		18.000	18.0	100	38	1.00	-	-	185.01	176.97	168.92	160.88
* 49860	.7500	3/4"	19.050	3/4"	3"	7/8"	.040"	-	-	173.41	165.87	158.33	150.79
* 49880	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.040"	-	-	177.00	169.30	161.61	153.91
* 49882	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.040"	-	-	245.53	234.85	224.18	213.50
* 49886	.7500	3/4"	19.050	3/4"	6"	1-1/2"	.040"	3"	.730"	295.21	282.37	269.54	256.70
* 49887	.7500	3/4"	19.050	3/4"	6"	1-1/2"	.040"	4"	.730"	295.21	282.37	269.54	256.70
* 49890	.7874		20.000	20.0	75	22	1.00	-	-	245.12	234.47	223.81	213.15
* 49900	.7874		20.000	20.0	100	38	1.00	-	-	250.48	239.59	228.70	217.81
* 49902	.7874		20.000	20.0	100	30	1.00	50	19.4	254.07	243.02	231.98	220.93
* 49904	.7874		20.000	20.0	150	40	1.00	100	19.4	311.52	297.98	284.43	270.89
* 49915	.9843		25.000	25.0	100	25	1.00	-	-	287.27	274.78	262.29	249.80
* 49920	.9843		25.000	25.0	100	38	1.00	-	-	287.27	274.78	262.29	249.80
* 49925	1.000	1"	25.400	1"	4"	1"	.040"	-	-	297.29	284.36	271.44	258.51
* 49930	1.000	1"	25.400	1"	4"	1-1/2"	.040"	-	-	297.29	284.36	271.44	258.51
* 49940	1.000	1"	25.400	1"	5"	2"	.040"	-	-	366.03	350.12	334.20	318.29

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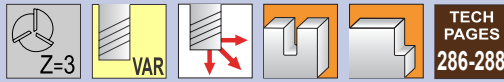
MATERIAL HARDNESS (Rc)

0

* - Tools with weldon flats

TOLERANCES	
$d1$	+0.000" -0.001" (+0.000mm -0.025mm)
$d2$	h6
r	+0.001" -0.001" (+0.025 -0.025mm)

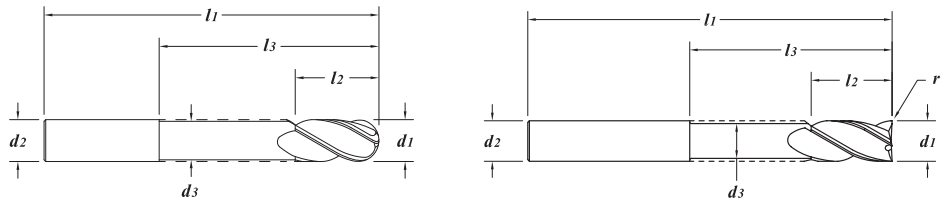
.1575" - .2500"
(4.000mm - 6.350mm)



Recommended for aluminum

Variable Helix End Mill

Solid submicron grain carbide end mill - center cutting
 Engineered for High Efficiency Milling of Aluminum
 Proprietary geometry with polished flutes breaks up harmonics
 Improved end geometry provides superior floor finishes and increased plunge rates
 Capable of running up to 40,000 RPM - reduces vibration and balance issues
 Chip splitters and necks can be added within 48 hours



MATERIAL HARDNESS (Rc) 70 35 0

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											
07000	.1575	4.000	6.0	50	12	-	16	3.80	26.47	25.32	24.17	23.02	
07001	.1575	4.000	6.0	50	12	0.20	16	3.80	30.18	28.86	27.55	26.24	
07002	.1575	4.000	6.0	50	12	0.50	16	3.80	30.18	28.86	27.55	26.24	
07003	.1575	4.000	6.0	50	12	1.00	16	3.80	30.18	28.86	27.55	26.24	
07004	.1875	3/16"	4.763	3/16"	2"	1/2"	-	5/8"	.179"	19.17	18.34	17.50	16.67
07005	.1875	3/16"	4.763	3/16"	2"	1/2"	.015"	5/8"	.179"	21.60	20.66	19.72	18.78
07006	.1875	3/16"	4.763	3/16"	2"	1/2"	.030"	5/8"	.179"	21.60	20.66	19.72	18.78
07007	.1875	3/16"	4.763	3/16"	2"	1/2"	.060"	5/8"	.179"	21.60	20.66	19.72	18.78
07008	.1875	3/16"	4.763	3/16"	2"	1/2"	BALL	5/8"	.179"	21.60	20.66	19.72	18.78
07009	.1969	5.000	6.0	65	16	-	26	4.70	26.88	25.71	24.54	23.37	
07010	.1969	5.000	6.0	65	16	0.20	26	4.70	32.06	30.67	29.27	27.88	
07011	.1969	5.000	6.0	65	16	0.50	26	4.70	32.06	30.67	29.27	27.88	
NEW 07012	.1969	5.000	6.0	65	16	1.00	26	4.70	32.06	30.67	29.27	27.88	
07013	.2362	6.000	6.0	65	19	-	26	5.70	25.79	24.67	23.55	22.43	
07014	.2362	6.000	6.0	65	19	0.20	26	5.70	30.74	29.40	28.07	26.73	
07015	.2362	6.000	6.0	65	19	0.50	26	5.70	30.74	29.40	28.07	26.73	
07016	.2362	6.000	6.0	65	19	1.00	26	5.70	30.74	29.40	28.07	26.73	
07017	.2362	6.000	6.0	65	19	1.50	26	5.70	30.74	29.40	28.07	26.73	
07018	.2362	6.000	6.0	65	19	2.00	26	5.70	30.74	29.40	28.07	26.73	
07019	.2362	6.000	6.0	65	19	BALL	26	5.70	30.74	29.40	28.07	26.73	
07020	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	-	-	19.45	18.60	17.76	16.91	
07021	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	-	24.15	23.10	22.05	21.00	
07022	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	-	24.15	23.10	22.05	21.00	
07023	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.060"	-	24.15	23.10	22.05	21.00	
07024	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.090"	-	24.15	23.10	22.05	21.00	
07025	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	BALL	-	24.15	23.10	22.05	21.00	
07026	.2500	1/4"	6.350	1/4"	3"	1"	-	-	33.28	31.83	30.39	28.94	
07027	.2500	1/4"	6.350	1/4"	3"	1"	.030"	-	39.11	37.41	35.71	34.01	
07028	.2500	1/4"	6.350	1/4"	3"	1"	.060"	-	39.11	37.41	35.71	34.01	
07029	.2500	1/4"	6.350	1/4"	3"	3/8"	-	1-1/8"	.235"	38.66	36.98	35.30	33.62
07030	.2500	1/4"	6.350	1/4"	3"	3/8"	.015"	1-1/8"	.235"	44.49	42.56	40.62	38.69
07031	.2500	1/4"	6.350	1/4"	3"	3/8"	.030"	1-1/8"	.235"	44.49	42.56	40.62	38.69
07032	.2500	1/4"	6.350	1/4"	3"	3/8"	.060"	1-1/8"	.235"	44.49	42.56	40.62	38.69

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											
07033	.3150	8.000	8.0	65	19	-	26	7.40	34.49	32.99	31.49	29.99	
07034	.3150	8.000	8.0	65	19	0.20	26	7.40	38.99	37.29	35.60	33.90	
07035	.3150	8.000	8.0	65	19	0.50	26	7.40	38.99	37.29	35.60	33.90	
07036	.3150	8.000	8.0	65	19	1.00	26	7.40	38.99	37.29	35.60	33.90	
07037	.3150	8.000	8.0	65	19	1.50	26	7.40	38.99	37.29	35.60	33.90	
07038	.3150	8.000	8.0	65	19	2.00	26	7.40	38.99	37.29	35.60	33.90	
07039	.3150	8.000	8.0	65	19	3.00	26	7.40	38.99	37.29	35.60	33.90	
07040	.3150	8.000	8.0	65	19	BALL	26	7.40	38.99	37.29	35.60	33.90	
07041	.3750	3/8"	9.525	3/8"	2-1/2"	1"	-	-	33.68	32.22	30.75	29.29	
07042	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.010"	-	38.32	36.65	34.99	33.32	
07043	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.015"	-	38.32	36.65	34.99	33.32	
07044	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.020"	-	38.32	36.65	34.99	33.32	
07045	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.030"	-	38.32	36.65	34.99	33.32	
07046	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.060"	-	38.32	36.65	34.99	33.32	
07047	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.090"	-	38.32	36.65	34.99	33.32	
07048	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.120"	-	38.32	36.65	34.99	33.32	
07049	.3750	3/8"	9.525	3/8"	2-1/2"	1"	BALL	-	38.32	36.65	34.99	33.32	
07050	.3750	3/8"	9.525	3/8"	3"	1-1/4"	-	-	46.39	44.37	42.36	40.34	
07051	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.015"	-	52.38	50.11	47.83	45.55	
07052	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.030"	-	52.38	50.11	47.83	45.55	
07053	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.060"	-	52.38	50.11	47.83	45.55	
07054	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.120"	-	52.38	50.11	47.83	45.55	
07055	.3750	3/8"	9.525	3/8"	3"	1/2"	-	1-1/8"	.355"	51.77	49.52	47.27	45.02
07056	.3750	3/8"	9.525	3/8"	3"	1/2"	.015"	1-1/8"	.355"	57.76	55.25	52.74	50.23
NEW 07057	.3750	3/8"	9.525	3/8"	3"	1/2"	.030"	1-1/8"	.355"	57.76	55.25	52.74	50.23
07058	.3750	3/8"	9.525	3/8"	3"	1/2"	.060"	1-1/8"	.355"	57.76	55.25	52.74	50.23
07059	.3750	3/8"	9.525	3/8"	3"	1/2"	.090"	1-1/8"	.355"	57.76	55.25	52.74	50.23
07060	.3750	3/8"	9.525	3/8"	3"	1/2"	.120"	1-1/8"	.355"	57.76	55.25	52.74	50.23
07061	.3750	3/8"	9.525	3/8"	4"	1/2"	-	2-1/8"	.355"	62.47	59.75	57.04	54.32
07062	.3750	3/8"	9.525	3/8"	4"	1/2"	.015"	2-1/8"	.355"	71.20	68.10	65.01	61.91
NEW 07063	.3750	3/8"	9.525	3/8"	4"	1/2"	.020"	2-1/8"	.355"	71.20	68.10	65.01	61.91
07064	.3750	3/8"	9.525	3/8"	4"	1/2"	.030"	2-1/8"	.355"	71.20	68.10	65.01	61.91
07065	.3750	3/8"	9.525	3/8"	4"	1/2"	.060"	2-1/8"	.355"	71.20	68.10	65.01	61.91
07066	.3750	3/8"	9.525	3/8"	4"	1/2"	.090"	2-1/8"	.355"	71.20	68.10	65.01	61.91
07067	.3750	3/8"	9.525	3/8"	4"	1/2"	.120"	2-1/8"	.355"	71.20	68.10	65.01	61.91
07068	.3937	10.000	10.0	70	22	-	30	9.40	64.87	62.05	59.23	56.41	
07069	.3937	10.000	10.0	70	22	0.20	30	9.40	64.87	62.05	59.23	56.41	
07070	.3937	10.000	10.0	70	22	0.50	30	9.40	64.87	62.05	59.23	56.41	
07071	.3937	10.000	10.0	70	22	1.00	30	9.40	64.87	62.05	59.23	56.41	
07072	.3937	10.000	10.0	70	22	1.50	30	9.40	64.87	62.05	59.23	56.41	
07073	.3937	10.000	10.0	70	22	2.00	30	9.40	64.87	62.05	59.23	56.41	
07074	.3937	10.000	10.0	70	22	3.00	30	9.40	64.87	62.05	59.23	56.41	
07075	.3937	10.000	10.0	70	22	BALL	30	9.40	64.87	62.05	59.23	56.41	
07076	.3937	10.000	10.0	100	40	-	-	-	65.50	62.66	59.81	56.96	
07077	.3937	10.000	10.0	100	22	-	55	9.40	76.82	73.48	70.14	66.80	
07078	.4724	12.000	12.0	88	26	-	38	11.40	98.46	94.18	89.90	85.62	
07079	.4724	12.000	12.0	88	26	0.20	38	11.40	98.46	94.18	89.90	85.62	
07212	.4724	12.000	12.0	88	26	0.50	38	11.40	98.46	94.18	89.90	85.62	
07081	.4724	12.000	12.0	88	26	1.00	38	11.40	98.46	94.18	89.90	85.62	
07082	.4724	12.000	12.0	88	26	1.50	38	11.40	98.46	94.18	89.90	85.62	
07083	.4724	12.000	12.0	88	26	2.00	38	11.40	98.46	94.18	89.90	85.62	
07084	.4724	12.000	12.0	88	26	3.00	38	11.40	98.46	94.18	89.90	85.62	
07085	.4724	12.000	12.0	88	26	4.00	38	11.40	98.46	94.18	89.90	85.62	
07086	.4724	12.000	12.0	88	26	BALL	38	11.40	98.46	94.18	89.90	85.62	

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MATERIAL HARDNESS (RC)

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continued →

Series A3 (continued)

.4724" - .6250"
(12.000mm - 15.875mm)

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											
07213	.4724	12.000	12.0	88	36	-	-	-	77.34	73.98	70.61	67.25	
07088	.4724	12.000	12.0	88	36	0.20	-	-	92.97	88.92	84.88	80.84	
07089	.4724	12.000	12.0	88	36	0.50	-	-	92.97	88.92	84.88	80.84	
07090	.4724	12.000	12.0	88	36	1.00	-	-	92.97	88.92	84.88	80.84	
07091	.4724	12.000	12.0	88	36	1.50	-	-	92.97	88.92	84.88	80.84	
07092	.4724	12.000	12.0	88	36	2.00	-	-	92.97	88.92	84.88	80.84	
07093	.4724	12.000	12.0	88	36	3.00	-	-	92.97	88.92	84.88	80.84	
07094	.4724	12.000	12.0	88	36	4.00	-	-	92.97	88.92	84.88	80.84	
07095	.4724	12.000	12.0	88	36	BALL	-	-	92.97	88.92	84.88	80.84	
NEW 07215	.5000	1/2"	12.700	1/2"	3"	1"	-	-	55.26	52.86	50.45	48.05	
NEW 07216	.5000	1/2"	12.700	1/2"	3"	1"	.030"	-	72.55	69.40	66.24	63.09	
NEW 07217	.5000	1/2"	12.700	1/2"	3"	1"	BALL	-	72.55	69.40	66.24	63.09	
07096	.5000	1/2"	12.700	1/2"	3"	1-1/4"	-	-	55.26	52.86	50.45	48.05	
07097	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.010"	-	72.55	69.40	66.24	63.09	
07098	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.015"	-	72.55	69.40	66.24	63.09	
07099	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.020"	-	72.55	69.40	66.24	63.09	
07100	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	72.55	69.40	66.24	63.09	
07101	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"	-	72.55	69.40	66.24	63.09	
07102	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.090"	-	72.55	69.40	66.24	63.09	
07103	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.120"	-	72.55	69.40	66.24	63.09	
NEW 07218	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.125"	-	72.55	69.40	66.24	63.09	
07104	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.190"	-	72.55	69.40	66.24	63.09	
07105	.5000	1/2"	12.700	1/2"	3"	1-1/4"	BALL	-	72.55	69.40	66.24	63.09	
NEW 07219	.5000	1/2"	12.700	1/2"	3"	1/2"	.030"	1-1/2"	.470"	77.94	74.55	71.16	67.77
NEW 07220	.5000	1/2"	12.700	1/2"	3"	1/2"	.090"	1-1/2"	.470"	77.94	74.55	71.16	67.77
NEW 07221	.5000	1/2"	12.700	1/2"	4"	1-5/8"	-	-	74.88	71.62	68.37	65.11	
NEW 07222	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.030"	-	84.31	80.64	76.98	73.31	
NEW 07223	.5000	1/2"	12.700	1/2"	4"	1-5/8"	BALL	-	84.31	80.64	76.98	73.31	
07106	.5000	1/2"	12.700	1/2"	4"	2-1/16"	-	-	74.88	71.62	68.37	65.11	
07107	.5000	1/2"	12.700	1/2"	4"	2-1/16"	.015"	-	84.31	80.64	76.98	73.31	
07108	.5000	1/2"	12.700	1/2"	4"	2-1/16"	.030"	-	84.31	80.64	76.98	73.31	
07109	.5000	1/2"	12.700	1/2"	4"	2-1/16"	.060"	-	84.31	80.64	76.98	73.31	
07110	.5000	1/2"	12.700	1/2"	4"	2-1/16"	.120"	-	84.31	80.64	76.98	73.31	
NEW 07224	.5000	1/2"	12.700	1/2"	4"	1/2"	.090"	2"	.470"	95.60	91.44	87.29	83.13
NEW 07225	.5000	1/2"	12.700	1/2"	4"	1/2"	.190"	2"	.470"	95.60	91.44	87.29	83.13
07111	.5000	1/2"	12.700	1/2"	4"	5/8"	-	2-1/4"	.475"	86.18	82.43	78.69	74.94
07112	.5000	1/2"	12.700	1/2"	4"	5/8"	.015"	2-1/4"	.475"	95.60	91.44	87.29	83.13
07113	.5000	1/2"	12.700	1/2"	4"	5/8"	.030"	2-1/4"	.475"	95.60	91.44	87.29	83.13
07114	.5000	1/2"	12.700	1/2"	4"	5/8"	.060"	2-1/4"	.475"	95.60	91.44	87.29	83.13
07115	.5000	1/2"	12.700	1/2"	4"	5/8"	BALL	2-1/4"	.475"	95.60	91.44	87.29	83.13
07116	.6250	5/8"	15.875	5/8"	4"	1-5/8"	-	-	118.96	113.78	108.61	103.44	
07214	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.030"	-	130.38	124.71	119.04	113.37	
07118	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.060"	-	130.38	124.71	119.04	113.37	
NEW 07119	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.090"	-	130.38	124.71	119.04	113.37	
07120	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.120"	-	130.38	124.71	119.04	113.37	
07121	.6250	5/8"	15.875	5/8"	4"	3/4"	-	2-3/8"	.590"	129.72	124.08	118.44	112.80
07122	.6250	5/8"	15.875	5/8"	4"	3/4"	.030"	2-3/8"	.590"	141.14	135.00	128.87	122.73
NEW 07123	.6250	5/8"	15.875	5/8"	4"	3/4"	.060"	2-3/8"	.590"	141.14	135.00	128.87	122.73
07124	.6250	5/8"	15.875	5/8"	4"	3/4"	.120"	2-3/8"	.590"	141.14	135.00	128.87	122.73
07125	.6250	5/8"	15.875	5/8"	4"	3/4"	.190"	2-3/8"	.590"	141.14	135.00	128.87	122.73

MATERIAL HARDNESS (Rc)

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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											
07126	.6299	16.000	16.0	100	24	-	50	15.40	131.93	126.19	120.46	114.72	
07127	.6299	16.000	16.0	100	24	0.50	50	15.40	144.00	137.74	131.48	125.22	
07128	.6299	16.000	16.0	100	24	1.00	50	15.40	144.00	137.74	131.48	125.22	
NEW 07129	.6299	16.000	16.0	100	24	1.50	50	15.40	144.00	137.74	131.48	125.22	
NEW 07130	.6299	16.000	16.0	100	24	3.00	50	15.40	144.00	137.74	131.48	125.22	
NEW 07131	.6299	16.000	16.0	100	24	6.00	50	15.40	144.00	137.74	131.48	125.22	
07132	.6299	16.000	16.0	100	32	-	50	15.40	131.93	126.19	120.46	114.72	
07133	.6299	16.000	16.0	100	32	0.50	50	15.40	144.00	137.74	131.48	125.22	
07134	.6299	16.000	16.0	100	32	1.00	50	15.40	144.00	137.74	131.48	125.22	
07135	.6299	16.000	16.0	100	32	1.50	50	15.40	144.00	137.74	131.48	125.22	
07136	.6299	16.000	16.0	100	32	3.00	50	15.40	144.00	137.74	131.48	125.22	
NEW 07137	.6299	16.000	16.0	100	32	6.00	50	15.40	144.00	137.74	131.48	125.22	
07138	.7500	3/4"	19.050	3/4"	4"	1-3/4"	-	-	153.73	147.05	140.36	133.68	
07139	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.015"	-	171.15	163.71	156.27	148.83	
NEW 07140	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.030"	-	171.15	163.71	156.27	148.83	
07141	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.060"	-	171.15	163.71	156.27	148.83	
07142	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.078"	-	171.15	163.71	156.27	148.83	
NEW 07143	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.094"	-	171.15	163.71	156.27	148.83	
07144	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.120"	-	171.15	163.71	156.27	148.83	
07145	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.156"	-	171.15	163.71	156.27	148.83	
07146	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.190"	-	171.15	163.71	156.27	148.83	
07147	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.250"	-	171.15	163.71	156.27	148.83	
07148	.7500	3/4"	19.050	3/4"	4"	1-3/4"	BALL	-	171.15	163.71	156.27	148.83	
07149	.7500	3/4"	19.050	3/4"	4"	1"	-	2"	.715"	159.11	152.20	145.28	138.36
07150	.7500	3/4"	19.050	3/4"	4"	1"	.030"	2"	.715"	176.54	168.86	161.19	153.51
07151	.7500	3/4"	19.050	3/4"	4"	1"	.060"	2"	.715"	176.54	168.86	161.19	153.51
07152	.7500	3/4"	19.050	3/4"	4"	1"	.090"	2"	.715"	176.54	168.86	161.19	153.51
07153	.7500	3/4"	19.050	3/4"	4"	1"	.120"	2"	.715"	176.54	168.86	161.19	153.51
07154	.7500	3/4"	19.050	3/4"	4"	1"	.125"	2"	.715"	176.54	168.86	161.19	153.51
NEW 07155	.7500	3/4"	19.050	3/4"	4"	1"	.160"	2"	.715"	176.54	168.86	161.19	153.51
NEW 07156	.7500	3/4"	19.050	3/4"	4"	1"	.190"	2"	.715"	176.54	168.86	161.19	153.51
NEW 07157	.7500	3/4"	19.050	3/4"	5"	2-1/4"	-	-	204.76	195.86	186.95	178.05	
07158	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.030"	-	237.72	227.38	217.05	206.71	
07159	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.060"	-	237.72	227.38	217.05	206.71	
07160	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.120"	-	237.72	227.38	217.05	206.71	
07161	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.125"	-	237.72	227.38	217.05	206.71	
07162	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.190"	-	237.72	227.38	217.05	206.71	
07163	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.250"	-	237.72	227.38	217.05	206.71	
NEW 07226	.7500	3/4"	19.050	3/4"	6"	3-1/4"	-	-	208.14	199.09	190.04	180.99	
07164	.7500	3/4"	19.050	3/4"	6"	1"	-	3-3/8"	.715"	221.43	211.81	202.18	192.55
07165	.7500	3/4"	19.050	3/4"	6"	1"	.030"	3-3/8"	.715"	257.04	245.86	234.69	223.51
07166	.7500	3/4"	19.050	3/4"	6"	1"	.060"	3-3/8"	.715"	257.04	245.86	234.69	223.51
07167	.7500	3/4"	19.050	3/4"	6"	1"	.090"	3-3/8"	.715"	257.04	245.86	234.69	223.51
07168	.7500	3/4"	19.050	3/4"	6"	1"	.125"	3-3/8"	.715"	257.04	245.86	234.69	223.51
07169	.7500	3/4"	19.050	3/4"	6"	1"	.250"	3-3/8"	.715"	257.04	245.86	234.69	223.51
07170	.7500	3/4"	19.050	3/4"	6"	1"	BALL	3-3/8"	.715"	257.04	245.86	234.69	223.51

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MATERIAL HARDNESS (RC)

35

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continued →

Series A3 (continued)

.7874" - 1.000"
(20.000mm - 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											
07171	.7874	20.000	20.0	100	30	-	50	19.4	211.11	201.93	192.75	183.57	
07172	.7874	20.000	20.0	100	30	0.50	50	19.4	246.50	235.79	225.07	214.35	
07173	.7874	20.000	20.0	100	30	1.00	50	19.4	246.50	235.79	225.07	214.35	
07174	.7874	20.000	20.0	100	30	1.50	50	19.4	246.50	235.79	225.07	214.35	
07175	.7874	20.000	20.0	100	30	3.00	50	19.4	246.50	235.79	225.07	214.35	
07176	.7874	20.000	20.0	100	30	4.00	50	19.4	246.50	235.79	225.07	214.35	
07177	.7874	20.000	20.0	100	30	5.00	50	19.4	246.50	235.79	225.07	214.35	
07178	.7874	20.000	20.0	100	30	6.00	50	19.4	246.50	235.79	225.07	214.35	
07179	.7874	20.000	20.0	100	30	8.00	50	19.4	246.50	235.79	225.07	214.35	
07180	.7874	20.000	20.0	150	30	-	100	19.40	264.83	253.32	241.80	230.29	
07181	.7874	20.000	20.0	150	30	0.50	100	19.40	328.35	314.07	299.80	285.52	
07182	.7874	20.000	20.0	150	30	1.00	100	19.40	328.35	314.07	299.80	285.52	
NEW 07183	.7874	20.000	20.0	150	30	1.50	100	19.40	328.35	314.07	299.80	285.52	
NEW 07184	.7874	20.000	20.0	150	30	3.00	100	19.40	328.35	314.07	299.80	285.52	
NEW 07185	.7874	20.000	20.0	150	30	4.00	100	19.40	328.35	314.07	299.80	285.52	
07186	.7874	20.000	20.0	150	30	5.00	100	19.40	328.35	314.07	299.80	285.52	
NEW 07187	.7874	20.000	20.0	150	30	6.00	100	19.40	328.35	314.07	299.80	285.52	
NEW 07188	.7874	20.000	20.0	150	30	8.00	100	19.40	328.35	314.07	299.80	285.52	
07189	1.000	1"	25.400	1"	4"	1-1/4"	-	2"	.950"	235.57	225.32	215.08	204.84
NEW 07190	1.000	1"	25.400	1"	4"	1-1/4"	.060"	2"	.950"	301.55	288.44	275.33	262.22
07191	1.000	1"	25.400	1"	4-1/2"	1-1/4"	-	2-1/2"	.950"	267.19	255.57	243.96	232.34
07192	1.000	1"	25.400	1"	4-1/2"	1-1/4"	.030"	2-1/2"	.950"	340.45	325.64	310.84	296.04
07193	1.000	1"	25.400	1"	4-1/2"	1-1/4"	.060"	2-1/2"	.950"	340.45	325.64	310.84	296.04
07194	1.000	1"	25.400	1"	4-1/2"	1-1/4"	.120"	2-1/2"	.950"	340.45	325.64	310.84	296.04
07195	1.000	1"	25.400	1"	4-1/2"	1-1/4"	.125"	2-1/2"	.950"	340.45	325.64	310.84	296.04
NEW 07196	1.000	1"	25.400	1"	5"	1"	-	2-5/8"	.950"	294.29	281.49	268.70	255.90
NEW 07197	1.000	1"	25.400	1"	5"	1"	.030"	2-5/8"	.950"	375.05	358.74	342.44	326.13
NEW 07198	1.000	1"	25.400	1"	5"	1"	.060"	2-5/8"	.950"	375.05	358.74	342.44	326.13
NEW 07199	1.000	1"	25.400	1"	5"	1"	.125"	2-5/8"	.950"	375.05	358.74	342.44	326.13
NEW 07200	1.000	1"	25.400	1"	5"	1"	.250"	2-5/8"	.950"	375.05	358.74	342.44	326.13
NEW 07201	1.000	1"	25.400	1"	5"	1"	BALL	2-5/8"	.950"	375.05	358.74	342.44	326.13
07202	1.000	1"	25.400	1"	5"	2-1/4"	-	-	-	283.52	271.19	258.87	246.54
07203	1.000	1"	25.400	1"	5"	2-1/4"	.030"	-	-	364.29	348.45	332.61	316.77
07204	1.000	1"	25.400	1"	5"	2-1/4"	.060"	-	-	364.29	348.45	332.61	316.77
NEW 07205	1.000	1"	25.400	1"	5"	2-1/4"	.120"	-	-	364.29	348.45	332.61	316.77
NEW 07206	1.000	1"	25.400	1"	5"	2-1/4"	.250"	-	-	364.29	348.45	332.61	316.77
NEW 07207	1.000	1"	25.400	1"	6"	3-1/4"	-	-	-	352.59	337.26	321.93	306.60
NEW 07208	1.000	1"	25.400	1"	6"	3-1/4"	.030"	-	-	413.16	395.20	377.23	359.27
NEW 07209	1.000	1"	25.400	1"	6"	3-1/4"	.060"	-	-	413.16	395.20	377.23	359.27
NEW 07210	1.000	1"	25.400	1"	6"	3-1/4"	.120"	-	-	413.16	395.20	377.23	359.27
07211	1.000	1"	25.400	1"	6"	3-1/4"	.250"	-	-	413.16	395.20	377.23	359.27

MATERIAL HARDNESS (Rc)

70

35

TOLERANCES

$d1$	+0.000" -0.001" (+0.000 -0.025mm)
$d2$	h6

HIGH EFFICIENCY MILLING

Series 142M

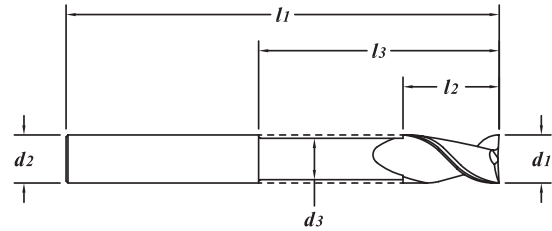


Recommended for aluminum

HSAL End Mill - Square End

ALUMASTAR Coating

- Solid submicron grain carbide end mill - center cutting
- Engineered for High Efficiency Milling
- 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	-	-	26.97	25.80	24.62	23.45
41232	.1575	4.000	6.0	65	6	20	3.7	33.76	32.30	30.83	29.36
41282	.1875	3/16"	4.763	3/16"	2"	9/16"	-	20.33	19.45	18.56	17.68
41342	.1969	5.000	6.0	65	16	-	-	27.83	26.62	25.41	24.20
41352	.1969	5.000	6.0	75	8	20	4.7	47.32	45.27	43.21	41.15
41402	.2362	6.000	6.0	65	19	-	-	26.94	25.77	24.60	23.43
41412	.2362	6.000	6.0	75	10	25	5.7	45.80	43.81	41.82	39.83
41462	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	-	25.60	24.49	23.37	22.26
41542	.2756	7.000	8.0	65	19	-	-	41.32	39.52	37.73	35.93
41602	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	-	35.56	34.01	32.47	30.92
41662	.3150	8.000	8.0	65	19	-	-	37.43	35.81	34.18	32.55
41672	.3150	8.000	8.0	75	12	25	7.4	56.49	54.03	51.58	49.12
41722	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	-	41.77	39.95	38.14	36.32
41802	.3937	10.000	10.0	70	24	-	-	62.85	60.12	57.38	54.65
41812	.3937	10.000	10.0	75	12	30	9.4	69.60	66.57	63.55	60.52
41822	.3937	10.000	10.0	100	12	35	9.4	83.79	80.15	76.50	72.86
41882	.4724	12.000	12.0	75	32	-	-	70.30	67.24	64.19	61.13
41892	.4724	12.000	12.0	75	16	30	11.4	75.67	72.38	69.09	65.80
41902	.4724	12.000	12.0	100	16	35	11.4	103.24	98.75	94.26	89.77
41912	.4724	12.000	12.0	100	16	40	11.4	103.24	98.75	94.26	89.77
41942	.5000	1/2"	12.700	1/2"	3"	1-1/4"	-	66.79	63.89	60.98	58.08
42022	.6250	5/8"	15.875	5/8"	4"	1-5/8"	-	133.12	127.34	121.55	115.76
42072	.6299	16.000	16.0	75	16	30	15.4	131.86	126.13	120.39	114.66
42082	.6299	16.000	16.0	100	40	-	-	140.12	134.02	127.93	121.84
42092	.6299	16.000	16.0	100	20	40	15.4	145.48	139.15	132.83	126.50
42102	.6299	16.000	16.0	125	20	60	15.4	185.90	177.82	169.73	161.65
42142	.7500	3/4"	19.050	3/4"	4"	1-5/8"	-	170.34	162.93	155.53	148.12
42212	.7874	20.000	20.0	100	32	-	-	228.69	218.75	208.80	198.86
42222	.7874	20.000	20.0	100	20	40	19	234.05	223.87	213.70	203.52
42232	.7874	20.000	20.0	125	20	60	19	271.02	259.24	247.45	235.67
42302	1.000	1"	25.400	1"	4"	1-5/8"	-	256.00	244.87	233.74	222.61

HIGH PERFORMANCE
END MILLS

MATERIAL HARDNESS (Rc)



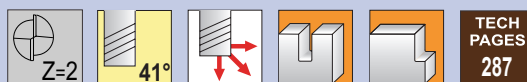
Series 142R

HIGH EFFICIENCY MILLING

TOLERANCES

$d1$	+0.00" - .001" (+0.00 - .025mm)
$d2$	h6
r	+0.0005" - .0005" (+.0127 - .0127mm)

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



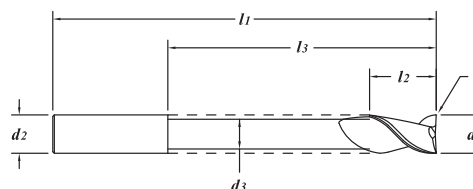
Recommended for aluminum



HSAL End Mill - Corner Radius

ALUMASTAR Coating

- Solid submicron grain carbide end mill - center cutting
- Engineered for High Efficiency Milling
- 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



MATERIAL HARDNESS (RC) 70
35
0

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										
39222	.1575	4.000	6.0	50	12	0.30	-	-	31.57	30.20	28.82	27.45
39232	.1575	4.000	6.0	65	6	0.50	20	3.7	38.59	36.92	35.24	33.56
39242	.1575	4.000	6.0	65	6	1.00	20	3.7	38.59	36.92	35.24	33.56
39282	.1875	3/16"	4.763	3/16"	2"	9/16"	.010"	-	23.40	22.39	21.37	20.35
39342	.1969	5.000	6.0	65	16	0.30	-	-	32.57	31.15	29.74	28.32
39352	.1969	5.000	6.0	75	8	0.50	20	4.7	53.21	50.90	48.58	46.27
39362	.1969	5.000	6.0	75	8	1.00	20	4.7	53.21	50.90	48.58	46.27
39402	.2362	6.000	6.0	65	19	0.30	-	-	31.52	30.15	28.78	27.41
39412	.2362	6.000	6.0	75	10	0.50	25	5.7	51.50	49.26	47.02	44.78
39422	.2362	6.000	6.0	75	10	1.00	25	5.7	51.50	49.26	47.02	44.78
39432	.2362	6.000	6.0	75	10	1.50	25	5.7	51.50	49.26	47.02	44.78
39442	.2362	6.000	6.0	75	10	2.00	25	5.7	51.50	49.26	47.02	44.78
39462	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	-	29.95	28.64	27.34	26.04
39602	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	.015"	-	39.64	37.92	36.19	34.47
39662	.3150	8.000	8.0	65	19	0.50	-	-	41.70	39.89	38.07	36.26
39672	.3150	8.000	8.0	75	12	0.50	25	7.4	63.55	60.79	58.02	55.26
39682	.3150	8.000	8.0	75	12	1.00	25	7.4	63.55	60.79	58.02	55.26
39692	.3150	8.000	8.0	75	12	2.00	25	7.4	63.55	60.79	58.02	55.26
39702	.3150	8.000	8.0	75	12	3.00	25	7.4	63.55	60.79	58.02	55.26
39722	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	-	46.18	44.18	42.17	40.16
39802	.3937	10.000	10.0	70	24	0.50	-	-	70.84	67.76	64.68	61.60
39812	.3937	10.000	10.0	100	12	1.00	35	9.4	95.22	91.08	86.94	82.80
39822	.3937	10.000	10.0	100	12	1.50	35	9.4	95.22	91.08	86.94	82.80
39832	.3937	10.000	10.0	100	12	2.00	35	9.4	95.22	91.08	86.94	82.80
39842	.3937	10.000	10.0	100	12	3.00	35	9.4	95.22	91.08	86.94	82.80
39882	.4724	12.000	12.0	75	32	0.50	-	-	87.62	83.81	80.00	76.19
39892	.4724	12.000	12.0	100	16	0.50	40	11.4	112.62	107.72	102.83	97.93
39902	.4724	12.000	12.0	100	16	1.00	40	11.4	112.62	107.72	102.83	97.93
39912	.4724	12.000	12.0	100	16	1.50	40	11.4	112.62	107.72	102.83	97.93
39922	.4724	12.000	12.0	100	16	2.00	40	11.4	112.62	107.72	102.83	97.93
39932	.4724	12.000	12.0	100	16	3.00	40	11.4	112.62	107.72	102.83	97.93

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										
39942	.5000	1/2"	12.700	3"	1-1/4"	.030"	-	-	83.24	79.62	76.00	72.38
40022	.6250	5/8"	15.875	4"	1-5/8"	.030"	-	-	143.99	137.73	131.47	125.21
40082	.6299		16.000	100	40	1.00	-	-	151.58	144.99	138.40	131.81
40092	.6299		16.000	125	20	1.00	60	15.4	205.98	197.02	188.07	179.11
40102	.6299		16.000	125	20	2.00	60	15.4	205.98	197.02	188.07	179.11
40142	.7500	3/4"	19.050	4"	1-5/8"	.030"	-	-	186.88	178.75	170.63	162.50
40182	.7874		20.000	100	40	1.00	-	-	262.32	250.91	239.51	228.10
40192	.7874		20.000	150	20	1.00	65	19.0	359.21	343.60	327.98	312.36
40202	.7874		20.000	150	20	2.00	65	19.0	359.21	343.60	327.98	312.36
40212	.7874		20.000	150	20	3.00	65	19.0	359.21	343.60	327.98	312.36

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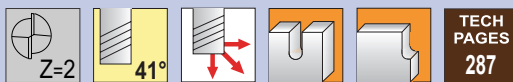
MATERIAL HARDNESS (Rc)

35

0



$d1$	+0.000" -0.011" (+0.000 -0.25mm)
$d2$	h6
ball radius	+0.0000" -0.0005" (+0.0000 -0.127mm)

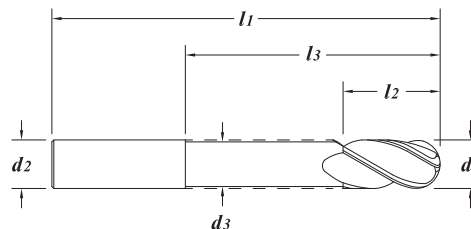


Recommended for aluminum

HSAL End Mill - Ball End

ALUMASTAR Coating

- Solid submicron grain carbide end mill - center cutting
- Engineered for High Efficiency Milling
- 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
- Honed edge on radius for improved finish
- Flats can be added within 48 hours



MATERIAL HARDNESS (Rc)

70

35

0

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										
42522	.1575	4.000	6.0	50	12	-	-	31.57	30.20	28.82	27.45	
42582	.1875	3/16"	4.763	3/16"	2"	9/16"	-	23.40	22.39	21.37	20.35	
42642	.1969	5.000	6.0	65	16	-	-	32.57	31.15	29.74	28.32	
42702	.2362	6.000	6.0	65	19	-	-	31.52	30.15	28.78	27.41	
42762	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	-	29.95	28.64	27.34	26.04	
42764	.2500	1/4"	6.350	1/4"	4"	3/8"	1-1/8"	.235"	51.89	49.63	47.38	45.12
42842	.2756	7.000	8.0	65	19	-	-	45.84	43.85	41.85	39.86	
42902	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	-	39.64	37.92	36.19	34.47	
42962	.3150	8.000	8.0	65	19	-	-	41.70	39.89	38.07	36.26	
43022	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	-	46.18	44.18	42.17	40.16	
43023	.3750	3/8"	9.525	3/8"	4"	1/2"	1-1/8"	.355"	78.88	75.45	72.02	68.59
43102	.3937	10.000	10.0	70	24	-	-	70.84	67.76	64.68	61.60	
43182	.4724	12.000	12.0	75	32	-	-	87.62	83.81	80.00	76.19	
43242	.5000	1/2"	12.700	1/2"	3"	1-1/4"	-	83.24	79.62	76.00	72.38	
43243	.5000	1/2"	12.700	1/2"	4"	5/8"	2-1/4"	.475"	106.98	102.33	97.68	93.03
43322	.6250	5/8"	15.875	5/8"	4"	1-5/8"	-	143.99	137.73	131.47	125.21	
43382	.6299	16.000	16.0	100	40	-	-	151.58	144.99	138.40	131.81	
43442	.7500	3/4"	19.050	3/4"	4"	1-5/8"	-	186.88	178.75	170.63	162.50	
43444	.7500	3/4"	19.050	3/4"	5"	1"	3-1/16"	.715"	256.35	245.20	234.06	222.91
43482	.7874	20.000	20.0	100	32	-	-	262.32	250.91	239.51	228.10	
43542	.9843	25.000	25.0	100	38	-	-	303.53	290.33	277.14	263.94	
43602	1.000	1"	25.400	1"	4"	1-5/8"	-	318.70	304.84	290.99	277.13	

TOLERANCES	
$d1$	$+0.000" - .001" (+.000 - .025mm)$
$d2$	$h6$

HIGH EFFICIENCY MILLING

Series 143M

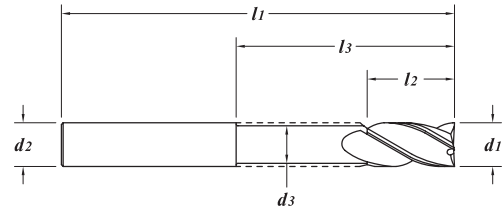


.1181" - .3150"
(3.000mm - 8.000mm)

Recommended for aluminum

HSAL End Mill - Square End ALUMASTAR Coating

- Solid submicron grain carbide end mill - center cutting
- Engineered for High Efficiency Milling
- 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 5,000-20,000 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	$l3$ Reach Length	$d3$ Neck Diameter	1-11	12-24	25-49	50-100	
	Decimal	Metric										
41173	.1181	3.000	3.0	38	6	-	-	20.29	19.40	18.52	17.64	
41183	.1181	3.000	3.0	38	12	-	-	20.29	19.40	18.52	17.64	
41193	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	-	19.76	18.90	18.04	17.18	
41203	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	-	19.76	18.90	18.04	17.18	
41213	.1575	4.000	6.0	50	8	-	-	26.97	25.80	24.62	23.45	
41223	.1575	4.000	6.0	50	12	-	-	26.97	25.80	24.62	23.45	
41243	.1575	4.000	6.0	65	6	20	3.7	33.76	32.30	30.83	29.36	
41273	.1875	3/16"	4.763	3/16"	2"	5/16"	-	20.33	19.45	18.56	17.68	
41283	.1875	3/16"	4.763	3/16"	2"	9/16"	-	20.33	19.45	18.56	17.68	
41303	.1875	3/16"	4.763	3/16"	3"	7/32"	3/4"	.170"	38.17	36.51	34.85	33.19
41313	.1875	3/16"	4.763	3/16"	3"	1"	-	-	32.81	31.38	29.96	28.53
41343	.1969	5.000	6.0	65	16	-	-	27.83	26.62	25.41	24.20	
41363	.1969	5.000	6.0	75	8	20	4.7	47.32	45.27	43.21	41.15	
41403	.2362	6.000	6.0	65	19	-	-	26.94	25.77	24.60	23.43	
41423	.2362	6.000	6.0	75	10	25	5.7	45.80	43.81	41.82	39.83	
39735	.2500	1/4"	6.350	1/4"	2"	3/8"	-	-	24.29	23.23	22.18	21.12
39737	.2500	1/4"	6.350	1/4"	2"	1/2"	-	-	24.29	23.23	22.18	21.12
41453	.2500	1/4"	6.350	1/4"	2-1/2"	3/8"	-	-	25.60	24.49	23.37	22.26
41463	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	-	-	25.60	24.49	23.37	22.26
41473	.2500	1/4"	6.350	1/4"	3"	1"	-	-	38.81	37.13	35.44	33.75
41475	.2500	1/4"	6.350	1/4"	3"	1-1/4"	-	-	38.81	37.13	35.44	33.75
41493	.2500	1/4"	6.350	1/4"	4"	3/8"	1-1/8"	.235"	46.28	44.26	42.25	40.24
41503	.2500	1/4"	6.350	1/4"	4"	3/8"	2-1/8"	.235"	51.65	49.40	47.16	44.91
41511	.2500	1/4"	6.350	1/4"	4"	1-1/2"	-	-	40.92	39.14	37.36	35.58
41513	.2500	1/4"	6.350	1/4"	4"	1-5/8"	-	-	40.92	39.14	37.36	35.58
41543	.2756	7.000	8.0	65	19	-	-	41.32	39.52	37.73	35.93	
41563	.2756	7.000	8.0	75	12	25	6.4	62.08	59.38	56.68	53.98	
41593	.3125	5/16"	7.938	5/16"	2-1/2"	7/16"	-	-	35.56	34.01	32.47	30.92
41603	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	-	-	35.56	34.01	32.47	30.92
41623	.3125	5/16"	7.938	5/16"	4"	7/16"	1-1/8"	.297"	60.72	58.08	55.44	52.80
39739	.3150	8.000	8.0	50	12	-	-	33.60	32.14	30.68	29.22	
41663	.3150	8.000	8.0	65	19	-	-	37.43	35.81	34.18	32.55	
41683	.3150	8.000	8.0	75	12	25	7.4	56.49	54.03	51.58	49.12	
41685	.3150	8.000	8.0	75	26	-	-	50.95	48.73	46.52	44.30	
41687	.3150	8.000	8.0	75	30	-	-	50.95	48.73	46.52	44.30	
41693	.3150	8.000	8.0	100	12	55	7.4	69.26	66.25	63.24	60.23	

HIGH PERFORMANCE
END MILLS

MATERIAL HARDNESS (Rc)

70
35
0

continued →

Series 143M (continued)

.3750" - .6299"
(9.525mm - 16.000mm)

MATERIAL HARDNESS (Rc)

70
35
0

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										
39741	.3750	3/8"	9.525	3/8"	2"	1/2"	-	-	37.41	35.78	34.16	32.53
41713	.3750	3/8"	9.525	3/8"	2-1/2"	1/2"	-	-	41.77	39.95	38.14	36.32
39743	.3750	3/8"	9.525	3/8"	2-1/2"	3/4"	-	-	41.77	39.95	38.14	36.32
41723	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	-	-	41.77	39.95	38.14	36.32
41733	.3750	3/8"	9.525	3/8"	3"	1"	-	-	53.84	51.50	49.16	46.82
41735	.3750	3/8"	9.525	3/8"	3"	1-1/4"	-	-	53.84	51.50	49.16	46.82
41737	.3750	3/8"	9.525	3/8"	3-1/2"	1-1/2"	-	-	57.78	55.26	52.75	50.24
41763	.3750	3/8"	9.525	3/8"	4"	1/2"	2-1/8"	.355"	70.59	67.52	64.45	61.38
41773	.3750	3/8"	9.525	3/8"	4"	1-5/8"	-	-	59.86	57.26	54.65	52.05
42363	.3750	3/8"	9.525	3/8"	4"	2"	-	-	59.86	57.26	54.65	52.05
41783	.3750	3/8"	9.525	3/8"	6"	1/2"	4"	.355"	106.95	102.30	97.65	93.00
39745	.3937		10.000	10.0	50	14	-	-	57.75	55.24	52.73	50.22
41803	.3937		10.000	10.0	70	24	-	-	62.85	60.12	57.38	54.65
41805	.3937		10.000	10.0	75	30	-	-	66.18	63.31	60.43	57.55
41843	.3937		10.000	10.0	100	12	35	9.4	83.79	80.15	76.50	72.86
41853	.3937		10.000	10.0	100	12	55	9.4	89.15	85.27	81.40	77.52
41863	.3937		10.000	10.0	150	12	110	9.4	124.92	119.49	114.06	108.63
39747	.4724		12.000	12.0	65	16	-	-	65.94	63.07	60.21	57.34
39749	.4724		12.000	12.0	75	26	-	-	70.30	67.24	64.19	61.13
41883	.4724		12.000	12.0	75	32	-	-	70.30	67.24	64.19	61.13
41893	.4724		12.000	12.0	100	50	-	-	91.92	87.92	83.93	79.93
41903	.4724		12.000	12.0	100	16	40	11.4	103.24	98.75	94.26	89.77
41913	.4724		12.000	12.0	100	16	55	11.4	103.24	98.75	94.26	89.77
41923	.4724		12.000	12.0	150	16	110	11.4	157.81	150.95	144.09	137.23
39751	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	-	-	62.56	59.84	57.12	54.40
39753	.5000	1/2"	12.700	1/2"	2-1/2"	3/4"	-	-	62.56	59.84	57.12	54.40
41933	.5000	1/2"	12.700	1/2"	3"	5/8"	-	-	66.79	63.89	60.98	58.08
39755	.5000	1/2"	12.700	1/2"	3"	1"	-	-	66.79	63.89	60.98	58.08
41943	.5000	1/2"	12.700	1/2"	3"	1-1/4"	-	-	66.79	63.89	60.98	58.08
41945	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	-	-	85.26	81.55	77.85	74.14
41963	.5000	1/2"	12.700	1/2"	4"	1-5/8"	-	-	87.33	83.53	79.74	75.94
41965	.5000	1/2"	12.700	1/2"	4"	1-3/4"	-	-	87.33	83.53	79.74	75.94
41973	.5000	1/2"	12.700	1/2"	4"	2"	-	-	87.33	83.53	79.74	75.94
41983	.5000	1/2"	12.700	1/2"	4"	5/8"	2-1/8"	.475"	98.06	93.80	89.53	85.27
41993	.5000	1/2"	12.700	1/2"	6"	5/8"	4-1/8"	.475"	149.93	143.41	136.89	130.37
42003	.5000	1/2"	12.700	1/2"	6"	3-1/8"	-	-	128.48	122.89	117.31	111.72
39757	.6250	5/8"	15.875	5/8"	3"	3/4"	-	-	123.76	118.38	113.00	107.62
42013	.6250	5/8"	15.875	5/8"	3-1/2"	3/4"	-	-	127.33	121.79	116.26	110.72
39759	.6250	5/8"	15.875	5/8"	3-1/2"	1"	-	-	127.33	121.79	116.26	110.72
42016	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	-	-	127.33	121.79	116.26	110.72
42021	.6250	5/8"	15.875	5/8"	4"	1-1/2"	-	-	133.12	127.34	121.55	115.76
42023	.6250	5/8"	15.875	5/8"	4"	1-5/8"	-	-	133.12	127.34	121.55	115.76
42025	.6250	5/8"	15.875	5/8"	4"	1-3/4"	-	-	133.12	127.34	121.55	115.76
42373	.6250	5/8"	15.875	5/8"	4"	2-1/8"	-	-	133.12	127.34	121.55	115.76
42033	.6250	5/8"	15.875	5/8"	6"	3/4"	2-3/8"	.590"	185.81	177.73	169.65	161.57
42043	.6250	5/8"	15.875	5/8"	6"	3/4"	4-3/8"	.590"	196.54	187.99	179.45	170.90
42053	.6250	5/8"	15.875	5/8"	6"	3-1/4"	-	-	175.08	167.46	159.85	152.24
42083	.6299		16.000	16.0	100	40	-	-	140.12	134.02	127.93	121.84
42103	.6299		16.000	16.0	100	20	40	15.4	145.48	139.15	132.83	126.50
42113	.6299		16.000	16.0	125	20	60	15.4	185.90	177.82	169.73	161.65
42123	.6299		16.000	16.0	150	20	110	15.4	206.90	197.90	188.91	179.91

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										
42133	.7500	3/4"	19.050	3/4"	4"	1"	-	-	170.34	162.93	155.53	148.12
42136	.7500	3/4"	19.050	3/4"	4"	1-1/4"	-	-	170.34	162.93	155.53	148.12
42141	.7500	3/4"	19.050	3/4"	4"	1-1/2"	-	-	170.34	162.93	155.53	148.12
42143	.7500	3/4"	19.050	3/4"	4"	1-5/8"	-	-	170.34	162.93	155.53	148.12
42145	.7500	3/4"	19.050	3/4"	4"	1-3/4"	-	-	170.34	162.93	155.53	148.12
42153	.7500	3/4"	19.050	3/4"	5"	2-1/4"	-	-	224.92	215.14	205.36	195.58
42155	.7500	3/4"	19.050	3/4"	5"	2-1/2"	-	-	224.92	215.14	205.36	195.58
42163	.7500	3/4"	19.050	3/4"	6"	1"	2-1/2"	.715"	244.67	234.04	223.40	212.76
42173	.7500	3/4"	19.050	3/4"	6"	1"	4-3/8"	.715"	252.25	241.29	230.32	219.35
42193	.7500	3/4"	19.050	3/4"	6"	3-1/4"	-	-	237.16	226.85	216.54	206.23
42203	.7874		20.000	20.0	100	25	-	-	228.69	218.75	208.80	198.86
42213	.7874		20.000	20.0	100	32	-	-	228.69	218.75	208.80	198.86
42223	.7874		20.000	20.0	100	20	40	19.0	234.05	223.87	213.70	203.52
42226	.7874		20.000	20.0	125	20	60	19.0	271.02	259.24	247.45	235.67
42233	.7874		20.000	20.0	150	20	85	19.0	314.05	300.40	286.74	273.09
42236	.7874		20.000	20.0	150	20	110	19.0	319.44	305.55	291.66	277.77
42243	.9843		25.000	25.0	100	38	-	-	263.88	252.41	240.93	229.46
42283	.9843		25.000	25.0	100	25	50	24.0	269.22	257.51	245.81	234.10
42286	.9843		25.000	25.0	125	25	65	24.0	336.50	321.87	307.24	292.61
42291	.9843		25.000	25.0	150	25	90	24.0	422.12	403.77	385.41	367.06
42293	1.000	1"	25.400	1"	4"	1"	-	-	256.00	244.87	233.74	222.61
42303	1.000	1"	25.400	1"	4"	1-5/8"	-	-	256.00	244.87	233.74	222.61
42313	1.000	1"	25.400	1"	5"	2"	-	-	316.02	302.28	288.54	274.80
42343	1.000	1"	25.400	1"	6"	1-1/4"	3-3/8"	.960"	409.45	391.64	373.84	356.04
42353	1.000	1"	25.400	1"	6"	3-1/4"	-	-	393.38	376.28	359.17	342.07

70

MATERIAL HARDNESS (Rc)

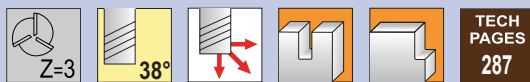
35

0



TOLERANCES	
$d1$	+0.000" -0.001" (+0.000 -0.025mm)
$d2$	h6
r	+0.0005" -0.0005" (+0.0127 -0.0127mm)

.1181" - .2362"
(3.000mm - 6.000mm)

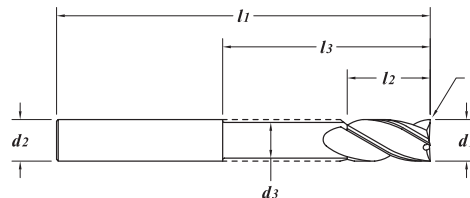


Recommended for aluminum

HSAL End Mill - Corner Radius

ALUMASTAR Coating

- Solid submicron grain carbide end mill - center cutting
- Engineered for High Efficiency Milling
- 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 5,000-20,000 RPM spindles)
- Need to use properly balanced holders
- Holds perpendicularity
- Flats can be added within 48 hours



MATERIAL HARDNESS (Rc) 70
35
0

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											
39113	.1181	3.000	3.0	38	6	0.20	-	-	23.38	22.36	21.35	20.33	
39123	.1181	3.000	3.0	38	6	0.50	-	-	23.38	22.36	21.35	20.33	
39133	.1181	3.000	3.0	38	12	0.20	-	-	23.38	22.36	21.35	20.33	
39143	.1181	3.000	3.0	38	12	0.50	-	-	23.38	22.36	21.35	20.33	
39153	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.010"	-	-	22.69	21.70	20.72	19.73
39163	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.020"	-	-	22.69	21.70	20.72	19.73
39173	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.010"	-	-	22.69	21.70	20.72	19.73
39183	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.020"	-	-	22.69	21.70	20.72	19.73
39193	.1575		4.000	6.0	50	8	0.20	-	-	31.57	30.20	28.82	27.45
39203	.1575		4.000	6.0	50	8	0.50	-	-	31.57	30.20	28.82	27.45
39213	.1575		4.000	6.0	50	12	0.20	-	-	31.57	30.20	28.82	27.45
39223	.1575		4.000	6.0	50	12	0.30	-	-	31.57	30.20	28.82	27.45
39225	.1575		4.000	6.0	50	12	0.50	-	-	31.57	30.20	28.82	27.45
39243	.1575		4.000	6.0	65	6	0.30	20	3.7	38.59	36.92	35.24	33.56
39253	.1575		4.000	6.0	65	6	0.50	20	3.7	38.59	36.92	35.24	33.56
39263	.1575		4.000	6.0	65	6	1.00	20	3.7	38.59	36.92	35.24	33.56
39265	.1875	3/16"	4.763	3/16"	2"	5/16"	.010"	-	-	23.40	22.39	21.37	20.35
39275	.1875	3/16"	4.763	3/16"	2"	5/16"	.020"	-	-	23.40	22.39	21.37	20.35
39280	.1875	3/16"	4.763	3/16"	2"	5/16"	.030"	-	-	23.40	22.39	21.37	20.35
39283	.1875	3/16"	4.763	3/16"	2"	9/16"	.010"	-	-	23.40	22.39	21.37	20.35
39285	.1875	3/16"	4.763	3/16"	2"	9/16"	.020"	-	-	23.40	22.39	21.37	20.35
39293	.1875	3/16"	4.763	3/16"	2"	9/16"	.030"	-	-	23.40	22.39	21.37	20.35
39303	.1875	3/16"	4.763	3/16"	3"	7/32"	.010"	3/4"	.170"	42.85	40.99	39.12	37.26
39313	.1875	3/16"	4.763	3/16"	3"	7/32"	.030"	3/4"	.170"	42.85	40.99	39.12	37.26
39343	.1969		5.000	6.0	65	16	0.30	-	-	32.57	31.15	29.74	28.32
39363	.1969		5.000	6.0	75	8	0.30	20	4.7	53.21	50.90	48.58	46.27
39373	.1969		5.000	6.0	75	8	0.50	20	4.7	53.21	50.90	48.58	46.27
39383	.1969		5.000	6.0	75	8	1.00	20	4.7	53.21	50.90	48.58	46.27
39403	.2362		6.000	6.0	65	19	0.30	-	-	31.52	30.15	28.78	27.41
39423	.2362		6.000	6.0	75	10	0.30	25	5.7	51.50	49.26	47.02	44.78
39433	.2362		6.000	6.0	75	10	0.50	25	5.7	51.50	49.26	47.02	44.78
39436	.2362		6.000	6.0	75	10	1.00	25	5.7	51.50	49.26	47.02	44.78
39439	.2362		6.000	6.0	75	10	1.50	25	5.7	51.50	49.26	47.02	44.78
39443	.2362		6.000	6.0	75	10	2.00	25	5.7	51.50	49.26	47.02	44.78

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											
39314	.2500	1/4"	6.350	1/4"	2"	1/2"	.010"	-	-	28.42	27.18	25.95	24.71
39316	.2500	1/4"	6.350	1/4"	2"	1/2"	.015"	-	-	28.42	27.18	25.95	24.71
39318	.2500	1/4"	6.350	1/4"	2"	1/2"	.020"	-	-	28.42	27.18	25.95	24.71
39453	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"	-	-	29.95	28.64	27.34	26.04
39463	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	-	-	29.95	28.64	27.34	26.04
39320	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"	-	-	29.95	28.64	27.34	26.04
39473	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	-	-	29.95	28.64	27.34	26.04
39483	.2500	1/4"	6.350	1/4"	3"	1-1/8"	.030"	-	-	45.41	43.44	41.46	39.49
39493	.2500	1/4"	6.350	1/4"	4"	3/8"	.015"	1-1/8"	.235"	51.89	49.63	47.38	45.12
40403	.2500	1/4"	6.350	1/4"	4"	3/8"	.030"	1-1/8"	.235"	51.89	49.63	47.38	45.12
39503	.2500	1/4"	6.350	1/4"	4"	3/8"	.015"	2-1/8"	.235"	57.22	54.74	52.25	49.76
39543	.2756		7.000	8.0	65	19	0.30	-	-	45.84	43.85	41.85	39.86
39563	.2756		7.000	8.0	75	12	0.30	25	6.4	69.84	66.80	63.77	60.73
39322	.3125	5/16"	7.938	5/16"	2"	1/2"	.010"	-	-	36.26	34.68	33.11	31.53
39324	.3125	5/16"	7.938	5/16"	2"	1/2"	.020"	-	-	36.26	34.68	33.11	31.53
39593	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	.010"	-	-	39.64	37.92	36.19	34.47
39603	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	.015"	-	-	39.64	37.92	36.19	34.47
39326	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	.020"	-	-	39.64	37.92	36.19	34.47
39613	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	.030"	-	-	39.64	37.92	36.19	34.47
39623	.3125	5/16"	7.938	5/16"	4"	7/16"	.015"	1-1/8"	.297"	68.21	65.24	62.28	59.31
39633	.3125	5/16"	7.938	5/16"	4"	7/16"	.030"	1-1/8"	.297"	68.21	65.24	62.28	59.31
39328	.3150		8.000	8.0	50	12	0.50	-	-	37.95	36.30	34.65	33.00
39663	.3150		8.000	8.0	65	19	0.50	-	-	41.70	39.89	38.07	36.26
39683	.3150		8.000	8.0	75	12	0.50	25	7.4	63.55	60.79	58.02	55.26
39688	.3150		8.000	8.0	75	12	1.00	25	7.4	63.55	60.79	58.02	55.26
39693	.3150		8.000	8.0	75	12	2.00	25	7.4	63.55	60.79	58.02	55.26
39698	.3150		8.000	8.0	75	12	3.00	25	7.4	63.55	60.79	58.02	55.26
39330	.3750	3/8"	9.525	3/8"	2"	1/2"	.010"	-	-	42.68	40.82	38.97	37.11
39332	.3750	3/8"	9.525	3/8"	2"	1/2"	.020"	-	-	42.68	40.82	38.97	37.11
39703	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.010"	-	-	46.18	44.18	42.17	40.16
39713	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.015"	-	-	46.18	44.18	42.17	40.16
39334	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.020"	-	-	46.18	44.18	42.17	40.16
39723	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	-	-	46.18	44.18	42.17	40.16
39733	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.060"	-	-	46.18	44.18	42.17	40.16
39734	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.120"	-	-	46.18	44.18	42.17	40.16
39738	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.030"	-	-	59.55	56.96	54.37	51.78
39763	.3750	3/8"	9.525	3/8"	4"	1/2"	.030"	2-1/8"	.355"	78.88	75.45	72.02	68.59
39773	.3750	3/8"	9.525	3/8"	4"	1/2"	.060"	2-1/8"	.355"	78.88	75.45	72.02	68.59
39783	.3750	3/8"	9.525	3/8"	6"	1/2"	.030"	4"	.355"	115.17	110.17	105.16	100.15
39336	.3937		10.000	10.0	50	14	0.50	-	-	64.17	61.38	58.59	55.80
39803	.3937		10.000	10.0	70	24	0.50	-	-	70.84	67.76	64.68	61.60
39843	.3937		10.000	10.0	100	12	0.50	35	9.4	95.22	91.08	86.94	82.80
39848	.3937		10.000	10.0	100	12	1.00	35	9.4	95.22	91.08	86.94	82.80
39853	.3937		10.000	10.0	100	12	1.50	35	9.4	95.22	91.08	86.94	82.80
39863	.3937		10.000	10.0	100	12	2.00	35	9.4	95.22	91.08	86.94	82.80
39873	.3937		10.000	10.0	100	12	3.00	35	9.4	95.22	91.08	86.94	82.80
39344	.4724		12.000	12.0	65	16	0.50	-	-	76.88	73.54	70.19	66.85
39883	.4724		12.000	12.0	75	32	0.50	-	-	87.62	83.81	80.00	76.19
39346	.4724		12.000	12.0	75	32	0.75	-	-	87.62	83.81	80.00	76.19
39348	.4724		12.000	12.0	75	32	1.00	-	-	87.62	83.81	80.00	76.19
39903	.4724		12.000	12.0	100	16	0.50	40	11.4	112.62	107.72	102.83	97.93
39907	.4724		12.000	12.0	100	16	1.00	40	11.4	112.62	107.72	102.83	97.93
39911	.4724		12.000	12.0	100	16	1.50	40	11.4	112.62	107.72	102.83	97.93
39915	.4724		12.000	12.0	100	16	2.00	40	11.4	112.62	107.72	102.83	97.93
39919	.4724		12.000	12.0	100	16	3.00	40	11.4	112.62	107.72	102.83	97.93

70

35

0

MATERIAL HARDNESS (RC)

continued →

Series 143R (continued)

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

MATERIAL HARDNESS (Rc)
70
35
0

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											
39353	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.010"	-	-	73.04	69.86	66.69	63.51
39355	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.020"	-	-	73.04	69.86	66.69	63.51
39923	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.010"	-	-	83.24	79.62	76.00	72.38
39933	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.015"	-	-	83.24	79.62	76.00	72.38
39356	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.020"	-	-	83.24	79.62	76.00	72.38
39943	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	-	83.24	79.62	76.00	72.38
39953	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"	-	-	83.24	79.62	76.00	72.38
39963	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.120"	-	-	83.24	79.62	76.00	72.38
39965	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.125"	-	-	83.24	79.62	76.00	72.38
39967	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.190"	-	-	83.24	79.62	76.00	72.38
39972	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.015"	-	-	96.26	92.07	87.89	83.70
39973	.5000	1/2"	12.700	1/2"	4"	2"	.010"	-	-	96.26	92.07	87.89	83.70
40413	.5000	1/2"	12.700	1/2"	4"	2"	.030"	-	-	96.26	92.07	87.89	83.70
40423	.5000	1/2"	12.700	1/2"	4"	2"	.060"	-	-	96.26	92.07	87.89	83.70
40433	.5000	1/2"	12.700	1/2"	4"	5/8"	.010"	2-1/8"	.475"	106.98	102.33	97.68	93.03
39983	.5000	1/2"	12.700	1/2"	4"	5/8"	.030"	2-1/8"	.475"	106.98	102.33	97.68	93.03
40443	.5000	1/2"	12.700	1/2"	4"	5/8"	.060"	2-1/8"	.475"	106.98	102.33	97.68	93.03
40453	.5000	1/2"	12.700	1/2"	4"	5/8"	.120"	2-1/8"	.475"	106.98	102.33	97.68	93.03
39993	.5000	1/2"	12.700	1/2"	6"	5/8"	.030"	4-1/8"	.475"	160.55	153.57	146.59	139.61
39366	.6250	5/8"	15.875	5/8"	3"	3/4"	.010"	-	-	134.31	128.47	122.63	116.79
39368	.6250	5/8"	15.875	5/8"	3"	3/4"	.020"	-	-	134.31	128.47	122.63	116.79
39369	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"	-	-	138.18	132.18	126.17	120.16
39370	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.020"	-	-	138.18	132.18	126.17	120.16
40463	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.015"	-	-	143.99	137.73	131.47	125.21
39372	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.020"	-	-	143.99	137.73	131.47	125.21
40023	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.030"	-	-	143.99	137.73	131.47	125.21
40473	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.060"	-	-	143.99	137.73	131.47	125.21
40483	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.120"	-	-	143.99	137.73	131.47	125.21
40485	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.190"	-	-	143.99	137.73	131.47	125.21
40033	.6250	5/8"	15.875	5/8"	6"	3/4"	.030"	2-3/8"	.590"	205.88	196.93	187.98	179.03
40043	.6250	5/8"	15.875	5/8"	6"	3/4"	.030"	4-3/8"	.590"	216.64	207.22	197.80	188.38
40083	.6299		16.000	16.0	100	40	1.00	-	-	151.58	144.99	138.40	131.81
40103	.6299		16.000	16.0	100	20	1.00	40	15.4	156.94	150.12	143.29	136.47
40113	.6299		16.000	16.0	125	20	2.00	60	15.4	205.98	197.02	188.07	179.11
40118	.6299		16.000	16.0	125	20	3.00	60	15.4	205.98	197.02	188.07	179.11
40123	.6299		16.000	16.0	125	20	4.00	60	15.4	205.98	197.02	188.07	179.11
39374	.7500	3/4"	19.050	3/4"	4"	1-1/4"	.020"	-	-	186.88	178.75	170.63	162.50
40133	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.015"	-	-	186.88	178.75	170.63	162.50
39376	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.020"	-	-	186.88	178.75	170.63	162.50
40143	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.030"	-	-	186.88	178.75	170.63	162.50
40153	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.060"	-	-	186.88	178.75	170.63	162.50
40493	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.120"	-	-	186.88	178.75	170.63	162.50
40495	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.190"	-	-	186.88	178.75	170.63	162.50
40497	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.250"	-	-	186.88	178.75	170.63	162.50
40503	.7500	3/4"	19.050	3/4"	6"	1"	.015"	2-1/2"	.715"	278.50	266.39	254.28	242.17
40163	.7500	3/4"	19.050	3/4"	6"	1"	.030"	2-1/2"	.715"	278.50	266.39	254.28	242.17
40513	.7500	3/4"	19.050	3/4"	6"	1"	.060"	2-1/2"	.715"	278.50	266.39	254.28	242.17
40523	.7500	3/4"	19.050	3/4"	6"	1"	.120"	2-1/2"	.715"	278.50	266.39	254.28	242.17
40171	.7500	3/4"	19.050	3/4"	6"	1"	.015"	4"	.715"	286.06	273.63	261.19	248.75
40173	.7500	3/4"	19.050	3/4"	6"	1"	.030"	4-3/8"	.715"	286.06	273.63	261.19	248.75
40183	.7874		20.000	20.0	100	32	1.00	-	-	262.32	250.91	239.51	228.10
40223	.7874		20.000	20.0	100	20	1.00	40	19.0	267.67	256.04	244.40	232.76
40225	.7874		20.000	20.0	150	20	1.00	65	19.0	359.21	343.60	327.98	312.36
40226	.7874		20.000	20.0	150	20	2.00	65	19.0	359.21	343.60	327.98	312.36
40229	.7874		20.000	20.0	150	20	3.00	65	19.0	359.21	343.60	327.98	312.36
40231	.7874		20.000	20.0	150	20	4.00	65	19.0	359.21	343.60	327.98	312.36
40243	.9843		25.000	25.0	100	38	1.00	-	-	303.53	290.33	277.14	263.94
40293	1.000	1"	25.400	1"	4"	1-5/8"	.030"	-	-	318.70	304.84	290.99	277.13
40303	1.000	1"	25.400	1"	4"	1-5/8"	.060"	-	-	318.70	304.84	290.99	277.13
40313	1.000	1"	25.400	1"	4"	1-5/8"	.120"	-	-	318.70	304.84	290.99	277.13
40343	1.000	1"	25.400	1"	6"	1-1/4"	.030"	3-3/8"	.960"	467.05	446.74	426.44	406.13
40353	1.000	1"	25.400	1"	6"	1-1/4"	.060"	3-3/8"	.960"	467.05	446.74	426.44	406.13
40363	1.000	1"	25.400	1"	6"	1-1/4"	.120"	3-3/8"	.960"	467.05	446.74	426.44	406.13
NEW 40366	1.000	1"	25.400	1"	6"	1-1/4"	.030"	4"	.960"	467.05	446.74	426.44	406.13

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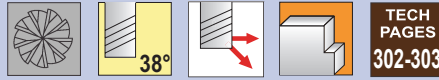


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d1	+0.000" -0.002" (+0.000mm -0.050mm)
d2	h6

.2362" - .5000"
(6.000mm - 12.700mm)

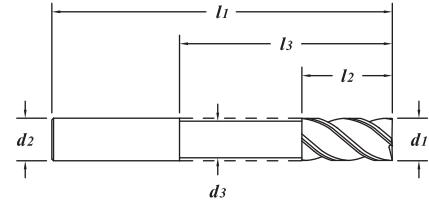


Recommended for titanium and steels under 40Rc

Multi-Flute End Mill - Square End

AlCrN Coating

- Solid submicron grain carbide end mill - non-center cutting
- Multiple flutes for increased feed rates
- Odd number of flutes to naturally break up harmonics
- Engineered for High Efficiency Milling
- Up to 8% Radial (ap) engagement
- Can be used to finish most steels under 40Rc, as well as aluminum
- Conventional grind for better finish cutting and less push off when finishing
- Regrindable



MATERIAL HARDNESS (Rc) 70 35 0

EDP#	d1 † Diameter		d2 Shank Diameter	l1 Overall Length	l2 Flute Length	l3 Reach Length	d3 Neck Diameter	Number Flutes	1-11	12-24	25-49	50-100
	Decimal	Metric										
98390	.2362	6.000	6.0	50	12	-	-	7	25.67	24.55	23.44	22.32
98392	.2362	6.000	6.0	65	19	-	-	7	28.93	27.68	26.42	25.16
98394	.2362	6.000	6.0	100	38	-	-	7	48.21	46.11	44.02	41.92
98396	.2362	6.000	6.0	100	10	60	5.4	7	51.78	49.53	47.28	45.03
98398	.2500	1/4"	6.350	1/4"	2"	3/8"	-	7	24.62	23.55	22.48	21.41
98400	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	-	7	27.92	26.71	25.49	24.28
98402	.2500	1/4"	6.350	1/4"	4"	1-1/2"	-	7	46.25	44.24	42.23	40.22
98404	.3125	5/16"	7.938	5/16"	2"	7/16"	-	7	36.56	34.97	33.38	31.79
98406	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	-	7	39.84	38.10	36.37	34.64
98408	.3125	5/16"	7.938	5/16"	4"	1-1/2"	-	7	63.11	60.37	57.62	54.88
98410	.3150	8.000	8.0	50	12	-	-	7	37.05	35.44	33.83	32.22
98412	.3150	8.000	8.0	65	22	-	-	7	41.27	39.48	37.68	35.89
98414	.3150	8.000	8.0	100	38	-	-	7	65.71	62.85	60.00	57.14
98416	.3150	8.000	8.0	100	12	60	7.4	7	69.29	66.28	63.26	60.25
98418	.3750	3/8"	9.525	3/8"	2"	1/2"	-	7	43.99	42.08	40.16	38.25
98420	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	-	7	47.00	44.96	42.91	40.87
98422	.3750	3/8"	9.525	3/8"	3"	1-1/4"	-	7	60.51	57.88	55.25	52.62
98424	.3750	3/8"	9.525	3/8"	4"	2"	-	7	67.83	64.88	61.93	58.98
98426	.3937	10.000	10.0	50	16	-	-	7	51.23	49.01	46.78	44.55
98428	.3937	10.000	10.0	70	22	-	-	7	56.37	53.92	51.47	49.02
98430	.3937	10.000	10.0	100	38	-	-	7	85.46	81.74	78.03	74.31
98432	.3937	10.000	10.0	100	50	-	-	7	85.46	81.74	78.03	74.31
98434	.3937	10.000	10.0	100	16	60	9.4	7	89.04	85.17	81.30	77.43
98436	.4724	12.000	12.0	75	26	-	-	9	73.22	70.04	66.85	63.67
98438	.4724	12.000	12.0	75	32	-	-	9	73.22	70.04	66.85	63.67
98440	.4724	12.000	12.0	100	42	-	-	9	100.48	96.11	91.74	87.37
98442	.4724	12.000	12.0	100	52	-	-	9	100.48	96.11	91.74	87.37
98444	.4724	12.000	12.0	150	19	105	11.4	9	141.65	135.49	129.33	123.17
98446	.5000	1/2"	12.700	1/2"	3"	1"	-	9	70.30	67.24	64.19	61.13
98448	.5000	1/2"	12.700	1/2"	3"	1-1/4"	-	9	70.30	67.24	64.19	61.13
98450	.5000	1/2"	12.700	1/2"	4"	5/8"	2-1/8"	9	98.70	94.41	90.12	85.83
98452	.5000	1/2"	12.700	1/2"	4"	1-1/2"	-	9	95.13	90.99	86.86	82.72
98454	.5000	1/2"	12.700	1/2"	4"	2-1/8"	-	9	95.13	90.99	86.86	82.72

EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	$l3$ Reach Length	$d3$ Neck Diameter	Number Flutes	1-11	12-24	25-49	50-100	
	Decimal	Metric											
98456	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	-	-	9	144.76	138.47	132.17	125.88
98458	.6250	5/8"	15.875	5/8"	4"	1-5/8"	-	-	9	154.61	147.88	141.16	134.44
98460	.6250	5/8"	15.875	5/8"	6"	3-1/4"	-	-	9	212.73	203.48	194.23	184.98
98462	.6250	5/8"	15.875	5/8"	6"	3/4"	4-1/8"	.590"	9	216.30	206.90	197.49	188.09
98464	.6299		16.000	16.0	88	32	-	-	9	151.02	144.45	137.89	131.32
98466	.6299		16.000	16.0	100	42	-	-	9	161.21	154.20	147.19	140.18
98468	.6299		16.000	16.0	150	60	-	-	9	221.82	212.18	202.53	192.89
98470	.6299		16.000	16.0	150	80	-	-	9	221.82	212.18	202.53	192.89
98472	.6299		16.000	16.0	150	22	102	15.4	9	225.40	215.60	205.80	196.00
98474	.7500	3/4"	19.050	3/4"	4"	1-1/2"	-	-	11	214.91	205.57	196.22	186.88
98476	.7500	3/4"	19.050	3/4"	4"	1-5/8"	-	-	11	214.91	205.57	196.22	186.88
98478	.7500	3/4"	19.050	3/4"	5"	2-1/8"	-	-	11	288.48	275.94	263.39	250.85
98480	.7500	3/4"	19.050	3/4"	6"	3-1/4"	-	-	11	337.56	322.88	308.21	293.53
98484	.7874		20.000	20.0	100	26	-	-	11	279.19	267.05	254.91	242.77
98486	.7874		20.000	20.0	100	38	-	-	11	279.19	267.05	254.91	242.77
98488	.7874		20.000	20.0	150	60	-	-	11	351.62	336.34	321.05	305.76
98490	.7874		20.000	20.0	150	80	-	-	11	351.62	336.34	321.05	305.76
98494	1.000	1"	25.400	1"	4"	1-1/2"	-	-	13	296.36	283.47	270.59	257.70
98496	1.000	1"	25.400	1"	5"	2-1/4"	-	-	13	396.68	379.43	362.19	344.94
98498	1.000	1"	25.400	1"	6"	3-1/4"	-	-	13	516.74	494.27	471.81	449.34
98500	1.000	1"	25.400	1"	7"	4-1/4"	-	-	13	694.86	664.65	634.44	604.23

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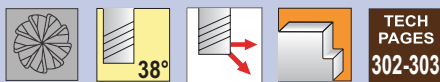
MATERIAL HARDNESS (Rc)

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TOLERANCES	
d_1	+0.00" -0.002" (+.000mm -.050mm)
d_2	h6
r	+0.001" -0.001" (+.025mm -.025mm)

.4724"
(12.000mm)

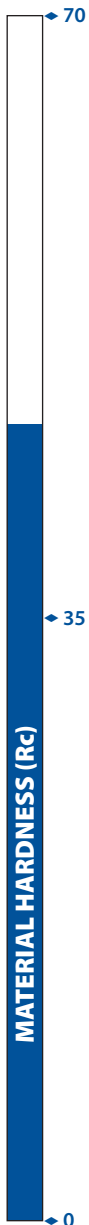
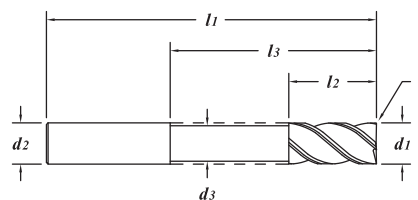


Recommended for titanium and steels under 40Rc

Multi-Flute End Mill - Corner Radius

AlCrN Coating

- Solid submicron grain carbide end mill - non-center cutting
- Multiple flutes for increased feed rates
- Odd number of flutes to naturally break up harmonics
- Engineered for High Efficiency Milling
- Up to 8% Radial (ap) engagement
- Can be used to finish most steels under 40Rc, as well as aluminum
- Conventional grind for better finish cutting and less push off when finishing
- Regrindable



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	Number Flutes	1-11	12-24	25-49	50-100
	Decimal	Metric											
98502	.4724	12.000	12.0	75	26	0.30	-	-	7	89.04	85.17	81.30	77.43
98504	.4724	12.000	12.0	75	26	0.50	-	-	7	89.04	85.17	81.30	77.43
98508	.4724	12.000	12.0	75	26	1.00	-	-	7	89.04	85.17	81.30	77.43
98516	.4724	12.000	12.0	75	26	4.00	-	-	7	89.04	85.17	81.30	77.43
98518	.4724	12.000	12.0	75	32	0.50	-	-	7	89.04	85.17	81.30	77.43
98522	.4724	12.000	12.0	75	32	1.00	-	-	7	89.04	85.17	81.30	77.43
98524	.4724	12.000	12.0	75	32	1.50	-	-	7	89.04	85.17	81.30	77.43
98528	.4724	12.000	12.0	75	32	3.00	-	-	7	89.04	85.17	81.30	77.43
98532	.4724	12.000	12.0	100	42	0.50	-	-	7	105.48	100.89	96.31	91.72
98538	.4724	12.000	12.0	100	42	1.50	-	-	7	105.48	100.89	96.31	91.72
98544	.4724	12.000	12.0	100	42	4.00	-	-	7	105.48	100.89	96.31	91.72
98546	.4724	12.000	12.0	100	52	0.50	-	-	7	105.48	100.89	96.31	91.72
98550	.4724	12.000	12.0	100	52	1.00	-	-	7	105.48	100.89	96.31	91.72
98552	.4724	12.000	12.0	100	52	1.50	-	-	7	105.48	100.89	96.31	91.72
98556	.4724	12.000	12.0	100	52	3.00	-	-	7	105.48	100.89	96.31	91.72
98560	.4724	12.000	12.0	150	19	0.50	105	11.4	7	146.34	139.98	133.61	127.25
98564	.4724	12.000	12.0	150	19	1.00	105	11.4	7	146.34	139.98	133.61	127.25
98570	.4724	12.000	12.0	150	19	3.00	105	11.4	7	146.34	139.98	133.61	127.25

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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	Number Flutes	1-11	12-24	25-49	50-100	
	Decimal	Metric												
98574	.5000	1/2"	12.700	1/2"	3"	1"	.010"	-	-	7	85.42	81.71	77.99	74.28
98576	.5000	1/2"	12.700	1/2"	3"	1"	.020"	-	-	7	85.42	81.71	77.99	74.28
98578	.5000	1/2"	12.700	1/2"	3"	1"	.030"	-	-	7	85.42	81.71	77.99	74.28
98580	.5000	1/2"	12.700	1/2"	3"	1"	.060"	-	-	7	85.42	81.71	77.99	74.28
98582	.5000	1/2"	12.700	1/2"	3"	1"	.090"	-	-	7	85.42	81.71	77.99	74.28
98584	.5000	1/2"	12.700	1/2"	3"	1"	.120"	-	-	7	85.42	81.71	77.99	74.28
98586	.5000	1/2"	12.700	1/2"	3"	1"	.125"	-	-	7	85.42	81.71	77.99	74.28
98588	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.010"	-	-	7	85.42	81.71	77.99	74.28
98590	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.020"	-	-	7	85.42	81.71	77.99	74.28
98592	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	-	7	85.42	81.71	77.99	74.28
98594	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"	-	-	7	85.42	81.71	77.99	74.28
98598	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.120"	-	-	7	85.42	81.71	77.99	74.28
98600	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.125"	-	-	7	85.42	81.71	77.99	74.28
98602	.5000	1/2"	12.700	1/2"	4"	5/8"	.010"	2-1/8"	.470"	7	104.52	99.98	95.43	90.89
98604	.5000	1/2"	12.700	1/2"	4"	5/8"	.020"	2-1/8"	.470"	7	104.52	99.98	95.43	90.89
98606	.5000	1/2"	12.700	1/2"	4"	5/8"	.030"	2-1/8"	.470"	7	104.52	99.98	95.43	90.89
98608	.5000	1/2"	12.700	1/2"	4"	5/8"	.060"	2-1/8"	.470"	7	104.52	99.98	95.43	90.89
98610	.5000	1/2"	12.700	1/2"	4"	5/8"	.120"	2-1/8"	.470"	7	104.52	99.98	95.43	90.89
98612	.5000	1/2"	12.700	1/2"	4"	5/8"	.125"	2-1/8"	.470"	7	104.52	99.98	95.43	90.89
98614	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.010"	-	-	7	100.95	96.56	92.17	87.78
98616	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.020"	-	-	7	100.95	96.56	92.17	87.78
98618	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.030"	-	-	7	100.95	96.56	92.17	87.78
98620	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.060"	-	-	7	100.95	96.56	92.17	87.78
98622	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.010"	-	-	7	100.95	96.56	92.17	87.78
98626	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.030"	-	-	7	100.95	96.56	92.17	87.78
98628	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.060"	-	-	7	100.95	96.56	92.17	87.78
98630	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.120"	-	-	7	100.95	96.56	92.17	87.78
98632	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.125"	-	-	7	100.95	96.56	92.17	87.78
98634	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.010"	-	-	7	151.78	145.18	138.58	131.98
98636	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.020"	-	-	7	151.78	145.18	138.58	131.98
98638	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	-	-	7	151.78	145.18	138.58	131.98
98640	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	-	-	7	151.78	145.18	138.58	131.98
98642	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.120"	-	-	7	151.78	145.18	138.58	131.98
98644	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.125"	-	-	7	151.78	145.18	138.58	131.98
98646	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.010"	-	-	7	164.98	157.81	150.63	143.46
98648	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.020"	-	-	7	164.98	157.81	150.63	143.46
98652	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.060"	-	-	7	164.98	157.81	150.63	143.46
98654	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.120"	-	-	7	164.98	157.81	150.63	143.46
98658	.6250	5/8"	15.875	5/8"	6"	3-1/4"	.010"	-	-	7	227.11	217.24	207.36	197.49
98660	.6250	5/8"	15.875	5/8"	6"	3-1/4"	.020"	-	-	7	227.11	217.24	207.36	197.49
98662	.6250	5/8"	15.875	5/8"	6"	3-1/4"	.030"	-	-	7	227.11	217.24	207.36	197.49
98666	.6250	5/8"	15.875	5/8"	6"	3-1/4"	.120"	-	-	7	227.11	217.24	207.36	197.49
98670	.6250	5/8"	15.875	5/8"	6"	3/4"	.010"	4-1/8"	.590"	7	230.71	220.68	210.65	200.62
98672	.6250	5/8"	15.875	5/8"	6"	3/4"	.020"	4-1/8"	.590"	7	230.71	220.68	210.65	200.62
98674	.6250	5/8"	15.875	5/8"	6"	3/4"	.030"	4-1/8"	.590"	7	230.71	220.68	210.65	200.62
98678	.6250	5/8"	15.875	5/8"	6"	3/4"	.120"	4-1/8"	.590"	7	230.71	220.68	210.65	200.62

continued →

Series TMR (continued)

.6299" - .7874"
(16.000mm - 20.000mm)

EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	$l3$ Reach Length	$d3$ Neck Diameter	Number Flutes	1-11	12-24	25-49	50-100	
	Decimal	Metric												
98680	.6299	16.000	16.0	88	32	0.50	-	-	7	158.38	151.49	144.61	137.72	
98690	.6299	16.000	16.0	88	32	3.00	-	-	7	158.38	151.49	144.61	137.72	
98696	.6299	16.000	16.0	100	42	0.50	-	-	7	168.42	161.10	153.77	146.45	
98700	.6299	16.000	16.0	100	42	1.00	-	-	7	168.42	161.10	153.77	146.45	
98704	.6299	16.000	16.0	100	42	2.00	-	-	7	168.42	161.10	153.77	146.45	
98706	.6299	16.000	16.0	100	42	3.00	-	-	7	168.42	161.10	153.77	146.45	
98708	.6299	16.000	16.0	100	42	4.00	-	-	7	168.42	161.10	153.77	146.45	
98710	.6299	16.000	16.0	100	42	5.00	-	-	7	168.42	161.10	153.77	146.45	
98712	.6299	16.000	16.0	150	60	0.50	-	-	7	236.19	225.92	215.65	205.38	
98716	.6299	16.000	16.0	150	60	1.00	-	-	7	236.19	225.92	215.65	205.38	
98720	.6299	16.000	16.0	150	60	2.00	-	-	7	236.19	225.92	215.65	205.38	
98722	.6299	16.000	16.0	150	60	3.00	-	-	7	236.19	225.92	215.65	205.38	
98724	.6299	16.000	16.0	150	60	4.00	-	-	7	236.19	225.92	215.65	205.38	
98726	.6299	16.000	16.0	150	60	5.00	-	-	7	236.19	225.92	215.65	205.38	
98732	.6299	16.000	16.0	150	80	1.00	-	-	7	236.19	225.92	215.65	205.38	
98738	.6299	16.000	16.0	150	80	3.00	-	-	7	236.19	225.92	215.65	205.38	
98744	.6299	16.000	16.0	150	22	0.50	102	15.4	7	239.78	229.35	218.93	208.50	
98752	.6299	16.000	16.0	150	22	2.00	102	15.4	7	239.78	229.35	218.93	208.50	
98754	.6299	16.000	16.0	150	22	3.00	102	15.4	7	239.78	229.35	218.93	208.50	
98760	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.010"	-	9	226.37	216.52	206.68	196.84	
98764	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	-	9	226.37	216.52	206.68	196.84	
98766	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	-	9	226.37	216.52	206.68	196.84	
98770	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.190"	-	9	226.37	216.52	206.68	196.84	
98772	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.250"	-	9	226.37	216.52	206.68	196.84	
98774	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.010"	-	9	226.37	216.52	206.68	196.84	
98778	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.030"	-	9	226.37	216.52	206.68	196.84	
98784	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.190"	-	9	226.37	216.52	206.68	196.84	
98788	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.010"	-	9	313.98	300.33	286.68	273.03	
98790	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.020"	-	9	313.98	300.33	286.68	273.03	
98794	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.060"	-	9	313.98	300.33	286.68	273.03	
98796	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.120"	-	9	313.98	300.33	286.68	273.03	
98800	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.250"	-	9	313.98	300.33	286.68	273.03	
98802	.7500	3/4"	19.050	3/4"	6"	3-1/4"	.010"	-	9	372.96	356.74	340.53	324.31	
98804	.7500	3/4"	19.050	3/4"	6"	3-1/4"	.020"	-	9	372.96	356.74	340.53	324.31	
98806	.7500	3/4"	19.050	3/4"	6"	3-1/4"	.030"	-	9	372.96	356.74	340.53	324.31	
98808	.7500	3/4"	19.050	3/4"	6"	3-1/4"	.060"	-	9	372.96	356.74	340.53	324.31	
98814	.7500	3/4"	19.050	3/4"	6"	3-1/4"	.250"	-	9	372.96	356.74	340.53	324.31	
98816	.7500	3/4"	19.050	3/4"	6"	1"	.010"	4-1/8"	.720"	9	376.54	360.17	343.80	327.43
98820	.7500	3/4"	19.050	3/4"	6"	1"	.030"	4-1/8"	.720"	9	376.54	360.17	343.80	327.43
98822	.7500	3/4"	19.050	3/4"	6"	1"	.060"	4-1/8"	.720"	9	376.54	360.17	343.80	327.43
98830	.7874	20.000	20.0	100	26	0.50	-	-	9	308.06	294.67	281.27	267.88	
98834	.7874	20.000	20.0	100	26	1.00	-	-	9	308.06	294.67	281.27	267.88	
98864	.7874	20.000	20.0	100	38	6.00	-	-	9	308.06	294.67	281.27	267.88	
98866	.7874	20.000	20.0	150	60	0.50	-	-	9	378.70	362.23	345.77	329.30	
98876	.7874	20.000	20.0	150	60	3.00	-	-	9	378.70	362.23	345.77	329.30	
98882	.7874	20.000	20.0	150	60	6.00	-	-	9	378.70	362.23	345.77	329.30	
98884	.7874	20.000	20.0	150	80	0.50	-	-	9	378.70	362.23	345.77	329.30	

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MATERIAL HARDNESS (Rc)

EDP#	$d1^+$ Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	$l3$ Reach Length	$d3$ Neck Diameter	Number Flutes	1-11	12-24	25-49	50-100	
	Decimal	Metric												
98920	1.000	1"	25.400	1"	4"	1-1/2"	.015"	-	-	11	356.72	341.21	325.70	310.19
98924	1.000	1"	25.400	1"	4"	1-1/2"	.060"	-	-	11	356.72	341.21	325.70	310.19
98928	1.000	1"	25.400	1"	4"	1-1/2"	.120"	-	-	11	356.72	341.21	325.70	310.19
98934	1.000	1"	25.400	1"	5"	2-1/4"	.015"	-	-	11	438.92	419.84	400.75	381.67
98936	1.000	1"	25.400	1"	5"	2-1/4"	.030"	-	-	11	438.92	419.84	400.75	381.67
98942	1.000	1"	25.400	1"	5"	2-1/4"	.120"	-	-	11	438.92	419.84	400.75	381.67
98944	1.000	1"	25.400	1"	5"	2-1/4"	.190"	-	-	11	438.92	419.84	400.75	381.67
98946	1.000	1"	25.400	1"	5"	2-1/4"	.250"	-	-	11	438.92	419.84	400.75	381.67
98948	1.000	1"	25.400	1"	6"	3-1/4"	.030"	-	-	11	572.46	547.57	522.68	497.79
98950	1.000	1"	25.400	1"	6"	3-1/4"	.060"	-	-	11	572.46	547.57	522.68	497.79
98954	1.000	1"	25.400	1"	6"	3-1/4"	.190"	-	-	11	572.46	547.57	522.68	497.79
98958	1.000	1"	25.400	1"	7"	4-1/4"	.030"	-	-	11	750.54	717.90	685.27	652.64
98966	1.000	1"	25.400	1"	7"	4-1/4"	.250"	-	-	11	750.54	717.90	685.27	652.64

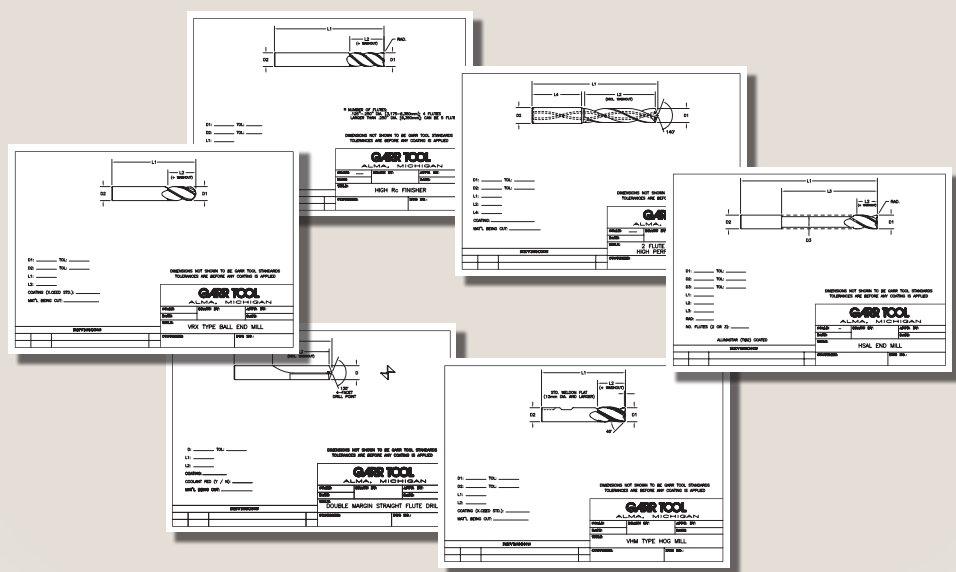
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MATERIAL HARDNESS (Rc)





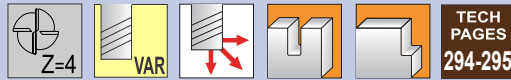
Access an assortment of 'fill-in-the-blank' prints
 from our website to aid in the quoting of custom tooling.
www.garrtool.com

TOLERANCES

d_1	+ .000" - .002" (+.000mm - .050mm)
d_2	h6
r	+ .001" - .001" (+.025 - .025mm)
ball radius	+ .000" - .001" (+.000 - .025mm)

HIGH EFFICIENCY MILLING

Series V4S, V4R, V4B



NEW ITEMS

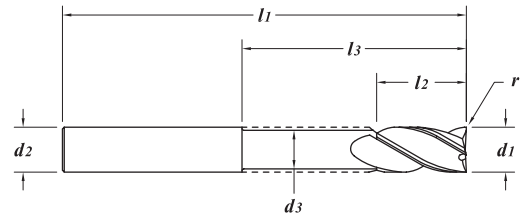
.1562" - .2188"
(3.967mm - 5.558mm)

Recommended for titanium, inconel, and stainless steel

Variable Helix End Mill

AlCrN Coating

- Solid submicron grain carbide end mill - center cutting
- Engineered for High Efficiency Milling
- Helix geometry varies over length of flutes
- Variable flute design helps with chip evacuation in slots and pockets
- Variable rake aids in chip formation
- PCT (Polish Carbide Treatment) enhances tool life
- Minimizes burr on part
- 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*



HIGH PERFORMANCE
END MILLS

NEW	EDP#	(plain)	(weldon)	d_1 †		d_2	l_1	l_2	r	l_3	d_3	1-11	12-24	25-49	50-100
				Decimal	Diameter										
NEW	50171	-	-	.1562	5/32"	3.967	1/4"	2"	1/2"	-	-	23.64	22.62	21.59	20.56
NEW	50172	-	-	.1562	5/32"	3.967	1/4"	2"	1/2"	.010"	-	25.70	24.59	23.47	22.35
NEW	50173	-	-	.1562	5/32"	3.967	1/4"	2"	1/2"	.015"	-	25.70	24.59	23.47	22.35
NEW	50174	-	-	.1562	5/32"	3.967	1/4"	2"	1/2"	.020"	-	25.70	24.59	23.47	22.35
NEW	50175	-	-	.1562	5/32"	3.967	1/4"	2"	1/2"	.030"	-	25.70	24.59	23.47	22.35
NEW	50176	-	-	.1562	5/32"	3.967	1/4"	2"	1/2"	BALL	-	25.70	24.59	23.47	22.35
NEW	50177	-	-	.1575		4.000	6.0	50	12	-	-	26.32	25.18	24.03	22.89
NEW	50178	-	-	.1575		4.000	6.0	50	12	0.20	-	26.74	25.58	24.41	23.25
NEW	50179	-	-	.1575		4.000	6.0	50	12	0.30	-	26.74	25.58	24.41	23.25
NEW	50180	-	-	.1575		4.000	6.0	50	12	0.50	-	26.74	25.58	24.41	23.25
NEW	50181	-	-	.1575		4.000	6.0	50	12	BALL	-	26.74	25.58	24.41	23.25
NEW	50182	-	-	.1875	3/16"	4.763	1/4"	2"	1/2"	-	-	23.18	22.18	21.17	20.16
NEW	50183	-	-	.1875	3/16"	4.763	1/4"	2"	1/2"	.010"	-	25.20	24.10	23.01	21.91
NEW	50184	-	-	.1875	3/16"	4.763	1/4"	2"	1/2"	.015"	-	25.20	24.10	23.01	21.91
NEW	50185	-	-	.1875	3/16"	4.763	1/4"	2"	1/2"	.020"	-	25.20	24.10	23.01	21.91
NEW	50186	-	-	.1875	3/16"	4.763	1/4"	2"	1/2"	.030"	-	25.20	24.10	23.01	21.91
NEW	50187	-	-	.1875	3/16"	4.763	1/4"	2"	1/2"	BALL	-	25.20	24.10	23.01	21.91
NEW	50188	-	-	.1969		5.000	6.0	65	20	-	-	28.16	26.94	25.71	24.49
NEW	50189	-	-	.1969		5.000	6.0	65	20	0.20	-	29.03	27.76	26.50	25.24
NEW	50190	-	-	.1969		5.000	6.0	65	20	0.30	-	29.03	27.76	26.50	25.24
NEW	50191	-	-	.1969		5.000	6.0	65	20	0.50	-	29.03	27.76	26.50	25.24
NEW	50192	-	-	.1969		5.000	6.0	65	20	BALL	-	29.03	27.76	26.50	25.24
NEW	50193	-	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	-	-	25.61	24.50	23.38	22.27
NEW	50194	-	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	.010"	-	27.95	26.73	25.52	24.30
NEW	50195	-	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	.015"	-	27.95	26.73	25.52	24.30
NEW	50196	-	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	.020"	-	27.95	26.73	25.52	24.30
NEW	50197	-	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	.030"	-	27.95	26.73	25.52	24.30
NEW	50198	-	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	BALL	-	27.95	26.73	25.52	24.30

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MATERIAL HARDNESS (Rc)

0

continued →

Series V4S, V4R, V4B (continued)

.2362" - .2500"
(6.000mm - 6.350mm)

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MATERIAL HARDNESS (Rc)

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										
50236	-	.2362	6.000	6.0	65	12	-	-	-	24.73	23.65	22.58	21.50
50199	-	.2362	6.000	6.0	65	12	0.30	-	-	28.11	26.88	25.66	24.44
50200	-	.2362	6.000	6.0	65	12	0.50	-	-	28.11	26.88	25.66	24.44
50201	-	.2362	6.000	6.0	65	12	0.75	-	-	28.11	26.88	25.66	24.44
50202	-	.2362	6.000	6.0	65	12	1.00	-	-	28.11	26.88	25.66	24.44
50203	-	.2362	6.000	6.0	65	12	1.50	-	-	28.11	26.88	25.66	24.44
50252	-	.2362	6.000	6.0	65	12	BALL	-	-	28.11	26.88	25.66	24.44
50237	-	.2362	6.000	6.0	65	19	-	-	-	24.73	23.65	22.58	21.50
50204	-	.2362	6.000	6.0	65	19	0.30	-	-	28.11	26.88	25.66	24.44
50205	-	.2362	6.000	6.0	65	19	0.50	-	-	28.11	26.88	25.66	24.44
50206	-	.2362	6.000	6.0	65	19	1.00	-	-	28.11	26.88	25.66	24.44
50253	-	.2362	6.000	6.0	65	19	BALL	-	-	28.11	26.88	25.66	24.44
50540	-	.2500	6.350	1/4"	2"	3/8"	-	-	-	21.15	20.23	19.31	18.39
50489	-	.2500	6.350	1/4"	2"	3/8"	.010"	-	-	24.40	23.34	22.28	21.22
50490	-	.2500	6.350	1/4"	2"	3/8"	.015"	-	-	24.40	23.34	22.28	21.22
50491	-	.2500	6.350	1/4"	2"	3/8"	.020"	-	-	24.40	23.34	22.28	21.22
NEW 50708	-	.2500	6.350	1/4"	2"	3/8"	.030"	-	-	24.40	23.34	22.28	21.22
NEW 50709	-	.2500	6.350	1/4"	2"	3/8"	.040"	-	-	24.40	23.34	22.28	21.22
NEW 50710	-	.2500	6.350	1/4"	2"	3/8"	.060"	-	-	24.40	23.34	22.28	21.22
NEW 50711	-	.2500	6.350	1/4"	2"	3/8"	.090"	-	-	24.40	23.34	22.28	21.22
50560	-	.2500	6.350	1/4"	2"	3/8"	BALL	-	-	24.40	23.34	22.28	21.22
50645	-	.2500	6.350	1/4"	2"	1/2"	-	-	-	21.15	20.23	19.31	18.39
50614	-	.2500	6.350	1/4"	2"	1/2"	.010"	-	-	24.40	23.34	22.28	21.22
50616	-	.2500	6.350	1/4"	2"	1/2"	.015"	-	-	24.40	23.34	22.28	21.22
50618	-	.2500	6.350	1/4"	2"	1/2"	.020"	-	-	24.40	23.34	22.28	21.22
NEW 50712	-	.2500	6.350	1/4"	2"	1/2"	.030"	-	-	24.40	23.34	22.28	21.22
NEW 50713	-	.2500	6.350	1/4"	2"	1/2"	.040"	-	-	24.40	23.34	22.28	21.22
NEW 50714	-	.2500	6.350	1/4"	2"	1/2"	.060"	-	-	24.40	23.34	22.28	21.22
NEW 50715	-	.2500	6.350	1/4"	2"	1/2"	.090"	-	-	24.40	23.34	22.28	21.22
50238	-	.2500	6.350	1/4"	2-1/2"	3/4"	-	-	-	23.86	22.83	21.79	20.75
50207	-	.2500	6.350	1/4"	2-1/2"	3/4"	.010"	-	-	27.03	25.85	24.68	23.50
50208	-	.2500	6.350	1/4"	2-1/2"	3/4"	.015"	-	-	27.03	25.85	24.68	23.50
50620	-	.2500	6.350	1/4"	2-1/2"	3/4"	.020"	-	-	27.03	25.85	24.68	23.50
50209	-	.2500	6.350	1/4"	2-1/2"	3/4"	.030"	-	-	27.03	25.85	24.68	23.50
NEW 50716	-	.2500	6.350	1/4"	2-1/2"	3/4"	.040"	-	-	27.03	25.85	24.68	23.50
50210	-	.2500	6.350	1/4"	2-1/2"	3/4"	.060"	-	-	27.03	25.85	24.68	23.50
NEW 50717	-	.2500	6.350	1/4"	2-1/2"	3/4"	.090"	-	-	27.03	25.85	24.68	23.50
50254	-	.2500	6.350	1/4"	2-1/2"	3/4"	BALL	-	-	27.03	25.85	24.68	23.50
NEW 50653	-	.2500	6.350	1/4"	3"	1-1/8"	-	-	-	36.31	34.73	33.15	31.57
50493	-	.2500	6.350	1/4"	3"	1-1/8"	.030"	-	-	40.03	38.29	36.55	34.81
NEW 50677	-	.2500	6.350	1/4"	3"	1-1/8"	BALL	-	-	40.03	38.29	36.55	34.81

	EDP#	$d1$ †		$d2$	$l1$	$l2$	r	$l3$	$d3$	1-11	12-24	25-49	50-100			
		(plain)	(weldon)											Decimal	Diameter	Metric
NEW	50654	-		.2500	1/4"	6.350	1/4"	4"	1-1/2"	-	-	-	39.07	37.37	35.67	33.97
NEW	50681	-		.2500	1/4"	6.350	1/4"	4"	1-1/2"	BALL	-	-	42.86	41.00	39.13	37.27
NEW	50655	-		.2500	1/4"	6.350	1/4"	4"	1-3/4"	-	-	-	39.07	37.37	35.67	33.97
NEW	50718	-		.2500	1/4"	6.350	1/4"	4"	1-3/4"	.020"	-	-	42.86	41.00	39.13	37.27
NEW	50682	-		.2500	1/4"	6.350	1/4"	4"	1-3/4"	BALL	-	-	42.86	41.00	39.13	37.27
NEW	50656	-		.2500	1/4"	6.350	1/4"	4"	2"	-	-	-	39.07	37.37	35.67	33.97
NEW	50683	-		.2500	1/4"	6.350	1/4"	4"	2"	BALL	-	-	42.86	41.00	39.13	37.27
NEW	50651	-		.2500	1/4"	6.350	1/4"	3"	3/8"	-	1-1/8"	.237"	45.77	43.78	41.79	39.80
NEW	50678	-		.2500	1/4"	6.350	1/4"	3"	3/8"	BALL	1-1/8"	.237"	49.54	47.39	45.23	43.08
	50600	-		.2500	1/4"	6.350	1/4"	4"	3/8"	-	1-1/8"	.237"	48.73	46.61	44.49	42.37
	50211	-		.2500	1/4"	6.350	1/4"	4"	3/8"	.015"	1-1/4"	.230"	52.37	50.09	47.82	45.54
	50474	-		.2500	1/4"	6.350	1/4"	4"	3/8"	BALL	1-1/8"	.237"	52.37	50.09	47.82	45.54
NEW	50679	-		.2500	1/4"	6.350	1/4"	4"	3/8"	BALL	1-1/2"	.237"	52.37	50.09	47.82	45.54
NEW	50652	-		.2500	1/4"	6.350	1/4"	4"	3/8"	-	2"	.237"	48.73	46.61	44.49	42.37
NEW	50680	-		.2500	1/4"	6.350	1/4"	4"	3/8"	BALL	2"	.237"	52.37	50.09	47.82	45.54
NEW	50719	-		.2500	1/4"	6.350	1/4"	6"	3/8"	.010"	4"	.230"	65.94	63.07	60.21	57.34
NEW	50684	-		.2500	1/4"	6.350	1/4"	6"	3/8"	BALL	4"	.230"	65.94	63.07	60.21	57.34
NEW	50720	-		.3125	5/16"	7.937	5/16"	2"	3/8"	.030"	-	-	33.32	31.87	30.42	28.97
	50541	-		.3125	5/16"	7.937	5/16"	2"	7/16"	-	-	-	29.21	27.94	26.67	25.40
	50622	-		.3125	5/16"	7.937	5/16"	2"	7/16"	.010"	-	-	33.32	31.87	30.42	28.97
	50624	-		.3125	5/16"	7.937	5/16"	2"	7/16"	.015"	-	-	33.32	31.87	30.42	28.97
	50492	-		.3125	5/16"	7.937	5/16"	2"	7/16"	.020"	-	-	33.32	31.87	30.42	28.97
NEW	50721	-		.3125	5/16"	7.937	5/16"	2"	7/16"	.125"	-	-	33.32	31.87	30.42	28.97
	50561	-		.3125	5/16"	7.937	5/16"	2"	7/16"	BALL	-	-	33.32	31.87	30.42	28.97
	50239	-		.3125	5/16"	7.937	5/16"	2-1/2"	13/16"	-	-	-	34.02	32.54	31.06	29.58
	50626	-		.3125	5/16"	7.937	5/16"	2-1/2"	13/16"	.010"	-	-	36.60	35.01	33.42	31.83
	50628	-		.3125	5/16"	7.937	5/16"	2-1/2"	13/16"	.015"	-	-	36.60	35.01	33.42	31.83
	50212	-		.3125	5/16"	7.937	5/16"	2-1/2"	13/16"	.020"	-	-	36.60	35.01	33.42	31.83
	50213	-		.3125	5/16"	7.937	5/16"	2-1/2"	13/16"	.030"	-	-	36.60	35.01	33.42	31.83
NEW	50722	-		.3125	5/16"	7.937	5/16"	2-1/2"	13/16"	.060"	-	-	36.60	35.01	33.42	31.83
NEW	50723	-		.3125	5/16"	7.937	5/16"	2-1/2"	13/16"	.125"	-	-	36.60	35.01	33.42	31.83
	50255	-		.3125	5/16"	7.937	5/16"	2-1/2"	13/16"	BALL	-	-	36.60	35.01	33.42	31.83
NEW	50657	-		.3125	5/16"	7.937	5/16"	3"	1-1/4"	-	-	-	46.43	44.41	42.39	40.37
NEW	50724	-		.3125	5/16"	7.937	5/16"	3"	1-1/4"	.015"	-	-	51.06	48.84	46.62	44.40
NEW	50725	-		.3125	5/16"	7.937	5/16"	3"	1-1/4"	.030"	-	-	51.06	48.84	46.62	44.40
NEW	50726	-		.3125	5/16"	7.937	5/16"	3"	1-1/4"	.060"	-	-	51.06	48.84	46.62	44.40
NEW	50685	-		.3125	5/16"	7.937	5/16"	3"	1-1/4"	BALL	-	-	51.06	48.84	46.62	44.40
NEW	50658	-		.3125	5/16"	7.937	5/16"	3"	7/16"	-	1-1/2"	.295"	57.55	55.04	52.54	50.04
NEW	50686	-		.3125	5/16"	7.937	5/16"	3"	7/16"	BALL	1-1/2"	.295"	62.18	59.48	56.77	54.07
	50602	-		.3150		8.000	8.0	50	12	-	-	-	30.27	28.95	27.64	26.32
	50630	-		.3150		8.000	8.0	50	12	0.50	-	-	34.56	33.06	31.55	30.05
	50240	-		.3150		8.000	8.0	65	22	-	-	-	35.25	33.72	32.18	30.65
	50214	-		.3150		8.000	8.0	65	22	0.50	-	-	37.98	36.33	34.68	33.03
	50356	-		.3150		8.000	8.0	65	22	0.75	-	-	37.98	36.33	34.68	33.03
	50215	-		.3150		8.000	8.0	65	22	1.00	-	-	37.98	36.33	34.68	33.03
NEW	50727	-		.3150		8.000	8.0	65	22	1.20	-	-	37.98	36.33	34.68	33.03
	50357	-		.3150		8.000	8.0	65	22	1.50	-	-	37.98	36.33	34.68	33.03
	50358	-		.3150		8.000	8.0	65	22	2.00	-	-	37.98	36.33	34.68	33.03
NEW	50728	-		.3150		8.000	8.0	65	22	3.00	-	-	37.98	36.33	34.68	33.03
	50256	-		.3150		8.000	8.0	65	22	BALL	-	-	37.98	36.33	34.68	33.03

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MATERIAL HARDNESS (Rc)

0

continued →

Series V4S, V4R, V4B (continued)

.3150" - .3937"
(8.000mm - 10.000mm)

MATERIAL HARDNESS (Rc)
70
35
0

	EDP#	$d1$ †		$d2$	$l1$	$l2$	r	$l3$	$d3$	1-11	12-24	25-49	50-100		
		(plain)	(weldon)											Decimal	Metric
NEW	50659	-	.3150	8.000	8.0	75	32	-	-	-	48.36	46.26	44.15	42.05	
NEW	50687	-	.3150	8.000	8.0	75	32	BALL	-	-	53.23	50.92	48.60	46.29	
NEW	50660	-	.3150	8.000	8.0	100	12	-	50	7.50	66.56	63.67	60.77	57.88	
NEW	50688	-	.3150	8.000	8.0	100	12	BALL	50	7.50	71.93	68.81	65.68	62.55	
	50542	-	.3750	3/8"	9.525	3/8"	2"	1/2"	-	-	34.45	32.96	31.46	29.96	
	50632	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.010"	-	39.34	37.63	35.92	34.21	
NEW	50729	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.015"	-	39.34	37.63	35.92	34.21	
	50494	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.020"	-	39.34	37.63	35.92	34.21	
	50634	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.030"	-	39.34	37.63	35.92	34.21	
NEW	50730	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.060"	-	39.34	37.63	35.92	34.21	
NEW	50732	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.090"	-	39.34	37.63	35.92	34.21	
NEW	50733	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.120"	-	39.34	37.63	35.92	34.21	
NEW	50734	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.125"	-	39.34	37.63	35.92	34.21	
	50562	-	.3750	3/8"	9.525	3/8"	2"	1/2"	BALL	-	39.34	37.63	35.92	34.21	
	50241	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	-	-	40.15	38.40	36.66	34.91	
	50216	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.010"	-	42.76	40.90	39.04	37.18	
NEW	50735	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.015"	-	42.76	40.90	39.04	37.18	
	50217	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.020"	-	42.76	40.90	39.04	37.18	
	50218	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.030"	-	42.76	40.90	39.04	37.18	
NEW	50736	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.040"	-	42.76	40.90	39.04	37.18	
	50219	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.060"	-	42.76	40.90	39.04	37.18	
	50636	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.090"	-	42.76	40.90	39.04	37.18	
NEW	50737	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.120"	-	42.76	40.90	39.04	37.18	
NEW	50738	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.125"	-	42.76	40.90	39.04	37.18	
	50257	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	BALL	-	42.76	40.90	39.04	37.18	
NEW	50661	-	.3750	3/8"	9.525	3/8"	3"	1-1/4"	-	-	51.21	48.98	46.76	44.53	
NEW	50739	-	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.015"	-	56.28	53.83	51.39	48.94	
	50637	-	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.030"	-	56.28	53.83	51.39	48.94	
NEW	50740	-	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.060"	-	56.28	53.83	51.39	48.94	
NEW	50689	-	.3750	3/8"	9.525	3/8"	3"	1-1/4"	BALL	-	56.28	53.83	51.39	48.94	
NEW	50662	-	.3750	3/8"	9.525	3/8"	4"	1-1/2"	-	-	57.87	55.35	52.84	50.32	
NEW	50741	-	.3750	3/8"	9.525	3/8"	4"	1-1/2"	.015"	-	63.33	60.58	57.82	55.07	
NEW	50742	-	.3750	3/8"	9.525	3/8"	4"	1-1/2"	.030"	-	63.33	60.58	57.82	55.07	
NEW	50743	-	.3750	3/8"	9.525	3/8"	4"	1-1/2"	.060"	-	63.33	60.58	57.82	55.07	
NEW	50744	-	.3750	3/8"	9.525	3/8"	4"	1-1/2"	.120"	-	63.33	60.58	57.82	55.07	
NEW	50690	-	.3750	3/8"	9.525	3/8"	4"	1-1/2"	BALL	-	63.33	60.58	57.82	55.07	
NEW	50745	-	.3750	3/8"	9.525	3/8"	6"	2-1/2"	.060	-	87.69	83.88	80.06	76.25	
	50604	-	.3750	3/8"	9.525	3/8"	4"	1/2"	-	1-1/8"	.355"	70.27	67.21	64.16	61.10
	50220	-	.3750	3/8"	9.525	3/8"	4"	1/2"	.020"	1-7/8"	.350"	75.58	72.29	69.01	65.72
	50476	-	.3750	3/8"	9.525	3/8"	4"	1/2"	BALL	1-1/8"	.355"	75.58	72.29	69.01	65.72
	50606	-	.3937	10.000	10.0	50	14	-	-	-	44.25	42.33	40.40	38.48	
	50638	-	.3937	10.000	10.0	50	14	0.50	-	-	47.48	45.42	43.35	41.29	
	50242	-	.3937	10.000	10.0	70	22	-	-	-	48.13	46.04	43.94	41.85	
NEW	50746	-	.3937	10.000	10.0	70	22	0.25	-	-	51.64	49.39	47.15	44.90	
	50221	-	.3937	10.000	10.0	70	22	0.50	-	-	51.64	49.39	47.15	44.90	
	50359	-	.3937	10.000	10.0	70	22	0.75	-	-	51.64	49.39	47.15	44.90	
	50360	-	.3937	10.000	10.0	70	22	1.00	-	-	51.64	49.39	47.15	44.90	
	50361	-	.3937	10.000	10.0	70	22	1.50	-	-	51.64	49.39	47.15	44.90	
	50362	-	.3937	10.000	10.0	70	22	2.00	-	-	51.64	49.39	47.15	44.90	
NEW	50747	-	.3937	10.000	10.0	70	22	3.00	-	-	51.64	49.39	47.15	44.90	
	50258	-	.3937	10.000	10.0	70	22	BALL	-	-	51.64	49.39	47.15	44.90	
	50608	-	.3937	10.000	10.0	70	26	-	-	-	48.13	46.04	43.94	41.85	
NEW	50748	-	.3937	10.000	10.0	70	26	1.50	-	-	51.64	49.39	47.15	44.90	
NEW	50663	-	.3937	10.000	10.0	70	30	-	-	-	48.13	46.04	43.94	41.85	
NEW	50691	-	.3937	10.000	10.0	70	30	BALL	-	-	51.64	49.39	47.15	44.90	

Series V4S, V4R, V4B (continued)

.3937" - .5000"
(10.000mm - 12.700mm)

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										
NEW	50749	-	.3937	10.000	10.0	70	22	0.50	30	9.40	62.76	60.03	57.30	54.57
NEW	50750	-	.3937	10.000	10.0	100	12	0.30	50	9.40	91.31	87.34	83.37	79.40
NEW	50692	-	.3937	10.000	10.0	100	14	BALL	50	9.40	91.31	87.34	83.37	79.40
	50450	50449	.4724	12.000	12.0	75	26	-	-	-	62.54	59.82	57.10	54.38
	50363	50369	.4724	12.000	12.0	75	26	0.30	-	-	76.05	72.74	69.44	66.13
	50364	50370	.4724	12.000	12.0	75	26	0.50	-	-	76.05	72.74	69.44	66.13
	50365	50366	.4724	12.000	12.0	75	26	0.75	-	-	76.05	72.74	69.44	66.13
	50367	50371	.4724	12.000	12.0	75	26	1.00	-	-	76.05	72.74	69.44	66.13
	50372	50373	.4724	12.000	12.0	75	26	1.50	-	-	76.05	72.74	69.44	66.13
	50374	50375	.4724	12.000	12.0	75	26	2.00	-	-	76.05	72.74	69.44	66.13
	50470	-	.4724	12.000	12.0	75	26	BALL	-	-	76.05	72.74	69.44	66.13
	50243	50283	.4724	12.000	12.0	75	32	-	-	-	62.54	59.82	57.10	54.38
	50222	50270	.4724	12.000	12.0	75	32	0.50	-	-	76.05	72.74	69.44	66.13
	50223	50271	.4724	12.000	12.0	75	32	1.00	-	-	76.05	72.74	69.44	66.13
	50259	50291	.4724	12.000	12.0	75	32	BALL	-	-	76.05	72.74	69.44	66.13
NEW	50664	-	.4724	12.000	12.0	88	36	-	-	-	80.49	76.99	73.49	69.99
NEW	50751	-	.4724	12.000	12.0	88	36	0.30	-	-	85.46	81.74	78.03	74.31
NEW	50752	-	.4724	12.000	12.0	88	36	0.50	-	-	85.46	81.74	78.03	74.31
NEW	50753	-	.4724	12.000	12.0	88	36	1.00	-	-	85.46	81.74	78.03	74.31
NEW	50754	-	.4724	12.000	12.0	88	36	1.50	-	-	85.46	81.74	78.03	74.31
NEW	50755	-	.4724	12.000	12.0	88	36	3.00	-	-	85.46	81.74	78.03	74.31
NEW	50693	-	.4724	12.000	12.0	88	36	BALL	-	-	85.46	81.74	78.03	74.31
	50564	-	.4724	12.000	12.0	100	42	-	-	-	83.58	79.95	76.31	72.68
	50566	-	.4724	12.000	12.0	100	42	0.30	-	-	88.50	84.66	80.81	76.96
	50568	-	.4724	12.000	12.0	100	42	0.50	-	-	88.50	84.66	80.81	76.96
	50570	-	.4724	12.000	12.0	100	42	1.00	-	-	88.50	84.66	80.81	76.96
	50572	-	.4724	12.000	12.0	100	42	2.00	-	-	88.50	84.66	80.81	76.96
	50574	-	.4724	12.000	12.0	100	42	3.00	-	-	88.50	84.66	80.81	76.96
	50576	-	.4724	12.000	12.0	100	42	BALL	-	-	88.50	84.66	80.81	76.96
NEW	50665	-	.4724	12.000	12.0	100	48	-	-	-	83.58	79.95	76.31	72.68
NEW	50756	-	.4724	12.000	12.0	100	48	0.30	-	-	88.50	84.66	80.81	76.96
NEW	50757	-	.4724	12.000	12.0	100	48	0.50	-	-	88.50	84.66	80.81	76.96
NEW	50758	-	.4724	12.000	12.0	100	48	1.00	-	-	88.50	84.66	80.81	76.96
NEW	50759	-	.4724	12.000	12.0	100	48	1.50	-	-	88.50	84.66	80.81	76.96
NEW	50760	-	.4724	12.000	12.0	100	48	3.00	-	-	88.50	84.66	80.81	76.96
NEW	50761	-	.4724	12.000	12.0	100	48	4.00	-	-	88.50	84.66	80.81	76.96
NEW	50694	-	.4724	12.000	12.0	100	48	BALL	-	-	88.50	84.66	80.81	76.96
NEW	50695	-	.4724	12.000	12.0	100	14	BALL	50	11.40	100.73	96.35	91.97	87.59
	50543	-	.5000	12.700	1/2"	2-1/2"	5/8"	-	-	-	56.33	53.88	51.43	48.98
	50640	-	.5000	12.700	1/2"	2-1/2"	5/8"	.010"	-	-	65.35	62.51	59.67	56.83
NEW	50762	-	.5000	12.700	1/2"	2-1/2"	5/8"	.015"	-	-	65.35	62.51	59.67	56.83
	50496	50497	.5000	12.700	1/2"	2-1/2"	5/8"	.020"	-	-	65.35	62.51	59.67	56.83
	50642	-	.5000	12.700	1/2"	2-1/2"	5/8"	.030"	-	-	65.35	62.51	59.67	56.83
NEW	50763	-	.5000	12.700	1/2"	2-1/2"	5/8"	.060"	-	-	65.35	62.51	59.67	56.83
NEW	50764	-	.5000	12.700	1/2"	2-1/2"	5/8"	.090"	-	-	65.35	62.51	59.67	56.83
NEW	50765	-	.5000	12.700	1/2"	2-1/2"	5/8"	.120"	-	-	65.35	62.51	59.67	56.83
	50644	-	.5000	12.700	1/2"	2-1/2"	5/8"	.125"	-	-	65.35	62.51	59.67	56.83
NEW	50766	-	.5000	12.700	1/2"	2-1/2"	5/8"	.156"	-	-	65.35	62.51	59.67	56.83
NEW	50767	-	.5000	12.700	1/2"	2-1/2"	5/8"	.190"	-	-	65.35	62.51	59.67	56.83
	50563	-	.5000	12.700	1/2"	2-1/2"	5/8"	BALL	-	-	65.35	62.51	59.67	56.83

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MATERIAL HARDNESS (Rc)

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continued →

Series V4S, V4R, V4B (continued)

.5000"
(12.700mm)

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											
50452	50453	.5000	1/2"	12.700	1/2"	3"	1"	-	-	-	60.04	57.43	54.82	52.21
50379	50380	.5000	1/2"	12.700	1/2"	3"	1"	.010"	-	-	72.94	69.77	66.60	63.43
NEW	50768	-	.5000	1/2"	12.700	1/2"	3"	1"	.015"	-	72.94	69.77	66.60	63.43
50381	50382	.5000	1/2"	12.700	1/2"	3"	1"	.020"	-	-	72.94	69.77	66.60	63.43
50383	50384	.5000	1/2"	12.700	1/2"	3"	1"	.030"	-	-	72.94	69.77	66.60	63.43
50385	50386	.5000	1/2"	12.700	1/2"	3"	1"	.060"	-	-	72.94	69.77	66.60	63.43
NEW	50769	-	.5000	1/2"	12.700	1/2"	3"	1"	.090"	-	72.94	69.77	66.60	63.43
NEW	50770	-	.5000	1/2"	12.700	1/2"	3"	1"	.120"	-	72.94	69.77	66.60	63.43
NEW	50771	-	.5000	1/2"	12.700	1/2"	3"	1"	.125"	-	72.94	69.77	66.60	63.43
NEW	50772	-	.5000	1/2"	12.700	1/2"	3"	1"	.190"	-	72.94	69.77	66.60	63.43
50472	50473	.5000	1/2"	12.700	1/2"	3"	1"	BALL	-	-	72.94	69.77	66.60	63.43
50244	50284	.5000	1/2"	12.700	1/2"	3"	1-1/4"	-	-	-	60.04	57.43	54.82	52.21
50224	50272	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.010"	-	-	72.94	69.77	66.60	63.43
NEW	50773	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.015"	-	72.94	69.77	66.60	63.43
50225	50273	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.020"	-	-	72.94	69.77	66.60	63.43
50226	50274	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	-	72.94	69.77	66.60	63.43
50227	50275	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"	-	-	72.94	69.77	66.60	63.43
NEW	50774	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.090"	-	72.94	69.77	66.60	63.43
NEW	50775	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.120"	-	72.94	69.77	66.60	63.43
NEW	50776	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.125"	-	72.94	69.77	66.60	63.43
NEW	50777	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.156"	-	72.94	69.77	66.60	63.43
NEW	50778	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.190"	-	72.94	69.77	66.60	63.43
50260	50292	.5000	1/2"	12.700	1/2"	3"	1-1/4"	BALL	-	-	72.94	69.77	66.60	63.43
NEW	50666	-	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	-	-	78.14	74.75	71.35	67.95
NEW	50779	-	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	.010"	-	83.15	79.53	75.92	72.30
NEW	50780	-	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	.015"	-	83.15	79.53	75.92	72.30
NEW	50781	-	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	.020"	-	83.15	79.53	75.92	72.30
NEW	50782	-	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	.030"	-	83.15	79.53	75.92	72.30
NEW	50783	-	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	.060"	-	83.15	79.53	75.92	72.30
NEW	50784	-	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	.090"	-	83.15	79.53	75.92	72.30
NEW	50785	-	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	.120"	-	83.15	79.53	75.92	72.30
NEW	50696	-	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	BALL	-	83.15	79.53	75.92	72.30
50578	50579	.5000	1/2"	12.700	1/2"	4"	1-5/8"	-	-	-	81.24	77.70	74.17	70.64
50580	50581	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.010"	-	-	86.22	82.47	78.72	74.97
50582	50583	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.020"	-	-	86.22	82.47	78.72	74.97
50584	50585	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.030"	-	-	86.22	82.47	78.72	74.97
50586	50587	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.040"	-	-	86.22	82.47	78.72	74.97
50588	50589	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.060"	-	-	86.22	82.47	78.72	74.97
50590	50591	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.120"	-	-	86.22	82.47	78.72	74.97
50592	50593	.5000	1/2"	12.700	1/2"	4"	1-5/8"	BALL	-	-	86.22	82.47	78.72	74.97
50646	-	.5000	1/2"	12.700	1/2"	4"	1-3/4"	-	-	-	81.24	77.70	74.17	70.64
50647	-	.5000	1/2"	12.700	1/2"	4"	2"	-	-	-	81.24	77.70	74.17	70.64
50245	50285	.5000	1/2"	12.700	1/2"	4"	2-1/8"	-	-	-	81.24	77.70	74.17	70.64
NEW	50786	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.010"	-	86.22	82.47	78.72	74.97
NEW	50787	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.015"	-	86.22	82.47	78.72	74.97
NEW	50788	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.020"	-	86.22	82.47	78.72	74.97
NEW	50789	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.030"	-	86.22	82.47	78.72	74.97
NEW	50790	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.060"	-	86.22	82.47	78.72	74.97
NEW	50791	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.090"	-	86.22	82.47	78.72	74.97
NEW	50792	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.120"	-	86.22	82.47	78.72	74.97
NEW	50793	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.125"	-	86.22	82.47	78.72	74.97
NEW	50794	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.190"	-	86.22	82.47	78.72	74.97
50261	50293	.5000	1/2"	12.700	1/2"	4"	2-1/8"	BALL	-	-	86.22	82.47	78.72	74.97

MATERIAL HARDNESS (Rc)

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Series V4S, V4R, V4B (continued)

.5000" - .6250"
(12.700mm - 15.875mm)

HIGH PERFORMANCE
END MILLS

	EDP#	$d1$ †		$d2$	$l1$	$l2$	r	$l3$	$d3$	1-11	12-24	25-49	50-100			
		(plain)	(weldon)											Decimal	Diameter	Metric
NEW	50668	-		.5000	1/2"	12.700	1/2"	6"	3"	-	-	-	116.92	111.84	106.75	101.67
NEW	50795	-		.5000	1/2"	12.700	1/2"	6"	3"	.020"	-	-	121.92	116.62	111.32	106.02
NEW	50796	-		.5000	1/2"	12.700	1/2"	6"	3"	.030"	-	-	121.92	116.62	111.32	106.02
NEW	50797	-		.5000	1/2"	12.700	1/2"	6"	3"	.060"	-	-	121.92	116.62	111.32	106.02
NEW	50798	-		.5000	1/2"	12.700	1/2"	6"	3"	.120"	-	-	121.92	116.62	111.32	106.02
NEW	50799	-		.5000	1/2"	12.700	1/2"	6"	3"	.190"	-	-	121.92	116.62	111.32	106.02
NEW	50699	-		.5000	1/2"	12.700	1/2"	6"	3"	BALL	-	-	121.92	116.62	111.32	106.02
	50610	-		.5000	1/2"	12.700	1/2"	4"	5/8"	-	2-1/4"	.475"	93.38	89.32	85.26	81.20
	50228	-		.5000	1/2"	12.700	1/2"	4"	5/8"	.020"	2-1/4"	.470"	98.42	94.14	89.86	85.58
NEW	50900	-		.5000	1/2"	12.700	1/2"	4"	5/8"	.030"	2-1/4"	.470"	98.42	94.14	89.86	85.58
NEW	50901	-		.5000	1/2"	12.700	1/2"	4"	5/8"	.060"	2-1/4"	.470"	98.42	94.14	89.86	85.58
NEW	50902	-		.5000	1/2"	12.700	1/2"	4"	5/8"	.120"	2-1/4"	.470"	98.42	94.14	89.86	85.58
	50478	-		.5000	1/2"	12.700	1/2"	4"	5/8"	BALL	2-1/4"	.475"	98.42	94.14	89.86	85.58
NEW	50667	-		.5000	1/2"	12.700	1/2"	6"	5/8"	-	3-1/8"	.475"	129.16	123.54	117.93	112.31
	50235	-		.5000	1/2"	12.700	1/2"	6"	5/8"	-	4-1/8"	.475"	129.16	123.54	117.93	112.31
	50594	-		.5000	1/2"	12.700	1/2"	6"	5/8"	.020"	4-1/8"	.470"	134.15	128.32	122.48	116.65
	50596	-		.5000	1/2"	12.700	1/2"	6"	5/8"	.030"	4-1/8"	.470"	134.15	128.32	122.48	116.65
NEW	50697	-		.5000	1/2"	12.700	1/2"	6"	5/8"	BALL	3-1/8"	.475"	134.15	128.32	122.48	116.65
	50598	-		.5000	1/2"	12.700	1/2"	6"	5/8"	BALL	4-1/8"	.475"	134.15	128.32	122.48	116.65
NEW	50698	-		.5000	1/2"	12.700	1/2"	6"	1"	BALL	4-1/2"	.475"	134.15	128.32	122.48	116.65
	50545	50546		.6250	5/8"	15.875	5/8"	3"	3/4"	-	-	-	104.75	100.20	95.64	91.09
NEW	50903	-		.6250	5/8"	15.875	5/8"	3"	3/4"	.010"	-	-	113.00	108.09	103.17	98.26
NEW	50904	-		.6250	5/8"	15.875	5/8"	3"	3/4"	.015"	-	-	113.00	108.09	103.17	98.26
	50498	50499		.6250	5/8"	15.875	5/8"	3"	3/4"	.020"	-	-	113.00	108.09	103.17	98.26
	50500	50501		.6250	5/8"	15.875	5/8"	3"	3/4"	.030"	-	-	113.00	108.09	103.17	98.26
	50502	50503		.6250	5/8"	15.875	5/8"	3"	3/4"	.060"	-	-	113.00	108.09	103.17	98.26
NEW	50905	-		.6250	5/8"	15.875	5/8"	3"	3/4"	.090"	-	-	113.00	108.09	103.17	98.26
NEW	50906	-		.6250	5/8"	15.875	5/8"	3"	3/4"	.120"	-	-	113.00	108.09	103.17	98.26
NEW	50907	-		.6250	5/8"	15.875	5/8"	3"	3/4"	.125"	-	-	113.00	108.09	103.17	98.26
NEW	50908	-		.6250	5/8"	15.875	5/8"	3"	3/4"	.156"	-	-	113.00	108.09	103.17	98.26
NEW	50909	-		.6250	5/8"	15.875	5/8"	3"	3/4"	.190"	-	-	113.00	108.09	103.17	98.26
NEW	50910	-		.6250	5/8"	15.875	5/8"	3"	3/4"	.250"	-	-	113.00	108.09	103.17	98.26
	50246	50286		.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	-	-	-	110.77	105.95	101.14	96.32
NEW	50911	-		.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.010"	-	-	116.13	111.08	106.03	100.98
NEW	50912	-		.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"	-	-	116.13	111.08	106.03	100.98
	50229	50277		.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.020"	-	-	116.13	111.08	106.03	100.98
	50534	50535		.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	-	-	116.13	111.08	106.03	100.98
	50536	50537		.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.040"	-	-	116.13	111.08	106.03	100.98
	50538	50539		.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	-	-	116.13	111.08	106.03	100.98
NEW	50913	-		.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.090"	-	-	116.13	111.08	106.03	100.98
	50230	50278		.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.120"	-	-	116.13	111.08	106.03	100.98
NEW	50914	-		.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.125"	-	-	116.13	111.08	106.03	100.98
NEW	50915	-		.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.156"	-	-	116.13	111.08	106.03	100.98
NEW	50916	-		.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.190"	-	-	116.13	111.08	106.03	100.98
NEW	50917	-		.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.250"	-	-	116.13	111.08	106.03	100.98
	50262	50294		.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	BALL	-	-	116.13	111.08	106.03	100.98

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MATERIAL HARDNESS (Rc)

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continued →

Series V4S, V4R, V4B (continued)

.6250" - .6299"
(15.875mm - 16.000mm)

MATERIAL HARDNESS (Rc)
70
35
0

	EDP#		$d1^{\dagger}$		$d2$	$l1$	$l2$	r	$l3$	$d3$	1-11	12-24	25-49	50-100	
	(plain)	(weldon)	Decimal	Diameter											Metric
NEW	50669	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	-	-	-	118.30	113.16	108.01	102.87
NEW	50918	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.010"	-	-	126.25	120.76	115.27	109.78
NEW	50919	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.015"	-	-	126.25	120.76	115.27	109.78
NEW	50920	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.020"	-	-	126.25	120.76	115.27	109.78
NEW	50921	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.030"	-	-	126.25	120.76	115.27	109.78
NEW	50922	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.060"	-	-	126.25	120.76	115.27	109.78
NEW	50923	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.090"	-	-	126.25	120.76	115.27	109.78
NEW	50924	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.120"	-	-	126.25	120.76	115.27	109.78
NEW	50925	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.125"	-	-	126.25	120.76	115.27	109.78
NEW	50926	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.156"	-	-	126.25	120.76	115.27	109.78
NEW	50927	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.190"	-	-	126.25	120.76	115.27	109.78
NEW	50928	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.250"	-	-	126.25	120.76	115.27	109.78
NEW	50700	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	BALL	-	-	126.25	120.76	115.27	109.78
	50612	-	.6250	5/8"	15.875	5/8"	4"	1-5/8"	-	-	-	118.30	113.16	108.01	102.87
NEW	50670	-	.6250	5/8"	15.875	5/8"	4"	1-3/4"	-	-	-	118.30	113.16	108.01	102.87
NEW	50701	-	.6250	5/8"	15.875	5/8"	4"	1-3/4"	BALL	-	-	126.25	120.76	115.27	109.78
	50547	-	.6299		16.000	16.0	75	19	-	-	-	109.53	104.76	100.00	95.24
	50504	-	.6299		16.000	16.0	75	19	0.50	-	-	117.97	112.84	107.71	102.58
	50506	-	.6299		16.000	16.0	75	19	1.00	-	-	117.97	112.84	107.71	102.58
	50508	-	.6299		16.000	16.0	75	19	3.00	-	-	117.97	112.84	107.71	102.58
NEW	50929	-	.6299		16.000	16.0	75	19	4.00	-	-	117.97	112.84	107.71	102.58
NEW	50930	-	.6299		16.000	16.0	75	19	5.00	-	-	117.97	112.84	107.71	102.58
NEW	50931	-	.6299		16.000	16.0	75	19	6.00	-	-	117.97	112.84	107.71	102.58
	50247	50287	.6299		16.000	16.0	88	32	-	-	-	115.58	110.55	105.53	100.50
	50231	50279	.6299		16.000	16.0	88	32	0.50	-	-	121.20	115.93	110.66	105.39
	50409	50410	.6299		16.000	16.0	88	32	0.75	-	-	121.20	115.93	110.66	105.39
	50411	50412	.6299		16.000	16.0	88	32	1.00	-	-	121.20	115.93	110.66	105.39
	50413	50414	.6299		16.000	16.0	88	32	1.50	-	-	121.20	115.93	110.66	105.39
	50415	50416	.6299		16.000	16.0	88	32	2.00	-	-	121.20	115.93	110.66	105.39
NEW	50932	-	.6299		16.000	16.0	88	32	2.50	-	-	121.20	115.93	110.66	105.39
	50417	50418	.6299		16.000	16.0	88	32	3.00	-	-	121.20	115.93	110.66	105.39
NEW	50933	-	.6299		16.000	16.0	88	32	4.00	-	-	121.20	115.93	110.66	105.39
NEW	50934	-	.6299		16.000	16.0	88	32	5.00	-	-	121.20	115.93	110.66	105.39
NEW	50935	-	.6299		16.000	16.0	88	32	6.00	-	-	121.20	115.93	110.66	105.39
	50263	50295	.6299		16.000	16.0	88	32	BALL	-	-	121.20	115.93	110.66	105.39
NEW	50671	-	.6299		16.000	16.0	100	48	-	-	-	122.87	117.52	112.18	106.84
NEW	50936	-	.6299		16.000	16.0	100	48	0.50	-	-	128.87	123.27	117.66	112.06
NEW	50937	-	.6299		16.000	16.0	100	48	1.00	-	-	128.87	123.27	117.66	112.06
NEW	50938	-	.6299		16.000	16.0	100	48	1.50	-	-	128.87	123.27	117.66	112.06
NEW	50939	-	.6299		16.000	16.0	100	48	2.00	-	-	128.87	123.27	117.66	112.06
NEW	50940	-	.6299		16.000	16.0	100	48	3.00	-	-	128.87	123.27	117.66	112.06
NEW	50941	-	.6299		16.000	16.0	100	48	4.00	-	-	128.87	123.27	117.66	112.06
NEW	50942	-	.6299		16.000	16.0	100	48	5.00	-	-	128.87	123.27	117.66	112.06
NEW	50943	-	.6299		16.000	16.0	100	48	6.00	-	-	128.87	123.27	117.66	112.06
NEW	50702	-	.6299		16.000	16.0	100	48	BALL	-	-	128.87	123.27	117.66	112.06

	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	Diameter Metric										
			.7500	3/4"	3/4"	3"	7/8"	-	-	-	154.74	148.02	141.29	134.56
NEW	50944	-	.7500	3/4"	3/4"	3"	7/8"	.010"	-	-	163.00	155.91	148.83	141.74
NEW	50945	-	.7500	3/4"	3/4"	3"	7/8"	.015"	-	-	163.00	155.91	148.83	141.74
NEW	50946	-	.7500	3/4"	3/4"	3"	7/8"	.020"	-	-	163.00	155.91	148.83	141.74
NEW	50947	-	.7500	3/4"	3/4"	3"	7/8"	.030"	-	-	163.00	155.91	148.83	141.74
NEW	50948	-	.7500	3/4"	3/4"	3"	7/8"	.120"	-	-	163.00	155.91	148.83	141.74
	50549	50550	.7500	3/4"	3/4"	4"	1"	-	-	-	158.13	151.25	144.38	137.50
NEW	50949	-	.7500	3/4"	3/4"	4"	1"	.010"	-	-	166.54	159.30	152.06	144.82
NEW	50950	-	.7500	3/4"	3/4"	4"	1"	.015"	-	-	166.54	159.30	152.06	144.82
	50510	50511	.7500	3/4"	3/4"	4"	1"	.020"	-	-	166.54	159.30	152.06	144.82
	50512	50513	.7500	3/4"	3/4"	4"	1"	.030"	-	-	166.54	159.30	152.06	144.82
	50514	50515	.7500	3/4"	3/4"	4"	1"	.060"	-	-	166.54	159.30	152.06	144.82
NEW	50951	-	.7500	3/4"	3/4"	4"	1"	.090"	-	-	166.54	159.30	152.06	144.82
NEW	50952	-	.7500	3/4"	3/4"	4"	1"	.120"	-	-	166.54	159.30	152.06	144.82
NEW	50953	-	.7500	3/4"	3/4"	4"	1"	.190"	-	-	166.54	159.30	152.06	144.82
NEW	50954	-	.7500	3/4"	3/4"	4"	1"	.250"	-	-	166.54	159.30	152.06	144.82
NEW	50955	-	.7500	3/4"	3/4"	4"	1"	.3125"	-	-	166.54	159.30	152.06	144.82
	50248	50288	.7500	3/4"	3/4"	4"	1-1/2"	-	-	-	158.13	151.25	144.38	137.50
NEW	50956	-	.7500	3/4"	3/4"	4"	1-1/2"	.010"	-	-	166.54	159.30	152.06	144.82
NEW	50957	-	.7500	3/4"	3/4"	4"	1-1/2"	.015"	-	-	166.54	159.30	152.06	144.82
	50516	50517	.7500	3/4"	3/4"	4"	1-1/2"	.020"	-	-	166.54	159.30	152.06	144.82
	50232	50280	.7500	3/4"	3/4"	4"	1-1/2"	.030"	-	-	166.54	159.30	152.06	144.82
	50518	50519	.7500	3/4"	3/4"	4"	1-1/2"	.060"	-	-	166.54	159.30	152.06	144.82
NEW	50958	-	.7500	3/4"	3/4"	4"	1-1/2"	.090"	-	-	166.54	159.30	152.06	144.82
	50520	50521	.7500	3/4"	3/4"	4"	1-1/2"	.120"	-	-	166.54	159.30	152.06	144.82
NEW	50959	-	.7500	3/4"	3/4"	4"	1-1/2"	.125"	-	-	166.54	159.30	152.06	144.82
NEW	50960	-	.7500	3/4"	3/4"	4"	1-1/2"	.156"	-	-	166.54	159.30	152.06	144.82
NEW	50961	-	.7500	3/4"	3/4"	4"	1-1/2"	.190"	-	-	166.54	159.30	152.06	144.82
NEW	50962	-	.7500	3/4"	3/4"	4"	1-1/2"	.250"	-	-	166.54	159.30	152.06	144.82
NEW	50963	-	.7500	3/4"	3/4"	4"	1-1/2"	.3125"	-	-	166.54	159.30	152.06	144.82
	50264	50296	.7500	3/4"	3/4"	4"	1-1/2"	BALL	-	-	166.54	159.30	152.06	144.82
	50551	50552	.7500	3/4"	3/4"	4"	1-3/4"	-	-	-	158.13	151.25	144.38	137.50
NEW	50964	-	.7500	3/4"	3/4"	4"	1-3/4"	.010"	-	-	166.54	159.30	152.06	144.82
NEW	50965	-	.7500	3/4"	3/4"	4"	1-3/4"	.015"	-	-	166.54	159.30	152.06	144.82
	50522	50523	.7500	3/4"	3/4"	4"	1-3/4"	.020"	-	-	166.54	159.30	152.06	144.82
	50524	50525	.7500	3/4"	3/4"	4"	1-3/4"	.030"	-	-	166.54	159.30	152.06	144.82
	50526	50527	.7500	3/4"	3/4"	4"	1-3/4"	.060"	-	-	166.54	159.30	152.06	144.82
NEW	50966	-	.7500	3/4"	3/4"	4"	1-3/4"	.090"	-	-	166.54	159.30	152.06	144.82
NEW	50967	-	.7500	3/4"	3/4"	4"	1-3/4"	.120"	-	-	166.54	159.30	152.06	144.82
NEW	50968	-	.7500	3/4"	3/4"	4"	1-3/4"	.125"	-	-	166.54	159.30	152.06	144.82
NEW	50969	-	.7500	3/4"	3/4"	4"	1-3/4"	.156"	-	-	166.54	159.30	152.06	144.82
NEW	50970	-	.7500	3/4"	3/4"	4"	1-3/4"	.190"	-	-	166.54	159.30	152.06	144.82
NEW	50971	-	.7500	3/4"	3/4"	4"	1-3/4"	.250"	-	-	166.54	159.30	152.06	144.82
NEW	50972	-	.7500	3/4"	3/4"	4"	1-3/4"	.3125"	-	-	166.54	159.30	152.06	144.82

70

35

MATERIAL HARDNESS (Rc)

0

continued →

Series V4S, V4R, V4B (continued)

.7500" - .7874"
(19.050mm - 20.000mm)

70
35
0
MATERIAL HARDNESS (Rc)

	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											
	50553	50554	.7500	3/4"	19.050	3/4"	5"	2-1/8"	-	-	-	212.23	203.01	193.78	184.55
NEW	50973	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.010"	-	-	231.02	220.98	210.93	200.89
NEW	50974	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.015"	-	-	231.02	220.98	210.93	200.89
NEW	50975	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.020"	-	-	231.02	220.98	210.93	200.89
NEW	50976	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.030"	-	-	231.02	220.98	210.93	200.89
NEW	50977	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.060"	-	-	231.02	220.98	210.93	200.89
NEW	50978	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.090"	-	-	231.02	220.98	210.93	200.89
NEW	50979	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.120"	-	-	231.02	220.98	210.93	200.89
NEW	50980	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.125"	-	-	231.02	220.98	210.93	200.89
NEW	50981	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.156"	-	-	231.02	220.98	210.93	200.89
NEW	50982	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.190"	-	-	231.02	220.98	210.93	200.89
NEW	50983	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.250"	-	-	231.02	220.98	210.93	200.89
NEW	50984	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.3125"	-	-	231.02	220.98	210.93	200.89
NEW	50672	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	-	-	-	212.23	203.01	193.78	184.55
NEW	50985	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.010"	-	-	231.02	220.98	210.93	200.89
NEW	50986	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.015"	-	-	231.02	220.98	210.93	200.89
NEW	50987	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.020"	-	-	231.02	220.98	210.93	200.89
NEW	50988	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.030"	-	-	231.02	220.98	210.93	200.89
NEW	50989	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.060"	-	-	231.02	220.98	210.93	200.89
NEW	50990	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.090"	-	-	231.02	220.98	210.93	200.89
NEW	50991	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.120"	-	-	231.02	220.98	210.93	200.89
NEW	50992	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.125"	-	-	231.02	220.98	210.93	200.89
NEW	50993	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.156"	-	-	231.02	220.98	210.93	200.89
NEW	50994	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.190"	-	-	231.02	220.98	210.93	200.89
NEW	50995	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.250"	-	-	231.02	220.98	210.93	200.89
NEW	50996	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.3125"	-	-	231.02	220.98	210.93	200.89
NEW	50703	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	BALL	-	-	231.02	220.98	210.93	200.89
	50555	-	.7874		20.000	20.0	100	25	-	-	-	213.65	204.36	195.07	185.78
	50249	50289	.7874		20.000	20.0	100	38	-	-	-	213.65	204.36	195.07	185.78
NEW	50997	-	.7874		20.000	20.0	100	38	0.50	-	-	235.72	225.47	215.22	204.97
	50528	-	.7874		20.000	20.0	100	38	1.00	-	-	235.72	225.47	215.22	204.97
NEW	50530	-	.7874		20.000	20.0	100	38	2.00	-	-	235.72	225.47	215.22	204.97
NEW	50998	-	.7874		20.000	20.0	100	38	2.50	-	-	235.72	225.47	215.22	204.97
	50532	-	.7874		20.000	20.0	100	38	3.00	-	-	235.72	225.47	215.22	204.97
NEW	50999	-	.7874		20.000	20.0	100	38	4.00	-	-	235.72	225.47	215.22	204.97
NEW	50121	-	.7874		20.000	20.0	100	38	5.00	-	-	235.72	225.47	215.22	204.97
NEW	50122	-	.7874		20.000	20.0	100	38	6.00	-	-	235.72	225.47	215.22	204.97
NEW	50123	-	.7874		20.000	20.0	100	38	8.00	-	-	235.72	225.47	215.22	204.97
	50265	50297	.7874		20.000	20.0	100	38	BALL	-	-	235.72	225.47	215.22	204.97
NEW	50673	-	.7874		20.000	20.0	100	48	-	-	-	213.65	204.36	195.07	185.78
NEW	50124	-	.7874		20.000	20.0	100	48	0.50	-	-	235.72	225.47	215.22	204.97
NEW	50125	-	.7874		20.000	20.0	100	48	1.00	-	-	235.72	225.47	215.22	204.97
NEW	50126	-	.7874		20.000	20.0	100	48	1.50	-	-	235.72	225.47	215.22	204.97
NEW	50127	-	.7874		20.000	20.0	100	48	2.00	-	-	235.72	225.47	215.22	204.97
NEW	50128	-	.7874		20.000	20.0	100	48	2.50	-	-	235.72	225.47	215.22	204.97
NEW	50129	-	.7874		20.000	20.0	100	48	3.00	-	-	235.72	225.47	215.22	204.97
NEW	50131	-	.7874		20.000	20.0	100	48	4.00	-	-	235.72	225.47	215.22	204.97
NEW	50132	-	.7874		20.000	20.0	100	48	5.00	-	-	235.72	225.47	215.22	204.97
NEW	50133	-	.7874		20.000	20.0	100	48	6.00	-	-	235.72	225.47	215.22	204.97
NEW	50134	-	.7874		20.000	20.0	100	48	8.00	-	-	235.72	225.47	215.22	204.97
NEW	50704	-	.7874		20.000	20.0	100	48	BALL	-	-	235.72	225.47	215.22	204.97

Series V4S, V4R, V4B (continued)

.7874" - 1.000"
(20.000mm - 25.400mm)

HIGH PERFORMANCE
END MILLS

	EDP#		$d1^{\dagger}$		$d2$	$l1$	$l2$	r	$l3$	$d3$	1-11	12-24	25-49	50-100
	(plain)	(weldon)	Decimal	Metric										
NEW	50674	-	.7874	20.000	20.0	150	60	-	-	-	268.07	256.41	244.76	233.10
NEW	50135	-	.7874	20.000	20.0	150	60	0.50	-	-	289.78	277.18	264.58	251.98
NEW	50136	-	.7874	20.000	20.0	150	60	1.00	-	-	289.78	277.18	264.58	251.98
NEW	50137	-	.7874	20.000	20.0	150	60	3.00	-	-	289.78	277.18	264.58	251.98
NEW	50138	-	.7874	20.000	20.0	150	60	6.00	-	-	289.78	277.18	264.58	251.98
NEW	50705	-	.7874	20.000	20.0	150	60	BALL	-	-	289.78	277.18	264.58	251.98
	50250	50290	1.000	1"	25.400	1"	4"	1-1/2"	-	-	236.23	225.96	215.69	205.42
NEW	50139	-	1.000	1"	25.400	1"	4"	1-1/2"	.020"	-	284.34	271.98	259.61	247.25
	50233	50281	1.000	1"	25.400	1"	4"	1-1/2"	.030"	-	284.34	271.98	259.61	247.25
NEW	50141	-	1.000	1"	25.400	1"	4"	1-1/2"	.060"	-	284.34	271.98	259.61	247.25
NEW	50142	-	1.000	1"	25.400	1"	4"	1-1/2"	.090"	-	284.34	271.98	259.61	247.25
NEW	50143	-	1.000	1"	25.400	1"	4"	1-1/2"	.120"	-	284.34	271.98	259.61	247.25
	50557	-	1.000	1"	25.400	1"	4"	1-1/2"	.125"	-	284.34	271.98	259.61	247.25
NEW	50144	-	1.000	1"	25.400	1"	4"	1-1/2"	.156"	-	284.34	271.98	259.61	247.25
NEW	50145	-	1.000	1"	25.400	1"	4"	1-1/2"	.190"	-	284.34	271.98	259.61	247.25
NEW	50146	-	1.000	1"	25.400	1"	4"	1-1/2"	.250"	-	284.34	271.98	259.61	247.25
NEW	50147	-	1.000	1"	25.400	1"	4"	1-1/2"	.3125"	-	284.34	271.98	259.61	247.25
NEW	50148	-	1.000	1"	25.400	1"	4"	1-1/2"	.375"	-	284.34	271.98	259.61	247.25
	50266	50298	1.000	1"	25.400	1"	4"	1-1/2"	BALL	-	284.34	271.98	259.61	247.25
NEW	50675	-	1.000	1"	25.400	1"	4-1/2"	2"	-	-	277.83	265.75	253.67	241.59
NEW	50149	-	1.000	1"	25.400	1"	4-1/2"	2"	.020"	-	317.10	303.31	289.53	275.74
NEW	50151	-	1.000	1"	25.400	1"	4-1/2"	2"	.030"	-	317.10	303.31	289.53	275.74
NEW	50152	-	1.000	1"	25.400	1"	4-1/2"	2"	.060"	-	317.10	303.31	289.53	275.74
NEW	50153	-	1.000	1"	25.400	1"	4-1/2"	2"	.090"	-	317.10	303.31	289.53	275.74
NEW	50154	-	1.000	1"	25.400	1"	4-1/2"	2"	.120"	-	317.10	303.31	289.53	275.74
NEW	50155	-	1.000	1"	25.400	1"	4-1/2"	2"	.156"	-	317.10	303.31	289.53	275.74
NEW	50156	-	1.000	1"	25.400	1"	4-1/2"	2"	.190"	-	317.10	303.31	289.53	275.74
NEW	50157	-	1.000	1"	25.400	1"	4-1/2"	2"	.250"	-	317.10	303.31	289.53	275.74
NEW	50158	-	1.000	1"	25.400	1"	4-1/2"	2"	.3125"	-	317.10	303.31	289.53	275.74
NEW	50706	-	1.000	1"	25.400	1"	4-1/2"	2"	BALL	-	317.10	303.31	289.53	275.74
	50234	50282	1.000	1"	25.400	1"	5"	2-1/8"	.030"	-	349.85	334.64	319.43	304.22
NEW	50676	-	1.000	1"	25.400	1"	5"	2-1/2"	-	-	316.23	302.48	288.73	274.98
NEW	50159	-	1.000	1"	25.400	1"	5"	2-1/2"	.020"	-	349.85	334.64	319.43	304.22
NEW	50161	-	1.000	1"	25.400	1"	5"	2-1/2"	.030"	-	349.85	334.64	319.43	304.22
NEW	50162	-	1.000	1"	25.400	1"	5"	2-1/2"	.060"	-	349.85	334.64	319.43	304.22
NEW	50163	-	1.000	1"	25.400	1"	5"	2-1/2"	.090"	-	349.85	334.64	319.43	304.22
NEW	50164	-	1.000	1"	25.400	1"	5"	2-1/2"	.120"	-	349.85	334.64	319.43	304.22
NEW	50165	-	1.000	1"	25.400	1"	5"	2-1/2"	.156"	-	349.85	334.64	319.43	304.22
NEW	50166	-	1.000	1"	25.400	1"	5"	2-1/2"	.190"	-	349.85	334.64	319.43	304.22
NEW	50167	-	1.000	1"	25.400	1"	5"	2-1/2"	.250"	-	349.85	334.64	319.43	304.22
NEW	50168	-	1.000	1"	25.400	1"	5"	2-1/2"	.3125"	-	349.85	334.64	319.43	304.22
NEW	50707	-	1.000	1"	25.400	1"	5"	2-1/2"	BALL	-	349.85	334.64	319.43	304.22

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MATERIAL HARDNESS (Rc)

0

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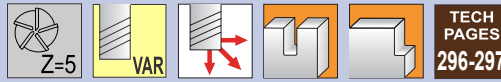
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$d1$	+0.000" - .002" (+.000mm - .050mm)
$d2$	h6
r	+0.001" - .001" (+.025 - .025mm)

.2362" - .3125"
(6.000mm - 7.938mm)



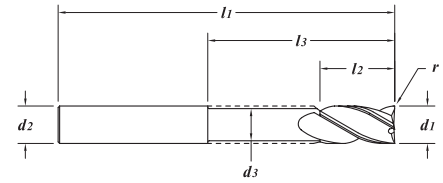
Recommended for titanium, inconel, and stainless steel

Variable Helix End Mill

AlCrN Coating

- Solid submicron grain carbide end mill - center cutting
- Engineered for High Efficiency Milling
- Staggered flutes to control harmonics
- Variable flute design helps with chip evacuation in slots and pockets
- PCT (Polish Carbide Treatment) enhances tool life
- 12mm and larger tools offered with weldon flat
- .375" and larger diameters can be modified 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



MATERIAL HARDNESS (Rc) 70
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EDP#	$d1$ †		$d2$	$l1$	$l2$	r	$l3$	$d3$	1-11	12-24	25-49	50-100	
	(plain)	(weldon)											Decimal
50000	-	.2362	6.000	6.0	50	13	-	-	-	22.92	21.92	20.93	19.93
50001	-	.2362	6.000	6.0	50	13	0.5	-	-	26.51	25.36	24.20	23.05
50002	-	.2362	6.000	6.0	65	19	-	-	-	25.83	24.71	23.58	22.46
50003	-	.2362	6.000	6.0	65	19	0.5	-	-	29.37	28.09	26.82	25.54
50004	-	.2362	6.000	6.0	65	13	-	20	5.4	34.45	32.96	31.46	29.96
50005	-	.2362	6.000	6.0	65	13	0.5	20	5.4	38.00	36.34	34.69	33.04
50006	-	.2362	6.000	6.0	65	13	1.0	20	5.4	38.00	36.34	34.69	33.04
50007	-	.2500	6.350	1/4"	2"	3/8"	-	-	-	21.15	20.23	19.31	18.39
51000	-	.2500	6.350	1/4"	2"	3/8"	.010"	-	-	25.51	24.40	23.29	22.18
50008	-	.2500	6.350	1/4"	2"	3/8"	.015"	-	-	25.51	24.40	23.29	22.18
51001	-	.2500	6.350	1/4"	2"	3/8"	.020"	-	-	25.51	24.40	23.29	22.18
50009	-	.2500	6.350	1/4"	2"	3/8"	.030"	-	-	25.51	24.40	23.29	22.18
51002	-	.2500	6.350	1/4"	2"	1/2"	-	-	-	22.00	21.04	20.09	19.13
51003	-	.2500	6.350	1/4"	2"	1/2"	.010"	-	-	25.51	24.40	23.29	22.18
51004	-	.2500	6.350	1/4"	2"	1/2"	.015"	-	-	25.51	24.40	23.29	22.18
50011	-	.2500	6.350	1/4"	2-1/2"	3/4"	-	-	-	24.93	23.85	22.76	21.68
51005	-	.2500	6.350	1/4"	2-1/2"	3/4"	.010"	-	-	28.23	27.01	25.78	24.55
50012	-	.2500	6.350	1/4"	2-1/2"	3/4"	.015"	-	-	28.23	27.01	25.78	24.55
50013	-	.2500	6.350	1/4"	2-1/2"	3/4"	.020"	-	-	28.23	27.01	25.78	24.55
50014	-	.2500	6.350	1/4"	2-1/2"	3/4"	.030"	-	-	28.23	27.01	25.78	24.55
50015	-	.2500	6.350	1/4"	3"	1"	-	-	-	38.09	36.43	34.78	33.12
51006	-	.2500	6.350	1/4"	3"	1"	.010"	-	-	41.86	40.04	38.22	36.40
51007	-	.2500	6.350	1/4"	3"	1"	.015"	-	-	41.86	40.04	38.22	36.40
50016	-	.2500	6.350	1/4"	3"	1"	.030"	-	-	41.86	40.04	38.22	36.40
50113	-	.2500	6.350	1/4"	3"	1-1/8"	.030"	-	-	41.86	40.04	38.22	36.40
50017	-	.2500	6.350	1/4"	4"	1/2"	.015"	1-1/4"	.235"	54.74	52.36	49.98	47.60
51008	-	.2500	6.350	1/4"	4"	1/2"	.015"	2-1/8"	.235"	54.74	52.36	49.98	47.60
50023	-	.2756	7.000	8.0	65	22	0.2	-	-	45.46	43.48	41.51	39.53
50018	-	.3125	7.938	5/16"	2-1/2"	13/16"	-	-	-	35.57	34.02	32.48	30.93
50019	-	.3125	7.938	5/16"	2-1/2"	13/16"	.015"	-	-	38.28	36.62	34.95	33.29
50021	-	.3125	7.938	5/16"	2-1/2"	13/16"	.020"	-	-	38.28	36.62	34.95	33.29
50022	-	.3125	7.938	5/16"	2-1/2"	13/16"	.030"	-	-	38.28	36.62	34.95	33.29

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	<i>l3</i> Reach Length	<i>d3</i> Neck Diameter	1-11	12-24	25-49	50-100			
												(plain)	(weldon)	Decimal
50024	-	.3150	8.000	8.0	65	22	0.2	-	-	39.72	37.99	36.27	34.54	
50025	-	.3150	8.000	8.0	65	22	0.5	-	-	39.72	37.99	36.27	34.54	
50026	-	.3150	8.000	8.0	75	19	-	26	7.2	61.67	58.99	56.31	53.63	
50027	-	.3150	8.000	8.0	75	19	0.5	26	7.2	66.73	63.83	60.93	58.03	
50028	-	.3150	8.000	8.0	75	19	1.0	26	7.2	66.73	63.83	60.93	58.03	
50029	-	.3750	3/8"	9.525	3/8"	2"	1/2"	-	-	35.91	34.35	32.79	31.23	
50031	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.015"	-	41.12	39.34	37.55	35.76	
50032	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.020"	-	41.12	39.34	37.55	35.76	
50033	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.030"	-	41.12	39.34	37.55	35.76	
50034	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	-	-	41.96	40.14	38.31	36.49	
50035	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.015"	-	44.71	42.77	40.82	38.88	
50036	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.020"	-	44.71	42.77	40.82	38.88	
50037	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.030"	-	44.71	42.77	40.82	38.88	
50038	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.060"	-	44.71	42.77	40.82	38.88	
51009	-	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.015"	-	58.83	56.28	53.72	51.16	
50114	-	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.030"	-	58.83	56.28	53.72	51.16	
51010	-	.3750	3/8"	9.525	3/8"	4"	1-1/2"	.015"	-	66.22	63.34	60.46	57.58	
50039	-	.3750	3/8"	9.525	3/8"	4"	2"	-	-	60.56	57.93	55.29	52.66	
50041	-	.3750	3/8"	9.525	3/8"	4"	2"	.030"	-	66.22	63.34	60.46	57.58	
51011	-	.3750	3/8"	9.525	3/8"	4"	1/2"	.015"	1-1/8"	.355"	79.02	75.58	72.15	68.71
50042	-	.3750	3/8"	9.525	3/8"	4"	7/8"	.015"	1-7/8"	.355"	79.02	75.58	72.15	68.71
51012	-	.3750	3/8"	9.525	3/8"	6"	1/2"	.015"	2-1/8"	.355"	104.47	99.92	95.38	90.84
51013	-	.3750	3/8"	9.525	3/8"	6"	1/2"	.015"	3-1/8"	.355"	104.47	99.92	95.38	90.84
51014	-	.3750	3/8"	9.525	3/8"	6"	1/2"	.015"	4-1/8"	.355"	104.47	99.92	95.38	90.84
50043	-	.3937	10.000	10.0	70	22	-	-	-	50.32	48.14	45.95	43.76	
51015	-	.3937	10.000	10.0	70	22	0.30	-	-	53.99	51.65	49.30	46.95	
50044	-	.3937	10.000	10.0	70	22	0.50	-	-	53.99	51.65	49.30	46.95	
51016	-	.3937	10.000	10.0	70	22	0.75	-	-	53.99	51.65	49.30	46.95	
51017	-	.3937	10.000	10.0	70	22	1.00	-	-	53.99	51.65	49.30	46.95	
50045	-	.3937	10.000	10.0	75	22	-	32	9.0	69.76	66.73	63.69	60.66	
50046	-	.3937	10.000	10.0	75	22	0.50	32	9.0	75.26	71.98	68.71	65.44	
NEW 51018	-	.3937	10.000	10.0	75	22	0.75	32	9.0	75.26	71.98	68.71	65.44	
50047	-	.3937	10.000	10.0	75	22	1.00	32	9.0	75.26	71.98	68.71	65.44	
51019	-	.4724	12.000	12.0	65	19	-	-	-	61.26	58.60	55.93	53.27	
51020	-	.4724	12.000	12.0	65	19	0.50	-	-	71.25	68.16	65.06	61.96	
50484	50485	.4724	12.000	12.0	75	26	-	-	-	65.37	62.52	59.68	56.84	
51021	-	.4724	12.000	12.0	75	26	0.30	-	-	79.51	76.05	72.60	69.14	
50486	50487	.4724	12.000	12.0	75	26	0.50	-	-	79.51	76.05	72.60	69.14	
51022	-	.4724	12.000	12.0	75	26	0.75	-	-	79.51	76.05	72.60	69.14	
51023	-	.4724	12.000	12.0	75	26	1.00	-	-	79.51	76.05	72.60	69.14	
50112	-	.4724	12.000	12.0	75	26	2.00	-	-	79.51	76.05	72.60	69.14	
50115	-	.4724	12.000	12.0	75	26	2.50	-	-	79.51	76.05	72.60	69.14	
50048	50299	.4724	12.000	12.0	75	32	-	-	-	65.37	62.52	59.68	56.84	
51024	-	.4724	12.000	12.0	75	32	0.30	-	-	79.51	76.05	72.60	69.14	
50049	50300	.4724	12.000	12.0	75	32	0.50	-	-	79.51	76.05	72.60	69.14	
51025	-	.4724	12.000	12.0	75	32	0.75	-	-	79.51	76.05	72.60	69.14	
51026	-	.4724	12.000	12.0	75	32	1.00	-	-	79.51	76.05	72.60	69.14	
51027	-	.4724	12.000	12.0	100	38	-	-	-	87.37	83.57	79.77	75.97	
51028	-	.4724	12.000	12.0	100	38	0.50	-	-	92.52	88.50	84.47	80.45	
50423	-	.4724	12.000	12.0	100	42	-	-	-	87.37	83.57	79.77	75.97	
50425	-	.4724	12.000	12.0	100	42	0.30	-	-	92.52	88.50	84.47	80.45	
50427	-	.4724	12.000	12.0	100	42	0.50	-	-	92.52	88.50	84.47	80.45	
50429	-	.4724	12.000	12.0	100	42	1.00	-	-	92.52	88.50	84.47	80.45	
50431	-	.4724	12.000	12.0	100	42	2.00	-	-	92.52	88.50	84.47	80.45	
51029	-	.4724	12.000	12.0	100	52	-	-	-	87.37	83.57	79.77	75.97	
51030	-	.4724	12.000	12.0	100	52	0.50	-	-	92.52	88.50	84.47	80.45	
50051	50301	.4724	12.000	12.0	100	26	-	38	10.8	100.11	95.76	91.40	87.05	
50052	50302	.4724	12.000	12.0	100	26	0.50	38	10.8	105.26	100.68	96.11	91.53	
50053	50303	.4724	12.000	12.0	100	26	1.00	38	10.8	105.26	100.68	96.11	91.53	

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MATERIAL HARDNESS (Rc)

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continued →

Series V5 (continued)

.5000"
(12.700mm)

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											
50054	50304	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	-	-	-	58.74	56.19	53.63	51.08
50106	50305	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.010"	-	-	68.33	65.36	62.39	59.42
50055	50306	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.020"	-	-	68.33	65.36	62.39	59.42
50107	50307	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"	-	-	68.33	65.36	62.39	59.42
50056	50308	.5000	1/2"	12.700	1/2"	3"	1"	-	-	-	62.77	60.04	57.31	54.58
50108	50309	.5000	1/2"	12.700	1/2"	3"	1"	.010"	-	-	76.27	72.95	69.64	66.32
50057	50310	.5000	1/2"	12.700	1/2"	3"	1"	.020"	-	-	76.27	72.95	69.64	66.32
50109	50311	.5000	1/2"	12.700	1/2"	3"	1"	.030"	-	-	76.27	72.95	69.64	66.32
50058	50312	.5000	1/2"	12.700	1/2"	3"	1-1/4"	-	-	-	62.77	60.04	57.31	54.58
50111	50313	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.010"	-	-	76.27	72.95	69.64	66.32
50059	50314	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.015"	-	-	76.27	72.95	69.64	66.32
50061	50315	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.020"	-	-	76.27	72.95	69.64	66.32
50062	50316	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	-	76.27	72.95	69.64	66.32
50063	50317	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.045"	-	-	76.27	72.95	69.64	66.32
50064	50318	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"	-	-	76.27	72.95	69.64	66.32
50065	50319	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.090"	-	-	76.27	72.95	69.64	66.32
50433	50435	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.010"	-	-	90.13	86.21	82.29	78.37
51031	-	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.015"	-	-	90.13	86.21	82.29	78.37
51032	-	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.030"	-	-	90.13	86.21	82.29	78.37
50436	50437	.5000	1/2"	12.700	1/2"	4"	1-5/8"	-	-	-	84.93	81.24	77.54	73.85
50438	50439	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.010"	-	-	90.13	86.21	82.29	78.37
50440	50441	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.020"	-	-	90.13	86.21	82.29	78.37
50442	50443	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.030"	-	-	90.13	86.21	82.29	78.37
50444	50445	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.040"	-	-	90.13	86.21	82.29	78.37
50446	50447	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.060"	-	-	90.13	86.21	82.29	78.37
50067	50321	.5000	1/2"	12.700	1/2"	4"	2-1/8"	-	-	-	84.93	81.24	77.54	73.85
51033	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.015"	-	-	90.13	86.21	82.29	78.37
50068	50322	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.030"	-	-	90.13	86.21	82.29	78.37
51034	-	.5000	1/2"	12.700	1/2"	6"	1"	.030"	-	-	127.47	121.92	116.38	110.84
51035	-	.5000	1/2"	12.700	1/2"	6"	3-1/8"	-	-	-	121.79	116.49	111.20	105.90
51036	-	.5000	1/2"	12.700	1/2"	6"	3-1/8"	.030"	-	-	127.47	121.92	116.38	110.84
51037	-	.5000	1/2"	12.700	1/2"	4"	5/8"	.015"	1-1/2"	.475"	102.89	98.42	93.94	89.47
51038	-	.5000	1/2"	12.700	1/2"	4"	5/8"	.015"	2-1/4"	.475"	102.89	98.42	93.94	89.47
50066	50320	.5000	1/2"	12.700	1/2"	4"	1-1/4"	.030"	2-1/4"	.475"	102.89	98.42	93.94	89.47
51039	-	.5000	1/2"	12.700	1/2"	6"	5/8"	.015"	3-3/8"	.475"	140.25	134.16	128.06	121.96
51040	-	.5000	1/2"	12.700	1/2"	6"	5/8"	.015"	4-1/8"	.475"	140.25	134.16	128.06	121.96

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MATERIAL HARDNESS (Rc)

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EDP#		$d1^{\dagger}$ 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	5/8"	Metric	5/8"	3-1/2"	1-1/4"							
50069	50323	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	-	-	-	115.81	110.77	105.74	100.70
51041	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.020"	-	-	121.42	116.14	110.86	105.58
50071	50324	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	-	-	121.42	116.14	110.86	105.58
50072	50325	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	-	-	121.42	116.14	110.86	105.58
50401	50402	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.120"	-	-	121.42	116.14	110.86	105.58
51042	-	.6250	5/8"	15.875	5/8"	4"	1-5/8"	-	-	-	123.68	118.31	112.93	107.55
51043	-	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.030"	-	-	131.99	126.25	120.51	114.77
51044	-	.6250	5/8"	15.875	5/8"	4"	2-1/8"	-	-	-	123.68	118.31	112.93	107.55
51045	-	.6250	5/8"	15.875	5/8"	4"	2-1/8"	.030"	-	-	131.99	126.25	120.51	114.77
51046	-	.6250	5/8"	15.875	5/8"	6"	2-1/2"	.030"	-	-	181.69	173.79	165.89	157.99
50403	50404	.6250	5/8"	15.875	5/8"	6"	3-1/8"	.030"	-	-	181.69	173.79	165.89	157.99
51047	-	.6250	5/8"	15.875	5/8"	6"	3-1/8"	.060"	-	-	181.69	173.79	165.89	157.99
51048	-	.6250	5/8"	15.875	5/8"	6"	3-1/2"	.030"	-	-	181.69	173.79	165.89	157.99
51049	-	.6250	5/8"	15.875	5/8"	4"	3/4"	.030"	1-5/8"	.590"	143.09	136.87	130.65	124.43
50073	50326	.6250	5/8"	15.875	5/8"	4"	1-1/4"	.030"	2-1/4"	.590"	143.09	136.87	130.65	124.43
51050	-	.6250	5/8"	15.875	5/8"	6"	3/4"	.030"	2-3/8"	.590"	194.45	186.00	177.54	169.09
51051	-	.6250	5/8"	15.875	5/8"	6"	3/4"	.030"	3-3/8"	.590"	194.45	186.00	177.54	169.09
51052	-	.6250	5/8"	15.875	5/8"	6"	3/4"	.030"	4-1/8"	.590"	194.45	186.00	177.54	169.09
51053	-	.6299		16.000	16.0	75	19	-	-	-	117.59	112.48	107.36	102.25
51054	-	.6299		16.000	16.0	75	19	0.50	-	-	123.31	117.95	112.59	107.23
50074	50327	.6299		16.000	16.0	88	32	-	-	-	120.82	115.57	110.31	105.06
50075	50328	.6299		16.000	16.0	88	32	0.50	-	-	126.70	121.19	115.68	110.17
50420	-	.6299		16.000	16.0	88	32	1.00	-	-	126.70	121.19	115.68	110.17
51055	-	.6299		16.000	16.0	88	32	2.00	-	-	126.70	121.19	115.68	110.17
50422	-	.6299		16.000	16.0	88	32	3.00	-	-	126.70	121.19	115.68	110.17
50424	-	.6299		16.000	16.0	88	32	4.00	-	-	126.70	121.19	115.68	110.17
50430	-	.6299		16.000	16.0	100	40	0.50	-	-	134.72	128.87	123.01	117.15
50432	-	.6299		16.000	16.0	100	40	1.00	-	-	134.72	128.87	123.01	117.15
50434	-	.6299		16.000	16.0	100	40	3.00	-	-	134.72	128.87	123.01	117.15
50076	50329	.6299		16.000	16.0	100	32	-	50	14.4	139.62	133.55	127.48	121.41
50077	-	.6299		16.000	16.0	100	32	0.50	50	14.4	145.84	139.50	133.16	126.82
50426	-	.6299		16.000	16.0	100	32	1.00	50	14.4	145.84	139.50	133.16	126.82
51056	-	.6299		16.000	16.0	100	32	2.00	50	14.4	145.84	139.50	133.16	126.82
50428	-	.6299		16.000	16.0	100	32	3.00	50	14.4	145.84	139.50	133.16	126.82
50078	-	.7087		18.000	18.0	100	32	0.75	-	-	181.88	173.98	166.07	158.16

continued →

Series V5 (continued)

.7500"
(19.050mm)

70
35
0
MATERIAL HARDNESS (Rc)

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										
50079	50332	.7500	3/4"	19.050	3/4"	3"	7/8"	-	-	-	161.60	154.57	147.55	140.52
51103	-	.7500	3/4"	19.050	3/4"	3"	7/8"	.015"	-	-	170.43	163.02	155.61	148.20
50081	50333	.7500	3/4"	19.050	3/4"	3"	7/8"	.030"	-	-	170.42	163.01	155.60	148.19
51057	-	.7500	3/4"	19.050	3/4"	3"	7/8"	.060"	-	-	170.43	163.02	155.61	148.20
51105	-	.7500	3/4"	19.050	3/4"	3"	7/8"	.120"	-	-	170.43	163.02	155.61	148.20
51107	-	.7500	3/4"	19.050	3/4"	4"	1-1/4"	.015"	-	-	174.12	166.55	158.98	151.41
51058	-	.7500	3/4"	19.050	3/4"	4"	1-1/4"	.030"	-	-	174.12	166.55	158.98	151.41
51109	-	.7500	3/4"	19.050	3/4"	4"	1-1/4"	.060"	-	-	174.12	166.55	158.98	151.41
50082	50334	.7500	3/4"	19.050	3/4"	4"	1-1/2"	-	-	-	165.31	158.13	150.94	143.75
51111	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"	-	-	174.12	166.55	158.98	151.41
50083	50335	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	-	-	174.12	166.55	158.98	151.41
50084	50336	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	-	-	174.12	166.55	158.98	151.41
51059	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.078"	-	-	174.12	166.55	158.98	151.41
50085	50337	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.120"	-	-	174.12	166.55	158.98	151.41
51113	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.190"	-	-	174.12	166.55	158.98	151.41
51060	-	.7500	3/4"	19.050	3/4"	4"	1-5/8"	-	-	-	165.31	158.13	150.94	143.75
51115	-	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.015"	-	-	174.12	166.55	158.98	151.41
51061	-	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.030"	-	-	174.12	166.55	158.98	151.41
51119	-	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.060"	-	-	174.12	166.55	158.98	151.41
51062	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	-	-	-	165.31	158.13	150.94	143.75
51121	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.015"	-	-	174.12	166.55	158.98	151.41
51063	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.030"	-	-	174.12	166.55	158.98	151.41
51123	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.060"	-	-	174.12	166.55	158.98	151.41
50086	50338	.7500	3/4"	19.050	3/4"	5"	2-1/8"	-	-	-	221.88	212.23	202.59	192.94
51125	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.015"	-	-	241.53	231.03	220.53	210.03
50087	50339	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.030"	-	-	241.53	231.03	220.53	210.03
51064	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.060"	-	-	241.53	231.03	220.53	210.03
51065	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.120"	-	-	241.53	231.03	220.53	210.03
51127	-	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.015"	-	-	241.53	231.03	220.53	210.03
51066	-	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.030"	-	-	241.53	231.03	220.53	210.03
51129	-	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.060"	-	-	241.53	231.03	220.53	210.03
51131	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.015"	-	-	241.53	231.03	220.53	210.03
51067	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.030"	-	-	241.53	231.03	220.53	210.03
51133	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.060"	-	-	241.53	231.03	220.53	210.03
51135	-	.7500	3/4"	19.050	3/4"	5"	2-3/4"	.015"	-	-	241.53	231.03	220.53	210.03
51068	-	.7500	3/4"	19.050	3/4"	5"	2-3/4"	.030"	-	-	241.53	231.03	220.53	210.03
51137	-	.7500	3/4"	19.050	3/4"	5"	2-3/4"	.060"	-	-	241.53	231.03	220.53	210.03
50089	50341	.7500	3/4"	19.050	3/4"	6"	3-1/4"	-	-	-	259.66	248.37	237.08	225.79
51139	-	.7500	3/4"	19.050	3/4"	6"	3-1/4"	.015"	-	-	286.90	274.43	261.95	249.48
50091	50342	.7500	3/4"	19.050	3/4"	6"	3-1/4"	.030"	-	-	286.90	274.43	261.95	249.48
51141	-	.7500	3/4"	19.050	3/4"	6"	3-1/4"	.060"	-	-	286.90	274.43	261.95	249.48
51143	-	.7500	3/4"	19.050	3/4"	7"	4-1/4"	.015"	-	-	361.84	346.10	330.37	314.64
51145	-	.7500	3/4"	19.050	3/4"	7"	4-1/4"	.030"	-	-	361.84	346.10	330.37	314.64
51147	-	.7500	3/4"	19.050	3/4"	7"	4-1/4"	.060"	-	-	361.84	346.10	330.37	314.64
51069	-	.7500	3/4"	19.050	3/4"	4"	1"	.030"	2"	.705"	186.91	178.78	170.66	162.53
51070	-	.7500	3/4"	19.050	3/4"	5"	1"	.030"	2-1/2"	.705"	254.33	243.28	232.22	221.16
50088	50340	.7500	3/4"	19.050	3/4"	5-1/2"	1-1/2"	.030"	3-1/4"	.705"	299.74	286.70	273.67	260.64
51071	-	.7500	3/4"	19.050	3/4"	6"	1"	.030"	4-1/8"	.705"	299.74	286.70	273.67	260.64

EDP#		$d1^{\dagger}$ 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										
50092	50343	.7874	20.000	20.0	100	38	-	-	-	223.34	213.63	203.92	194.21
51072	-	.7874	20.000	20.0	100	38	0.50	-	-	246.43	235.72	225.00	214.29
50093	50344	.7874	20.000	20.0	100	38	0.75	-	-	246.43	235.72	225.00	214.29
51073	-	.7874	20.000	20.0	100	38	1.00	-	-	246.43	235.72	225.00	214.29
51074	-	.7874	20.000	20.0	100	38	1.50	-	-	246.43	235.72	225.00	214.29
51075	-	.7874	20.000	20.0	100	38	2.00	-	-	246.43	235.72	225.00	214.29
51076	-	.7874	20.000	20.0	100	38	3.00	-	-	246.43	235.72	225.00	214.29
51077	-	.9843	25.000	25.0	100	38	-	-	-	255.07	243.98	232.89	221.80
51078	-	.9843	25.000	25.0	100	38	0.50	-	-	282.45	270.17	257.89	245.61
NEW 51079	-	.9843	25.000	25.0	100	38	0.75	-	-	282.45	270.17	257.89	245.61
51080	-	.9843	25.000	25.0	100	38	1.50	-	-	282.45	270.17	257.89	245.61
51081	-	.9843	25.000	25.0	100	38	3.00	-	-	282.45	270.17	257.89	245.61
50094	-	1.000	1" 25.400	1"	4"	1-1/4"	-	-	-	246.96	236.23	225.49	214.75
50095	-	1.000	1" 25.400	1"	4"	1-1/4"	.030"	-	-	297.28	284.35	271.43	258.50
NEW 51082	-	1.000	1" 25.400	1"	4"	1-1/4"	.120"	-	-	297.28	284.35	271.43	258.50
-	50348	1.000	1" 25.400	1"	4"	1-1/2"	-	-	-	237.46	227.14	216.81	206.49
-	50349	1.000	1" 25.400	1"	4"	1-1/2"	.030"	-	-	285.84	273.42	260.99	248.56
-	50350	1.000	1" 25.400	1"	4"	1-1/2"	.060"	-	-	285.84	273.42	260.99	248.56
51083	-	1.000	1" 25.400	1"	4"	1-1/2"	.120"	-	-	297.28	284.35	271.43	258.50
NEW 50116	-	1.000	1" 25.400	1"	4"	1-1/2"	.125"	-	-	297.28	284.35	271.43	258.50
50097	-	1.000	1" 25.400	1"	4"	1-3/4"	-	-	-	246.96	236.23	225.49	214.75
50098	-	1.000	1" 25.400	1"	4"	1-3/4"	.030"	-	-	297.28	284.35	271.43	258.50
50099	-	1.000	1" 25.400	1"	4"	1-3/4"	.060"	-	-	297.28	284.35	271.43	258.50
51084	-	1.000	1" 25.400	1"	4"	1-3/4"	.120"	-	-	297.28	284.35	271.43	258.50
51085	-	1.000	1" 25.400	1"	4-1/2"	2"	.030"	-	-	331.51	317.10	302.68	288.27
51086	-	1.000	1" 25.400	1"	4-1/2"	2"	.060"	-	-	331.51	317.10	302.68	288.27
51087	-	1.000	1" 25.400	1"	4-1/2"	2"	.120"	-	-	331.51	317.10	302.68	288.27
51088	-	1.000	1" 25.400	1"	4-1/2"	2"	.250"	-	-	331.51	317.10	302.68	288.27
51089	-	1.000	1" 25.400	1"	5"	2-1/2"	.030"	-	-	365.75	349.84	333.94	318.04
51090	-	1.000	1" 25.400	1"	5"	2-5/8"	.030"	-	-	365.75	349.84	333.94	318.04
50104	50354	1.000	1" 25.400	1"	6"	3-1/4"	-	-	-	430.63	411.91	393.18	374.46
50105	-	1.000	1" 25.400	1"	6"	3-1/4"	.030"	-	-	477.02	456.28	435.54	414.80
51091	-	1.000	1" 25.400	1"	6"	3-3/8"	.060"	-	-	477.02	456.28	435.54	414.80
51092	-	1.000	1" 25.400	1"	7"	4-1/4"	.030"	-	-	582.12	556.81	531.50	506.19
51093	-	1.000	1" 25.400	1"	7"	4-1/4"	.060"	-	-	582.12	556.81	531.50	506.19
51094	-	1.000	1" 25.400	1"	5"	1-1/4"	.030"	2-5/8"	.940"	378.56	362.10	345.64	329.18
50101	-	1.000	1" 25.400	1"	5-1/2"	1-3/4"	.030"	3-1/4"	.940"	485.02	463.94	442.85	421.76
50102	50352	1.000	1" 25.400	1"	5-1/2"	1-3/4"	.060"	3-1/4"	.940"	485.02	463.94	442.85	421.76
51095	-	1.000	1" 25.400	1"	6"	1-1/4"	.030"	3-3/8"	.940"	489.82	468.52	447.23	425.93
51096	-	1.000	1" 25.400	1"	7"	1-1/4"	.030"	4-1/4"	.940"	595.15	569.27	543.40	517.52

70

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MATERIAL HARDNESS (Rc)

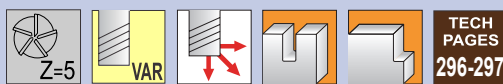
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Series V5C - Chip Splitter

HIGH EFFICIENCY MILLING

TOLERANCES	
d_1	+0.000" - .002" (+.000mm - .050mm)
d_2	h6
r	+0.011" - .001" (+.025 - .025mm)

.4724" - .6299"
(12.000mm - 16.000mm)



Recommended for titanium, inconel, and stainless steel

Variable Helix End Mill

AlCrN Coating

Solid submicron grain carbide end mill - center cutting

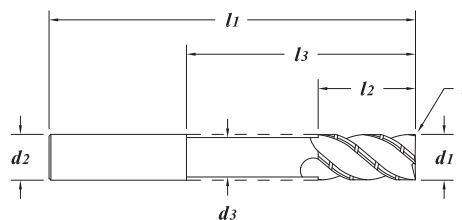
Chip splitter to help break long chips

Engineered for High Efficiency Milling

Staggered flutes to control harmonics

Variable flute design helps with chip evacuation in slots and pockets

PCT (Polish Carbide Treatment) enhances tool life



MATERIAL HARDNESS (Rc)

70

35

0

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
	Decimal	Metric										
50801	.4724	12.000	12.0	100	42	0.30	-	-	98.80	94.50	90.21	85.91
50800	.4724	12.000	12.0	100	42	1.00	-	-	98.80	94.50	90.21	85.91
50803	.5000	12.700	12.700	3"	1"	-	-	-	69.05	66.04	63.04	60.04
50807	.5000	12.700	12.700	3"	1"	.015"	-	-	82.55	78.96	75.37	71.78
50805	.5000	12.700	12.700	3"	1"	.020"	-	-	82.55	78.96	75.37	71.78
50809	.5000	12.700	12.700	3"	1"	.030"	-	-	82.55	78.96	75.37	71.78
50811	.5000	12.700	12.700	3"	1-1/4"	.015"	-	-	82.55	78.96	75.37	71.78
50810	.5000	12.700	12.700	3"	1-1/4"	.020"	-	-	82.55	78.96	75.37	71.78
50815	.5000	12.700	12.700	3"	1-1/4"	.030"	-	-	82.55	78.96	75.37	71.78
50813	.5000	12.700	12.700	3"	1-1/4"	.060"	-	-	82.55	78.96	75.37	71.78
50820	.5000	12.700	12.700	3"	1-1/4"	.090"	-	-	82.55	78.96	75.37	71.78
50825	.5000	12.700	12.700	4"	1-1/2"	.010"	-	-	96.40	92.21	88.02	83.83
50817	.5000	12.700	12.700	4"	1-1/2"	.030"	-	-	96.40	92.21	88.02	83.83
50830	.5000	12.700	12.700	4"	1-5/8"	-	-	-	91.21	87.24	83.28	79.31
50819	.5000	12.700	12.700	4"	1-5/8"	.030"	-	-	96.40	92.21	88.02	83.83
50835	.5000	12.700	12.700	4"	2-1/8"	-	-	-	91.21	87.24	83.28	79.31
NEW 50836	.5000	12.700	12.700	4"	2-1/8"	.030"	-	-	96.40	92.21	88.02	83.83
50821	.5000	12.700	12.700	4"	5/8"	.015"	1-1/2"	.475"	109.17	104.42	99.68	94.93
NEW 50823	.6250	15.875	15.875	3-1/2"	1-1/4"	.020"	-	-	128.95	123.34	117.74	112.13
50840	.6250	15.875	15.875	3-1/2"	1-1/4"	.030"	-	-	128.95	123.34	117.74	112.13
50827	.6250	15.875	15.875	4"	1-5/8"	-	-	-	131.22	125.51	119.81	114.10
50829	.6250	15.875	15.875	4"	1-5/8"	.030"	-	-	139.53	133.46	127.40	121.33
50845	.6250	15.875	15.875	4"	2-1/8"	.030"	-	-	139.53	133.46	127.40	121.33
50831	.6250	15.875	15.875	6"	2-1/2"	.030"	-	-	189.22	180.99	172.77	164.54
50833	.6299	16.000	16.000	100	40	0.50	-	-	142.26	136.07	129.89	123.70
50837	.6299	16.000	16.000	100	40	1.00	-	-	142.26	136.07	129.89	123.70

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	
	Decimal	Metric											
50839	.7500	3/4"	19.050	3/4"	3"	7/8"	-	-	-	169.46	162.10	154.73	147.36
50841	.7500	3/4"	19.050	3/4"	3"	7/8"	.030"	-	-	178.27	170.52	162.77	155.02
50843	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	-	-	181.99	174.08	166.16	158.25
50847	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	-	-	181.99	174.08	166.16	158.25
50850	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.120"	-	-	181.99	174.08	166.16	158.25
50849	.7500	3/4"	19.050	3/4"	4"	1-3/4"	-	-	-	173.17	165.64	158.11	150.58
50851	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.030"	-	-	181.99	174.08	166.16	158.25
50855	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.030"	-	-	249.38	238.54	227.69	216.85
50853	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.030"	-	-	249.38	238.54	227.69	216.85
50857	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.030"	-	-	249.38	238.54	227.69	216.85
50859	.7500	3/4"	19.050	3/4"	5"	2-3/4"	.015"	-	-	249.38	238.54	227.69	216.85
50861	.7500	3/4"	19.050	3/4"	5"	2-3/4"	.030"	-	-	249.38	238.54	227.69	216.85
50863	.7500	3/4"	19.050	3/4"	6"	3-1/4"	-	-	-	267.52	255.89	244.26	232.63
50860	.7500	3/4"	19.050	3/4"	6"	3-1/4"	.030"	-	-	294.76	281.94	269.13	256.31
50867	.7500	3/4"	19.050	3/4"	7"	4-1/4"	.015"	-	-	369.69	353.62	337.54	321.47
NEW 50869	1.000	1"	25.400	1"	5"	2-1/2"	.030"	-	-	373.61	357.37	341.12	324.88
NEW 50871	1.000	1"	25.400	1"	5"	2-5/8"	.030"	-	-	373.61	357.37	341.12	324.88
50873	1.000	1"	25.400	1"	6"	3-1/4"	.030"	-	-	484.89	463.80	442.72	421.64

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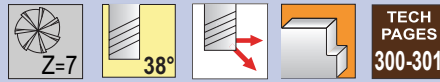
MATERIAL HARDNESS (Rc)

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Series VX-7 **NEW ITEMS** HIGH EFFICIENCY MILLING

.3150" - .5000"
(8.000mm - 12.700mm)



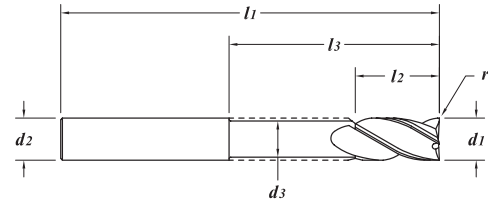
TOLERANCES	
d1	+0.000" - .002" (+.000mm - .050mm)
d2	h6
r	+0.011" - .001" (+.025 - .025mm)

Recommended for titanium, stainless, and tool steels under 45Rc

Seven-Flute End Mill

AlCrN-Based Coating

- Solid submicron grain carbide end mill - non-center cutting
- Engineered for High Efficiency Milling
- Multiple flutes for increased feed rates
- Staggered flute geometry
- PCT (Polish Carbide Treatment) enhances tool life
- Up to 15% Radial (ae) engagement



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											
64100	.3150	8.000	8.0	65	22	-	-	-	53.99	51.65	49.30	46.95	
64102	.3150	8.000	8.0	65	22	0.50	-	-	59.48	56.89	54.31	51.72	
64104	.3150	8.000	8.0	65	22	1.00	-	-	59.48	56.89	54.31	51.72	
NEW 64105	.3150	8.000	8.0	75	27	1.60	-	-	72.94	69.77	66.60	63.43	
64106	.3150	8.000	8.0	75	32	-	-	-	66.75	63.84	60.94	58.04	
64108	.3150	8.000	8.0	75	32	0.50	-	-	72.94	69.77	66.60	63.43	
64110	.3150	8.000	8.0	75	32	1.00	-	-	72.94	69.77	66.60	63.43	
64112	.3750	3/8"	9.525	3/8"	2-1/2"	1"	-	-	58.67	56.12	53.57	51.02	
64114	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.020"	-	64.24	61.45	58.65	55.86	
64116	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.030"	-	64.24	61.45	58.65	55.86	
NEW 64117	.3750	3/8"	9.525	3/8"	3"	1"	.025"	-	78.14	74.75	71.35	67.95	
64118	.3750	3/8"	9.525	3/8"	3"	1-1/2"	-	-	70.76	67.68	64.61	61.53	
64120	.3750	3/8"	9.525	3/8"	3"	1-1/2"	.020"	-	78.14	74.75	71.35	67.95	
64122	.3750	3/8"	9.525	3/8"	3"	1-1/2"	.030"	-	78.14	74.75	71.35	67.95	
NEW 64123	.3750	3/8"	9.525	3/8"	3"	1-1/2"	.060"	-	78.14	74.75	71.35	67.95	
NEW 64246	.3750	3/8"	9.525	3/8"	4"	7/8"	.015"	1-7/8"	.355"	101.71	97.28	92.86	88.44
64124	.3937	10.000	10.0	70	25	-	-	-	68.70	65.71	62.73	59.74	
64126	.3937	10.000	10.0	70	25	0.50	-	-	75.83	72.53	69.24	65.94	
64128	.3937	10.000	10.0	70	25	1.00	-	-	75.83	72.53	69.24	65.94	
64130	.4724	12.000	12.0	75	26	-	-	-	82.48	78.89	75.31	71.72	
64132	.4724	12.000	12.0	75	26	0.50	-	-	100.42	96.05	91.69	87.32	
64134	.4724	12.000	12.0	75	26	1.00	-	-	100.42	96.05	91.69	87.32	
64136	.4724	12.000	12.0	75	32	-	-	-	82.48	78.89	75.31	71.72	
64138	.4724	12.000	12.0	75	32	0.50	-	-	100.42	96.05	91.69	87.32	
64140	.4724	12.000	12.0	75	32	1.00	-	-	100.42	96.05	91.69	87.32	
NEW 64141	.4724	12.000	12.0	100	42	1.00	-	-	121.80	116.50	111.21	105.91	
64142	.4724	12.000	12.0	100	50	-	-	-	110.76	105.94	101.13	96.31	
64144	.4724	12.000	12.0	100	50	0.50	-	-	121.80	116.50	111.21	105.91	
64146	.4724	12.000	12.0	100	50	1.00	-	-	121.80	116.50	111.21	105.91	
64218	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	-	-	77.07	73.72	70.37	67.02	
64220	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.015"	-	89.80	85.90	81.99	78.09	
64222	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"	-	89.80	85.90	81.99	78.09	
NEW 64223	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.060"	-	89.80	85.90	81.99	78.09	
64224	.5000	1/2"	12.700	1/2"	3"	1"	-	-	80.10	76.62	73.13	69.65	
64226	.5000	1/2"	12.700	1/2"	3"	1"	.015"	-	97.27	93.04	88.81	84.58	
64228	.5000	1/2"	12.700	1/2"	3"	1"	.030"	-	97.27	93.04	88.81	84.58	

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MATERIAL HARDNESS (Rc)

Series VX-7 (continued)

.5000" - .7500"
(12.700mm - 19.050mm)

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	
	Decimal	Metric											
64148	.5000	1/2"	12.700	1/2"	3"	1-1/4"	-	-	-	80.10	76.62	73.13	69.65
64150	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.015"	-	-	97.27	93.04	88.81	84.58
64152	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.020"	-	-	97.27	93.04	88.81	84.58
64154	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	-	97.27	93.04	88.81	84.58
64156	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"	-	-	97.27	93.04	88.81	84.58
NEW 64157	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.125"	-	-	97.27	93.04	88.81	84.58
64158	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	-	-	-	104.17	99.64	95.11	90.58
64160	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	.030"	-	-	114.82	109.82	104.83	99.84
NEW 64161	.5000	1/2"	12.700	1/2"	4"	5/8"	.015"	2-1/8"	.475"	128.62	123.02	117.43	111.84
NEW 64242	.5000	1/2"	12.700	1/2"	4"	1-5/8"	-	-	-	106.87	102.22	97.58	92.93
NEW 64244	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.015"	-	-	117.52	112.41	107.30	102.19
64162	.5000	1/2"	12.700	1/2"	4"	2"	-	-	-	106.87	102.22	97.58	92.93
NEW 64163	.5000	1/2"	12.700	1/2"	4"	2"	.015"	-	-	117.52	112.41	107.30	102.19
64164	.5000	1/2"	12.700	1/2"	4"	2"	.030"	-	-	117.52	112.41	107.30	102.19
NEW 64165	.5000	1/2"	12.700	1/2"	4"	2"	.125"	-	-	117.52	112.41	107.30	102.19
NEW 64248	.5512		14.000	14.0	88	32	0.50	-	-	143.31	137.08	130.85	124.62
64166	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	-	-	-	135.99	130.08	124.16	118.25
64168	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	-	-	148.65	142.19	135.72	129.26
64170	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	-	-	148.65	142.19	135.72	129.26
NEW 64171	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.120"	-	-	148.65	142.19	135.72	129.26
64172	.6250	5/8"	15.875	5/8"	4"	1-3/4"	-	-	-	143.18	136.95	130.73	124.50
64174	.6250	5/8"	15.875	5/8"	4"	1-3/4"	.030"	-	-	156.71	149.90	143.08	136.27
64176	.6250	5/8"	15.875	5/8"	4"	1-3/4"	.060"	-	-	156.71	149.90	143.08	136.27
NEW 64177	.6250	5/8"	15.875	5/8"	4"	1-3/4"	.120"	-	-	156.71	149.90	143.08	136.27
NEW 64250	.6250	5/8"	15.875	5/8"	4"	2"	.120"	-	-	156.71	149.90	143.08	136.27
64178	.6299		16.000	16.0	88	32	-	-	-	145.51	139.18	132.86	126.53
64180	.6299		16.000	16.0	88	32	0.50	-	-	158.64	151.75	144.85	137.95
64182	.6299		16.000	16.0	88	32	1.00	-	-	158.64	151.75	144.85	137.95
64230	.6299		16.000	16.0	88	32	2.00	-	-	158.64	151.75	144.85	137.95
NEW 64231	.6299		16.000	16.0	100	40	1.00	-	-	166.49	159.25	152.01	144.77
64232	.6299		16.000	16.0	100	40	1.50	-	-	166.49	159.25	152.01	144.77
64234	.6299		16.000	16.0	125	65	0.50	-	-	209.33	200.23	191.13	182.03
64236	.6299		16.000	16.0	125	65	3.00	-	-	209.33	200.23	191.13	182.03
NEW 64252	.7500	3/4"	19.050	3/4"	3"	1"	-	-	-	176.90	169.21	161.52	153.83
NEW 64254	.7500	3/4"	19.050	3/4"	3"	1"	.030"	-	-	195.07	186.59	178.11	169.63
64184	.7500	3/4"	19.050	3/4"	4"	1-1/2"	-	-	-	186.22	178.12	170.03	161.93
64186	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	-	-	204.72	195.82	186.92	178.02
64188	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	-	-	204.72	195.82	186.92	178.02
64190	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.120"	-	-	204.72	195.82	186.92	178.02
NEW 64256	.7500	3/4"	19.050	3/4"	4"	1-3/4"	-	-	-	186.23	178.13	170.04	161.94
NEW 64258	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.030"	-	-	204.72	195.82	186.92	178.02
NEW 64260	.7500	3/4"	19.050	3/4"	5"	1"	.030"	3"	.730"	288.37	275.84	263.30	250.76
64192	.7500	3/4"	19.050	3/4"	5"	2-1/4"	-	-	-	245.23	234.56	223.90	213.24
64194	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.030"	-	-	277.27	265.21	253.16	241.10
64238	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.060"	-	-	277.27	265.21	253.16	241.10
NEW 64262	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.120"	-	-	277.27	265.21	253.16	241.10
NEW 64264	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.060"	-	-	277.27	265.21	253.16	241.10
NEW 64266	.7500	3/4"	19.050	3/4"	6"	1-1/8"	.120"	3-5/8"	.730"	336.93	322.28	307.63	292.98
64196	.7500	3/4"	19.050	3/4"	6"	3-1/4"	-	-	-	287.04	274.56	262.08	249.60
64198	.7500	3/4"	19.050	3/4"	6"	3-1/4"	.030"	-	-	325.81	311.64	297.48	283.31

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MATERIAL HARDNESS (Rc)

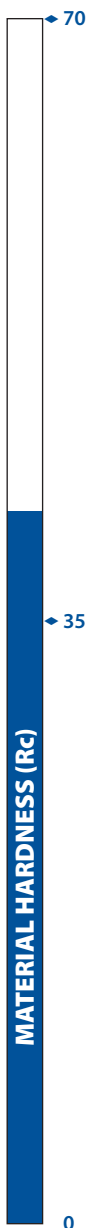
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continued →

Series VX-7 (continued)

.7874" - 1.0000"
(20.000mm - 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										
64200	.7874	20.000	20.0	100	38	-	-	-	249.19	238.36	227.52	216.69
64202	.7874	20.000	20.0	100	38	0.50	-	-	285.07	272.68	260.28	247.89
64204	.7874	20.000	20.0	100	38	1.00	-	-	285.07	272.68	260.28	247.89
64206	1.000	1" 25.400	1"	4"	1-1/2"	-	-	-	270.81	259.04	247.26	235.49
64208	1.000	1" 25.400	1"	4"	1-1/2"	.030"	-	-	334.04	319.52	304.99	290.47
64240	1.000	1" 25.400	1"	4"	1-1/2"	.125"	-	-	334.05	319.53	305.00	290.48
64210	1.000	1" 25.400	1"	5"	2"	-	-	-	353.38	338.02	322.65	307.29
64212	1.000	1" 25.400	1"	5"	2-1/2"	-	-	-	353.38	338.02	322.65	307.29
NEW 64213	1.000	1" 25.400	1"	5"	2-1/2"	.030"	-	-	406.56	388.88	371.21	353.53
64214	1.000	1" 25.400	1"	6"	3-1/4"	-	-	-	450.47	430.88	411.30	391.71
64216	1.000	1" 25.400	1"	6"	3-1/4"	.030"	-	-	515.95	493.52	471.08	448.65



TOLERANCES

<i>d1</i>	+0.000" -0.002" (+.000mm -.050mm)
<i>d2</i>	h6
<i>r</i>	+0.001" -0.001" (+.025 -.025mm)

HIGH EFFICIENCY MILLING

Series VX-7C - Chip Splitter



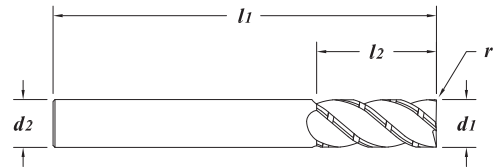
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Recommended for titanium, stainless, and tool steels under 45Rc

Seven-Flute End Mill

AlCrN-Based Coating

- Solid submicron grain carbide end mill - non-center cutting
- Chip splitter to help break long chips
- Engineered for High Efficiency Milling
- Multiple flutes for increased feed rates
- Staggered flute geometry
- PCT (Polish Carbide Treatment) enhances tool life
- Up to 15% Radial (ae) engagement



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									
64300	.3750	3/8"	9.525	3/8"	2-1/2"	1"	-	65.50	62.66	59.81	56.96
64302	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.020"	71.08	67.99	64.90	61.81
64304	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.030"	71.08	67.99	64.90	61.81
64310	.4724		12.000	12.0	100	50	0.50	130.35	124.69	119.02	113.35
64316	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"	98.35	94.07	89.80	85.52
64318	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.060"	98.35	94.07	89.80	85.52
64322	.5000	1/2"	12.700	1/2"	3"	1"	.030"	105.81	101.21	96.61	92.01
64330	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	105.81	101.21	96.61	92.01
64332	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"	105.81	101.21	96.61	92.01
64338	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	-	112.71	107.81	102.91	98.01
64342	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	.030"	123.36	118.00	112.63	107.27
64346	.5000	1/2"	12.700	1/2"	4"	2"	-	115.41	110.40	105.38	100.36
64348	.5000	1/2"	12.700	1/2"	4"	2"	.030"	126.06	120.58	115.10	109.62
64352	.5000	1/2"	12.700	1/2"	4"	2"	.125"	126.06	120.58	115.10	109.62
64360	.6250	5/8"	15.875	5/8"	4"	1-3/4"	-	153.43	146.76	140.09	133.42
64364	.6250	5/8"	15.875	5/8"	4"	1-3/4"	.030"	166.96	159.70	152.44	145.18
64368	.6299		16.000	16.0	100	40	0.75	176.73	169.05	161.36	153.68
64369	.6299		16.000	16.0	100	40	1.00	176.73	169.05	161.36	153.68
64372	.6299		16.000	16.0	100	50	1.00	176.73	169.05	161.36	153.68
64380	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	215.41	206.04	196.68	187.31
64386	.7500	3/4"	19.050	3/4"	6"	3-1/4"	.030"	336.48	321.85	307.22	292.59
NEW 64389	.7874		20.000	20.0	100	38	0.50	297.88	284.93	271.98	259.03
64400	1.000	1"	25.400	1"	5"	2-1/2"	.030"	419.38	401.15	382.91	364.68

HIGH PERFORMANCE
END MILLS

70
35
0
MATERIAL HARDNESS (Rc)

Series VRX NEW ITEMS HIGH EFFICIENCY MILLING

.0591" - .1181"
(1.500mm - 3.000mm)



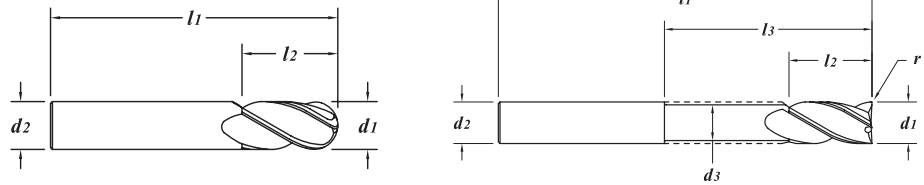
TOLERANCES	
d1	+0.000" - .002" (+.000mm - .050mm)
d2	h6
r	+0.001" - .001" (+.025 - .025mm)

Recommended for inconel, pH materials, titanium and tool steels >40Rc

Square End, Corner Radius, Ball End AlTiN Coating

Solid submicron grain carbide end mill - center cutting
Excellent for High Efficiency Milling
Reduces vibration for more aggressive machining resulting in less cycle times and greater productivity
Staggered flute geometry

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



MATERIAL HARDNESS (Rc) 70 35 0

EDP#	D1 †	D2	L1	L2	r	L3	D3						
								1-11	12-24	25-49	50-100		
(plain)	(weldon)	Decimal	Metric	Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter				
61084	-	.0591	1.500	3.0	38	3.0	-	-	-	15.08	14.42	13.77	13.11
61086	-	.0591	1.500	3.0	38	3.0	0.20	-	-	17.10	16.36	15.61	14.87
61088	-	.0591	1.500	3.0	38	3.0	BALL	-	-	17.10	16.36	15.61	14.87
61090	-	.0591	1.500	3.0	38	6.0	-	-	-	15.08	14.42	13.77	13.11
61092	-	.0591	1.500	3.0	38	6.0	0.20	-	-	17.10	16.36	15.61	14.87
61094	-	.0591	1.500	3.0	38	6.0	BALL	-	-	17.10	16.36	15.61	14.87
61096	-	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	-	-	14.21	13.60	12.98	12.36
61098	-	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	.010"	-	16.11	15.41	14.71	14.01
61100	-	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	BALL	-	16.11	15.41	14.71	14.01
61102	-	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	-	-	14.21	13.60	12.98	12.36
61104	-	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	.010"	-	16.11	15.41	14.71	14.01
61106	-	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	BALL	-	16.11	15.41	14.71	14.01
61108	-	.0787	2.000	3.0	38	4.0	-	-	-	14.21	13.60	12.98	12.36
61110	-	.0787	2.000	3.0	38	4.0	0.20	-	-	16.11	15.41	14.71	14.01
61112	-	.0787	2.000	3.0	38	4.0	BALL	-	-	16.11	15.41	14.71	14.01
61114	-	.0787	2.000	3.0	38	8.0	-	-	-	14.21	13.60	12.98	12.36
61116	-	.0787	2.000	3.0	38	8.0	0.20	-	-	16.11	15.41	14.71	14.01
61118	-	.0787	2.000	3.0	38	8.0	BALL	-	-	16.11	15.41	14.71	14.01
61120	-	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	-	-	13.57	12.98	12.39	11.80
61122	-	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	.010"	-	15.53	14.85	14.18	13.50
61124	-	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	BALL	-	15.53	14.85	14.18	13.50
61126	-	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	-	-	13.57	12.98	12.39	11.80
61128	-	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.010"	-	15.53	14.85	14.18	13.50
61130	-	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	BALL	-	15.53	14.85	14.18	13.50
61877	-	.1181	3.000	3.0	38	8	-	-	-	12.75	12.20	11.64	11.09
27420	-	.1181	3.000	3.0	50	8	0.20	-	-	14.34	13.72	13.09	12.47
61132	-	.1181	3.000	3.0	50	8	0.30	-	-	14.34	13.72	13.09	12.47
27425	-	.1181	3.000	3.0	50	8	0.50	-	-	14.34	13.72	13.09	12.47
61134	-	.1181	3.000	3.0	50	8	BALL	-	-	14.34	13.72	13.09	12.47
61887	-	.1181	3.000	3.0	38	12	-	-	-	12.75	12.20	11.64	11.09
27430	-	.1181	3.000	3.0	50	12	0.20	-	-	14.34	13.72	13.09	12.47
61136	-	.1181	3.000	3.0	50	12	0.30	-	-	14.34	13.72	13.09	12.47
27435	-	.1181	3.000	3.0	50	12	0.50	-	-	14.34	13.72	13.09	12.47
61138	-	.1181	3.000	3.0	50	12	BALL	-	-	14.34	13.72	13.09	12.47

EDP# (plain)	(weldon)	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											
61917	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	-	-	-	12.75	12.20	11.64	11.09
27440	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.010"	-	-	14.34	13.72	13.09	12.47
61140	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.015"	-	-	14.34	13.72	13.09	12.47
61073	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.030"	-	-	14.34	13.72	13.09	12.47
61142	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	BALL	-	-	14.34	13.72	13.09	12.47
61144	-	.1250	1/8"	3.175	1/8"	1-1/2"	3/8"	-	-	-	12.75	12.20	11.64	11.09
61146	-	.1250	1/8"	3.175	1/8"	1-1/2"	3/8"	.010"	-	-	14.34	13.72	13.09	12.47
61148	-	.1250	1/8"	3.175	1/8"	1-1/2"	3/8"	.015"	-	-	14.34	13.72	13.09	12.47
61074	-	.1250	1/8"	3.175	1/8"	1-1/2"	3/8"	.030"	-	-	14.34	13.72	13.09	12.47
61149	-	.1250	1/8"	3.175	1/8"	1-1/2"	3/8"	BALL	-	-	14.34	13.72	13.09	12.47
61927	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	-	-	-	12.75	12.20	11.64	11.09
27450	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.010"	-	-	14.34	13.72	13.09	12.47
61150	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.015"	-	-	14.34	13.72	13.09	12.47
27455	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.020"	-	-	14.34	13.72	13.09	12.47
61075	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.030"	-	-	14.34	13.72	13.09	12.47
61152	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	BALL	-	-	14.34	13.72	13.09	12.47
61154	-	.1562	5/32"	3.967	3/16"	2"	5/16"	-	-	-	16.80	16.07	15.34	14.61
27460	-	.1562	5/32"	3.967	3/16"	2"	5/16"	.010"	-	-	19.77	18.91	18.05	17.19
61156	-	.1562	5/32"	3.967	3/16"	2"	5/16"	.015"	-	-	19.77	18.91	18.05	17.19
61076	-	.1562	5/32"	3.967	3/16"	2"	5/16"	.030"	-	-	19.77	18.91	18.05	17.19
61077	-	.1562	5/32"	3.967	3/16"	2"	5/16"	BALL	-	-	19.77	18.91	18.05	17.19
61158	-	.1562	5/32"	3.967	3/16"	2"	1/2"	-	-	-	16.80	16.07	15.34	14.61
27470	-	.1562	5/32"	3.967	3/16"	2"	1/2"	.010"	-	-	19.77	18.91	18.05	17.19
61160	-	.1562	5/32"	3.967	3/16"	2"	1/2"	.015"	-	-	19.77	18.91	18.05	17.19
61078	-	.1562	5/32"	3.967	3/16"	2"	1/2"	.030"	-	-	19.77	18.91	18.05	17.19
61079	-	.1562	5/32"	3.967	3/16"	2"	1/2"	BALL	-	-	19.77	18.91	18.05	17.19
61162	-	.1575		4.000	6.0	50	8	-	-	-	23.93	22.89	21.85	20.81
27480	-	.1575		4.000	6.0	50	8	0.30	-	-	24.30	23.24	22.19	21.13
61164	-	.1575		4.000	6.0	50	8	0.50	-	-	24.30	23.24	22.19	21.13
28470	-	.1575		4.000	6.0	50	8	BALL	-	-	24.30	23.24	22.19	21.13
61977	-	.1575		4.000	6.0	50	12	-	-	-	23.93	22.89	21.85	20.81
27490	-	.1575		4.000	6.0	50	12	0.30	-	-	24.30	23.24	22.19	21.13
27495	-	.1575		4.000	6.0	50	12	0.50	-	-	24.30	23.24	22.19	21.13
28480	-	.1575		4.000	6.0	50	12	BALL	-	-	24.30	23.24	22.19	21.13
61166	-	.1575		4.000	6.0	65	19	-	-	-	26.54	25.39	24.23	23.08
61168	-	.1575		4.000	6.0	65	19	0.30	-	-	26.93	25.76	24.59	23.42
62007	-	.1875	3/16"	4.763	3/16"	2"	5/16"	-	-	-	16.08	15.38	14.68	13.98
27500	-	.1875	3/16"	4.763	3/16"	2"	5/16"	.010"	-	-	18.01	17.23	16.44	15.66
61170	-	.1875	3/16"	4.763	3/16"	2"	5/16"	.015"	-	-	18.01	17.23	16.44	15.66
61172	-	.1875	3/16"	4.763	3/16"	2"	5/16"	.020"	-	-	18.01	17.23	16.44	15.66
28490	-	.1875	3/16"	4.763	3/16"	2"	5/16"	BALL	-	-	18.01	17.23	16.44	15.66
61174	-	.1875	3/16"	4.763	3/16"	2"	7/16"	-	-	-	16.08	15.38	14.68	13.98
61176	-	.1875	3/16"	4.763	3/16"	2"	7/16"	.010"	-	-	18.01	17.23	16.44	15.66
61178	-	.1875	3/16"	4.763	3/16"	2"	7/16"	.015"	-	-	18.01	17.23	16.44	15.66
62017	-	.1875	3/16"	4.763	3/16"	2"	9/16"	-	-	-	16.08	15.38	14.68	13.98
27520	-	.1875	3/16"	4.763	3/16"	2"	9/16"	.010"	-	-	18.01	17.23	16.44	15.66
61180	-	.1875	3/16"	4.763	3/16"	2"	9/16"	.015"	-	-	18.01	17.23	16.44	15.66
27521	-	.1875	3/16"	4.763	3/16"	2"	9/16"	.020"	-	-	18.01	17.23	16.44	15.66
61182	-	.1875	3/16"	4.763	3/16"	2"	9/16"	.030"	-	-	18.01	17.23	16.44	15.66
28500	-	.1875	3/16"	4.763	3/16"	2"	9/16"	BALL	-	-	18.01	17.23	16.44	15.66
61184	-	.1875	3/16"	4.763	3/16"	3"	1"	.010"	-	-	30.82	29.48	28.14	26.80
61186	-	.1875	3/16"	4.763	3/16"	3"	1-1/4"	.010"	-	-	30.82	29.48	28.14	26.80
63100	-	.1875	3/16"	4.763	3/16"	4"	5/16"	.010"	-	-	33.55	32.09	30.63	29.17
61188	-	.1969		5.000	6.0	50	10	-	-	-	23.44	22.42	21.40	20.38
27522	-	.1969		5.000	6.0	50	10	0.30	-	-	23.82	22.78	21.75	20.71
61190	-	.1969		5.000	6.0	50	10	0.50	-	-	23.82	22.78	21.75	20.71
28510	-	.1969		5.000	6.0	50	10	BALL	-	-	23.82	22.78	21.75	20.71

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MATERIAL HARDNESS (Rc)

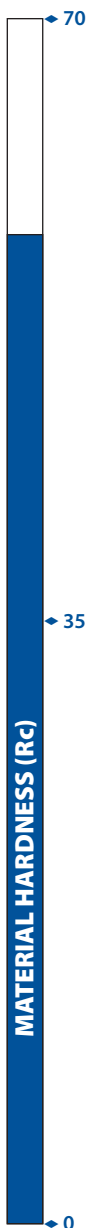
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continued →

Series VRX (continued)

.1969" - .2500"
(5.000mm - 6.350mm)

EDP#	(plain) (weldon)	$d1$ † 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											
62057	-	.1969	5.000	6.0	65	15	-	-	-	25.60	24.49	23.37	22.26	
27524	-	.1969	5.000	6.0	65	15	0.30	-	-	26.38	25.23	24.09	22.94	
27526	-	.1969	5.000	6.0	65	15	0.50	-	-	26.38	25.23	24.09	22.94	
27528	-	.1969	5.000	6.0	65	15	1.00	-	-	26.38	25.23	24.09	22.94	
28520	-	.1969	5.000	6.0	65	15	BALL	-	-	26.38	25.23	24.09	22.94	
63110	-	.1969	5.000	6.0	100	10	0.30	-	-	50.55	48.36	46.16	43.96	
61192	-	.1969	5.000	6.0	100	10	0.30	55	4.70	59.20	56.63	54.05	51.48	
61194	-	.2188	7/32"	5.558	1/4"	2"	3/8"	-	-	19.76	18.90	18.04	17.18	
61196	-	.2188	7/32"	5.558	1/4"	2"	3/8"	.010"	-	22.91	21.91	20.92	19.92	
27525	-	.2188	7/32"	5.558	1/4"	2"	3/8"	.015"	-	22.91	21.91	20.92	19.92	
61198	-	.2188	7/32"	5.558	1/4"	2"	3/8"	BALL	-	22.91	21.91	20.92	19.92	
61200	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	-	-	22.43	21.45	20.48	19.50	
61202	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	.010"	-	25.40	24.30	23.19	22.09	
27530	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	.015"	-	25.40	24.30	23.19	22.09	
61204	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	.020"	-	25.40	24.30	23.19	22.09	
61206	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	BALL	-	25.40	24.30	23.19	22.09	
61208	-	.2188	7/32"	5.558	1/4"	3"	1-1/4"	.015"	-	37.65	36.01	34.38	32.74	
63120	-	.2188	7/32"	5.558	1/4"	4"	3/8"	.015"	-	48.82	46.70	44.57	42.45	
61210	-	.2188	7/32"	5.558	1/4"	4"	3/8"	.015"	2-1/4"	.205"	57.47	54.97	52.47	49.97
62077	-	.2362	6.000	6.0	50	12	-	-	-	19.93	19.06	18.20	17.33	
27535	-	.2362	6.000	6.0	50	12	0.30	-	-	23.05	22.04	21.04	20.04	
61212	-	.2362	6.000	6.0	50	12	0.50	-	-	23.05	22.04	21.04	20.04	
61214	-	.2362	6.000	6.0	50	12	0.75	-	-	23.05	22.04	21.04	20.04	
28530	-	.2362	6.000	6.0	50	12	BALL	-	-	23.05	22.04	21.04	20.04	
62087	-	.2362	6.000	6.0	65	19	-	-	-	22.46	21.48	20.51	19.53	
61216	-	.2362	6.000	6.0	65	19	0.20	-	-	25.54	24.43	23.32	22.21	
27540	-	.2362	6.000	6.0	65	19	0.30	-	-	25.54	24.43	23.32	22.21	
27545	-	.2362	6.000	6.0	65	19	0.50	-	-	25.54	24.43	23.32	22.21	
61218	-	.2362	6.000	6.0	65	19	0.75	-	-	25.54	24.43	23.32	22.21	
27547	-	.2362	6.000	6.0	65	19	1.00	-	-	25.54	24.43	23.32	22.21	
27548	-	.2362	6.000	6.0	65	19	1.50	-	-	25.54	24.43	23.32	22.21	
28540	-	.2362	6.000	6.0	65	19	BALL	-	-	25.54	24.43	23.32	22.21	
61220	-	.2362	6.000	6.0	75	26	0.30	-	-	38.00	36.34	34.69	33.04	
61222	-	.2362	6.000	6.0	75	26	0.50	-	-	38.00	36.34	34.69	33.04	
61224	-	.2362	6.000	6.0	75	38	0.30	-	-	38.00	36.34	34.69	33.04	
61226	-	.2362	6.000	6.0	75	38	0.50	-	-	38.00	36.34	34.69	33.04	
63130	-	.2362	6.000	6.0	100	12	0.30	32	5.70	49.29	47.15	45.00	42.86	
62137	-	.2500	1/4"	6.350	1/4"	2"	3/8"	-	-	19.12	18.29	17.46	16.63	
61228	-	.2500	1/4"	6.350	1/4"	2"	3/8"	.010"	-	21.32	20.39	19.47	18.54	
27560	-	.2500	1/4"	6.350	1/4"	2"	3/8"	.015"	-	22.17	21.21	20.24	19.28	
61230	-	.2500	1/4"	6.350	1/4"	2"	3/8"	.020"	-	22.17	21.21	20.24	19.28	
28570	-	.2500	1/4"	6.350	1/4"	2"	3/8"	BALL	-	22.17	21.21	20.24	19.28	
61232	-	.2500	1/4"	6.350	1/4"	2"	1/2"	-	-	19.12	18.29	17.46	16.63	
61234	-	.2500	1/4"	6.350	1/4"	2"	1/2"	.015"	-	22.17	21.21	20.24	19.28	
62147	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	-	-	21.69	20.75	19.80	18.86	
27570	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"	-	24.56	23.50	22.43	21.36	
27580	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	-	24.56	23.50	22.43	21.36	
61236	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"	-	24.56	23.50	22.43	21.36	
27581	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	-	24.56	23.50	22.43	21.36	
61238	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.040"	-	24.56	23.50	22.43	21.36	
27583	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.060"	-	24.56	23.50	22.43	21.36	
28580	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	BALL	-	24.56	23.50	22.43	21.36	



NEW	EDP#		$d1$ †		$d2$	$l1$	$l2$	r	$l3$	$d3$	1-11	12-24	25-49	50-100
	(plain)	(weldon)	Decimal	Diameter	Metric	Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length				
61240	-	.2500	1/4"	6.350	1/4"	3"	1"	.015"	-	-	36.40	34.82	33.23	31.65
61241	-	.2500	1/4"	6.350	1/4"	3"	1-1/8"	.030"	-	-	36.40	34.82	33.23	31.65
61242	-	.2500	1/4"	6.350	1/4"	3"	1-1/2"	.015"	-	-	36.40	34.82	33.23	31.65
61244	-	.2500	1/4"	6.350	1/4"	4"	3/8"	.015"	3/4"	.240"	47.60	45.53	43.46	41.39
63140	-	.2500	1/4"	6.350	1/4"	4"	3/8"	.015"	1-1/4"	.240"	47.60	45.53	43.46	41.39
61246	-	.2500	1/4"	6.350	1/4"	4"	3/8"	.015"	2-1/8"	.240"	47.60	45.53	43.46	41.39
27585	-	.2756		7.000	8.0	50	12	0.30	-	-	35.96	34.40	32.83	31.27
27590	-	.2756		7.000	8.0	65	22	0.30	-	-	39.53	37.81	36.09	34.37
61248	-	.2812	9/32"	7.142	5/16"	2"	7/16"	-	-	-	30.25	28.93	27.62	26.30
27595	-	.2812	9/32"	7.142	5/16"	2"	7/16"	.015"	-	-	34.66	33.15	31.65	30.14
61250	-	.2812	9/32"	7.142	5/16"	2-1/2"	13/16"	-	-	-	35.40	33.86	32.32	30.78
61252	-	.2812	9/32"	7.142	5/16"	2-1/2"	13/16"	.010"	-	-	38.10	36.44	34.79	33.13
27597	-	.2812	9/32"	7.142	5/16"	2-1/2"	13/16"	.015"	-	-	38.10	36.44	34.79	33.13
61254	-	.2812	9/32"	7.142	5/16"	2-1/2"	13/16"	.020"	-	-	38.10	36.44	34.79	33.13
63150	-	.2812	9/32"	7.142	5/16"	4"	7/16"	.015"	-	-	65.83	62.96	60.10	57.24
62207	-	.3125	5/16"	7.938	5/16"	2"	7/16"	-	-	-	26.43	25.28	24.13	22.98
61256	-	.3125	5/16"	7.938	5/16"	2"	7/16"	.010"	-	-	30.29	28.97	27.66	26.34
61258	-	.3125	5/16"	7.938	5/16"	2"	7/16"	.015"	-	-	30.29	28.97	27.66	26.34
27600	-	.3125	5/16"	7.938	5/16"	2"	7/16"	.020"	-	-	30.29	28.97	27.66	26.34
61260	-	.3125	5/16"	7.938	5/16"	2"	7/16"	.030"	-	-	30.29	28.97	27.66	26.34
28610	-	.3125	5/16"	7.938	5/16"	2"	7/16"	BALL	-	-	30.29	28.97	27.66	26.34
62217	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	-	-	-	30.92	29.58	28.23	26.89
27610	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.010"	-	-	33.29	31.85	30.40	28.95
61262	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.015"	-	-	33.29	31.85	30.40	28.95
27620	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.020"	-	-	33.29	31.85	30.40	28.95
27622	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.030"	-	-	33.29	31.85	30.40	28.95
61264	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.040"	-	-	33.29	31.85	30.40	28.95
27624	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.060"	-	-	33.29	31.85	30.40	28.95
28620	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	BALL	-	-	33.29	31.85	30.40	28.95
61266	-	.3125	5/16"	7.938	5/16"	3"	1-1/4"	.015"	-	-	46.41	44.40	42.38	40.36
63160	-	.3125	5/16"	7.938	5/16"	4"	7/16"	.020"	1-7/8"	.300"	64.19	61.40	58.61	55.82
62257	-	.3150		8.000	8.0	50	12	-	-	-	27.52	26.32	25.13	23.93
61268	-	.3150		8.000	8.0	50	12	0.30	-	-	31.41	30.04	28.68	27.31
27630	-	.3150		8.000	8.0	50	12	0.50	-	-	31.41	30.04	28.68	27.31
61270	-	.3150		8.000	8.0	50	12	0.75	-	-	31.41	30.04	28.68	27.31
28630	-	.3150		8.000	8.0	50	12	BALL	-	-	31.41	30.04	28.68	27.31
62267	-	.3150		8.000	8.0	65	22	-	-	-	32.05	30.66	29.26	27.87
27635	-	.3150		8.000	8.0	65	22	0.30	-	-	34.55	33.04	31.54	30.04
27640	-	.3150		8.000	8.0	65	22	0.50	-	-	34.55	33.04	31.54	30.04
61272	-	.3150		8.000	8.0	65	22	0.75	-	-	34.55	33.04	31.54	30.04
27642	-	.3150		8.000	8.0	65	22	1.00	-	-	34.55	33.04	31.54	30.04
27643	-	.3150		8.000	8.0	65	22	1.50	-	-	34.55	33.04	31.54	30.04
61274	-	.3150		8.000	8.0	65	22	2.00	-	-	34.55	33.04	31.54	30.04
28640	-	.3150		8.000	8.0	65	22	BALL	-	-	34.55	33.04	31.54	30.04
61276	-	.3150		8.000	8.0	75	38	0.50	-	-	48.39	46.29	44.18	42.08
61278	-	.3150		8.000	8.0	100	50	0.50	-	-	55.28	52.88	50.47	48.07
63170	-	.3150		8.000	8.0	100	12	0.50	47	7.60	66.40	63.51	60.63	57.74
61280	-	.3438	11/32"	8.733	3/8"	2"	1/2"	-	-	-	35.34	33.80	32.27	30.73
27645	-	.3438	11/32"	8.733	3/8"	2"	1/2"	.020"	-	-	40.45	38.69	36.93	35.17
61282	-	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	-	-	-	41.29	39.49	37.70	35.90
27650	-	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	.020"	-	-	43.98	42.06	40.15	38.24
61284	-	.3438	11/32"	8.733	3/8"	3"	1-1/4"	.015"	-	-	57.88	55.36	52.85	50.33

70

35

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MATERIAL HARDNESS (Rc)

continued →

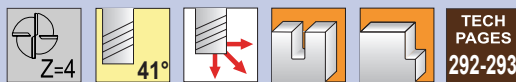
Series VRX (continued)

HIGH EFFICIENCY MILLING

TOLERANCES

d1	+0.00" -0.02" (+0.000mm -0.50mm)
d2	h6
r	+0.01" -0.01" (+0.025 -0.25mm)

.3438" - .3937"
(8.733mm - 10.000mm)



Recommended for inconel, pH materials, titanium and tool steels >40Rc



AlTiN Coating

Solid submicron grain carbide end mill - center cutting

Excellent for High Efficiency Milling

Reduces vibration for more aggressive machining resulting in less cycle times and greater productivity

Staggered flute geometry

EDP#	(plain) (weldon)	d1 †		d2	l1	l2	r	l3	d3	1-11	12-24	25-49	50-100	
		Decimal	Diameter Metric											
63180	-	.3438	11/32"	8.733	3/8"	4"	1/2"	.020"	-	-	70.48	67.42	64.35	61.29
27655	-	.3543		9.000	10.0	50	14	0.50	-	-	48.83	46.71	44.58	42.46
62287	-	.3543		9.000	10.0	65	22	-	-	-	49.50	47.34	45.19	43.04
27657	-	.3543		9.000	10.0	65	22	0.50	-	-	53.08	50.78	48.47	46.16
62317	-	.3750	3/8"	9.525	3/8"	2"	1/2"	-	-	-	31.22	29.87	28.51	27.15
27658	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.010"	-	-	35.75	34.20	32.64	31.09
61286	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.015"	-	-	35.75	34.20	32.64	31.09
27660	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.020"	-	-	35.75	34.20	32.64	31.09
27662	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.030"	-	-	35.75	34.20	32.64	31.09
61288	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.060"	-	-	35.75	34.20	32.64	31.09
28670	-	.3750	3/8"	9.525	3/8"	2"	1/2"	BALL	-	-	35.75	34.20	32.64	31.09
62327	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	-	-	-	36.49	34.90	33.32	31.73
27670	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.010"	-	-	38.88	37.19	35.50	33.81
61290	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.015"	-	-	38.88	37.19	35.50	33.81
27680	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.020"	-	-	38.88	37.19	35.50	33.81
27682	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	-	-	38.88	37.19	35.50	33.81
61292	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.040"	-	-	38.88	37.19	35.50	33.81
61294	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.050"	-	-	38.88	37.19	35.50	33.81
27684	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.060"	-	-	38.88	37.19	35.50	33.81
61296	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.094"	-	-	38.88	37.19	35.50	33.81
28680	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	BALL	-	-	38.88	37.19	35.50	33.81
61298	-	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.015"	-	-	51.16	48.94	46.71	44.49
61299	-	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.030"	-	-	51.16	48.94	46.71	44.49
61300	-	.3750	3/8"	9.525	3/8"	4"	1-1/2"	.015"	-	-	57.58	55.08	52.57	50.07
61302	-	.3750	3/8"	9.525	3/8"	4"	1-1/2"	BALL	-	-	57.58	55.08	52.57	50.07
61304	-	.3750	3/8"	9.525	3/8"	4"	2"	.015"	-	-	57.58	55.08	52.57	50.07
61306	-	.3750	3/8"	9.525	3/8"	4"	1/2"	.015"	1-1/8"	.360"	68.71	65.73	62.74	59.75
63190	-	.3750	3/8"	9.525	3/8"	4"	1/2"	.020"	1-7/8"	.360"	68.71	65.73	62.74	59.75
61308	-	.3750	3/8"	9.525	3/8"	4"	1/2"	.015"	2-1/8"	.360"	68.71	65.73	62.74	59.75
61310	-	.3750	3/8"	9.525	3/8"	6"	1/2"	.015"	3-1/8"	.360"	90.85	86.90	82.95	79.00
61312	-	.3937		10.000	10.0	50	16	-	-	-	40.24	38.49	36.74	34.99
27690	-	.3937		10.000	10.0	50	16	0.50	-	-	43.16	41.28	39.41	37.53
61314	-	.3937		10.000	10.0	50	16	1.00	-	-	43.16	41.28	39.41	37.53
28690	-	.3937		10.000	10.0	50	16	BALL	-	-	43.16	41.28	39.41	37.53
62397	-	.3937		10.000	10.0	70	22	-	-	-	43.76	41.86	39.95	38.05
27698	-	.3937		10.000	10.0	70	22	0.30	-	-	46.94	44.90	42.86	40.82
27700	-	.3937		10.000	10.0	70	22	0.50	-	-	46.94	44.90	42.86	40.82
61316	-	.3937		10.000	10.0	70	22	0.75	-	-	46.94	44.90	42.86	40.82
27702	-	.3937		10.000	10.0	70	22	1.00	-	-	46.94	44.90	42.86	40.82
28700	-	.3937		10.000	10.0	70	22	BALL	-	-	46.94	44.90	42.86	40.82
61318	-	.3937		10.000	10.0	70	32	0.50	-	-	46.94	44.90	42.86	40.82
61320	-	.3937		10.000	10.0	100	38	0.50	-	-	72.90	69.73	66.56	63.39
61322	-	.3937		10.000	10.0	100	50	0.50	-	-	72.90	69.73	66.56	63.39
63200	-	.3937		10.000	10.0	100	14	0.50	47	9.50	84.03	80.38	76.72	73.07

MATERIAL HARDNESS (Rc) 70 35 0

EDP#		$d1$ †			$d2$	$l1$	$l2$	r	$l3$	$d3$	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				
27705	-	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.020"	-	-	47.01	44.97	42.92	40.88
28705	-	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	BALL	-	-	47.01	44.97	42.92	40.88
62437	-	.4375	7/16"	11.113	7/16"	2-3/4"	7/8"	-	-	-	43.87	41.97	40.06	38.15
27708	-	.4375	7/16"	11.113	7/16"	2-3/4"	7/8"	.010"	-	-	47.01	44.97	42.92	40.88
27710	-	.4375	7/16"	11.113	7/16"	2-3/4"	7/8"	.020"	-	-	47.01	44.97	42.92	40.88
28710	-	.4375	7/16"	11.113	7/16"	2-3/4"	7/8"	BALL	-	-	47.01	44.97	42.92	40.88
63210	-	.4375	7/16"	11.113	7/16"	6"	1"	.020"	-	-	101.35	96.94	92.54	88.13
62475	-	.4724		12.000	12.0	65	19	-	-	-	53.27	50.95	48.64	46.32
27712	-	.4724		12.000	12.0	65	19	0.30	-	-	61.96	59.27	56.57	53.88
27715	-	.4724		12.000	12.0	65	19	0.50	-	-	61.96	59.27	56.57	53.88
28715	-	.4724		12.000	12.0	65	19	BALL	-	-	61.96	59.27	56.57	53.88
61324	-	.4724		12.000	12.0	75	26	-	-	-	56.83	54.36	51.89	49.42
61326	-	.4724		12.000	12.0	75	26	0.50	-	-	69.13	66.12	63.12	60.11
62485	-	.4724		12.000	12.0	75	32	-	-	-	56.83	54.36	51.89	49.42
27718	-	.4724		12.000	12.0	75	32	0.30	-	-	69.13	66.12	63.12	60.11
27720	-	.4724		12.000	12.0	75	32	0.50	-	-	69.13	66.12	63.12	60.11
61328	-	.4724		12.000	12.0	75	32	0.75	-	-	69.13	66.12	63.12	60.11
27722	-	.4724		12.000	12.0	75	32	1.00	-	-	69.13	66.12	63.12	60.11
27730	-	.4724		12.000	12.0	75	32	1.50	-	-	69.13	66.12	63.12	60.11
27735	-	.4724		12.000	12.0	75	32	2.00	-	-	69.13	66.12	63.12	60.11
61330	-	.4724		12.000	12.0	75	32	3.00	-	-	69.13	66.12	63.12	60.11
28720	-	.4724		12.000	12.0	75	32	BALL	-	-	69.13	66.12	63.12	60.11
61332	-	.4724		12.000	12.0	100	38	-	-	-	77.51	74.14	70.77	67.40
61334	-	.4724		12.000	12.0	100	38	0.50	-	-	81.89	78.33	74.77	71.21
61336	-	.4724		12.000	12.0	100	42	-	-	-	77.51	74.14	70.77	67.40
61338	-	.4724		12.000	12.0	100	42	0.50	-	-	81.89	78.33	74.77	71.21
61340	-	.4724		12.000	12.0	100	52	-	-	-	77.51	74.14	70.77	67.40
61342	-	.4724		12.000	12.0	100	52	0.50	-	-	81.89	78.33	74.77	71.21
63220	-	.4724		12.000	12.0	150	19	0.50	57	11.50	121.96	116.66	111.35	106.05
62525	62527	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	-	-	-	51.08	48.86	46.64	44.42
27739	27738	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.010"	-	-	59.42	56.84	54.25	51.67
61344	-	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.015"	-	-	59.42	56.84	54.25	51.67
27741	27740	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.020"	-	-	59.42	56.84	54.25	51.67
27743	27742	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"	-	-	59.42	56.84	54.25	51.67
61346	-	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.060"	-	-	59.42	56.84	54.25	51.67
28751	28750	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	BALL	-	-	59.42	56.84	54.25	51.67
61348	-	.5000	1/2"	12.700	1/2"	3"	1"	-	-	-	54.58	52.21	49.83	47.46
61350	-	.5000	1/2"	12.700	1/2"	3"	1"	.015"	-	-	63.77	61.00	58.22	55.45
61352	-	.5000	1/2"	12.700	1/2"	3"	1"	.030"	-	-	63.77	61.00	58.22	55.45
61354	-	.5000	1/2"	12.700	1/2"	3"	1"	.060"	-	-	63.77	61.00	58.22	55.45
61356	-	.5000	1/2"	12.700	1/2"	3"	1"	.125"	-	-	63.77	61.00	58.22	55.45
61358	-	.5000	1/2"	12.700	1/2"	3"	1"	BALL	-	-	66.32	63.44	60.55	57.67
62535	62537	.5000	1/2"	12.700	1/2"	3"	1-1/4"	-	-	-	54.58	52.21	49.83	47.46
27751	27750	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.010"	-	-	66.32	63.44	60.55	57.67
61360	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.015"	-	-	66.32	63.44	60.55	57.67
27761	27760	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.020"	-	-	66.32	63.44	60.55	57.67
27763	27762	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	-	66.32	63.44	60.55	57.67
61362	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.040"	-	-	66.32	63.44	60.55	57.67
61364	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.050"	-	-	66.32	63.44	60.55	57.67
27767	27764	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"	-	-	66.32	63.44	60.55	57.67
61366	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.078"	-	-	66.32	63.44	60.55	57.67
63398	63399	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.090"	-	-	66.32	63.44	60.55	57.67

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MATERIAL HARDNESS (Rc)

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continued →

Series VRX (continued)

.5000" - .6250"
(12.700mm - 15.875mm)

EDP#		$d1$ †			$d2$	$l1$	$l2$	r	$l3$	$d3$	1-11	12-24	25-49	50-100
(plain)	(weldon)	Decimal	1/2"	Metric	Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter				
61368	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.094"	-	-	66.32	63.44	60.55	57.67
61370	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.100"	-	-	66.32	63.44	60.55	57.67
27769	27768	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.120"	-	-	66.32	63.44	60.55	57.67
61372	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.125"	-	-	66.32	63.44	60.55	57.67
28761	28760	.5000	1/2"	12.700	1/2"	3"	1-1/4"	BALL	-	-	66.32	63.44	60.55	57.67
28771	28770	.5000	1/2"	12.700	1/2"	4"	5/8"	BALL	-	-	78.37	74.97	71.56	68.15
61374	-	.5000	1/2"	12.700	1/2"	4"	1-1/2"	-	-	-	73.85	70.64	67.43	64.22
63401	63400	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.010"	-	-	78.37	74.97	71.56	68.15
61376	-	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.015"	-	-	78.37	74.97	71.56	68.15
63411	63410	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.030"	-	-	78.37	74.97	71.56	68.15
63421	63420	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.060"	-	-	78.37	74.97	71.56	68.15
63424	-	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.125"	-	-	78.37	74.97	71.56	68.15
61378	-	.5000	1/2"	12.700	1/2"	4"	1-1/2"	BALL	-	-	78.37	74.97	71.56	68.15
61380	-	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.015"	-	-	78.37	74.97	71.56	68.15
61382	-	.5000	1/2"	12.700	1/2"	4"	1-3/4"	.015"	-	-	78.37	74.97	71.56	68.15
62565	62567	.5000	1/2"	12.700	1/2"	4"	2"	-	-	-	73.85	70.64	67.43	64.22
63431	63430	.5000	1/2"	12.700	1/2"	4"	2"	.010"	-	-	78.37	74.97	71.56	68.15
61384	-	.5000	1/2"	12.700	1/2"	4"	2"	.015"	-	-	78.37	74.97	71.56	68.15
63441	63440	.5000	1/2"	12.700	1/2"	4"	2"	.030"	-	-	78.37	74.97	71.56	68.15
63451	63450	.5000	1/2"	12.700	1/2"	4"	2"	.060"	-	-	78.37	74.97	71.56	68.15
61386	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.015"	-	-	78.37	74.97	71.56	68.15
63241	63240	.5000	1/2"	12.700	1/2"	6"	2"	.020"	-	-	110.84	106.02	101.20	96.38
61388	-	.5000	1/2"	12.700	1/2"	6"	2-1/2"	.015"	-	-	110.84	106.02	101.20	96.38
61390	-	.5000	1/2"	12.700	1/2"	6"	2-1/2"	.030"	-	-	110.84	106.02	101.20	96.38
61392	-	.5000	1/2"	12.700	1/2"	6"	3-1/4"	.030"	-	-	110.84	106.02	101.20	96.38
61394	-	.5000	1/2"	12.700	1/2"	4"	5/8"	.015"	1-1/2"	.480"	89.46	85.57	81.68	77.79
61396	-	.5000	1/2"	12.700	1/2"	4"	5/8"	.015"	2-1/4"	.480"	89.46	85.57	81.68	77.79
63231	63230	.5000	1/2"	12.700	1/2"	4"	5/8"	.020"	2-1/4"	.480"	89.46	85.57	81.68	77.79
61398	-	.5000	1/2"	12.700	1/2"	6"	5/8"	.015"	3-3/8"	.480"	121.92	116.62	111.32	106.02
61400	-	.5000	1/2"	12.700	1/2"	6"	5/8"	.015"	4-1/8"	.480"	121.92	116.62	111.32	106.02
27766	27765	.5512		14.000	14.0	75	19	0.50	-	-	97.85	93.60	89.34	85.09
28781	28780	.5512		14.000	14.0	75	19	BALL	-	-	97.85	93.60	89.34	85.09
27771	27770	.5512		14.000	14.0	88	32	0.50	-	-	100.57	96.20	91.82	87.45
28786	28785	.5512		14.000	14.0	88	32	BALL	-	-	100.57	96.20	91.82	87.45
63261	63260	.5512		14.000	14.0	150	50	0.50	-	-	145.16	138.85	132.54	126.23
63251	-	.5512		14.000	14.0	150	19	0.50	57	13.50	155.86	149.08	142.31	135.53
62625	62627	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	-	-	-	90.76	86.81	82.87	78.92
61402	-	.6250	5/8"	15.875	5/8"	3"	3/4"	-	-	-	97.84	93.59	89.33	85.08
63461	63460	.6250	5/8"	15.875	5/8"	3"	3/4"	.010"	-	-	102.73	98.26	93.80	89.33
61404	-	.6250	5/8"	15.875	5/8"	3"	3/4"	.015"	-	-	102.73	98.26	93.80	89.33
27781	27780	.6250	5/8"	15.875	5/8"	3"	3/4"	.025"	-	-	102.73	98.26	93.80	89.33
61406	-	.6250	5/8"	15.875	5/8"	3"	3/4"	.060"	-	-	102.73	98.26	93.80	89.33
28796	28795	.6250	5/8"	15.875	5/8"	3"	3/4"	BALL	-	-	102.73	98.26	93.80	89.33
62655	62657	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	-	-	-	100.71	96.33	91.95	87.57
27791	27790	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.010"	-	-	105.58	100.99	96.40	91.81
61408	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"	-	-	105.58	100.99	96.40	91.81
61410	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.020"	-	-	105.58	100.99	96.40	91.81
27801	27800	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.025"	-	-	105.58	100.99	96.40	91.81
61412	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	-	-	105.58	100.99	96.40	91.81
61414	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.040"	-	-	105.58	100.99	96.40	91.81
27803	27802	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	-	-	105.58	100.99	96.40	91.81
61416	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.078"	-	-	105.58	100.99	96.40	91.81
61418	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.094"	-	-	105.58	100.99	96.40	91.81
27805	27804	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.120"	-	-	105.58	100.99	96.40	91.81
61420	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.125"	-	-	105.58	100.99	96.40	91.81
28801	28800	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	BALL	-	-	105.58	100.99	96.40	91.81

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MATERIAL HARDNESS (Rc)

EDP#	<i>d1</i> †	<i>d2</i>	<i>l1</i>	<i>l2</i>	<i>r</i>	<i>l3</i>	<i>d3</i>	1-11	12-24	25-49	50-100			
												(plain)	(weldon)	Decimal
61422	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	-	-	-	107.55	102.87	98.20	93.52
63501	63500	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.010"	-	-	114.77	109.78	104.79	99.80
61424	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.015"	-	-	114.77	109.78	104.79	99.80
63511	63510	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.030"	-	-	114.77	109.78	104.79	99.80
63521	63520	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.060"	-	-	114.77	109.78	104.79	99.80
61426	-	.6250	5/8"	15.875	5/8"	4"	1-5/8"	-	-	-	107.55	102.87	98.20	93.52
61428	-	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.015"	-	-	114.77	109.78	104.79	99.80
61430	-	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.030"	-	-	114.77	109.78	104.79	99.80
61432	-	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.060"	-	-	114.77	109.78	104.79	99.80
62675	62677	.6250	5/8"	15.875	5/8"	4"	1-3/4"	-	-	-	107.55	102.87	98.20	93.52
63531	63530	.6250	5/8"	15.875	5/8"	4"	1-3/4"	.010"	-	-	114.77	109.78	104.79	99.80
63541	63540	.6250	5/8"	15.875	5/8"	4"	1-3/4"	.030"	-	-	114.77	109.78	104.79	99.80
63551	63550	.6250	5/8"	15.875	5/8"	4"	1-3/4"	.060"	-	-	114.77	109.78	104.79	99.80
63281	63280	.6250	5/8"	15.875	5/8"	6"	2"	.025"	-	-	157.99	151.12	144.25	137.38
63283	-	.6250	5/8"	15.875	5/8"	6"	2"	.090"	-	-	157.99	151.12	144.25	137.38
63285	-	.6250	5/8"	15.875	5/8"	6"	2"	.125"	-	-	157.99	151.12	144.25	137.38
28806	28805	.6250	5/8"	15.875	5/8"	6"	2"	BALL	-	-	157.99	151.12	144.25	137.38
61434	-	.6250	5/8"	15.875	5/8"	6"	2-1/2"	.030"	-	-	157.99	151.12	144.25	137.38
61436	-	.6250	5/8"	15.875	5/8"	6"	3-1/4"	.030"	-	-	157.99	151.12	144.25	137.38
61438	-	.6250	5/8"	15.875	5/8"	4"	3/4"	.030"	1-5/8"	.600"	125.87	120.40	114.92	109.45
61440	-	.6250	5/8"	15.875	5/8"	6"	3/4"	.030"	2-3/8"	.600"	169.10	161.74	154.39	147.04
63271	63270	.6250	5/8"	15.875	5/8"	6"	3/4"	.025"	3-1/4"	.600"	169.10	161.74	154.39	147.04
61442	-	.6250	5/8"	15.875	5/8"	6"	3/4"	.030"	4-1/8"	.600"	169.10	161.74	154.39	147.04
61444	-	.6299		16.000	16.0	75	19	-	-	-	102.26	97.81	93.37	88.92
27809	-	.6299		16.000	16.0	75	19	0.30	-	-	107.24	102.58	97.91	93.25
27811	27810	.6299		16.000	16.0	75	19	0.50	-	-	107.24	102.58	97.91	93.25
61446	-	.6299		16.000	16.0	75	19	1.00	-	-	107.24	102.58	97.91	93.25
28811	28810	.6299		16.000	16.0	75	19	BALL	-	-	107.24	102.58	97.91	93.25
62715	62717	.6299		16.000	16.0	88	32	-	-	-	105.05	100.49	95.92	91.35
27819	27818	.6299		16.000	16.0	88	32	0.30	-	-	110.17	105.38	100.59	95.80
27821	27820	.6299		16.000	16.0	88	32	0.50	-	-	110.17	105.38	100.59	95.80
61448	-	.6299		16.000	16.0	88	32	0.75	-	-	110.17	105.38	100.59	95.80
27823	27822	.6299		16.000	16.0	88	32	1.00	-	-	110.17	105.38	100.59	95.80
61450	-	.6299		16.000	16.0	88	32	1.50	-	-	110.17	105.38	100.59	95.80
27825	27824	.6299		16.000	16.0	88	32	2.00	-	-	110.17	105.38	100.59	95.80
61452	-	.6299		16.000	16.0	88	32	3.00	-	-	110.17	105.38	100.59	95.80
28821	28820	.6299		16.000	16.0	88	32	BALL	-	-	110.17	105.38	100.59	95.80
63581	63580	.6299		16.000	16.0	100	38	0.30	-	-	117.15	112.06	106.96	101.87
61454	-	.6299		16.000	16.0	100	38	0.50	-	-	117.15	112.06	106.96	101.87
61456	-	.6299		16.000	16.0	100	42	0.50	-	-	117.15	112.06	106.96	101.87
63291	63290	.6299		16.000	16.0	150	19	0.50	82	15.25	169.10	161.74	154.39	147.04
27831	-	.7087		18.000	18.0	75	22	0.80	-	-	154.69	147.96	141.24	134.51
28831	-	.7087		18.000	18.0	75	22	BALL	-	-	154.69	147.96	141.24	134.51
27836	27835	.7087		18.000	18.0	100	38	0.80	-	-	158.17	151.29	144.42	137.54
28836	28835	.7087		18.000	18.0	100	38	BALL	-	-	158.17	151.29	144.42	137.54
63301	-	.7087		18.000	18.0	150	25	0.80	82	17.25	246.48	235.76	225.05	214.33
61458	-	.7500	3/4"	19.050	3/4"	3"	7/8"	-	-	-	140.67	134.55	128.44	122.32
27841	27840	.7500	3/4"	19.050	3/4"	3"	7/8"	.030"	-	-	148.19	141.75	135.30	128.86
61460	-	.7500	3/4"	19.050	3/4"	3"	7/8"	.060"	-	-	148.19	141.75	135.30	128.86
28841	28840	.7500	3/4"	19.050	3/4"	3"	7/8"	BALL	-	-	148.19	141.75	135.30	128.86
61462	-	.7500	3/4"	19.050	3/4"	4"	1-1/4"	-	-	-	143.75	137.50	131.25	125.00
61464	-	.7500	3/4"	19.050	3/4"	4"	1-1/4"	.030"	-	-	151.41	144.83	138.24	131.66
62775	62777	.7500	3/4"	19.050	3/4"	4"	1-1/2"	-	-	-	143.75	137.50	131.25	125.00
27851	27850	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"	-	-	151.41	144.83	138.24	131.66
27861	27860	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	-	-	151.41	144.83	138.24	131.66
27865	27864	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	-	-	151.41	144.83	138.24	131.66
27867	27866	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.120"	-	-	151.41	144.83	138.24	131.66
28861	28860	.7500	3/4"	19.050	3/4"	4"	1-1/2"	BALL	-	-	151.41	144.83	138.24	131.66

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MATERIAL HARDNESS (Rc)

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continued →

Series VRX (continued)

.7500" - .8661"
(19.050mm - 22.000mm)

EDP#		d1 †			d2	l1	l2	r	l3	d3	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				
61466	-	.7500	3/4"	19.050	3/4"	4"	1-5/8"	-	-	-	138.22	132.21	126.20	120.19
61468	-	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.015"	-	-	151.41	144.83	138.24	131.66
61470	-	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.030"	-	-	151.41	144.83	138.24	131.66
61472	-	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.060"	-	-	151.41	144.83	138.24	131.66
61474	-	.7500	3/4"	19.050	3/4"	4"	1-5/8"	BALL	-	-	151.41	144.83	138.24	131.66
62785	62787	.7500	3/4"	19.050	3/4"	4"	1-3/4"	-	-	-	143.75	137.50	131.25	125.00
63601	63600	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.015"	-	-	151.41	144.83	138.24	131.66
27869	27868	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.030"	-	-	151.41	144.83	138.24	131.66
63611	63610	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.060"	-	-	151.41	144.83	138.24	131.66
61476	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.094"	-	-	151.41	144.83	138.24	131.66
63621	63620	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.120"	-	-	151.41	144.83	138.24	131.66
61478	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.190"	-	-	151.41	144.83	138.24	131.66
61480	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	BALL	-	-	151.41	144.83	138.24	131.66
62795	62797	.7500	3/4"	19.050	3/4"	5"	2"	-	-	-	192.94	184.55	176.16	167.77
63631	63630	.7500	3/4"	19.050	3/4"	5"	2"	.015"	-	-	210.01	200.88	191.75	182.62
63311	63310	.7500	3/4"	19.050	3/4"	5"	2"	.030"	-	-	210.01	200.88	191.75	182.62
63641	63640	.7500	3/4"	19.050	3/4"	5"	2"	.060"	-	-	210.01	200.88	191.75	182.62
61482	-	.7500	3/4"	19.050	3/4"	5"	2"	.094"	-	-	210.01	200.88	191.75	182.62
61484	-	.7500	3/4"	19.050	3/4"	5"	2"	.125"	-	-	210.01	200.88	191.75	182.62
28866	28865	.7500	3/4"	19.050	3/4"	5"	2"	BALL	-	-	210.01	200.88	191.75	182.62
61486	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	-	-	-	192.94	184.55	176.16	167.77
61488	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.030"	-	-	210.01	200.88	191.75	182.62
62805	62807	.7500	3/4"	19.050	3/4"	6"	3"	-	-	-	225.79	215.97	206.16	196.34
63651	63650	.7500	3/4"	19.050	3/4"	6"	3"	.015"	-	-	249.47	238.62	227.78	216.93
63661	63660	.7500	3/4"	19.050	3/4"	6"	3"	.030"	-	-	249.47	238.62	227.78	216.93
63671	63670	.7500	3/4"	19.050	3/4"	6"	3"	.060"	-	-	249.47	238.62	227.78	216.93
61490	-	.7500	3/4"	19.050	3/4"	6"	3-1/4"	-	-	-	225.79	215.97	206.16	196.34
61492	-	.7500	3/4"	19.050	3/4"	6"	3-1/4"	.030"	-	-	249.47	238.62	227.78	216.93
61494	-	.7500	3/4"	19.050	3/4"	7"	4-1/4"	-	-	-	283.58	271.25	258.92	246.59
61496	-	.7500	3/4"	19.050	3/4"	7"	4-1/4"	.030"	-	-	314.64	300.96	287.28	273.60
63321	63320	.7500	3/4"	19.050	3/4"	6"	1"	.030"	3-1/4"	.730"	260.66	249.33	237.99	226.66
63323	-	.7500	3/4"	19.050	3/4"	6"	1"	.060"	3-1/4"	.730"	260.66	249.33	237.99	226.66
63325	-	.7500	3/4"	19.050	3/4"	6"	1"	.090"	3-1/4"	.730"	260.66	249.33	237.99	226.66
63327	-	.7500	3/4"	19.050	3/4"	6"	1"	.125"	3-1/4"	.730"	260.66	249.33	237.99	226.66
63329	-	.7500	3/4"	19.050	3/4"	6"	1"	.190"	3-1/4"	.730"	260.66	249.33	237.99	226.66
61498	-	.7874		20.000	20.0	75	22	-	-	-	189.92	181.67	173.41	165.15
61500	-	.7874		20.000	20.0	75	22	0.50	-	-	209.56	200.45	191.34	182.23
27871	27870	.7874		20.000	20.0	75	22	1.00	-	-	209.56	200.45	191.34	182.23
28871	28870	.7874		20.000	20.0	75	22	BALL	-	-	209.56	200.45	191.34	182.23
62825	62827	.7874		20.000	20.0	100	38	-	-	-	194.21	185.77	177.32	168.88
27879	27878	.7874		20.000	20.0	100	38	0.50	-	-	214.29	204.97	195.66	186.34
61502	-	.7874		20.000	20.0	100	38	0.75	-	-	214.29	204.97	195.66	186.34
27881	27880	.7874		20.000	20.0	100	38	1.00	-	-	214.29	204.97	195.66	186.34
27891	27890	.7874		20.000	20.0	100	38	1.50	-	-	214.29	204.97	195.66	186.34
61504	-	.7874		20.000	20.0	100	38	3.00	-	-	214.29	204.97	195.66	186.34
28881	28880	.7874		20.000	20.0	100	38	BALL	-	-	214.29	204.97	195.66	186.34
61506	-	.7874		20.000	20.0	100	42	0.50	-	-	214.29	204.97	195.66	186.34
61508	-	.7874		20.000	20.0	125	52	0.50	-	-	237.57	227.24	216.91	206.58
63331	63330	.7874		20.000	20.0	150	25	1.00	82	19.30	274.52	262.58	250.65	238.71
27911	-	.8661		22.000	22.0	100	38	1.00	-	-	235.39	225.16	214.92	204.69

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MATERIAL HARDNESS (Rc)

	EDP#		d_1 †		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											
NEW	61510	-	.9843	25.000	25.0	100	26	-	-	-	221.79	212.15	202.50	192.86	
	61512	-	.9843	25.000	25.0	100	26	0.50	-	-	245.59	234.92	224.24	213.56	
	62855	62857	.9843	25.000	25.0	100	38	-	-	-	221.79	212.15	202.50	192.86	
	61514	-	.9843	25.000	25.0	100	38	0.50	-	-	245.59	234.92	224.24	213.56	
	27941	27940	.9843	25.000	25.0	100	38	1.00	-	-	245.59	234.92	224.24	213.56	
	27951	-	.9843	25.000	25.0	100	38	1.50	-	-	245.59	234.92	224.24	213.56	
NEW	61516	-	.9843	25.000	25.0	100	38	3.00	-	-	245.59	234.92	224.24	213.56	
	28901	28900	.9843	25.000	25.0	100	38	BALL	-	-	245.59	234.92	224.24	213.56	
	61518	-	.9843	25.000	25.0	100	42	-	-	-	221.79	212.15	202.50	192.86	
NEW	61520	-	.9843	25.000	25.0	100	42	0.50	-	-	245.59	234.92	224.24	213.56	
	61522	-	.9843	25.000	25.0	125	50	0.50	-	-	306.61	293.28	279.95	266.62	
	63351	63350	.9843	25.000	25.0	125	50	1.00	-	-	306.61	293.28	279.95	266.62	
	63361	63360	.9843	25.000	25.0	150	32	1.00	82	24.40	411.17	393.29	375.42	357.54	
	61524	-	1.000	1"	25.400	1"	4"	1"	-	-	214.75	205.41	196.08	186.74	
	27959	27958	1.000	1"	25.400	1"	4"	1"	.015"	-	258.50	247.26	236.02	224.78	
	27961	27960	1.000	1"	25.400	1"	4"	1"	.035"	-	258.50	247.26	236.02	224.78	
	-	27962	1.000	1"	25.400	1"	4"	1"	.060"	-	258.50	247.26	236.02	224.78	
	28911	28910	1.000	1"	25.400	1"	4"	1"	BALL	-	258.50	247.26	236.02	224.78	
	62885	62887	1.000	1"	25.400	1"	4"	1-1/2"	-	-	214.75	205.41	196.08	186.74	
	27967	27966	1.000	1"	25.400	1"	4"	1-1/2"	.015"	-	258.50	247.26	236.02	224.78	
	61526	-	1.000	1"	25.400	1"	4"	1-1/2"	.025"	-	258.50	247.26	236.02	224.78	
	27971	27970	1.000	1"	25.400	1"	4"	1-1/2"	.035"	-	258.50	247.26	236.02	224.78	
	27981	27980	1.000	1"	25.400	1"	4"	1-1/2"	.060"	-	258.50	247.26	236.02	224.78	
	27991	-	1.000	1"	25.400	1"	4"	1-1/2"	.090"	-	258.50	247.26	236.02	224.78	
	61528	-	1.000	1"	25.400	1"	4"	1-1/2"	.125"	-	258.50	247.26	236.02	224.78	
	61530	-	1.000	1"	25.400	1"	4"	1-1/2"	.190"	-	258.50	247.26	236.02	224.78	
	61532	-	1.000	1"	25.400	1"	4"	1-1/2"	.250"	-	258.50	247.26	236.02	224.78	
	28916	28915	1.000	1"	25.400	1"	4"	1-1/2"	BALL	-	258.50	247.26	236.02	224.78	
	61534	-	1.000	1"	25.400	1"	4"	1-5/8"	.030"	-	258.50	247.26	236.02	224.78	
	62895	62897	1.000	1"	25.400	1"	4"	1-3/4"	-	-	214.75	205.41	196.08	186.74	
	28001	28000	1.000	1"	25.400	1"	4"	1-3/4"	.015"	-	258.50	247.26	236.02	224.78	
	61536	-	1.000	1"	25.400	1"	4"	1-3/4"	.030"	-	258.50	247.26	236.02	224.78	
	28011	28012	1.000	1"	25.400	1"	4"	1-3/4"	.060"	-	258.50	247.26	236.02	224.78	
	28021	-	1.000	1"	25.400	1"	4"	1-3/4"	.090"	-	258.50	247.26	236.02	224.78	
	61538	-	1.000	1"	25.400	1"	4"	1-3/4"	.125"	-	258.50	247.26	236.02	224.78	
NEW	61540	-	1.000	1"	25.400	1"	4"	1-3/4"	.190"	-	258.50	247.26	236.02	224.78	
NEW	61542	-	1.000	1"	25.400	1"	4"	1-3/4"	.250"	-	258.50	247.26	236.02	224.78	
	62905	62907	1.000	1"	25.400	1"	5"	2"	-	-	287.47	274.97	262.47	249.97	
	63369	63368	1.000	1"	25.400	1"	5"	2"	.015"	-	318.04	304.22	290.39	276.56	
	63371	63370	1.000	1"	25.400	1"	5"	2"	.035"	-	318.04	304.22	290.39	276.56	
	63373	63372	1.000	1"	25.400	1"	5"	2"	.060"	-	318.04	304.22	290.39	276.56	
	63375	63374	1.000	1"	25.400	1"	5"	2"	.090"	-	318.04	304.22	290.39	276.56	
	61544	-	1.000	1"	25.400	1"	5"	2"	.125"	-	318.04	304.22	290.39	276.56	
	61546	-	1.000	1"	25.400	1"	5"	2"	.250"	-	318.04	304.22	290.39	276.56	
	28931	28930	1.000	1"	25.400	1"	5"	2"	BALL	-	318.04	304.22	290.39	276.56	
	61548	-	1.000	1"	25.400	1"	5"	2-1/2"	-	-	287.47	274.97	262.47	249.97	
	61550	-	1.000	1"	25.400	1"	5"	2-1/2"	.030"	-	318.04	304.22	290.39	276.56	
	62915	62917	1.000	1"	25.400	1"	6"	3"	-	-	374.44	358.16	341.88	325.60	
	61552	-	1.000	1"	25.400	1"	6"	3-1/4"	.030"	-	414.81	396.77	378.74	360.70	
	61554	-	1.000	1"	25.400	1"	7"	4-1/4"	.030"	-	506.18	484.18	462.17	440.16	
	61556	-	1.000	1"	25.400	1"	7"	4-1/4"	.060"	-	506.18	484.18	462.17	440.16	
NEW	61558	-	1.000	1"	25.400	1"	6"	1-1/4"	.030"	2-5/8"	.980"	429.63	410.95	392.27	373.59
	63381	63380	1.000	1"	25.400	1"	6"	1-1/4"	.035"	3-1/4"	.980"	429.63	410.95	392.27	373.59
NEW	61560	-	1.000	1"	25.400	1"	6"	1-1/4"	.060"	3-1/4"	.980"	429.63	410.95	392.27	373.59
	61562	-	1.000	1"	25.400	1"	7"	1-1/4"	.030"	4-1/4"	.980"	521.00	498.34	475.69	453.04

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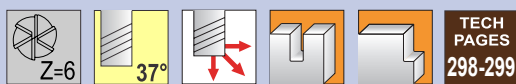
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MATERIAL HARDNESS (Rc)

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Series VRX-6 **NEW ITEMS** HIGH EFFICIENCY MILLING

.2362" - .4724"
(6.000mm - 12.000mm)

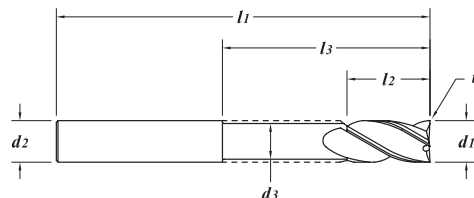


TOLERANCES	
d_1	+0.001" -0.002" (+0.000mm -0.050mm)
d_2	h6
r	+0.001" -0.001" (+0.025 -0.025mm)

Recommended for inconel, pH materials, titanium and tool steels >40Rc

Square End, Corner Radius
AlTiN Coating

Solid submicron grain carbide end mill - center cutting
6 flutes for better finish and longer tool life
Reduces vibration for more aggressive machining resulting in less cycle times and greater productivity
Staggered flute geometry
Engineered for High Efficiency Milling



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35
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MATERIAL HARDNESS (Rc)

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
	Decimal	Metric										
60101	.2362	6.000	6.0	65	20	-	-	-	22.46	21.48	20.51	19.53
60103	.2362	6.000	6.0	65	20	0.50	-	-	27.54	26.35	25.15	23.95
60100	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	-	-	21.69	20.75	19.80	18.86
60102	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"	-	26.54	25.39	24.23	23.08
60104	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	-	26.54	25.39	24.23	23.08
60105	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"	-	26.54	25.39	24.23	23.08
60106	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	-	26.54	25.39	24.23	23.08
60162	.3150	8.000	8.0	65	22	-	-	-	32.05	30.66	29.26	27.87
60107	.3150	8.000	8.0	65	22	0.50	-	-	37.27	35.65	34.03	32.41
60109	.3750	3/8"	9.525	3/8"	2"	1/2"	-	-	31.22	29.87	28.51	27.15
60111	.3750	3/8"	9.525	3/8"	2"	1/2"	.020"	-	38.00	36.34	34.69	33.04
60108	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	-	-	36.49	34.90	33.32	31.73
60110	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.015"	-	41.79	39.97	38.16	36.34
60113	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.020"	-	41.79	39.97	38.16	36.34
60112	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	-	41.79	39.97	38.16	36.34
60114	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.060"	-	41.79	39.97	38.16	36.34
60184	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.030"	-	54.99	52.60	50.21	47.82
60164	.3937	10.000	10.0	70	22	-	-	-	43.76	41.86	39.95	38.05
60115	.3937	10.000	10.0	70	22	0.50	-	-	50.52	48.32	46.13	43.93
60117	.3937	10.000	10.0	70	22	1.00	-	-	50.52	48.32	46.13	43.93
60119	.4724	12.000	12.0	65	20	-	-	-	53.27	50.95	48.64	46.32
60121	.4724	12.000	12.0	65	20	0.50	-	-	66.22	63.34	60.46	57.58
60123	.4724	12.000	12.0	75	26	-	-	-	56.83	54.36	51.89	49.42
60125	.4724	12.000	12.0	75	26	0.75	-	-	73.88	70.66	67.45	64.24
60166	.4724	12.000	12.0	75	32	-	-	-	56.83	54.36	51.89	49.42
60127	.4724	12.000	12.0	75	32	0.50	-	-	73.88	70.66	67.45	64.24
60129	.4724	12.000	12.0	75	32	1.00	-	-	73.88	70.66	67.45	64.24

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										
NEW 60131	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	-	-	-	51.08	48.86	46.64	44.42
60185	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.010"	-	-	63.50	60.74	57.98	55.22
60157	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.015"	-	-	63.50	60.74	57.98	55.22
60133	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.020"	-	-	63.50	60.74	57.98	55.22
NEW 60159	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"	-	-	63.50	60.74	57.98	55.22
NEW 60189	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.060"	-	-	63.50	60.74	57.98	55.22
60186	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.125"	-	-	63.50	60.74	57.98	55.22
60135	.5000	1/2"	12.700	1/2"	3"	1"	-	-	-	54.58	52.21	49.83	47.46
60201	.5000	1/2"	12.700	1/2"	3"	1"	.030"	-	-	70.89	67.80	64.72	61.64
60116	.5000	1/2"	12.700	1/2"	3"	1-1/4"	-	-	-	54.58	52.21	49.83	47.46
60118	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.010"	-	-	70.89	67.80	64.72	61.64
60120	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.015"	-	-	70.89	67.80	64.72	61.64
60122	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.020"	-	-	70.89	67.80	64.72	61.64
60124	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	-	70.89	67.80	64.72	61.64
60126	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"	-	-	70.89	67.80	64.72	61.64
60128	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.125"	-	-	70.89	67.80	64.72	61.64
60137	.5000	1/2"	12.700	1/2"	4"	1-1/2"	-	-	-	73.85	70.64	67.43	64.22
60139	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.030"	-	-	83.97	80.32	76.67	73.02
60190	.5000	1/2"	12.700	1/2"	4"	1-5/8"	-	-	-	73.85	70.64	67.43	64.22
60194	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.030"	-	-	83.97	80.32	76.67	73.02
60196	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.060"	-	-	83.97	80.32	76.67	73.02
60130	.5000	1/2"	12.700	1/2"	4"	2-1/8"	-	-	-	73.85	70.64	67.43	64.22
60132	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.010"	-	-	83.97	80.32	76.67	73.02
60134	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.020"	-	-	83.97	80.32	76.67	73.02
60136	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.030"	-	-	83.97	80.32	76.67	73.02
60200	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.060"	-	-	83.97	80.32	76.67	73.02
NEW 60141	.6250	5/8"	15.875	5/8"	3"	3/4"	-	-	-	97.84	93.59	89.33	85.08
NEW 60143	.6250	5/8"	15.875	5/8"	3"	3/4"	.020"	-	-	109.68	104.91	100.14	95.37
60138	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	-	-	-	100.71	96.33	91.95	87.57
60140	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"	-	-	112.73	107.83	102.93	98.03
60145	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.020"	-	-	112.73	107.83	102.93	98.03
60142	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	-	-	112.73	107.83	102.93	98.03
60144	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	-	-	112.73	107.83	102.93	98.03
60146	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.125"	-	-	112.73	107.83	102.93	98.03
60148	.6250	5/8"	15.875	5/8"	4"	1-5/8"	-	-	-	107.55	102.87	98.20	93.52
60150	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.030"	-	-	120.39	115.16	109.92	104.69
60168	.6299		16.000	16.0	88	32	-	-	-	105.05	100.49	95.92	91.35
60170	.6299		16.000	16.0	88	32	0.50	-	-	117.55	112.44	107.33	102.22
60174	.6299		16.000	16.0	100	40	-	-	-	111.71	106.85	102.00	97.14
60176	.6299		16.000	16.0	100	40	0.50	-	-	124.99	119.56	114.12	108.69
NEW 60180	.6299		16.000	16.0	100	32	-	50	14.50	122.29	116.97	111.66	106.34
NEW 60182	.6299		16.000	16.0	100	32	0.50	50	14.50	135.57	129.68	123.78	117.89
60152	.7500	3/4"	19.050	3/4"	4"	1-1/2"	-	-	-	143.75	137.50	131.25	125.00
60154	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"	-	-	161.33	154.32	147.30	140.29
60147	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.020"	-	-	161.33	154.32	147.30	140.29
60156	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	-	-	161.33	154.32	147.30	140.29
60158	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	-	-	161.33	154.32	147.30	140.29
60160	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.125"	-	-	161.33	154.32	147.30	140.29
60149	.7500	3/4"	19.050	3/4"	6"	3"	-	-	-	225.79	215.97	206.16	196.34
60151	.7500	3/4"	19.050	3/4"	6"	3"	.030"	-	-	262.61	251.20	239.78	228.36
NEW 60188	1.000	1"	25.400	1"	4"	1-1/2"	.125"	-	-	274.83	262.88	250.93	238.98
60153	1.000	1"	25.400	1"	6"	3"	.030"	-	-	436.63	417.65	398.66	379.68
60155	1.000	1"	25.400	1"	7"	1-1/4"	-	4-1/8"	.980"	471.50	451.00	430.50	410.00

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MATERIAL HARDNESS (Rc)

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CAM Tool Libraries

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Mastercam[®]



Access **Simulation Files** in DXF format for each GARR TOOL end mill, drill, or reamer from the Mastercam tech exchange, or download individual STP files from MachiningCloud.com.

TOLERANCES

d_1	+0.000" -0.001" (+0.000 -0.025mm)
d_2	h6

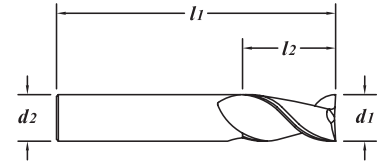
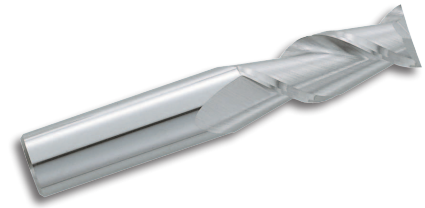


Recommended for aluminum and titanium

Square End

- 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
- Sharp corners (Can be modified with a corner radius)

Designed for spindles between 3,000-8,000 RPM, 1% diameter for chip load



EDP#	d_1 †		d_2	l_1	l_2	1-11	12-24	25-49	50-100	
	Decimal	Diameter								Metric
08910	.1181		3.000	3.0	38	8	12.09	11.56	11.04	10.51
08920	.1181		3.000	3.0	50	12	14.57	13.94	13.30	12.67
85160	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	11.35	10.86	10.36	9.87
85170	.1250	1/8"	3.175	1/8"	2"	1/2"	13.67	13.08	12.48	11.89
08950	.1575		4.000	6.0	50	8	19.65	18.80	17.94	17.09
08960	.1575		4.000	6.0	50	12	19.65	18.80	17.94	17.09
85180	.1875	3/16"	4.763	3/16"	2"	5/16"	14.17	13.55	12.94	12.32
85190	.1875	3/16"	4.763	3/16"	2"	9/16"	14.17	13.55	12.94	12.32
08990	.1969		5.000	6.0	50	10	18.50	17.70	16.89	16.09
09000	.1969		5.000	6.0	65	15	20.57	19.68	18.78	17.89
09010	.2362		6.000	6.0	50	12	15.76	15.07	14.39	13.70
09020	.2362		6.000	6.0	65	25	16.93	16.19	15.46	14.72
09030	.2362		6.000	6.0	100	50	30.68	29.35	28.01	26.68
85200	.2500	1/4"	6.350	1/4"	2"	1/2"	14.93	14.28	13.63	12.98
85220	.2500	1/4"	6.350	1/4"	2-1/2"	1"	16.13	15.43	14.73	14.03
85240	.2500	1/4"	6.350	1/4"	4"	2"	29.14	27.87	26.61	25.34
85300	.3125	5/16"	7.938	5/16"	3"	1-1/8"	34.06	32.58	31.10	29.62
09240	.3150		8.000	8.0	65	20	23.76	22.73	21.69	20.66
09040	.3150		8.000	8.0	75	30	35.89	34.33	32.77	31.21
09050	.3150		8.000	8.0	100	50	40.03	38.29	36.55	34.81
85400	.3750	3/8"	9.525	3/8"	2"	5/8"	25.22	24.12	23.03	21.93
85420	.3750	3/8"	9.525	3/8"	2-1/2"	1"	28.18	26.95	25.73	24.50
85440	.3750	3/8"	9.525	3/8"	4"	2"	42.10	40.27	38.44	36.61
09060	.3937		10.000	10.0	50	16	29.35	28.07	26.80	25.52
09070	.3937		10.000	10.0	70	25	34.30	32.81	31.32	29.83
09080	.3937		10.000	10.0	100	50	53.65	51.32	48.98	46.65
09090	.4724		12.000	12.0	65	20	43.84	41.93	40.03	38.12
09100	.4724		12.000	12.0	75	32	47.40	45.34	43.28	41.22
09110	.4724		12.000	12.0	100	50	65.30	62.46	59.62	56.78
85500	.5000	1/2"	12.700	1/2"	2-1/2"	3/4"	41.40	39.60	37.80	36.00
85520	.5000	1/2"	12.700	1/2"	3"	1-1/4"	45.14	43.18	41.21	39.25
85540	.5000	1/2"	12.700	1/2"	4"	2"	61.61	58.93	56.25	53.57
85600	.6250	5/8"	15.875	5/8"	3-1/2"	1-5/8"	87.04	83.26	79.47	75.69
85620	.6250	5/8"	15.875	5/8"	6"	3"	126.98	121.46	115.94	110.42
09120	.6299		16.000	16.0	88	40	91.39	87.42	83.44	79.47
09130	.6299		16.000	16.0	150	75	126.98	121.46	115.94	110.42
09140	.7087		18.000	18.0	100	45	134.02	128.19	122.37	116.54
85700	.7500	3/4"	19.050	3/4"	4"	1-3/4"	127.63	122.08	116.53	110.98
85720	.7500	3/4"	19.050	3/4"	6"	3"	202.29	193.49	184.70	175.90
09350	.7874		20.000	20.0	100	38	170.38	162.98	155.57	148.16
09150	.7874		20.000	20.0	150	75	213.10	203.83	194.57	185.30
09160	.9843		25.000	25.0	100	45	197.94	189.33	180.73	172.12
09170	.9843		25.000	25.0	150	75	328.37	314.09	299.82	285.54
85800	1.000	1"	25.400	1"	4"	1-3/4"	190.90	182.60	174.30	166.00
85820	1.000	1"	25.400	1"	6"	3"	343.91	328.96	314.00	299.05

HIGH PERFORMANCE
END MILLS

MATERIAL HARDNESS (RC) 70 35 0

Series 253MA, 853MA

.1181" - .5512"
(3.000mm - 14.000mm)

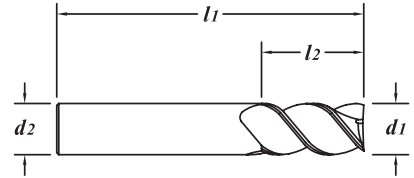


TOLERANCES	
d_1	+0.000" - .002" (+0.000 - .050mm)
d_2	h6

Recommended for stainless steel

Square End
AlTiN Coating

- 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
- Slots stainless steel at an axial depth of 25% of diameter
- Sharp corners (Can be modified with a corner radius)
- Uncoated - page 180
- TiCN Coated - page 182



MATERIAL HARDNESS (Rc)

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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								
10347	.1181	3.000	3.0	38	8	14.81	14.17	13.52	12.88	
10357	.1181	3.000	3.0	50	12	17.85	17.07	16.30	15.52	
86137	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	14.06	13.45	12.84	12.23
86147	.1250	1/8"	3.175	1/8"	2"	1/2"	16.96	16.23	15.49	14.75
10387	.1575	4.000	6.0	50	8	23.93	22.89	21.85	20.81	
10397	.1575	4.000	6.0	50	12	23.93	22.89	21.85	20.81	
86157	.1875	3/16"	4.763	3/16"	2"	5/16"	16.08	15.38	14.68	13.98
86167	.1875	3/16"	4.763	3/16"	2"	9/16"	16.08	15.38	14.68	13.98
86187	.1875	3/16"	4.763	3/16"	3"	1"	28.04	26.82	25.60	24.38
10407	.1969	5.000	5.0	50	8	19.06	18.23	17.40	16.57	
10417	.1969	5.000	5.0	50	14	19.06	18.23	17.40	16.57	
10507	.1969	5.000	6.0	50	8	23.44	22.42	21.40	20.38	
10517	.1969	5.000	6.0	65	16	25.60	24.49	23.37	22.26	
10017	.2362	6.000	6.0	50	12	19.93	19.06	18.20	17.33	
10027	.2362	6.000	6.0	65	19	22.46	21.48	20.51	19.53	
10037	.2362	6.000	6.0	75	32	34.63	33.12	31.62	30.11	
86207	.2500	1/4"	6.350	1/4"	2"	1/2"	19.12	18.29	17.46	16.63
86227	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	21.69	20.75	19.80	18.86
86247	.2500	1/4"	6.350	1/4"	3"	1-1/4"	33.15	31.71	30.27	28.83
86267	.3125	5/16"	7.938	5/16"	2"	7/16"	26.43	25.28	24.13	22.98
86277	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	30.92	29.58	28.23	26.89
86287	.3125	5/16"	7.938	5/16"	4"	1-1/4"	48.58	46.46	44.35	42.24
10427	.3150	8.000	8.0	50	11	27.52	26.32	25.13	23.93	
10047	.3150	8.000	8.0	65	20	32.05	30.66	29.26	27.87	
10057	.3150	8.000	8.0	75	32	44.18	42.26	40.34	38.42	
86307	.3750	3/8"	9.525	3/8"	2"	1/2"	31.22	29.87	28.51	27.15
86327	.3750	3/8"	9.525	3/8"	2-1/2"	1"	36.49	34.90	33.32	31.73
86347	.3750	3/8"	9.525	3/8"	3-1/2"	1-1/2"	52.66	50.37	48.08	45.79
10067	.3937	10.000	10.0	50	12	36.14	34.57	33.00	31.43	
10077	.3937	10.000	10.0	75	25	51.05	48.83	46.61	44.39	
10087	.3937	10.000	10.0	88	38	64.63	61.82	59.01	56.20	
86367	.4375	7/16"	11.113	7/16"	2-1/2"	9/16"	43.87	41.97	40.06	38.15
86377	.4375	7/16"	11.113	7/16"	2-3/4"	1"	43.87	41.97	40.06	38.15
86387	.4375	7/16"	11.113	7/16"	4"	2"	70.15	67.10	64.05	61.00
10097	.4724	12.000	12.0	65	16	53.27	50.95	48.64	46.32	
10107	.4724	12.000	12.0	75	26	56.83	54.36	51.89	49.42	
10117	.4724	12.000	12.0	100	50	77.57	74.20	70.82	67.45	
86407	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	51.08	48.86	46.64	44.42
86427	.5000	1/2"	12.700	1/2"	3"	1"	54.58	52.21	49.83	47.46
86447	.5000	1/2"	12.700	1/2"	4"	2"	73.85	70.64	67.43	64.22
10437	.5512	14.000	14.0	65	16	79.55	76.09	72.63	69.17	
10447	.5512	14.000	14.0	75	25	85.17	81.47	77.76	74.06	
10457	.5512	14.000	14.0	100	50	103.37	98.88	94.38	89.89	

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								
86467	.5625	9/16"	14.288	9/16"	3"	7/8"	85.41	81.70	77.98	74.27
86477	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	90.76	86.81	82.87	78.92
86507	.6250	5/8"	15.875	5/8"	3"	7/8"	90.56	86.63	82.69	78.75
86527	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	100.71	96.33	91.95	87.57
86547	.6250	5/8"	15.875	5/8"	6"	2-1/2"	147.28	140.88	134.47	128.07
10137	.6299		16.000	16.0	88	32	60.81	58.17	55.52	52.88
10147	.6299		16.000	16.0	150	65	147.28	140.88	134.47	128.07
10167	.7087		18.000	18.0	100	38	150.12	143.59	137.07	130.54
86607	.7500	3/4"	19.050	3/4"	3-1/2"	1"	143.75	137.50	131.25	125.00
86627	.7500	3/4"	19.050	3/4"	4"	1-1/2"	143.75	137.50	131.25	125.00
86647	.7500	3/4"	19.050	3/4"	6"	3"	225.79	215.97	206.16	196.34
10187	.7874		20.000	20.0	100	38	194.21	185.77	177.32	168.88
10197	.7874		20.000	20.0	150	75	243.62	233.02	222.43	211.84
86697	1.000	1"	25.400	1"	4"	1-1/8"	214.75	205.41	196.08	186.74
86727	1.000	1"	25.400	1"	4"	2"	214.75	205.41	196.08	186.74
86747	1.000	1"	25.400	1"	6"	3-1/4"	374.44	358.16	341.88	325.60

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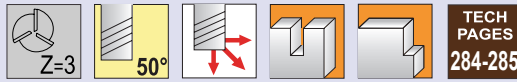
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MATERIAL HARDNESS (Rc)

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Series 253M, 853M

.1181" - .5512"
(3.000mm - 14.000mm)

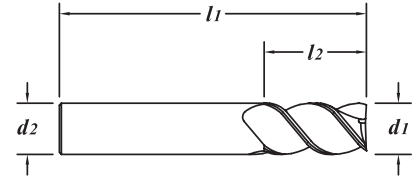


TOLERANCES	
d_1	+0.000" - .002" (+.000 - .050mm)
d_2	h6

Recommended for aluminum and stainless steel

Square End

- 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
- Sharp corners (Can be modified with a corner radius)
- AlTiN Coating - page 178
- TiCN Coated - page 182



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MATERIAL HARDNESS (Rc)

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	12.09	11.56	11.04	10.51	
10350	.1181	3.000	3.0	50	12	14.57	13.94	13.30	12.67	
86130	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	11.35	10.86	10.36	9.87
86140	.1250	1/8"	3.175	1/8"	2"	1/2"	13.67	13.08	12.48	11.89
10380	.1575	4.000	6.0	50	8	19.65	18.80	17.94	17.09	
10390	.1575	4.000	6.0	50	12	19.65	18.80	17.94	17.09	
86150	.1875	3/16"	4.763	3/16"	2"	5/16"	13.37	12.79	12.21	11.63
86160	.1875	3/16"	4.763	3/16"	2"	9/16"	13.37	12.79	12.21	11.63
86180	.1875	3/16"	4.763	3/16"	3"	1"	23.84	22.80	21.77	20.73
10400	.1969	5.000	5.0	50	8	14.86	14.21	13.57	12.92	
10410	.1969	5.000	5.0	50	14	14.86	14.21	13.57	12.92	
10010	.2362	6.000	6.0	50	12	15.76	15.07	14.39	13.70	
10020	.2362	6.000	6.0	65	19	16.93	16.19	15.46	14.72	
10030	.2362	6.000	6.0	75	32	29.06	27.80	26.53	25.27	
86200	.2500	1/4"	6.350	1/4"	2"	1/2"	14.93	14.28	13.63	12.98
86220	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	16.13	15.43	14.73	14.03
86240	.2500	1/4"	6.350	1/4"	3"	1-1/4"	27.62	26.42	25.22	24.02
86260	.3125	5/16"	7.938	5/16"	2"	7/16"	20.41	19.53	18.64	17.75
86270	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	22.63	21.65	20.66	19.68
86280	.3125	5/16"	7.938	5/16"	4"	1-1/4"	38.01	36.36	34.70	33.05
10420	.3150	8.000	8.0	50	11	21.53	20.59	19.66	18.72	
10040	.3150	8.000	8.0	65	20	23.76	22.73	21.69	20.66	
10050	.3150	8.000	8.0	75	32	35.89	34.33	32.77	31.21	
86300	.3750	3/8"	9.525	3/8"	2"	1/2"	25.22	24.12	23.03	21.93
86320	.3750	3/8"	9.525	3/8"	2-1/2"	1"	28.18	26.95	25.73	24.50
86340	.3750	3/8"	9.525	3/8"	3-1/2"	1-1/2"	42.10	40.27	38.44	36.61
10060	.3937	10.000	10.0	50	12	29.35	28.07	26.80	25.52	
10070	.3937	10.000	10.0	75	25	41.61	39.80	37.99	36.18	
10080	.3937	10.000	10.0	88	38	52.41	50.13	47.85	45.57	
86360	.4375	7/16"	11.113	7/16"	2-1/2"	9/16"	34.40	32.90	31.41	29.91
86370	.4375	7/16"	11.113	7/16"	2-3/4"	1"	34.40	32.90	31.41	29.91
86380	.4375	7/16"	11.113	7/16"	4"	2"	57.93	55.41	52.89	50.37
10090	.4724	12.000	12.0	65	16	43.84	41.93	40.03	38.12	
10100	.4724	12.000	12.0	75	26	47.40	45.34	43.28	41.22	
10110	.4724	12.000	12.0	100	50	65.30	62.46	59.62	56.78	
86400	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	41.63	39.82	38.01	36.20
86420	.5000	1/2"	12.700	1/2"	3"	1"	45.14	43.18	41.21	39.25
86440	.5000	1/2"	12.700	1/2"	4"	2"	61.61	58.93	56.25	53.57
10430	.5512	14.000	14.0	65	16	68.57	65.59	62.61	59.63	
10440	.5512	14.000	14.0	75	25	74.19	70.96	67.74	64.51	
10450	.5512	14.000	14.0	100	50	89.70	85.80	81.90	78.00	

EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
86460	.5625	9/16"	14.288	9/16"	3"	7/8"	74.45	71.21	67.98	64.74
86470	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	77.08	73.73	70.38	67.03
86480	.5625	9/16"	14.288	9/16"	6"	2-1/2"	116.96	111.87	106.79	101.70
86500	.6250	5/8"	15.875	5/8"	3"	7/8"	79.60	76.14	72.68	69.22
86520	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	87.04	83.26	79.47	75.69
86540	.6250	5/8"	15.875	5/8"	6"	2-1/2"	126.98	121.46	115.94	110.42
10120	.6299		16.000	16.0	75	20	83.78	80.14	76.49	72.85
10130	.6299		16.000	16.0	88	32	91.39	87.42	83.44	79.47
10140	.6299		16.000	16.0	150	65	126.98	121.46	115.94	110.42
10160	.7087		18.000	18.0	100	38	134.00	128.17	122.35	116.52
10170	.7087		18.000	18.0	150	75	190.90	182.60	174.30	166.00
86600	.7500	3/4"	19.050	3/4"	3-1/2"	1"	127.63	122.08	116.53	110.98
86620	.7500	3/4"	19.050	3/4"	4"	1-1/2"	127.63	122.08	116.53	110.98
86640	.7500	3/4"	19.050	3/4"	6"	3"	202.29	193.49	184.70	175.90
10460	.7874		20.000	20.0	75	22	155.25	148.50	141.75	135.00
10180	.7874		20.000	20.0	100	38	170.38	162.98	155.57	148.16
10190	.7874		20.000	20.0	150	75	213.10	203.83	194.57	185.30
10480	.9843		25.000	25.0	100	50	197.94	189.33	180.73	172.12
10490	.9843		25.000	25.0	150	82	328.37	314.09	299.82	285.54
86690	1.000	1"	25.400	1"	4"	1-1/8"	190.90	182.60	174.30	166.00
86720	1.000	1"	25.400	1"	4"	2"	190.90	182.60	174.30	166.00
86740	1.000	1"	25.400	1"	6"	3-1/4"	343.91	328.96	314.00	299.05

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MATERIAL HARDNESS (Rc)

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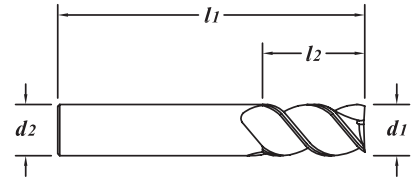
$d1$	+0.000" - .002" (+.000 - .050mm)
$d2$	h6



Recommended for aluminum and 303 stainless steel

**Square End
TiCN Coated**

- 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
- Slots aluminum and stainless steel at an axial depth of 25% of diameter
- Sharp corners (Can be modified with a corner radius)
- AlTiN Coating - page 178
- Uncoated - page 180



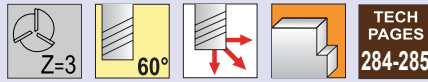
MATERIAL HARDNESS (Rc) 70 35 0

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"	15.76	15.07	14.39	13.70
86164	.1875	3/16"	4.763	3/16"	2"	9/16"	15.76	15.07	14.39	13.70
86184	.1875	3/16"	4.763	3/16"	3"	1"	27.16	25.98	24.80	23.62
86204	.2500	1/4"	6.350	1/4"	2"	1/2"	18.27	17.48	16.68	15.89
86224	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	20.95	20.04	19.13	18.22
86244	.2500	1/4"	6.350	1/4"	3"	1-1/4"	32.42	31.01	29.60	28.19
86264	.3125	5/16"	7.938	5/16"	2"	7/16"	25.63	24.52	23.40	22.29
86274	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	29.06	27.80	26.53	25.27
86284	.3125	5/16"	7.938	5/16"	4"	1-1/4"	46.02	44.02	42.02	40.02
86304	.3750	3/8"	9.525	3/8"	2"	1/2"	30.44	29.12	27.79	26.47
86324	.3750	3/8"	9.525	3/8"	2-1/2"	1"	33.40	31.94	30.49	29.04
86344	.3750	3/8"	9.525	3/8"	3-1/2"	1-1/2"	50.07	47.89	45.72	43.54
86364	.4375	7/16"	11.113	7/16"	2-1/2"	9/16"	42.14	40.30	38.47	36.64
86374	.4375	7/16"	11.113	7/16"	2-3/4"	1"	42.14	40.30	38.47	36.64
86384	.4375	7/16"	11.113	7/16"	4"	2"	67.56	64.63	61.69	58.75
86404	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	49.36	47.21	45.07	42.92
86424	.5000	1/2"	12.700	1/2"	3"	1"	52.85	50.56	48.26	45.96
86444	.5000	1/2"	12.700	1/2"	4"	2"	71.27	68.17	65.07	61.97
86464	.5625	9/16	14.288	9/16"	3"	7/8"	84.84	81.15	77.46	73.77
86474	.5625	9/16	14.288	9/16"	3-1/2"	1-1/4"	89.13	85.25	81.38	77.50
86484	.5625	9/16	14.288	9/16"	6"	2-1/2"	133.83	128.01	122.19	116.37
86504	.6250	5/8"	15.875	5/8"	3"	7/8"	89.98	86.06	82.15	78.24
86524	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	99.06	94.75	90.45	86.14
86544	.6250	5/8"	15.875	5/8"	6"	2-1/2"	143.85	137.60	131.34	125.09
86604	.7500	3/4"	19.050	3/4"	3-1/2"	1"	141.40	135.26	129.11	122.96
86624	.7500	3/4"	19.050	3/4"	4"	1-1/2"	141.40	135.26	129.11	122.96
86644	.7500	3/4"	19.050	3/4"	6"	3"	221.55	211.92	202.28	192.65
86694	1.000	1"	25.400	1"	4"	1-1/8"	211.62	202.42	193.22	184.02
86724	1.000	1"	25.400	1"	4"	2"	211.62	202.42	193.22	184.02
86744	1.000	1"	25.400	1"	6"	3-1/4"	371.15	355.01	338.88	322.74

TOLERANCES

<i>d1</i>	+0.000° -0.002° (+.000 -.050mm)
<i>d2</i>	h6

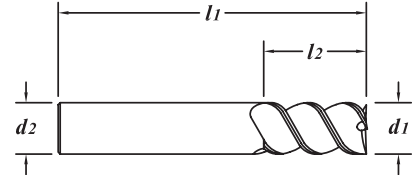
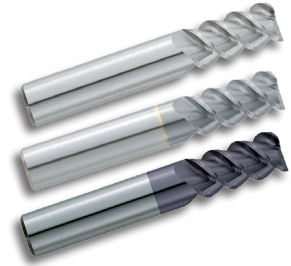
Series 263M, 263MC, 263MA, 863MA



Recommended for steels, stainless steel, high-temperature alloys

Square End

- 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
- Can be modified with a corner radius



HIGH PERFORMANCE END MILLS

(263M) UNCOATED EDP#	(263MC) TiCN EDP#	(263MA/863MA) AlTiN 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								
23010	-	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	16.13	15.43	14.73	14.03
23020	-	-	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	22.63	21.65	20.66	19.68
23030	-	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	28.18	26.95	25.73	24.50
23040	-	-	.4375	7/16"	11.113	7/16"	2-3/4"	1"	34.40	32.90	31.41	29.91
23050	-	-	.5000	1/2"	12.700	1/2"	3"	1"	45.14	43.18	41.21	39.25
23060	-	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	87.04	83.26	79.47	75.69
23070	-	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	127.63	122.08	116.53	110.98
23080	-	-	1.000	1"	25.400	1"	4"	1-1/2"	190.90	182.60	174.30	166.00
-	23014	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	20.95	20.04	19.13	18.22
-	23024	-	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	29.06	27.80	26.53	25.27
-	23034	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	34.63	33.12	31.62	30.11
-	23044	-	.4375	7/16"	11.113	7/16"	2-3/4"	1"	42.14	40.30	38.47	36.64
-	23054	-	.5000	1/2"	12.700	1/2"	3"	1"	52.85	50.56	48.26	45.96
-	23064	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	99.06	94.75	90.45	86.14
-	23074	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	141.40	135.26	129.11	122.96
-	23084	-	1.000	1"	25.400	1"	4"	1-1/2"	211.62	202.42	193.22	184.02
-	-	23517	.2362		6.000	6.0	65	13	22.46	21.48	20.51	19.53
-	-	23017	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	21.69	20.75	19.80	18.86
-	-	23027	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	30.92	29.58	28.23	26.89
-	-	23527	.3150		8.000	8.0	65	19	32.05	30.66	29.26	27.87
-	-	23037	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	36.49	34.90	33.32	31.73
-	-	23537	.3937		10.000	10.0	70	22	43.76	41.86	39.95	38.05
-	-	23047	.4375	7/16"	11.113	7/16"	2-3/4"	1"	43.87	41.97	40.06	38.15
-	-	23547	.4724		12.000	12.0	75	26	56.83	54.36	51.89	49.42
-	-	23057	.5000	1/2"	12.700	1/2"	3"	1"	54.58	52.21	49.83	47.46
-	-	23067	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	100.71	96.33	91.95	87.57
-	-	23557	.6299		16.000	16.0	88	32	105.05	100.49	95.92	91.35
-	-	23077	.7500	3/4"	19.050	3/4"	4"	1-1/2"	143.75	137.50	131.25	125.00
-	-	23087	1.000	1"	25.400	1"	4"	1-1/2"	214.75	205.41	196.08	186.74

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MATERIAL HARDNESS (Rc)

Series 255MA, 855MA

.1181" - .4724"
(3.000mm - 12.000mm)

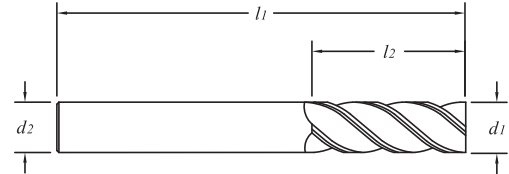


TOLERANCES	
d_1	+0.000" - .002" (+.000 - .050mm)
d_2	h6

Recommended for steels, stainless steel, and exotics

Square End
AlTiN Coating

- 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
- Improved finishes in titanium
- Heavy core, Sharp corners
- Uncoated - page 186
- TiCN Coated - page 188



MATERIAL HARDNESS (Rc)

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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								
40047	.1181	3.000	3.0	38	8	14.81	14.17	13.52	12.88	
40057	.1181	3.000	3.0	50	12	17.85	17.07	16.30	15.52	
52087	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	14.06	13.45	12.84	12.23
52097	.1250	1/8"	3.175	1/8"	2"	1/2"	16.96	16.23	15.49	14.75
40087	.1575	4.000	6.0	50	8	23.93	22.89	21.85	20.81	
40097	.1575	4.000	6.0	50	12	23.93	22.89	21.85	20.81	
52107	.1875	3/16"	4.763	3/16"	2"	5/16"	16.08	15.38	14.68	13.98
52127	.1875	3/16"	4.763	3/16"	2"	9/16"	16.08	15.38	14.68	13.98
40107	.1969	5.000	5.0	50	8	19.06	18.23	17.40	16.57	
40127	.1969	5.000	5.0	50	14	19.06	18.23	17.40	16.57	
40117	.1969	5.000	6.0	50	8	23.44	22.42	21.40	20.38	
40137	.1969	5.000	6.0	65	16	25.60	24.49	23.37	22.26	
40207	.2362	6.000	6.0	50	10	19.93	19.06	18.20	17.33	
40227	.2362	6.000	6.0	65	20	22.46	21.48	20.51	19.53	
40247	.2362	6.000	6.0	100	32	37.18	35.56	33.95	32.33	
52207	.2500	1/4"	6.350	1/4"	2"	3/8"	19.12	18.29	17.46	16.63
52227	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	21.69	20.75	19.80	18.86
52237	.2500	1/4"	6.350	1/4"	3"	1-1/8"	33.15	31.71	30.27	28.83
52247	.2500	1/4"	6.350	1/4"	4"	1-1/4"	35.65	34.10	32.55	31.00
52307	.3125	5/16"	7.938	5/16"	2"	7/16"	26.43	25.28	24.13	22.98
52327	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	30.92	29.58	28.23	26.89
52347	.3125	5/16"	7.938	5/16"	4"	1-1/4"	48.58	46.46	44.35	42.24
40307	.3150	8.000	8.0	50	11	27.52	26.32	25.13	23.93	
40327	.3150	8.000	8.0	65	21	32.05	30.66	29.26	27.87	
40347	.3150	8.000	8.0	100	32	50.58	48.38	46.18	43.98	
40367	.3543	9.000	10.0	65	22	49.50	47.34	45.19	43.04	
52407	.3750	3/8"	9.525	3/8"	2"	1/2"	31.22	29.87	28.51	27.15
52427	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	36.49	34.90	33.32	31.73
52437	.3750	3/8"	9.525	3/8"	3"	1-1/4"	46.58	44.55	42.53	40.50
52447	.3750	3/8"	9.525	3/8"	3-1/2"	1-1/2"	52.66	50.37	48.08	45.79
40407	.3937	10.000	10.0	50	12	36.14	34.57	33.00	31.43	
40427	.3937	10.000	10.0	70	22	43.76	41.86	39.95	38.05	
40447	.3937	10.000	10.0	88	38	64.63	61.82	59.01	56.20	
52507	.4375	7/16"	11.113	7/16"	2-1/2"	9/16"	43.87	41.97	40.06	38.15
52527	.4375	7/16"	11.113	7/16"	2-3/4"	1"	43.87	41.97	40.06	38.15
52547	.4375	7/16"	11.113	7/16"	4"	2"	70.15	67.10	64.05	61.00
40507	.4724	12.000	12.0	65	16	53.27	50.95	48.64	46.32	
40527	.4724	12.000	12.0	75	32	56.83	54.36	51.89	49.42	
40547	.4724	12.000	12.0	100	50	77.57	74.20	70.82	67.45	

EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
52607	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	51.08	48.86	46.64	44.42
52627	.5000	1/2"	12.700	1/2"	3"	1-1/4"	54.58	52.21	49.83	47.46
52647	.5000	1/2"	12.700	1/2"	4"	2"	73.85	70.64	67.43	64.22
52707	.6250	5/8"	15.875	5/8"	3"	3/4"	90.56	86.63	82.69	78.75
52727	.6250	5/8"	15.875	5/8"	3-1/2"	1-5/8"	100.71	96.33	91.95	87.57
52747	.6250	5/8"	15.875	5/8"	6"	2-1/2"	147.28	140.88	134.47	128.07
40607	.6299		16.000	16.0	75	20	94.73	90.61	86.49	82.37
40627	.6299		16.000	16.0	88	41	105.05	100.49	95.92	91.35
40647	.6299		16.000	16.0	150	63	147.28	140.88	134.47	128.07
52807	.7500	3/4"	19.050	3/4"	3"	7/8"	127.59	122.05	116.50	110.95
52827	.7500	3/4"	19.050	3/4"	4"	1-5/8"	143.75	137.50	131.25	125.00
52837	.7500	3/4"	19.050	3/4"	5"	2"	192.94	184.55	176.16	167.77
52847	.7500	3/4"	19.050	3/4"	6"	3-1/4"	225.79	215.97	206.16	196.34
40727	.7874		20.000	20.0	100	41	194.21	185.77	177.32	168.88
40747	.7874		20.000	20.0	150	82	243.62	233.02	222.43	211.84
40787	.9843		25.000	25.0	100	28	221.79	212.15	202.50	192.86
40827	.9843		25.000	25.0	100	50	221.79	212.15	202.50	192.86
40847	.9843		25.000	25.0	150	82	358.89	343.29	327.68	312.08
52897	1.000	1"	25.400	1"	4"	1-1/8"	214.75	205.41	196.08	186.74
52927	1.000	1"	25.400	1"	4"	2"	214.75	205.41	196.08	186.74
52947	1.000	1"	25.400	1"	6"	3-1/4"	374.44	358.16	341.88	325.60

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MATERIAL HARDNESS (Rc)



End Mill Manufacturing

Series 255M, 855M

.1181" - .5000"
(3.000mm - 12.700mm)

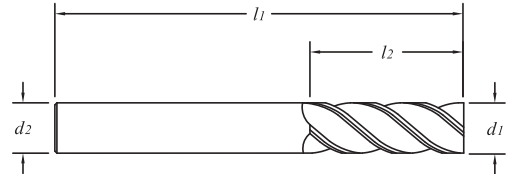


TOLERANCES	
d1	+0.000" - .002" (+.000 - .050mm)
d2	h6

Recommended for steels, stainless steel, and exotics

Square End

- 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
- AlTiN Coating - page 184
- TiCN Coated - page 188



MATERIAL HARDNESS (Rc)

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EDP#	d1 † Diameter		d2 Shank Diameter	l1 Overall Length	l2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
40040	.1181	3.000	3.0	38	8	12.09	11.56	11.04	10.51	
40050	.1181	3.000	3.0	50	12	14.57	13.94	13.30	12.67	
52080	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	11.35	10.86	10.36	9.87
52090	.1250	1/8"	3.175	1/8"	2"	1/2"	13.67	13.08	12.48	11.89
40080	.1575	4.000	6.0	50	8	19.65	18.80	17.94	17.09	
40090	.1575	4.000	6.0	50	12	19.65	18.80	17.94	17.09	
52100	.1875	3/16"	4.763	3/16"	2"	5/16"	13.37	12.79	12.21	11.63
52120	.1875	3/16"	4.763	3/16"	2"	9/16"	13.37	12.79	12.21	11.63
40100	.1969	5.000	5.0	50	8	14.86	14.21	13.57	12.92	
40120	.1969	5.000	5.0	50	14	14.86	14.21	13.57	12.92	
40200	.2362	6.000	6.0	50	10	15.76	15.07	14.39	13.70	
40220	.2362	6.000	6.0	65	20	16.93	16.19	15.46	14.72	
40240	.2362	6.000	6.0	100	32	30.68	29.35	28.01	26.68	
52200	.2500	1/4"	6.350	1/4"	2"	3/8"	14.93	14.28	13.63	12.98
52220	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	16.13	15.43	14.73	14.03
52240	.2500	1/4"	6.350	1/4"	4"	1-1/4"	29.14	27.87	26.61	25.34
52300	.3125	5/16"	7.938	5/16"	2"	7/16"	20.41	19.53	18.64	17.75
52320	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	22.63	21.65	20.66	19.68
52340	.3125	5/16"	7.938	5/16"	4"	1-1/4"	38.01	36.36	34.70	33.05
40320	.3150	8.000	8.0	65	21	23.76	22.73	21.69	20.66	
40340	.3150	8.000	8.0	100	32	40.03	38.29	36.55	34.81	
52400	.3750	3/8"	9.525	3/8"	2"	1/2"	25.22	24.12	23.03	21.93
52420	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	28.18	26.95	25.73	24.50
52440	.3750	3/8"	9.525	3/8"	3-1/2"	1-1/2"	42.10	40.27	38.44	36.61
40420	.3937	10.000	10.0	70	22	34.30	32.81	31.32	29.83	
40440	.3937	10.000	10.0	88	38	52.41	50.13	47.85	45.57	
52500	.4375	7/16"	11.113	7/16"	2-1/2"	9/16"	34.40	32.90	31.41	29.91
52520	.4375	7/16"	11.113	7/16"	2-3/4"	1"	34.40	32.90	31.41	29.91
52540	.4375	7/16"	11.113	7/16"	4"	2"	57.93	55.41	52.89	50.37
40520	.4724	12.000	12.0	75	32	47.40	45.34	43.28	41.22	
40540	.4724	12.000	12.0	100	50	65.30	62.46	59.62	56.78	
52600	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	41.63	39.82	38.01	36.20
52620	.5000	1/2"	12.700	1/2"	3"	1-1/4"	45.14	43.18	41.21	39.25
52640	.5000	1/2"	12.700	1/2"	4"	2"	61.61	58.93	56.25	53.57

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								
52700	.6250	5/8"	15.875	5/8"	3"	3/4"	79.60	76.14	72.68	69.22
52720	.6250	5/8"	15.875	5/8"	3-1/2"	1-5/8"	87.04	83.26	79.47	75.69
52740	.6250	5/8"	15.875	5/8"	6"	2-1/2"	126.98	121.46	115.94	110.42
40600	.6299		16.000	16.0	75	20	83.78	80.14	76.49	72.85
40620	.6299		16.000	16.0	88	41	91.39	87.42	83.44	79.47
40640	.6299		16.000	16.0	150	63	126.98	121.46	115.94	110.42
52800	.7500	3/4"	19.050	3/4"	3"	7/8"	114.47	109.49	104.52	99.54
52820	.7500	3/4"	19.050	3/4"	4"	1-5/8"	127.63	122.08	116.53	110.98
52830	.7500	3/4"	19.050	3/4"	5"	2"	172.76	165.25	157.74	150.23
52840	.7500	3/4"	19.050	3/4"	6"	3-1/4"	202.29	193.49	184.70	175.90
40700	.7874		20.000	20.0	75	22	155.25	148.50	141.75	135.00
40720	.7874		20.000	20.0	100	41	170.38	162.98	155.57	148.16
40740	.7874		20.000	20.0	150	82	213.10	203.83	194.57	185.30
40780	.9843		25.000	25.0	100	28	197.94	189.33	180.73	172.12
40820	.9843		25.000	25.0	100	50	197.94	189.33	180.73	172.12
40840	.9843		25.000	25.0	150	82	328.37	314.09	299.82	285.54
52890	1.000	1"	25.400	1"	4"	1-1/8"	190.90	182.60	174.30	166.00
52920	1.000	1"	25.400	1"	4"	2"	190.90	182.60	174.30	166.00
52940	1.000	1"	25.400	1"	6"	3-1/4"	343.91	328.96	314.00	299.05



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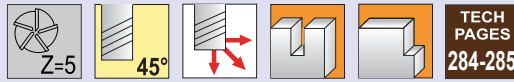
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MATERIAL HARDNESS (Rc)

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Series 255MC

.1875" - 1.000"
(4.763mm - 25.400mm)

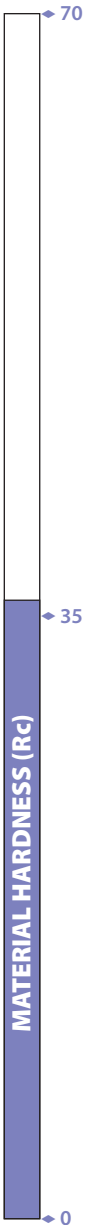
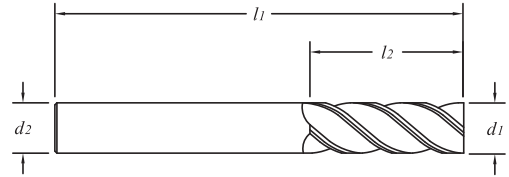


TOLERANCES	
d_1	+0.000" - .002" (+.000 - .050mm)
d_2	h6

Recommended for steels, stainless steel, and exotics

Square End
TiCN Coated

- 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
- Improved finishes in titanium
- Heavy core
- Sharp corners
- AlTiN Coating - page 184
- Uncoated - page 186



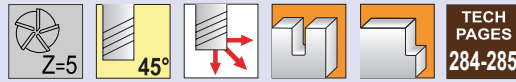
EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
52104	.1875	3/16"	4.763	3/16"	2"	5/16"	15.76	15.07	14.39	13.70
52124	.1875	3/16"	4.763	3/16"	2"	9/16"	15.76	15.07	14.39	13.70
52204	.2500	1/4"	6.350	1/4"	2"	3/8"	18.27	17.48	16.68	15.89
52224	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	20.95	20.04	19.13	18.22
52244	.2500	1/4"	6.350	1/4"	4"	1-1/4"	34.35	32.86	31.36	29.87
52304	.3125	5/16"	7.938	5/16"	2"	7/16"	25.63	24.52	23.40	22.29
52324	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	29.06	27.80	26.53	25.27
52344	.3125	5/16"	7.938	5/16"	4"	1-1/4"	46.02	44.02	42.02	40.02
52404	.3750	3/8"	9.525	3/8"	2"	1/2"	30.44	29.12	27.79	26.47
52424	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	34.63	33.12	31.62	30.11
52444	.3750	3/8"	9.525	3/8"	3-1/2"	1-1/2"	50.07	47.89	45.72	43.54
52504	.4375	7/16"	11.113	7/16"	2-1/2"	9/16"	42.14	40.30	38.47	36.64
52524	.4375	7/16"	11.113	7/16"	2-3/4"	1"	42.14	40.30	38.47	36.64
52544	.4375	7/16"	11.113	7/16"	4"	2"	67.56	64.63	61.69	58.75
52604	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	49.36	47.21	45.07	42.92
52624	.5000	1/2"	12.700	1/2"	3"	1-1/4"	52.85	50.56	48.26	45.96
52644	.5000	1/2"	12.700	1/2"	4"	2"	71.27	68.17	65.07	61.97
52704	.6250	5/8"	15.875	5/8"	3"	3/4"	89.98	86.06	82.15	78.24
52724	.6250	5/8"	15.875	5/8"	3-1/2"	1-5/8"	99.06	94.75	90.45	86.14
52744	.6250	5/8"	15.875	5/8"	6"	2-1/2"	143.85	137.60	131.34	125.09
52804	.7500	3/4"	19.050	3/4"	3"	7/8"	127.25	121.72	116.18	110.65
52824	.7500	3/4"	19.050	3/4"	4"	1-5/8"	141.40	135.26	129.11	122.96
52844	.7500	3/4"	19.050	3/4"	6"	3-1/4"	221.55	211.92	202.28	192.65
52894	1.000	1"	25.400	1"	4"	1-1/8"	211.62	202.42	193.22	184.02
52924	1.000	1"	25.400	1"	4"	2"	211.62	202.42	193.22	184.02
52944	1.000	1"	25.400	1"	6"	3-1/4"	371.15	355.01	338.88	322.74

TOLERANCES

<i>d1</i>	+0.000" - .002" (+0.000 - .050mm)
<i>d2</i>	h6
<i>r</i>	+0.001" - .001" (+0.025 - .025mm)

Series 255RA, 855RA

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

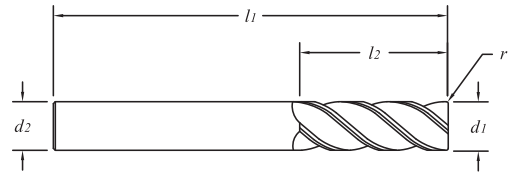


Recommended for steels, stainless steel, and exotics

Corner Radius

AlTiN Coating

- 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
- Improved finishes in titanium
- Heavy core



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									
83527	.1181	3.000	3.0	38	8	0.20	16.17	15.47	14.76	14.06	
83537	.1181	3.000	3.0	38	8	0.50	16.17	15.47	14.76	14.06	
83547	.1181	3.000	3.0	50	12	0.20	19.38	18.54	17.69	16.85	
83550	.1181	3.000	3.0	50	12	0.30	19.38	18.54	17.69	16.85	
83557	.1181	3.000	3.0	50	12	0.50	19.38	18.54	17.69	16.85	
83567	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.010"	15.36	14.70	14.03	13.36
83577	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.020"	15.36	14.70	14.03	13.36
83587	.1250	1/8"	3.175	1/8"	2"	1/2"	.010"	18.88	18.06	17.24	16.42
83597	.1250	1/8"	3.175	1/8"	2"	1/2"	.020"	18.88	18.06	17.24	16.42
83600	.1250	1/8"	3.175	1/8"	2"	1/2"	.030"	18.88	18.06	17.24	16.42
83607	.1575	4.000	6.0	50	8	0.30	26.07	24.94	23.80	22.67	
83617	.1575	4.000	6.0	50	8	0.50	26.07	24.94	23.80	22.67	
83627	.1575	4.000	6.0	50	12	0.30	26.07	24.94	23.80	22.67	
83637	.1575	4.000	6.0	50	12	0.50	26.07	24.94	23.80	22.67	
83647	.1875	3/16"	4.763	3/16"	2"	5/16"	.010"	19.32	18.48	17.64	16.80
83657	.1875	3/16"	4.763	3/16"	2"	5/16"	.020"	19.32	18.48	17.64	16.80
83667	.1875	3/16"	4.763	3/16"	2"	9/16"	.010"	19.32	18.48	17.64	16.80
83677	.1875	3/16"	4.763	3/16"	2"	9/16"	.020"	19.32	18.48	17.64	16.80
83680	.1875	3/16"	4.763	3/16"	2"	9/16"	.030"	19.32	18.48	17.64	16.80
83707	.1969	5.000	6.0	65	15	0.30	28.43	27.19	25.96	24.72	
83717	.1969	5.000	6.0	65	15	0.50	28.43	27.19	25.96	24.72	
83767	.2362	6.000	6.0	50	12	0.30	24.53	23.46	22.40	21.33	
83777	.2362	6.000	6.0	50	12	0.50	24.53	23.46	22.40	21.33	
83780	.2362	6.000	6.0	65	19	0.20	27.54	26.35	25.15	23.95	
83787	.2362	6.000	6.0	65	19	0.30	27.54	26.35	25.15	23.95	
83797	.2362	6.000	6.0	65	19	0.50	27.54	26.35	25.15	23.95	
83807	.2362	6.000	6.0	65	19	1.00	27.54	26.35	25.15	23.95	
83827	.2500	1/4"	6.350	1/4"	2"	3/8"	.015"	23.61	22.58	21.56	20.53
83837	.2500	1/4"	6.350	1/4"	2"	3/8"	.030"	23.61	22.58	21.56	20.53
83845	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"	26.54	25.39	24.23	23.08
83847	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	26.54	25.39	24.23	23.08
83857	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	26.54	25.39	24.23	23.08
83877	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.060"	26.54	25.39	24.23	23.08
83907	.2500	1/4"	6.350	1/4"	3"	1-1/8"	.030"	38.11	36.45	34.80	33.14
83927	.3125	5/16"	7.938	5/16"	2"	7/16"	.020"	32.23	30.83	29.43	28.03
83937	.3125	5/16"	7.938	5/16"	2"	7/16"	.030"	32.23	30.83	29.43	28.03
83940	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.010"	35.93	34.36	32.80	31.24
83947	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.020"	35.93	34.36	32.80	31.24
83957	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.030"	35.93	34.36	32.80	31.24
83977	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.060"	35.93	34.36	32.80	31.24

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MATERIAL HARDNESS (Rc)

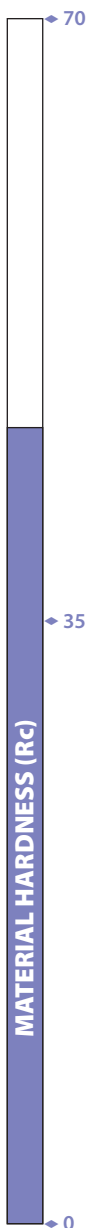
HIGH PERFORMANCE
END MILLS

continued →

Series 255RA, 855RA (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	0.50	33.42	31.97	30.51	29.06	
83997	.3150	8.000	8.0	50	12	1.00	33.42	31.97	30.51	29.06	
84000	.3150	8.000	8.0	65	22	0.30	37.27	35.65	34.03	32.41	
84007	.3150	8.000	8.0	65	22	0.50	37.27	35.65	34.03	32.41	
84017	.3150	8.000	8.0	65	22	1.00	37.27	35.65	34.03	32.41	
84027	.3150	8.000	8.0	65	22	1.50	37.27	35.65	34.03	32.41	
84087	.3750	3/8"	9.525	3/8"	2"	1/2"	.020"	38.00	36.34	34.69	33.04
84097	.3750	3/8"	9.525	3/8"	2"	1/2"	.030"	38.00	36.34	34.69	33.04
84100	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.010"	41.79	39.97	38.16	36.34
84107	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.020"	41.79	39.97	38.16	36.34
84117	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	41.79	39.97	38.16	36.34
84137	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.060"	41.79	39.97	38.16	36.34
84147	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.030"	54.99	52.60	50.21	47.82
84167	.3937	10.000	10.0	70	22	0.50	50.52	48.32	46.13	43.93	
84177	.3937	10.000	10.0	70	22	1.00	50.52	48.32	46.13	43.93	
84257	.4724	12.000	12.0	75	32	0.30	73.88	70.66	67.45	64.24	
84267	.4724	12.000	12.0	75	32	0.50	73.88	70.66	67.45	64.24	
84277	.4724	12.000	12.0	75	32	1.00	73.88	70.66	67.45	64.24	
84287	.4724	12.000	12.0	75	32	1.50	73.88	70.66	67.45	64.24	
84307	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.010"	70.89	67.80	64.72	61.64
84317	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.020"	70.89	67.80	64.72	61.64
84327	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	70.89	67.80	64.72	61.64
84337	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"	70.89	67.80	64.72	61.64
84357	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.120"	70.89	67.80	64.72	61.64
84367	.5000	1/2"	12.700	1/2"	4"	2"	.030"	83.97	80.32	76.67	73.02
84377	.5000	1/2"	12.700	1/2"	4"	2"	.060"	83.97	80.32	76.67	73.02
84397	.5000	1/2"	12.700	1/2"	4"	2"	.120"	83.97	80.32	76.67	73.02
84467	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"	112.73	107.83	102.93	98.03
84487	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	112.73	107.83	102.93	98.03
84497	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	112.73	107.83	102.93	98.03
84507	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.120"	112.73	107.83	102.93	98.03
84567	.6299	16.000	16.0	88	32	1.00	117.55	112.44	107.33	102.22	
84577	.6299	16.000	16.0	88	32	2.00	117.55	112.44	107.33	102.22	
84587	.6299	16.000	16.0	150	65	1.00	175.55	167.92	160.28	152.65	
84597	.6299	16.000	16.0	150	65	2.00	175.55	167.92	160.28	152.65	
84667	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"	161.33	154.32	147.30	140.29
84687	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	161.33	154.32	147.30	140.29
84697	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	161.33	154.32	147.30	140.29
84700	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.120"	161.33	154.32	147.30	140.29
84707	.7500	3/4"	19.050	3/4"	5"	2"	.030"	223.38	213.66	203.95	194.24
84717	.7500	3/4"	19.050	3/4"	5"	2"	.060"	223.38	213.66	203.95	194.24
84747	.7500	3/4"	19.050	3/4"	5"	2"	.120"	223.38	213.66	203.95	194.24
84757	.7500	3/4"	19.050	3/4"	5"	2"	.190"	223.38	213.66	203.95	194.24
84767	.7874	20.000	20.0	100	38	1.00	228.31	218.38	208.46	198.53	
84777	.7874	20.000	20.0	100	38	3.00	228.31	218.38	208.46	198.53	
84887	.9843	25.000	25.0	100	38	1.00	261.27	249.91	238.55	227.19	
84897	.9843	25.000	25.0	100	38	3.00	261.27	249.91	238.55	227.19	
84957	1.000	1"	25.400	1"	4"	1-1/2"	.015"	274.83	262.88	250.93	238.98
84967	1.000	1"	25.400	1"	4"	1-1/2"	.030"	274.83	262.88	250.93	238.98
84970	1.000	1"	25.400	1"	4"	1-1/2"	.060"	274.83	262.88	250.93	238.98
84977	1.000	1"	25.400	1"	4"	1-1/2"	.120"	274.83	262.88	250.93	238.98
84987	1.000	1"	25.400	1"	5"	2"	.030"	337.97	323.28	308.58	293.89
84990	1.000	1"	25.400	1"	5"	2"	.060"	337.97	323.28	308.58	293.89
84997	1.000	1"	25.400	1"	5"	2"	.120"	337.97	323.28	308.58	293.89
85007	1.000	1"	25.400	1"	5"	2"	.190"	337.97	323.28	308.58	293.89



TOLERANCES

$d1$	+0.000" - .002" (+0.000 - .050mm)
$d2$	h6

NEW ITEM

Series 246M, 246MC, 246MA, 846M, 846MA

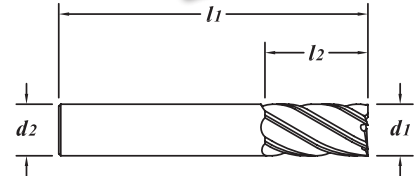


TECH PAGES 284-285

Recommended for steels

Square End

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



(246M/846M) UNCOATED EDP#	(246MC) TiCN EDP#	(246MA/846MA) AlTiN EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
51110	-	-	.1875	3/16"	4.763	3/16"	2"	5/8"	13.37	12.79	12.21	11.63
51510	-	-	.1969		5.000	5.0	50	16	14.86	14.21	13.57	12.92
51520	-	-	.2362		6.000	6.0	65	20	16.93	16.19	15.46	14.72
51150	-	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	16.13	15.43	14.73	14.03
51190	-	-	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	22.63	21.65	20.66	19.68
51530	-	-	.3150		8.000	8.0	65	22	23.76	22.73	21.69	20.66
51230	-	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	28.18	26.95	25.73	24.50
51540	-	-	.3937		10.000	10.0	70	25	34.30	32.81	31.32	29.83
51270	-	-	.4375	7/16"	11.113	7/16"	2-3/4"	1"	34.40	32.90	31.41	29.91
51310	-	-	.5000	1/2"	12.700	1/2"	3"	1"	45.14	43.18	41.21	39.25
51330	-	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	87.04	83.26	79.47	75.69
51560	-	-	.6299		16.000	16.0	88	32	91.39	87.42	83.44	79.47
51350	-	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	127.63	122.08	116.53	110.98
51370	-	-	1.000	1"	25.400	1"	4"	1-1/2"	190.90	182.60	174.30	166.00
51400	-	-	1.250	1-1/4"	31.750	1-1/4"	4-1/2"	2"	557.35	533.12	508.88	484.65
51430	-	-	1.250	1-1/4"	31.750	1-1/4"	6"	3"	729.58	697.86	666.14	634.42
-	51114	-	.1875	3/16"	4.763	3/16"	2"	5/8"	15.76	15.07	14.39	13.70
-	51154	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	20.95	20.04	19.13	18.22
-	51194	-	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	29.06	27.80	26.53	25.27
-	51234	-	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	34.63	33.12	31.62	30.11
-	51274	-	.4375	7/16"	11.113	7/16"	2-3/4"	1"	42.14	40.30	38.47	36.64
-	51314	-	.5000	1/2"	12.700	1/2"	3"	1"	52.85	50.56	48.26	45.96
-	51334	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	99.06	94.75	90.45	86.14
-	51354	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	141.40	135.26	129.11	122.96
-	51374	-	1.000	1"	25.400	1"	4"	1-1/2"	211.58	202.38	193.18	183.98
-	51404	-	1.250	1-1/4"	31.750	1-1/4"	4-1/2"	2"	590.76	565.07	539.39	513.70
-	51434	-	1.250	1-1/4"	31.750	1-1/4"	6"	3"	767.36	734.00	700.63	667.27
-	-	51117	.1875	3/16"	4.763	3/16"	2"	5/8"	16.08	15.38	14.68	13.98
-	-	51517	.1969		5.000	5.0	50	16	19.06	18.23	17.40	16.57
NEW	-	51597	.1969		5.000	6.0	65	16	25.60	24.49	23.37	22.26
-	-	51527	.2362		6.000	6.0	65	20	22.46	21.48	20.51	19.53
-	-	51157	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	21.69	20.75	19.80	18.86
-	-	51197	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	30.92	29.58	28.23	26.89
-	-	51537	.3150		8.000	8.0	65	22	32.05	30.66	29.26	27.87
-	-	51237	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	36.49	34.90	33.32	31.73
-	-	51547	.3937		10.000	10.0	70	25	43.76	41.86	39.95	38.05
-	-	51277	.4375	7/16"	11.113	7/16"	2-3/4"	1"	43.87	41.97	40.06	38.15
-	-	51557	.4724		12.000	12.0	75	26	56.83	54.36	51.89	49.42
-	-	51317	.5000	1/2"	12.700	1/2"	3"	1"	54.58	52.21	49.83	47.46
-	-	51337	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	100.71	96.33	91.95	87.57
-	-	51567	.6299		16.000	16.0	88	32	105.05	100.49	95.92	91.35
-	-	51357	.7500	3/4"	19.050	3/4"	4"	1-1/2"	143.75	137.50	131.25	125.00
-	-	51577	.7874		20.000	20.0	100	38	194.21	185.77	177.32	168.88
-	-	51587	.9843		25.000	25.0	100	38	221.79	212.15	202.50	192.86
-	-	51377	1.000	1"	25.400	1"	4"	1-1/2"	214.75	205.41	196.08	186.74
-	-	51407	1.250	1-1/4"	31.750	1-1/4"	4-1/2"	2"	596.45	570.52	544.58	518.65
-	-	51437	1.250	1-1/4"	31.750	1-1/4"	6"	3"	768.68	735.26	701.84	668.42

HIGH PERFORMANCE END MILLS

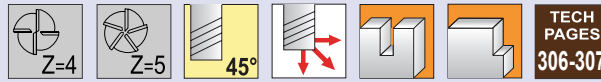
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35

MATERIAL HARDNESS (Rc)

0

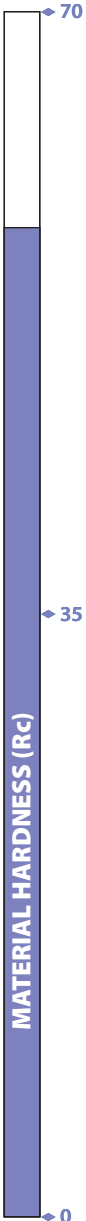
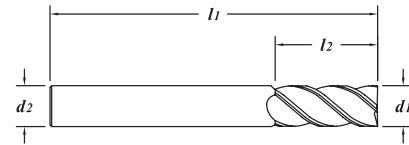
$d1$	+0.000" -0.002" (+0.000 -0.050mm)
$d2$	h6



Recommended for inconel, tool steels, hardened die mold >40Rc

Square End
AlTiN Coating

Solid submicron grain carbide end mill - center cutting
High performance tool for use in high Rockwell and difficult to machine materials
Corner Radius - page 193
Ball End - page 194



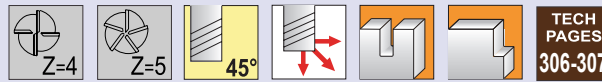
EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	Number of Flutes	1-11	12-24	25-49	50-100	
	Decimal	Metric									
21200	.1181	3.000	3.0	38	12	4	15.63	14.95	14.27	13.59	
21230	.1250	1/8"	3.175	1/8"	1-1/2"	4	14.86	14.21	13.57	12.92	
21260	.1575	4.000	6.0	50	12	4	25.25	24.16	23.06	21.96	
21290	.1875	3/16"	4.763	3/16"	2"	9/16"	4	18.66	17.85	17.04	16.23
21320	.1969	5.000	6.0	65	15	4	27.67	26.47	25.26	24.06	
21350	.2362	6.000	6.0	65	19	4	26.83	25.66	24.50	23.33	
21380	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	4	25.85	24.73	23.60	22.48
21410	.2756	7.000	8.0	65	22	5	40.50	38.74	36.98	35.22	
21440	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	5	35.10	33.57	32.05	30.52
21470	.3150	8.000	8.0	65	22	5	36.89	35.29	33.68	32.08	
21500	.3543	9.000	10.0	65	22	5	54.20	51.84	49.49	47.13	
21530	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	5	40.69	38.92	37.15	35.38
21560	.3937	10.000	10.0	70	22	5	49.11	46.97	44.84	42.70	
21620	.4724	12.000	12.0	75	32	5	72.00	68.87	65.74	62.61	
21660	.5000	1/2"	12.700	1/2"	3"	1-1/4"	5	68.46	65.48	62.51	59.53
21710	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	5	108.70	103.97	99.25	94.52
21740	.6299	16.000	16.0	88	32	5	114.31	109.34	104.37	99.40	
21800	.7500	3/4"	19.050	3/4"	4"	1-1/2"	5	155.69	148.92	142.15	135.38
21830	.7874	20.000	20.0	100	38	5	220.09	210.52	200.95	191.38	
21890	.9843	25.000	25.0	100	38	5	275.17	263.21	251.24	239.28	
21920	1.000	1"	25.400	1"	4"	1-1/2"	5	266.05	254.49	242.92	231.35

TOLERANCES

d_1	+0.000" - .002" (+.000mm - .050mm)
d_2	h6
r	+0.01" - .001" (+.025 - .025mm)

HIGH ROCKWELL END MILLS

Series 545RA



Recommended for inconel, tool steels, hardened die mold >40Rc

Corner Radius

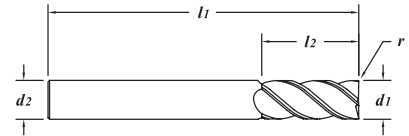
AlTiN Coating

Solid submicron grain carbide end mill - center cutting

High performance tool for use in high Rockwell and difficult to machine materials

Square End - page 192

Ball End - page 194



HIGH PERFORMANCE END MILLS

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	Number of Flutes	1-11	12-24	25-49	50-100	
	Decimal	Metric										
21202	.1181	3.000	3.0	38	12	0.20	4	17.07	16.32	15.58	14.84	
21212	.1181	3.000	3.0	38	12	0.50	4	17.07	16.32	15.58	14.84	
21232	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.010"	4	16.22	15.51	14.81	14.10
21242	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.020"	4	16.22	15.51	14.81	14.10
21262	.1575	4.000	6.0	50	12	0.30	4	27.52	26.32	25.13	23.93	
21292	.1875	3/16"	4.763	3/16"	2"	9/16"	.010"	4	20.38	19.49	18.61	17.72
21302	.1875	3/16"	4.763	3/16"	2"	9/16"	.020"	4	20.38	19.49	18.61	17.72
21322	.1969	5.000	6.0	65	15	0.30	4	30.02	28.71	27.41	26.10	
21342	.2362	6.000	6.0	65	19	0.20	4	29.07	27.81	26.54	25.28	
21352	.2362	6.000	6.0	65	19	0.50	4	29.07	27.81	26.54	25.28	
21372	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"	4	28.01	26.80	25.58	24.36
21382	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	4	28.01	26.80	25.58	24.36
21392	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	4	28.01	26.80	25.58	24.36
21412	.2756	7.000	8.0	65	22	0.50	5	43.93	42.02	40.11	38.20	
21432	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.010"	5	37.93	36.28	34.63	32.98
21442	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.015"	5	37.93	36.28	34.63	32.98
21452	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.030"	5	37.93	36.28	34.63	32.98
21462	.3150	8.000	8.0	65	22	0.20	5	39.93	38.19	36.46	34.72	
21472	.3150	8.000	8.0	65	22	0.50	5	39.93	38.19	36.46	34.72	
21502	.3543	9.000	10.0	65	22	0.50	5	59.00	56.43	53.87	51.30	
21522	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.010"	5	44.14	42.22	40.30	38.38
21532	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.015"	5	44.14	42.22	40.30	38.38
21542	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	5	44.14	42.22	40.30	38.38
21552	.3937	10.000	10.0	70	22	0.20	5	53.31	51.00	48.68	46.36	
21562	.3937	10.000	10.0	70	22	0.50	5	53.31	51.00	48.68	46.36	
21612	.4724	12.000	12.0	75	32	0.50	5	78.76	75.34	71.91	68.49	
21622	.4724	12.000	12.0	75	32	1.00	5	78.76	75.34	71.91	68.49	
21642	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.010"	5	74.82	71.57	68.31	65.06
21652	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.015"	5	74.82	71.57	68.31	65.06
21662	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	5	74.82	71.57	68.31	65.06
21672	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"	5	74.82	71.57	68.31	65.06
21692	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.010"	5	119.00	113.83	108.65	103.48
21702	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"	5	119.00	113.83	108.65	103.48
21712	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	5	119.00	113.83	108.65	103.48
21722	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	5	119.00	113.83	108.65	103.48
21732	.6299	16.000	16.0	88	32	0.50	5	125.27	119.82	114.38	108.93	
21742	.6299	16.000	16.0	88	32	1.00	5	125.27	119.82	114.38	108.93	
21772	.7087	18.000	18.0	100	38	0.50	5	178.78	171.01	163.23	155.46	
21802	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"	5	171.07	163.64	156.20	148.76
21812	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	5	171.07	163.64	156.20	148.76
21822	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	5	171.07	163.64	156.20	148.76
21832	.7874	20.000	20.0	100	38	0.50	5	241.86	231.34	220.83	210.31	
21922	1.000	1"	25.400	1"	4"	1-1/2"	.015"	5	292.38	279.66	266.95	254.24
21932	1.000	1"	25.400	1"	4"	1-1/2"	.030"	5	292.38	279.66	266.95	254.24
21942	1.000	1"	25.400	1"	4"	1-1/2"	.060"	5	292.38	279.66	266.95	254.24

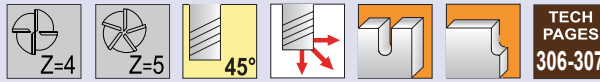
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MATERIAL HARDNESS (Rc)

d_1	+0.000" - .002" (+.000 - .050mm)
d_2	h6
ball radius	+0.000" - .001" (+.000 - .025mm)

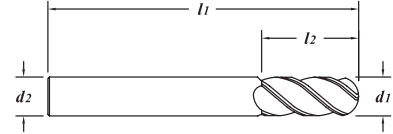


Recommended for inconel, tool steels, hardened die mold >40Rc

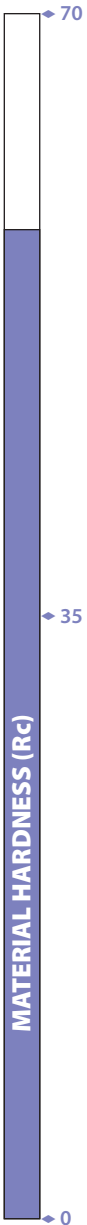


Ball End
AlTiN Coating

Solid submicron grain carbide end mill - center cutting
High performance tool for use in high Rockwell and difficult to machine materials
Square End - page 192
Corner Radius - page 193



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	17.07	16.32	15.58	14.84	
21234	.1250	1/8"	3.175	1/8"	1-1/2"	4	16.22	15.51	14.81	14.10	
21264	.1575		4.000	6.0	50	12	4	27.52	26.32	25.13	23.93
21294	.1875	3/16"	4.763	3/16"	2"	9/16"	4	20.38	19.49	18.61	17.72
21324	.1969		5.000	6.0	65	15	4	30.02	28.71	27.41	26.10
21354	.2362		6.000	6.0	65	19	4	29.07	27.81	26.54	25.28
21384	.2500	1/4"	6.353	1/4"	2-1/2"	3/4"	4	28.01	26.80	25.58	24.36
21414	.2756		7.000	8.0	65	22	5	43.93	42.02	40.11	38.20
21444	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	5	37.93	36.28	34.63	32.98
21474	.3150		8.000	8.0	65	22	5	39.93	38.19	36.46	34.72
21504	.3543		9.000	10.0	65	22	5	59.00	56.43	53.87	51.30
21534	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	5	44.14	42.22	40.30	38.38
21564	.3937		10.000	10.0	70	22	5	53.31	51.00	48.68	46.36
21624	.4724		12.000	12.0	75	32	5	78.76	75.34	71.91	68.49
21664	.5000	1/2"	12.700	1/2"	3"	1-1/4"	5	74.82	71.57	68.31	65.06
21714	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	5	119.00	113.83	108.65	103.48
21744	.6299		16.000	16.0	88	32	5	125.27	119.82	114.38	108.93
21774	.7087		18.000	18.0	100	38	5	178.78	171.01	163.23	155.46
21804	.7500	3/4"	19.050	3/4"	4"	1-1/2"	5	171.07	163.64	156.20	148.76
21924	1.000	1"	25.400	1"	4"	1-1/2"	5	292.38	279.66	266.95	254.24

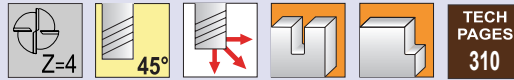


TOLERANCES

$d1$	+ .000" - .002" (+.000mm -.050mm)
$d2$	h6
r	+ .001" - .001" (+.025 -.025mm)

HIGH FEED END MILLS

Series H-45



Recommended for die mold applications

Corner Radius

AlTiN Coating

Solid submicron grain carbide end mill - center cutting

For light axial / radial depths of cut

Rigid work holding, machine stability and part integrity are critical!

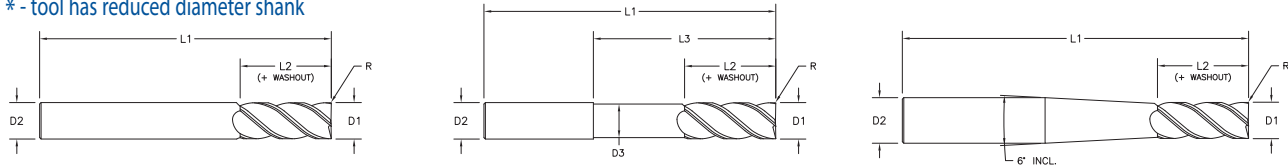
Recommended for high Rockwell materials

Modified reach lengths available within 48 hours



* - tool has 3° per side blend angle to shank

* - tool has reduced diameter shank



70

35

0

MATERIAL HARDNESS (Rc)

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										
48300	.1181	3.000	6.0	65	3	0.75	15.0	2.80	38.63	36.95	35.27	33.59
48305	.1250	3.175	1/8"	3"	1/8"	.015"	-	-	29.19	27.92	26.65	25.38
48310	.1250	3.175	1/8"	3"	1/8"	.030"	-	-	29.19	27.92	26.65	25.38
48315	.1250	3.175	3/16"	2-1/2"	1/8"	.010"	3/4"	.115"	34.29	32.80	31.31	29.82
48320	.1250	3.175	3/16"	2-1/2"	1/8"	.015"	3/4"	.115"	34.29	32.80	31.31	29.82
48325	.1250	3.175	3/16"	2-1/2"	1/8"	.020"	3/4"	.115"	34.29	32.80	31.31	29.82
* 48330	.1250	3.175	3/16"	3"	1/8"	.030"	*	-	31.29	29.93	28.57	27.21
48335	.1575	4.000	6.0	65	4	1.00	20.0	3.70	37.09	35.48	33.86	32.25
48340	.1875	4.763	3/16"	3"	3/16"	.015"	-	-	33.66	32.20	30.73	29.27
48345	.1875	4.763	3/16"	3"	3/16"	.030"	-	-	33.66	32.20	30.73	29.27
48350	.1875	4.763	3/16"	3"	3/16"	.060"	-	-	33.66	32.20	30.73	29.27
48355	.1875	4.763	1/4"	2-1/2"	3/16"	.020"	7/8"	.175"	36.02	34.45	32.89	31.32
48360	.1875	4.763	1/4"	2-1/2"	3/16"	.030"	7/8"	.175"	36.02	34.45	32.89	31.32
48365	.1875	4.763	1/4"	2-1/2"	3/16"	.060"	7/8"	.175"	36.02	34.45	32.89	31.32
48370	.1875	4.763	1/4"	4"	3/16"	.020"	1-1/2"	.175"	52.07	49.81	47.54	45.28
48375	.1875	4.763	1/4"	4"	3/16"	.030"	1-1/2"	.175"	52.07	49.81	47.54	45.28
* 48380	.1875	4.763	1/4"	4"	3/16"	.030"	*	-	52.07	49.81	47.54	45.28
* 48385	.1969	5.000	6.0	100	5	1.20	* 10.0	5.00	53.98	51.63	49.29	46.94
48390	.2362	6.000	6.0	100	6	1.50	30.0	5.70	51.20	48.97	46.75	44.52
48395	.2500	6.350	1/4"	3"	1/4"	.015"	-	-	38.89	37.20	35.51	33.82
48400	.2500	6.350	1/4"	3"	1/4"	.030"	-	-	38.89	37.20	35.51	33.82
48405	.2500	6.350	1/4"	3"	1/4"	.060"	-	-	38.89	37.20	35.51	33.82
* 48410	.2756	7.000	6.0	100	7	1.50	*	-	81.01	77.48	73.96	70.44
48415	.3125	7.938	5/16"	2-1/2"	5/16"	.020"	-	-	35.93	34.36	32.80	31.24
48420	.3125	7.938	5/16"	3"	5/16"	.078"	1-5/8"	.300"	57.34	54.85	52.35	49.86
48425	.3125	7.938	5/16"	3"	5/16"	.094"	1-5/8"	.300"	57.34	54.85	52.35	49.86
48430	.3150	8.000	8.0	75	8	2.00	-	-	51.62	49.38	47.13	44.89
48435	.3150	8.000	8.0	100	8	2.00	40.0	7.70	66.95	64.04	61.13	58.22
48440	.3750	9.525	3/8"	3"	3/8"	.015"	-	-	54.53	52.16	49.79	47.42
48445	.3750	9.525	3/8"	3"	3/8"	.030"	-	-	54.53	52.16	49.79	47.42
48450	.3750	9.525	3/8"	3"	3/8"	.060"	-	-	54.53	52.16	49.79	47.42
48455	.3750	9.525	3/8"	3"	3/8"	.094"	2.00"	.365"	62.32	59.61	56.90	54.19
48460	.3750	9.525	3/8"	4"	3/8"	.030"	2-1/2"	.365"	69.37	66.35	63.34	60.32
48465	.3750	9.525	3/8"	4"	3/8"	.094"	2-1/2"	.365"	69.37	66.35	63.34	60.32
48470	.3937	10.000	10.0	100	10	2.00	50.0	9.70	85.64	81.92	78.19	74.47
48475	.4724	12.000	12.0	100	12	3.00	60.0	11.70	95.12	90.98	86.85	82.71
48480	.5000	12.700	1/2"	3"	1/2"	.015"	-	-	70.89	67.80	64.72	61.64
48485	.5000	12.700	1/2"	3"	1/2"	.030"	-	-	70.89	67.80	64.72	61.64
48490	.5000	12.700	1/2"	3"	1/2"	.060"	-	-	70.89	67.80	64.72	61.64
48495	.5000	12.700	1/2"	3"	1/2"	.125"	-	-	70.89	67.80	64.72	61.64
48500	.5000	12.700	1/2"	4"	1/2"	.125"	-	-	83.97	80.32	76.67	73.02

$d1$	+0.000" -0.011" (+0.000 -0.25mm)
$d2$	h6
ball radius	+0.0000" -0.0005" (+0.0000 -0.127mm)

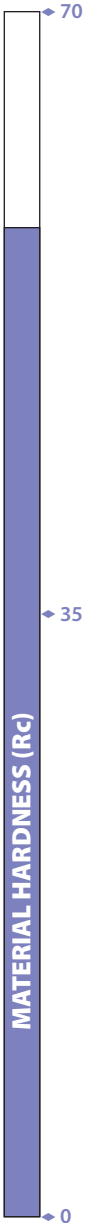
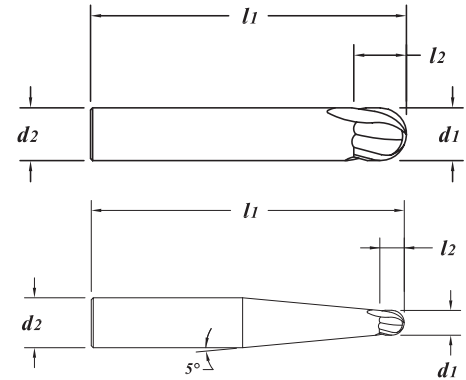
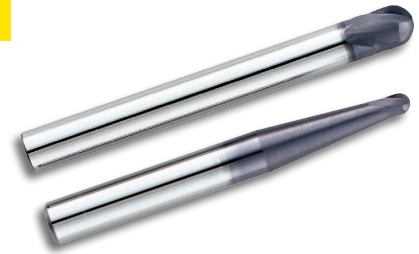


Recommended for die mold applications

Die Mold Cutter - Ball End

AlTiN Coating

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!
 <5mm (.1969") diameter have 5° per side taper to shank
 Recommended for high Rockwell materials
 Can be modified with a neck in 48 hours



EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
14210	.0312	1/32"	0.792	1/4"	3"	1/32"	60.36	57.74	55.11	52.49
15210	.0394		1.000	6.0	75	1	60.36	57.74	55.11	52.49
15220	.0591		1.500	6.0	75	1.5	60.36	57.74	55.11	52.49
14220	.0625	1/16"	1.588	1/4"	3"	1/16"	60.36	57.74	55.11	52.49
15230	.0787		2.000	6.0	75	2	60.36	57.74	55.11	52.49
14230	.0938	3/32"	2.383	1/4"	3"	3/32"	60.36	57.74	55.11	52.49
15240	.1181		3.000	6.0	75	3	58.98	56.42	53.85	51.29
14240	.1250	1/8"	3.175	1/4"	3"	1/8"	58.98	56.42	53.85	51.29
15250	.1575		4.000	6.0	75	4	58.12	55.59	53.07	50.54
14250	.1875	3/16"	4.763	1/4"	3"	3/16"	58.12	55.59	53.07	50.54
15260	.1969		5.000	6.0	75	5	58.12	55.59	53.07	50.54
15270	.2362		6.000	6.0	75	6	56.91	54.44	51.96	49.49
14260	.2500	1/4"	6.350	1/4"	3"	1/4"	56.91	54.44	51.96	49.49
14270	.3125	5/16"	7.938	5/16"	4"	5/16"	69.70	66.67	63.64	60.61
15280	.3150		8.000	8.0	100	8	69.70	66.67	63.64	60.61
14280	.3750	3/8"	9.525	3/8"	4"	3/8"	77.12	73.77	70.41	67.06
15290	.3937		10.000	10.0	100	10	83.43	79.81	76.18	72.55
15300	.4724		12.000	12.0	100	12	101.05	96.66	92.26	87.87
14290	.5000	1/2"	12.700	1/2"	4"	1/2"	112.53	107.64	102.74	97.85

TOLERANCES

d_1	+0.000" - .002" (+.000 - .050mm)
d_2	h6

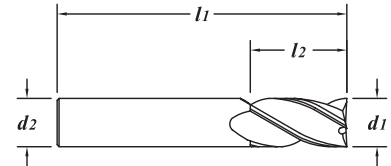
Series 210D



Recommended for graphite, fiber-reinforced plastics, carbon fiber

**Square End
Diamond Coating**

Solid grade C-2 carbide end mill - center cutting
Crystalline diamond coating



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								
10018	.0312	1/32"	0.792	1/8"	1-1/2"	3/32"	73.26	70.07	66.89	63.70
46018	.0394		1.000	3.0	38	4	77.11	73.76	70.40	67.05
10028	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"	73.26	70.07	66.89	63.70
46028	.0591		1.500	3.0	38	6	77.11	73.76	70.40	67.05
10038	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	70.92	67.84	64.75	61.67
46038	.0787		2.000	3.0	38	8	74.67	71.42	68.18	64.93
10058	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	69.67	66.64	63.61	60.58
46058	.1181		3.000	3.0	38	12	69.30	66.29	63.27	60.26
10078	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	65.81	62.95	60.09	57.23
46078	.1575		4.000	4.0	50	14	110.73	105.92	101.10	96.29
10118	.1875	3/16"	4.763	3/16"	2"	5/8"	105.20	100.63	96.05	91.48
46098	.1969		5.000	5.0	50	16	127.64	122.09	116.54	110.99
46108	.2362		6.000	6.0	65	20	130.17	124.51	118.85	113.19
10158	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	123.66	118.28	112.91	107.53
10198	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	147.95	141.52	135.08	128.65
46128	.3150		8.000	8.0	65	20	174.64	167.05	159.45	151.86
10238	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	165.78	158.58	151.37	144.16
46148	.3937		10.000	10.0	70	25	193.42	185.01	176.60	168.19
46168	.4724		12.000	12.0	75	25	212.04	202.82	193.60	184.38
10318	.5000	1/2"	12.700	1/2"	3"	1"	201.43	192.68	183.92	175.16
13338	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	291.12	278.47	265.81	253.15
46188	.6299		16.000	16.0	88	32	354.48	339.06	323.65	308.24
13358	.7500	3/4"	19.050	3/4"	4"	1-1/2"	550.79	526.85	502.90	478.95
13378	1.000	1"	25.400	1"	4"	1-1/2"	865.35	827.73	790.10	752.48

MATERIAL HARDNESS (RC)
70
35
0

Series 210RD



TOLERANCES

$d1$	+0.00" -0.002" (+0.00 -0.050mm)
$d2$	h6
r	+0.001" -0.001" (+0.025 -0.025mm)

Recommended for graphite, fiber-reinforced plastics, carbon fiber

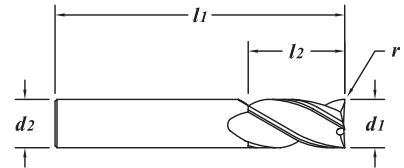
Corner Radius

Diamond Coating

Solid grade C-2 carbide end mill - center cutting

Crystalline diamond coating

For stronger corners and part radius



MATERIAL HARDNESS (Rc) 70 35 0

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									
24118	.1181	3.000	3.0	38	12	0.50	96.00	91.83	87.65	83.48	
80018	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.015"	91.20	87.23	83.27	79.30
80028	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.020"	91.20	87.23	83.27	79.30
24148	.1575	4.000	4.0	50	14	0.30	138.72	132.69	126.66	120.63	
24158	.1575	4.000	4.0	50	14	0.50	138.72	132.69	126.66	120.63	
80058	.1875	3/16"	4.763	3/16"	2"	5/8"	.015"	131.80	126.07	120.34	114.61
80068	.1875	3/16"	4.763	3/16"	2"	5/8"	.020"	131.80	126.07	120.34	114.61
24178	.2362	6.000	6.0	65	20	0.50	148.03	141.59	135.16	128.72	
24208	.2362	6.000	6.0	65	20	1.50	148.03	141.59	135.16	128.72	
80108	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	140.63	134.52	128.40	122.29
80118	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"	140.63	134.52	128.40	122.29
80128	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	140.63	134.52	128.40	122.29
24248	.3150	8.000	8.0	65	20	1.00	185.64	177.57	169.50	161.43	
80248	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.020"	176.88	169.19	161.50	153.81
80258	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	176.88	169.19	161.50	153.81
24318	.3937	10.000	10.0	70	25	1.00	206.21	197.24	188.28	179.31	
24378	.4724	12.000	12.0	75	25	0.50	226.75	216.89	207.03	197.17	
24398	.4724	12.000	12.0	75	25	1.00	226.75	216.89	207.03	197.17	
80328	.5000	1/2"	12.700	1/2"	3"	1"	.030"	215.41	206.04	196.68	187.31
80348	.5000	1/2"	12.700	1/2"	3"	1"	.060"	215.41	206.04	196.68	187.31

TOLERANCES

<i>d1</i>	+0.000" -0.002" (+0.000 -0.050mm)
<i>d2</i>	h6
<i>ball radius</i>	+0.000" -0.001" (+0.000 -0.025mm)



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Series 310D

HIGH PERFORMANCE
END MILLS

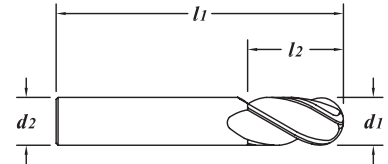
Recommended for graphite, fiber-reinforced plastics, carbon fiber

Ball End

Diamond Coating

Solid grade C-2 carbide end mill - center cutting

Crystalline diamond coating



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								
15018	.0312	1/32"	0.792	1/8"	1-1/2"	3/32"	99.04	94.73	90.43	86.12
48018	.0394		1.000	3.0	38	4	104.26	99.73	95.19	90.66
15028	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"	99.04	94.73	90.43	86.12
48028	.0591		1.500	3.0	38	6	104.26	99.73	95.19	90.66
15038	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	96.72	92.51	88.31	84.10
48038	.0787		2.000	3.0	38	8	101.79	97.36	92.94	88.51
15058	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	95.04	90.90	86.77	82.64
48058	.1181		3.000	3.0	38	12	96.00	91.83	87.65	83.48
15078	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	91.20	87.23	83.27	79.30
48078	.1575		4.000	4.0	50	14	138.72	132.69	126.66	120.63
15118	.1875	3/16"	4.763	3/16"	2"	5/8"	131.80	126.07	120.34	114.61
48098	.1969		5.000	5.0	50	16	144.96	138.66	132.35	126.05
48108	.2362		6.000	6.0	65	20	148.03	141.59	135.16	128.72
15158	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	140.63	134.52	128.40	122.29
15198	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	158.40	151.51	144.63	137.74
48128	.3150		8.000	8.0	65	20	185.64	177.57	169.50	161.43
15238	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	176.88	169.19	161.50	153.81
48168	.4724		12.000	12.0	75	25	226.75	216.89	207.03	197.17
15318	.5000	1/2"	12.700	1/2"	3"	1"	215.41	206.04	196.68	187.31

MATERIAL HARDNESS (RC)
70
35
0

d_1	+0.00" -0.002" (+.000 -.050mm)
d_2	h6

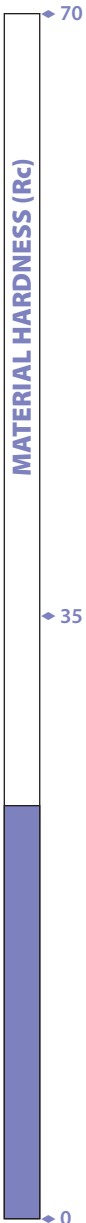
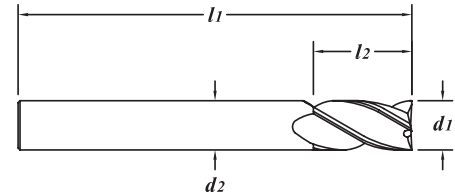


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Recommended for graphite, fiber-reinforced plastics, carbon fiber

**Extra Length - Square End
Diamond Coating**

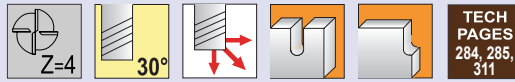
Solid grade C-2 carbide end mill - center cutting
Crystalline diamond coating
Can be modified with a neck in 48 hours



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							
94028	.1181	3.000	3.0	75	20	106.18	101.56	96.95	92.33
38038	.1250	1/8"	3.175	1/8"	3"	100.88	96.49	92.11	87.72
94068	.1575	4.000	4.0	75	25	142.07	135.89	129.72	123.54
38048	.1875	3/16"	4.763	3/16"	4"	134.95	129.09	123.22	117.35
38058	.2500	1/4"	6.350	1/4"	3"	144.60	138.31	132.03	125.74
38068	.2500	1/4"	6.350	1/4"	4"	150.17	143.64	137.11	130.58
38078	.2500	1/4"	6.350	1/4"	6"	171.87	164.40	156.92	149.45
38098	.3125	5/16"	7.938	5/16"	4"	176.05	168.40	160.74	153.09
94168	.3150	8.000	8.0	100	25	210.58	201.42	192.27	183.11
38128	.3750	3/8"	9.525	3/8"	4"	196.05	187.53	179.00	170.48
38138	.3750	3/8"	9.525	3/8"	6"	216.67	207.25	197.83	188.41
94208	.3937	10.000	10.0	100	25	235.09	224.87	214.65	204.43
94248	.4724	12.000	12.0	100	25	259.60	248.31	237.03	225.74
38168	.5000	1/2"	12.700	1/2"	4"	246.64	235.92	225.19	214.47
38178	.5000	1/2"	12.700	1/2"	4"	246.64	235.92	225.19	214.47

TOLERANCES

d_1	+0.000" -0.002" (+0.000 -0.050mm)
d_2	h6
ball radius	+0.000" -0.001" (+0.000 -0.025mm)



Series 710D

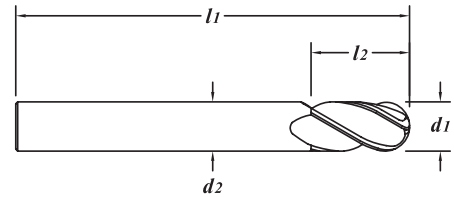
HIGH PERFORMANCE END MILLS

Recommended for graphite, fiber-reinforced plastics, carbon fiber

Extra Length - Ball End

Diamond Coating

- Solid grade C-2 carbide end mill - center cutting
- Crystalline diamond coating
- 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	129.69	124.05	118.41	112.77
40038	.1250	1/8"	3.175	3"	1"	123.21	117.85	112.50	107.14
99068	.1575		4.000	4.0	25	161.36	154.34	147.33	140.31
40048	.1875	3/16"	4.763	3/16"	4"	153.28	146.62	139.95	133.29
99108	.2362		6.000	6.0	25	177.34	169.63	161.92	154.21
99128	.2362		6.000	6.0	38	196.91	188.35	179.79	171.23
40058	.2500	1/4"	6.350	1/4"	3"	162.92	155.84	148.75	141.67
40068	.2500	1/4"	6.350	1/4"	4"	168.50	161.17	153.85	146.52
40078	.2500	1/4"	6.350	1/4"	6"	187.07	178.94	170.80	162.67
40098	.3125	5/16"	7.938	5/16"	4"	194.37	185.92	177.47	169.02
99168	.3150		8.000	8.0	25	226.55	216.70	206.85	197.00
40128	.3750	3/8"	9.525	3/8"	4"	214.38	205.06	195.74	186.42
40138	.3750	3/8"	9.525	3/8"	6"	226.83	216.96	207.10	197.24
99208	.3937		10.000	10.0	25	251.08	240.16	229.25	218.33
40168	.5000	1/2"	12.700	1/2"	4"	261.84	250.46	239.07	227.69
40178	.5000	1/2"	12.700	1/2"	4"	261.84	250.46	239.07	227.69

70
MATERIAL HARDNESS (RC)
35
0

HARD CARBON COATING

An addition to the Garr Tool lineup of quality coating options

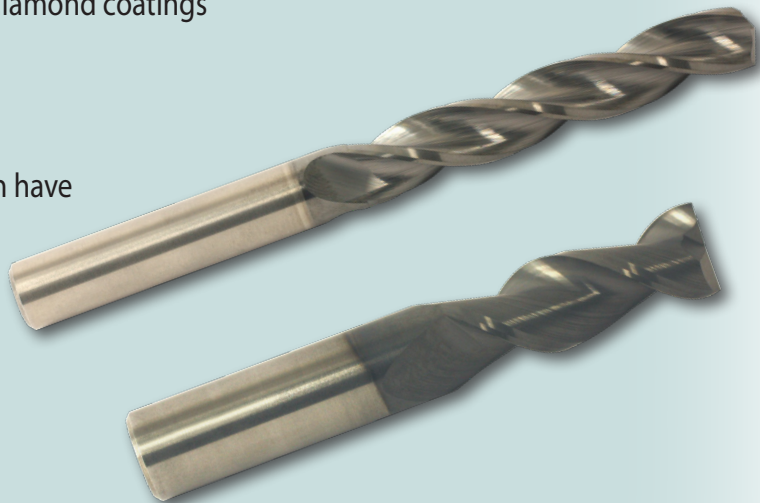


Recommended applications:

Aluminum and aluminum alloys with up to 12% silicon
 Non-ferrous metals such as copper, bronze, and platinum
 Composites such as GRP, CFK, CFRP, and PEEK
 Applications involving combined abrasion and adhesion

Advantages of using Hard Carbon:

Excellent wear resistance due to high hardness
 Sharp cutting edges in comparison with diamond coatings
 Very good adhesion
 Thin, smooth, high density
 Can be used on end mills and drills
 Most standard products in our catalog can have
 Hard Carbon added in 2 weeks



** Sample Pricing:*

50-100 pc. pricing column

<13157> 230MA 1/4" TiAlN Coated - \$18.16 each

<13150> 230M 1/4" add Hard Carbon Coating - \$24.74 each

<10158> 210D 1/4" Diamond Coated - \$107.53 each

* Pricing listed as of 5/16/2022, and is meant for comparison only.
 For specific and current pricing, please contact our sales office to request a quote.

Solid micrograin carbide tested for drilling of carbon fiber and glass-filled composites

These specials are built to order uncoated in two weeks

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



SERIES 780 - 8-FACET POINT

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 805 - CARBON FIBER

Designed for drilling CFRP and plastics

Good in both multidirectional fibers and unidirectional fibers

90° center cutting point for better entry and exit hole with little to no delamination

Parabolic flute shape for less tool pressure on the material, and also for better chip flow in soft plastics

Add Hard Carbon coating for longer tool life than uncoated tools, and shorter lead times than Diamond coating

ROUTERS

Solid micrograin carbide tested for milling of carbon fiber and glass-filled composites

These specials are built to order uncoated in two weeks

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:

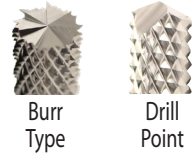
- Polycrystalline Diamond
- Amorphous Diamond / Hard Carbon
- AlCrN Coated



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 milling of carbon fiber and glass-filled composites

These specials are built to order uncoated in two weeks

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
- Amorphous Diamond / Hard Carbon
- AlCrN Coated



SERIES 704 - COMPRESSION ROUTER - 4 FLUTE
For profile milling of carbon fiber



SERIES 705 - COMPRESSION ROUTER - 2 FLUTE
For slotting of carbon fiber



SERIES 706 - SINGLE FLUTE ROUTER
For aluminum and soft plastics



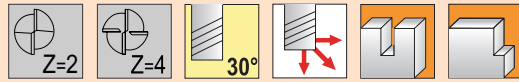


Blank Prep



TOLERANCES

$d1$	$\leq .030"$	$+0.000" - .001"$ (+.000 - .025mm)
	$\geq 1/32"$	$+0.000" - .002"$ (+.000 - .050mm)
$d2$	h6	



Series 160M, 170M, 860M, 870M

TECH
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.0200" - .2362"
(0.508mm - 6.000mm)

GENERAL PURPOSE
END MILLS

Stub Length - Square End

Solid submicron grain carbide end mill - center cutting

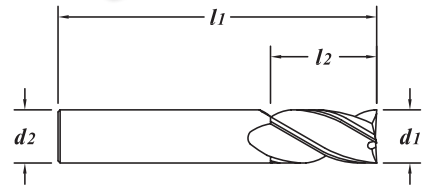
Shorter flute length for rigidity

Extremely versatile

TiAlN Coated - page 209

Standard Length - page 216

Extended length - page 236



(160M/860M) 2 Flute EDP#	(170M/870M) 4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
01350	-	.0200	.0200"	0.508	1/8"	1-1/2"	.030"	18.40	17.60	16.80	16.00
01360	-	.0210	.0210"	0.533	1/8"	1-1/2"	.032"	18.40	17.60	16.80	16.00
01370	-	.0220	.0220"	0.559	1/8"	1-1/2"	.033"	18.18	17.39	16.60	15.81
01380	-	.0230	.0230"	0.584	1/8"	1-1/2"	.035"	18.18	17.39	16.60	15.81
01390	-	.0240	.0240"	0.610	1/8"	1-1/2"	.036"	18.18	17.39	16.60	15.81
01400	-	.0250	.0250"	0.635	1/8"	1-1/2"	.038"	17.15	16.40	15.66	14.91
01410	-	.0260	.0260"	0.660	1/8"	1-1/2"	.039"	17.15	16.40	15.66	14.91
01420	-	.0270	.0270"	0.686	1/8"	1-1/2"	.041"	15.38	14.71	14.04	13.37
01430	-	.0280	.0280"	0.711	1/8"	1-1/2"	.042"	15.38	14.71	14.04	13.37
01440	-	.0290	.0290"	0.737	1/8"	1-1/2"	.044"	15.38	14.71	14.04	13.37
01450	-	.0300	.0300"	0.762	1/8"	1-1/2"	.045"	15.38	14.71	14.04	13.37
01010	02010	.0312	1/32"	0.792	1/8"	1-1/2"	1/16"	11.19	10.70	10.22	9.73
01510	02510	.0394		1.000	3.0	38	2	11.75	11.24	10.73	10.22
01020	02020	.0469	3/64"	1.191	1/8"	1-1/2"	3/32"	11.19	10.70	10.22	9.73
01520	02520	.0591		1.500	3.0	38	3	11.75	11.24	10.73	10.22
01030	02030	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	8.88	8.49	8.11	7.72
01530	02530	.0787		2.000	3.0	38	4	9.34	8.93	8.53	8.12
01040	02040	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	8.40	8.03	7.67	7.30
01540	02540	.0984		2.500	3.0	38	5	8.84	8.46	8.07	7.69
01550	02550	.1181		3.000	3.0	38	6	8.63	8.25	7.88	7.50
01050	02050	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	8.18	7.82	7.47	7.11
01560	02560	.1378		3.500	4.0	50	7	12.06	11.54	11.01	10.49
01060	02060	.1562	5/32"	3.967	3/16"	2"	5/16"	11.48	10.98	10.48	9.98
01570	02570	.1575		4.000	4.0	50	8	11.41	10.91	10.42	9.92
01580	02580	.1772		4.500	5.0	50	9.5	15.15	14.49	13.83	13.17
01070	02070	.1875	3/16"	4.763	3/16"	2"	3/8"	10.86	10.38	9.91	9.44
01590	02590	.1969		5.000	5.0	50	10	14.12	13.51	12.89	12.28
01080	02080	.2188	7/32"	5.558	1/4"	2"	7/16"	14.40	13.77	13.15	12.52
01600	02600	.2362		6.000	6.0	50	12	14.96	14.31	13.66	13.01

70

35

MATERIAL HARDNESS (Rc)

0

continued →

Series 160M, 170M, 860M, 870M (continued)

.2500" - 1.000"
(6.350mm - 25.400mm)

(160M/860M) 2 Flute EDP#	(170M/870M) 4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
01090	02090	.2500	1/4"	6.350	1/4"	2"	1/2"	14.19	13.57	12.96	12.34
01610	02610	.2756		7.000	7.0	50	12	19.45	18.60	17.76	16.91
01100	02100	.3125	5/16"	7.938	5/16"	2"	1/2"	19.42	18.58	17.73	16.89
01620	02620	.3150		8.000	8.0	50	12	20.41	19.53	18.64	17.75
01630	02630	.3543		9.000	9.0	50	14	25.22	24.12	23.03	21.93
01110	02110	.3750	3/8"	9.525	3/8"	2"	5/8"	23.99	22.95	21.90	20.86
01640	02640	.3937		10.000	10.0	50	16	27.88	26.66	25.45	24.24
01650	02650	.4331		11.000	11.0	65	19	32.58	31.16	29.75	28.33
01120	02120	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	29.66	28.37	27.08	25.79
01660	02660	.4724		12.000	12.0	65	19	41.63	39.82	38.01	36.20
01130	02130	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	39.56	37.84	36.12	34.40
01140	02140	.6250	5/8"	15.875	5/8"	3"	3/4"	75.61	72.33	69.04	65.75
-	02670	.6299		16.000	16.0	75	19	79.58	76.12	72.66	69.20
01150	02150	.7500	3/4"	19.050	3/4"	3"	1"	108.76	104.03	99.30	94.57
-	02680	.7874		20.000	20.0	75	25	147.49	141.08	134.66	128.25
-	02160	1.000	1"	25.400	1"	3"	1"	187.14	179.00	170.87	162.73



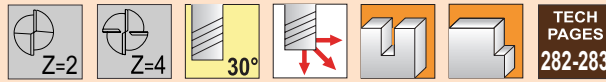
End Mill Manufacturing

70
35
0
MATERIAL HARDNESS (Rc)

TOLERANCES

$d1$	+0.000" -0.002" (+0.000 -0.050mm)
$d2$	h6

Series 160MA, 170MA, 860MA, 870MA



**GENERAL PURPOSE
END MILLS**

Stub Length - Square End

TiAlN Coating

Solid submicron grain carbide end mill - center cutting

Shorter flute length for rigidity

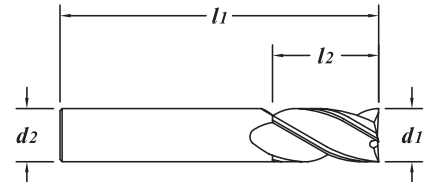
Dry or semi-dry machining

Extremely versatile

Uncoated - page 207

Standard Length - page 220

Extended length - page 239



(160MA/860MA) 2 Flute EDP#	(170MA/870MA) 4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ 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"	13.88	13.28	12.67	12.07
01517	02517	.0394		1.000	3.0	38	2	14.47	13.84	13.21	12.58
01027	02027	.0469	3/64"	1.191	1/8"	1-1/2"	3/32"	13.88	13.28	12.67	12.07
01527	02527	.0591		1.500	3.0	38	3	14.47	13.84	13.21	12.58
01037	02037	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	11.58	11.08	10.57	10.07
01537	02537	.0787		2.000	3.0	38	4	12.04	11.52	10.99	10.47
01047	02047	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	11.10	10.62	10.13	9.65
01547	02547	.0984		2.500	3.0	38	5	11.53	11.03	10.53	10.03
01557	02557	.1181		3.000	3.0	38	6	11.30	10.81	10.32	9.83
01057	02057	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	10.86	10.38	9.91	9.44
01567	02567	.1378		3.500	4.0	50	7	14.75	14.11	13.47	12.83
01067	02067	.1562	5/32"	3.967	3/16"	2"	5/16"	14.16	13.54	12.93	12.31
01577	02577	.1575		4.000	4.0	50	8	14.12	13.51	12.89	12.28
01587	02587	.1772		4.500	5.0	50	9.5	19.35	18.51	17.67	16.83
01077	02077	.1875	3/16"	4.763	3/16"	2"	3/8"	13.56	12.97	12.38	11.79
01597	02597	.1969		5.000	5.0	50	10	18.31	17.51	16.72	15.92
01087	02087	.2188	7/32"	5.558	1/4"	2"	7/16"	18.61	17.80	16.99	16.18
01607	02607	.2362		6.000	6.0	50	12	19.15	18.32	17.48	16.65
01097	02097	.2500	1/4"	6.350	1/4"	2"	1/2"	18.40	17.60	16.80	16.00
01617	02617	.2756		7.000	7.0	50	12	25.44	24.33	23.23	22.12
01107	02107	.3125	5/16"	7.938	5/16"	2"	1/2"	25.42	24.31	23.21	22.10
01627	02627	.3150		8.000	8.0	50	12	26.43	25.28	24.13	22.98
01637	02637	.3543		9.000	9.0	50	14	31.21	29.85	28.50	27.14
01117	02117	.3750	3/8"	9.525	3/8"	2"	5/8"	29.97	28.67	27.36	26.06
01647	02647	.3937		10.000	10.0	50	16	34.67	33.17	31.66	30.15
01657	02657	.4331		11.000	11.0	65	19	42.03	40.21	38.38	36.55
01127	02127	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	39.11	37.41	35.71	34.01
01667	02667	.4724		12.000	12.0	65	19	51.08	48.86	46.64	44.42
01137	02137	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	49.01	46.88	44.75	42.62
01147	02147	.6250	5/8"	15.875	5/8"	3"	3/4"	86.58	82.82	79.05	75.29
-	02677	.6299		16.000	16.0	75	19	90.52	86.58	82.65	78.71
01157	02157	.7500	3/4"	19.050	3/4"	3"	1"	121.88	116.58	111.28	105.98
-	02687	.7874		20.000	20.0	75	25	168.16	160.85	153.54	146.23
-	02167	1.000	1"	25.400	1"	3"	1"	207.82	198.78	189.75	180.71

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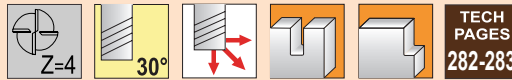
35

MATERIAL HARDNESS (Rc)

0

Series 170R, 870R

.0625" - .3150"
(1.588mm - 8.000mm)



TOLERANCES	
d_1	+0.000" - .002" (+.000 - .050mm)
d_2	h6
r	+0.001" - .001" (+.025 - .025mm)

Stub Length - Corner Radius

Solid submicron grain carbide end mill - center cutting

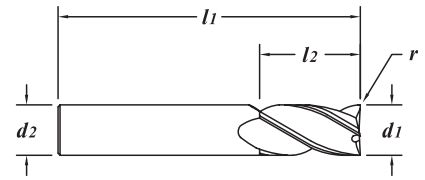
For stronger corners and part radius

Extremely versatile

TiALN Coating - page 212

Standard Length - page 222

Extended Length - page 241



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									
30701	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	.010"	10.47	10.01	9.56	9.10
30703	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	.015"	10.47	10.01	9.56	9.10
30705	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	.010"	9.88	9.45	9.02	8.59
30707	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	.015"	9.88	9.45	9.02	8.59
30709	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	.020"	9.88	9.45	9.02	8.59
30711	.1181		3.000	3.0	38	6	0.20	10.12	9.68	9.24	8.80
30713	.1181		3.000	3.0	38	6	0.50	10.12	9.68	9.24	8.80
30715	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.010"	9.63	9.21	8.79	8.37
30717	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.015"	9.63	9.21	8.79	8.37
30719	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.020"	9.63	9.21	8.79	8.37
30721	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.030"	9.63	9.21	8.79	8.37
30904	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.040"	9.63	9.21	8.79	8.37
30909	.1562	5/32"	3.967	3/16"	2"	5/16"	.015"	13.48	12.89	12.31	11.72
30911	.1562	5/32"	3.967	3/16"	2"	5/16"	.030"	13.48	12.89	12.31	11.72
30913	.1562	5/32"	3.967	3/16"	2"	5/16"	.060"	13.48	12.89	12.31	11.72
30723	.1575		4.000	4.0	50	8	0.30	13.47	12.88	12.30	11.71
30725	.1575		4.000	4.0	50	8	0.50	13.47	12.88	12.30	11.71
30727	.1875	3/16"	4.763	3/16"	2"	3/8"	.010"	12.79	12.23	11.68	11.12
30729	.1875	3/16"	4.763	3/16"	2"	3/8"	.015"	12.79	12.23	11.68	11.12
30731	.1875	3/16"	4.763	3/16"	2"	3/8"	.020"	12.79	12.23	11.68	11.12
30733	.1875	3/16"	4.763	3/16"	2"	3/8"	.030"	12.79	12.23	11.68	11.12
30735	.1969		5.000	5.0	50	10	0.30	16.77	16.04	15.31	14.58
30737	.1969		5.000	5.0	50	10	0.50	16.77	16.04	15.31	14.58
30739	.2362		6.000	6.0	50	12	0.50	17.61	16.84	16.08	15.31
30741	.2362		6.000	6.0	50	12	0.80	17.61	16.84	16.08	15.31
30743	.2362		6.000	6.0	50	12	1.00	17.61	16.84	16.08	15.31
30745	.2362		6.000	6.0	50	12	1.50	17.61	16.84	16.08	15.31
30747	.2362		6.000	6.0	50	12	2.00	17.61	16.84	16.08	15.31
30749	.2500	1/4"	6.350	1/4"	2"	1/2"	.010"	16.69	15.96	15.24	14.51
30751	.2500	1/4"	6.350	1/4"	2"	1/2"	.015"	16.69	15.96	15.24	14.51
30753	.2500	1/4"	6.350	1/4"	2"	1/2"	.020"	16.69	15.96	15.24	14.51
30755	.2500	1/4"	6.350	1/4"	2"	1/2"	.030"	16.69	15.96	15.24	14.51
30757	.2500	1/4"	6.350	1/4"	2"	1/2"	.045"	16.69	15.96	15.24	14.51
30759	.2500	1/4"	6.350	1/4"	2"	1/2"	.060"	16.69	15.96	15.24	14.51
30761	.3125	5/16"	7.938	5/16"	2"	1/2"	.015"	22.83	21.84	20.84	19.85
30763	.3125	5/16"	7.938	5/16"	2"	1/2"	.020"	22.83	21.84	20.84	19.85
30765	.3125	5/16"	7.938	5/16"	2"	1/2"	.030"	22.83	21.84	20.84	19.85
30767	.3125	5/16"	7.938	5/16"	2"	1/2"	.045"	22.83	21.84	20.84	19.85
30769	.3125	5/16"	7.938	5/16"	2"	1/2"	.060"	22.83	21.84	20.84	19.85
30771	.3150		8.000	8.0	50	12	0.50	24.04	22.99	21.95	20.90
30773	.3150		8.000	8.0	50	12	0.80	24.04	22.99	21.95	20.90
30775	.3150		8.000	8.0	50	12	1.00	24.04	22.99	21.95	20.90
30777	.3150		8.000	8.0	50	12	1.50	24.04	22.99	21.95	20.90
30779	.3150		8.000	8.0	50	12	2.00	24.04	22.99	21.95	20.90
30781	.3150		8.000	8.0	50	12	2.50	24.04	22.99	21.95	20.90
30783	.3150		8.000	8.0	50	12	3.00	24.04	22.99	21.95	20.90

MATERIAL HARDNESS (Rc)
70
35
0

Series 170R, 870R (continued)

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

GENERAL PURPOSE
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									
30785	.3750	3/8"	9.525	3/8"	2"	5/8"	.010"	28.20	26.97	25.75	24.52
30787	.3750	3/8"	9.525	3/8"	2"	5/8"	.015"	28.20	26.97	25.75	24.52
30789	.3750	3/8"	9.525	3/8"	2"	5/8"	.020"	28.20	26.97	25.75	24.52
30791	.3750	3/8"	9.525	3/8"	2"	5/8"	.030"	28.20	26.97	25.75	24.52
30793	.3750	3/8"	9.525	3/8"	2"	5/8"	.045"	28.20	26.97	25.75	24.52
30795	.3750	3/8"	9.525	3/8"	2"	5/8"	.060"	28.20	26.97	25.75	24.52
30797	.3937		10.000	10.0	50	16	0.50	32.81	31.38	29.96	28.53
30799	.3937		10.000	10.0	50	16	0.80	32.81	31.38	29.96	28.53
30801	.3937		10.000	10.0	50	16	1.00	32.81	31.38	29.96	28.53
30803	.3937		10.000	10.0	50	16	1.50	32.81	31.38	29.96	28.53
30805	.3937		10.000	10.0	50	16	2.00	32.81	31.38	29.96	28.53
30807	.3937		10.000	10.0	50	16	2.50	32.81	31.38	29.96	28.53
30809	.3937		10.000	10.0	50	16	3.00	32.81	31.38	29.96	28.53
30811	.3937		10.000	10.0	50	16	3.20	32.81	31.38	29.96	28.53
30813	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.010"	34.89	33.37	31.86	30.34
30815	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.015"	34.89	33.37	31.86	30.34
30817	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.020"	34.89	33.37	31.86	30.34
30819	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.030"	34.89	33.37	31.86	30.34
30821	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.045"	34.89	33.37	31.86	30.34
30823	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.060"	34.89	33.37	31.86	30.34
30825	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.090"	34.89	33.37	31.86	30.34
30827	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.125"	34.89	33.37	31.86	30.34
30829	.4724		12.000	12.0	65	19	0.50	48.94	46.82	44.69	42.56
30831	.4724		12.000	12.0	65	19	0.80	48.94	46.82	44.69	42.56
30833	.4724		12.000	12.0	65	19	1.00	48.94	46.82	44.69	42.56
30835	.4724		12.000	12.0	65	19	1.50	48.94	46.82	44.69	42.56
30837	.4724		12.000	12.0	65	19	2.00	48.94	46.82	44.69	42.56
30839	.4724		12.000	12.0	65	19	2.50	48.94	46.82	44.69	42.56
30841	.4724		12.000	12.0	65	19	3.00	48.94	46.82	44.69	42.56
30843	.4724		12.000	12.0	65	19	3.20	48.94	46.82	44.69	42.56
30845	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.010"	46.52	44.50	42.47	40.45
30847	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.015"	46.52	44.50	42.47	40.45
30849	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.020"	46.52	44.50	42.47	40.45
30851	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"	46.52	44.50	42.47	40.45
30853	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.045"	46.52	44.50	42.47	40.45
30855	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.060"	46.52	44.50	42.47	40.45
30857	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.090"	46.52	44.50	42.47	40.45
30859	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.125"	46.52	44.50	42.47	40.45
30861	.6250	5/8"	15.875	5/8"	3"	3/4"	.015"	88.99	85.12	81.25	77.38
30863	.6250	5/8"	15.875	5/8"	3"	3/4"	.020"	88.99	85.12	81.25	77.38
30865	.6250	5/8"	15.875	5/8"	3"	3/4"	.030"	88.99	85.12	81.25	77.38
30867	.6250	5/8"	15.875	5/8"	3"	3/4"	.045"	88.99	85.12	81.25	77.38
30869	.6250	5/8"	15.875	5/8"	3"	3/4"	.060"	88.99	85.12	81.25	77.38
30871	.6250	5/8"	15.875	5/8"	3"	3/4"	.090"	88.99	85.12	81.25	77.38
30873	.6299		16.000	16.0	75	19	0.50	93.62	89.55	85.48	81.41
30875	.6299		16.000	16.0	75	19	1.00	93.62	89.55	85.48	81.41
30877	.6299		16.000	16.0	75	19	2.00	93.62	89.55	85.48	81.41
30879	.6299		16.000	16.0	75	19	2.50	93.62	89.55	85.48	81.41
30881	.6299		16.000	16.0	75	19	3.00	93.62	89.55	85.48	81.41
30883	.6299		16.000	16.0	75	19	4.00	93.62	89.55	85.48	81.41
30885	.6299		16.000	16.0	75	19	5.00	93.62	89.55	85.48	81.41
30887	.7500	3/4"	19.050	3/4"	3"	1"	.015"	127.97	122.41	116.84	111.28
30889	.7500	3/4"	19.050	3/4"	3"	1"	.020"	127.97	122.41	116.84	111.28
30891	.7500	3/4"	19.050	3/4"	3"	1"	.030"	127.97	122.41	116.84	111.28
30893	.7500	3/4"	19.050	3/4"	3"	1"	.045"	127.97	122.41	116.84	111.28
30895	.7500	3/4"	19.050	3/4"	3"	1"	.060"	127.97	122.41	116.84	111.28
30897	.7500	3/4"	19.050	3/4"	3"	1"	.090"	127.97	122.41	116.84	111.28
30899	.7500	3/4"	19.050	3/4"	3"	1"	.125"	127.97	122.41	116.84	111.28
30901	.7500	3/4"	19.050	3/4"	3"	1"	.250"	127.97	122.41	116.84	111.28

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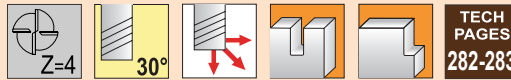
35

MATERIAL HARDNESS (Rc)

0

Series 170RA, 870RA

.0625" - .3150"
(1.588mm - 8.000mm)



TOLERANCES	
d1	+0.000" - .002" (+.000 - .050mm)
d2	h6
r	+0.001" - .001" (+.025 - .025mm)

Stub Length - Corner Radius

TiAlN Coating

Solid submicron grain carbide end mill - center cutting

Dry or semi-dry machining

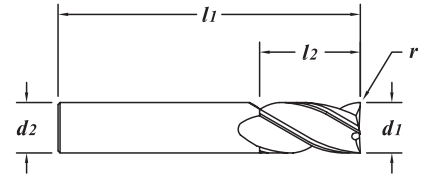
For stronger corners and part radius

Extremely versatile

Uncoated - page 210

Standard Length - page 225

Extended Length - page 244



MATERIAL HARDNESS (Rc)
70
35
0

EDP#	d1 †		d2 Shank Diameter	l1 Overall Length	l2 Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
	Decimal	Diameter									Metric
30702	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	.010"	13.14	12.57	12.00	11.43
30704	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	.015"	13.14	12.57	12.00	11.43
30706	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	.010"	12.57	12.02	11.48	10.93
30708	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	.015"	12.57	12.02	11.48	10.93
30710	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	.020"	12.57	12.02	11.48	10.93
30712	.1181		3.000	3.0	38	6	0.20	12.81	12.25	11.70	11.14
30714	.1181		3.000	3.0	38	6	0.50	12.81	12.25	11.70	11.14
30716	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.010"	12.32	11.78	11.25	10.71
30718	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.015"	12.32	11.78	11.25	10.71
30720	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.020"	12.32	11.78	11.25	10.71
30722	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.030"	12.32	11.78	11.25	10.71
30906	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.040"	12.32	11.78	11.25	10.71
30910	.1562	5/32"	3.967	3/16"	2"	5/16"	.015"	16.16	15.46	14.75	14.05
30912	.1562	5/32"	3.967	3/16"	2"	5/16"	.030"	16.16	15.46	14.75	14.05
30914	.1562	5/32"	3.967	3/16"	2"	5/16"	.060"	16.16	15.46	14.75	14.05
30724	.1575		4.000	4.0	50	8	0.30	16.15	15.44	14.74	14.04
30726	.1575		4.000	4.0	50	8	0.50	16.15	15.44	14.74	14.04
30728	.1875	3/16"	4.763	3/16"	2"	3/8"	.010"	15.48	14.81	14.13	13.46
30730	.1875	3/16"	4.763	3/16"	2"	3/8"	.015"	15.48	14.81	14.13	13.46
30732	.1875	3/16"	4.763	3/16"	2"	3/8"	.020"	15.48	14.81	14.13	13.46
30734	.1875	3/16"	4.763	3/16"	2"	3/8"	.030"	15.48	14.81	14.13	13.46
30736	.1969		5.000	5.0	50	10	0.30	20.95	20.04	19.13	18.22
30738	.1969		5.000	5.0	50	10	0.50	20.95	20.04	19.13	18.22
24117	.1969		5.000	5.0	50	16	0.30	25.05	23.97	22.88	21.79
30740	.2362		6.000	6.0	50	12	0.50	21.79	20.85	19.90	18.95
30742	.2362		6.000	6.0	50	12	0.80	21.79	20.85	19.90	18.95
30744	.2362		6.000	6.0	50	12	1.00	21.79	20.85	19.90	18.95
30746	.2362		6.000	6.0	50	12	1.50	21.79	20.85	19.90	18.95
30748	.2362		6.000	6.0	50	12	2.00	21.79	20.85	19.90	18.95
30750	.2500	1/4"	6.350	1/4"	2"	1/2"	.010"	20.91	20.00	19.09	18.18
30752	.2500	1/4"	6.350	1/4"	2"	1/2"	.015"	20.91	20.00	19.09	18.18
30754	.2500	1/4"	6.350	1/4"	2"	1/2"	.020"	20.91	20.00	19.09	18.18
30756	.2500	1/4"	6.350	1/4"	2"	1/2"	.030"	20.91	20.00	19.09	18.18
30758	.2500	1/4"	6.350	1/4"	2"	1/2"	.045"	20.91	20.00	19.09	18.18
30760	.2500	1/4"	6.350	1/4"	2"	1/2"	.060"	20.91	20.00	19.09	18.18
30762	.3125	5/16"	7.938	5/16"	2"	1/2"	.015"	28.82	27.57	26.31	25.06
30764	.3125	5/16"	7.938	5/16"	2"	1/2"	.020"	28.82	27.57	26.31	25.06
30766	.3125	5/16"	7.938	5/16"	2"	1/2"	.030"	28.82	27.57	26.31	25.06
30768	.3125	5/16"	7.938	5/16"	2"	1/2"	.045"	28.82	27.57	26.31	25.06
30770	.3125	5/16"	7.938	5/16"	2"	1/2"	.060"	28.82	27.57	26.31	25.06
30772	.3150		8.000	8.0	50	12	0.50	30.03	28.72	27.42	26.11
30774	.3150		8.000	8.0	50	12	0.80	30.03	28.72	27.42	26.11
30776	.3150		8.000	8.0	50	12	1.00	30.03	28.72	27.42	26.11
30778	.3150		8.000	8.0	50	12	1.50	30.03	28.72	27.42	26.11
30780	.3150		8.000	8.0	50	12	2.00	30.03	28.72	27.42	26.11
30782	.3150		8.000	8.0	50	12	2.50	30.03	28.72	27.42	26.11
30784	.3150		8.000	8.0	50	12	3.00	30.03	28.72	27.42	26.11

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									
30786	.3750	3/8"	9.525	3/8"	2"	5/8"	.010"	34.19	32.70	31.22	29.73
30788	.3750	3/8"	9.525	3/8"	2"	5/8"	.015"	34.19	32.70	31.22	29.73
30790	.3750	3/8"	9.525	3/8"	2"	5/8"	.020"	34.19	32.70	31.22	29.73
30792	.3750	3/8"	9.525	3/8"	2"	5/8"	.030"	34.19	32.70	31.22	29.73
30794	.3750	3/8"	9.525	3/8"	2"	5/8"	.045"	34.19	32.70	31.22	29.73
30796	.3750	3/8"	9.525	3/8"	2"	5/8"	.060"	34.19	32.70	31.22	29.73
30798	.3937		10.000	10.0	50	16	0.50	39.59	37.87	36.15	34.43
30800	.3937		10.000	10.0	50	16	0.80	39.59	37.87	36.15	34.43
30802	.3937		10.000	10.0	50	16	1.00	39.59	37.87	36.15	34.43
30804	.3937		10.000	10.0	50	16	1.50	39.59	37.87	36.15	34.43
30806	.3937		10.000	10.0	50	16	2.00	39.59	37.87	36.15	34.43
30808	.3937		10.000	10.0	50	16	2.50	39.59	37.87	36.15	34.43
30810	.3937		10.000	10.0	50	16	3.00	39.59	37.87	36.15	34.43
30812	.3937		10.000	10.0	50	16	3.20	39.59	37.87	36.15	34.43
30814	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.010"	44.34	42.42	40.49	38.56
30816	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.015"	44.34	42.42	40.49	38.56
30818	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.020"	44.34	42.42	40.49	38.56
30820	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.030"	44.34	42.42	40.49	38.56
30822	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.045"	44.34	42.42	40.49	38.56
30824	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.060"	44.34	42.42	40.49	38.56
30826	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.090"	44.34	42.42	40.49	38.56
30828	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.125"	44.34	42.42	40.49	38.56
30830	.4724		12.000	12.0	65	19	0.50	58.41	55.87	53.33	50.79
30832	.4724		12.000	12.0	65	19	0.80	58.41	55.87	53.33	50.79
30834	.4724		12.000	12.0	65	19	1.00	58.41	55.87	53.33	50.79
30836	.4724		12.000	12.0	65	19	1.50	58.41	55.87	53.33	50.79
30838	.4724		12.000	12.0	65	19	2.00	58.41	55.87	53.33	50.79
30840	.4724		12.000	12.0	65	19	2.50	58.41	55.87	53.33	50.79
30842	.4724		12.000	12.0	65	19	3.00	58.41	55.87	53.33	50.79
30844	.4724		12.000	12.0	65	19	3.20	58.41	55.87	53.33	50.79
30846	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.010"	55.96	53.53	51.09	48.66
30848	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.015"	55.96	53.53	51.09	48.66
30850	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.020"	55.96	53.53	51.09	48.66
30852	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"	55.96	53.53	51.09	48.66
30854	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.045"	55.96	53.53	51.09	48.66
30856	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.060"	55.96	53.53	51.09	48.66
30858	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.090"	55.96	53.53	51.09	48.66
30860	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.125"	55.96	53.53	51.09	48.66
30862	.6250	5/8"	15.875	5/8"	3"	3/4"	.015"	99.94	95.59	91.25	86.90
30864	.6250	5/8"	15.875	5/8"	3"	3/4"	.020"	99.94	95.59	91.25	86.90
30866	.6250	5/8"	15.875	5/8"	3"	3/4"	.030"	99.94	95.59	91.25	86.90
30868	.6250	5/8"	15.875	5/8"	3"	3/4"	.045"	99.94	95.59	91.25	86.90
30870	.6250	5/8"	15.875	5/8"	3"	3/4"	.060"	99.94	95.59	91.25	86.90
30872	.6250	5/8"	15.875	5/8"	3"	3/4"	.090"	99.94	95.59	91.25	86.90
30874	.6299		16.000	16.0	75	19	0.50	104.56	100.01	95.47	90.92
30876	.6299		16.000	16.0	75	19	1.00	104.56	100.01	95.47	90.92
30878	.6299		16.000	16.0	75	19	2.00	104.56	100.01	95.47	90.92
30880	.6299		16.000	16.0	75	19	2.50	104.56	100.01	95.47	90.92
30882	.6299		16.000	16.0	75	19	3.00	104.56	100.01	95.47	90.92
30884	.6299		16.000	16.0	75	19	4.00	104.56	100.01	95.47	90.92
30886	.6299		16.000	16.0	75	19	5.00	104.56	100.01	95.47	90.92
30888	.7500	3/4"	19.050	3/4"	3"	1"	.015"	141.11	134.97	128.84	122.70
30890	.7500	3/4"	19.050	3/4"	3"	1"	.020"	141.11	134.97	128.84	122.70
30892	.7500	3/4"	19.050	3/4"	3"	1"	.030"	141.11	134.97	128.84	122.70
30894	.7500	3/4"	19.050	3/4"	3"	1"	.045"	141.11	134.97	128.84	122.70
30896	.7500	3/4"	19.050	3/4"	3"	1"	.060"	141.11	134.97	128.84	122.70
30898	.7500	3/4"	19.050	3/4"	3"	1"	.090"	141.11	134.97	128.84	122.70
30900	.7500	3/4"	19.050	3/4"	3"	1"	.125"	141.11	134.97	128.84	122.70
30902	.7500	3/4"	19.050	3/4"	3"	1"	.250"	141.11	134.97	128.84	122.70

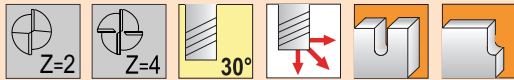
70

35

MATERIAL HARDNESS (Rc)

0

Series 180M, 190M, 980M, 990M



TECH
PAGES
282-283

TOLERANCES

d_1	$\leq .030"$	$+0.000"-.001"$ (+.000-.025mm)
	$\geq 1/32"$	$+0.000"-.002"$ (+.000-.050mm)
d_2	h6	
ball radius	$+0.000"-.001"$ (+.000-.025mm)	

Stub Length - Ball End

Solid submicron grain carbide end mill - center cutting

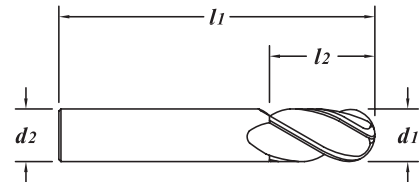
Shorter flute length for rigidity

Extremely versatile

TiAlN Coating - page 215

Standard Length - page 228

Extended length - page 247



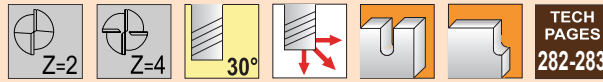
MATERIAL HARDNESS (Rc) 70
35
0

(180M/980M) 2 Flute EDP#	(190M/990M) 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								
03350	-	.0200	.0200"	0.508	1/8"	1-1/2"	.030"	22.99	21.99	20.99	19.99
03400	-	.0250	.0250"	0.635	1/8"	1-1/2"	.038"	22.21	21.24	20.28	19.31
03450	-	.0300	.0300"	0.762	1/8"	1-1/2"	.045"	19.14	18.30	17.47	16.64
03010	04010	.0312	1/32"	0.792	1/8"	1-1/2"	1/16"	14.19	13.57	12.96	12.34
03510	04510	.0394		1.000	3.0	38	2	14.90	14.26	13.61	12.96
03020	04020	.0469	3/64"	1.191	1/8"	1-1/2"	3/32"	14.19	13.57	12.96	12.34
03520	-	.0591		1.500	3.0	38	3	14.90	14.26	13.61	12.96
03030	04030	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	10.47	10.01	9.56	9.10
03530	04530	.0787		2.000	3.0	38	4	11.01	10.53	10.05	9.57
03040	04040	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	9.88	9.45	9.02	8.59
03540	04540	.0984		2.500	3.0	38	5	10.38	9.93	9.48	9.03
03550	04550	.1181		3.000	3.0	38	6	10.12	9.68	9.24	8.80
03050	04050	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	9.63	9.21	8.79	8.37
03560	04560	.1378		3.500	4.0	50	7	14.17	13.55	12.94	12.32
03060	04060	.1562	5/32"	3.967	3/16"	2"	5/16"	13.48	12.89	12.31	11.72
03570	04570	.1575		4.000	4.0	50	8	13.47	12.88	12.30	11.71
03580	04580	.1772		4.500	5.0	50	9.5	17.80	17.03	16.25	15.48
03070	04070	.1875	3/16"	4.763	3/16"	2"	3/8"	12.79	12.23	11.68	11.12
03590	04590	.1969		5.000	5.0	50	10	16.77	16.04	15.31	14.58
03080	04080	.2188	7/32"	5.558	1/4"	2"	7/16"	16.96	16.23	15.49	14.75
03600	04600	.2362		6.000	6.0	50	12	17.61	16.84	16.08	15.31
03090	04090	.2500	1/4"	6.350	1/4"	2"	1/2"	16.69	15.96	15.24	14.51
03610	04610	.2756		7.000	7.0	50	12	23.03	22.03	21.03	20.03
03100	04100	.3125	5/16"	7.938	5/16"	2"	1/2"	22.83	21.84	20.84	19.85
03620	04620	.3150		8.000	8.0	50	12	24.04	22.99	21.95	20.90
03630	04630	.3543		9.000	9.0	50	14	29.68	28.39	27.10	25.81
03110	04110	.3750	3/8"	9.525	3/8"	2"	5/8"	28.20	26.97	25.75	24.52
03640	04640	.3937		10.000	10.0	50	16	32.81	31.38	29.96	28.53
03120	04120	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	34.89	33.37	31.86	30.34
03660	04660	.4724		12.000	12.0	65	19	48.94	46.82	44.69	42.56
03130	04130	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	46.52	44.50	42.47	40.45
03150	04150	.7500	3/4"	19.050	3/4"	3"	1"	127.97	122.41	116.84	111.28

TOLERANCES

<i>d1</i>	+0.000" -0.002" (+0.000 -0.050mm)
<i>d2</i>	h6
ball radius	+0.000" -0.001" (+0.000 -0.025mm)

Series 180MA, 190MA, 980MA, 990MA

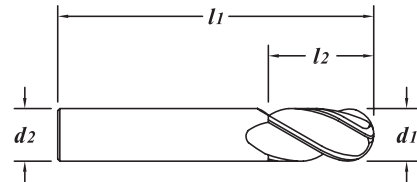


**GENERAL PURPOSE
END MILLS**

Stub Length - Ball End

TiALN Coating

- Solid submicron grain carbide end mill - center cutting
- Shorter flute length for rigidity
- Dry or semi-dry machining
- Extremely versatile
- Uncoated - page 214
- Standard Length - page 232
- Extended length - page 250



(180MA/980MA) 2 Flute EDP#	(190MA/990MA) 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								
03017	04017	.0312	1/32"	0.792	1/8"	1-1/2"	1/16"	16.91	16.17	15.44	14.70
03517	04517	.0394		1.000	3.0	38	2	17.61	16.84	16.08	15.31
03027	04027	.0469	3/64"	1.191	1/8"	1-1/2"	3/32"	16.91	16.17	15.44	14.70
03527	04527	.0591		1.500	3.0	38	3	17.61	16.84	16.08	15.31
03037	04037	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"	13.14	12.57	12.00	11.43
03537	04537	.0787		2.000	3.0	38	4	13.70	13.10	12.51	11.91
03047	04047	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"	12.57	12.02	11.48	10.93
03547	04547	.0984		2.500	3.0	38	5	13.09	12.52	11.95	11.38
03557	04557	.1181		3.000	3.0	38	6	12.81	12.25	11.70	11.14
03057	04057	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	12.32	11.78	11.25	10.71
03567	04567	.1378		3.500	4.0	50	7	16.87	16.14	15.40	14.67
03067	04067	.1562	5/32"	3.967	3/16"	2"	5/16"	16.16	15.46	14.75	14.05
03577	04577	.1575		4.000	4.0	50	8	16.15	15.44	14.74	14.04
03587	04587	.1772		4.500	5.0	50	9.5	22.00	21.04	20.09	19.13
03077	04077	.1875	3/16"	4.763	3/16"	2"	3/8"	15.48	14.81	14.13	13.46
03597	04597	.1969		5.000	5.0	50	10	20.95	20.04	19.13	18.22
03087	04087	.2188	7/32"	5.558	1/4"	2"	7/16"	21.16	20.24	19.32	18.40
03607	04607	.2362		6.000	6.0	50	12	21.79	20.85	19.90	18.95
03097	04097	.2500	1/4"	6.350	1/4"	2"	1/2"	20.91	20.00	19.09	18.18
03617	04617	.2756		7.000	7.0	50	12	29.04	27.78	26.51	25.25
03107	04107	.3125	5/16"	7.938	5/16"	2"	1/2"	28.82	27.57	26.31	25.06
03627	04627	.3150		8.000	8.0	50	12	30.03	28.72	27.42	26.11
03637	04637	.3543		9.000	9.0	50	14	35.68	34.13	32.58	31.03
03117	04117	.3750	3/8"	9.525	3/8"	2"	5/8"	34.19	32.70	31.22	29.73
03647	04647	.3937		10.000	10.0	50	16	39.59	37.87	36.15	34.43
03657	04657	.4331		11.000	11.0	65	19	47.18	45.13	43.08	41.03
03127	04127	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	44.34	42.42	40.49	38.56
03667	04667	.4724		12.000	12.0	65	19	58.41	55.87	53.33	50.79
03137	04137	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	55.96	53.53	51.09	48.66
-	04147	.6250	5/8"	15.875	5/8"	3"	3/4"	99.94	95.59	91.25	86.90
-	04157	.7500	3/4"	19.050	3/4"	3"	1"	141.11	134.97	128.84	122.70
-	04687	.7874		20.000	20.0	75	25	194.18	185.74	177.29	168.85

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MATERIAL HARDNESS (Rc)

0

Series 220M, 223M, 230M, 820M, 823M, 830M

.0200" - .2362"
(0.508mm - 6.000mm)



TECH
PAGES
282-283

TOLERANCES		
d_1	$\leq .030"$	$+0.000" - .001" (+0.000 - .025mm)$
	$\geq 1/32"$	$+0.000" - .002" (+0.000 - .050mm)$
d_2	h6	

Standard Length - Square End

Solid submicron grain carbide end mill - center cutting

Extremely versatile

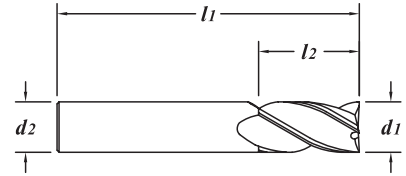
TiN Coating - page 218

TiCN Coating - page 219

TiAlN Coating - page 220

Stub Length - page 207

Extended length - page 236



(220M/820M) 2 Flute EDP#	(223M/823M) 3 Flute EDP#	(230M/830M) 4 Flute EDP#	Decimal	d_1 † Diameter	Metric	d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
11650	-	13650	.0200	.0200"	0.508	1/8"	1-1/2"	.060"	18.40	17.60	16.80	16.00
11660	-	-	.0210	.0210"	0.533	1/8"	1-1/2"	.063"	18.40	17.60	16.80	16.00
11670	-	-	.0220	.0220"	0.559	1/8"	1-1/2"	.066"	18.18	17.39	16.60	15.81
11680	-	-	.0230	.0230"	0.584	1/8"	1-1/2"	.069"	18.18	17.39	16.60	15.81
11690	-	-	.0240	.0240"	0.610	1/8"	1-1/2"	.072"	18.18	17.39	16.60	15.81
11700	-	13700	.0250	.0250"	0.635	1/8"	1-1/2"	.075"	17.15	16.40	15.66	14.91
11710	-	-	.0260	.0260"	0.660	1/8"	1-1/2"	.078"	17.15	16.40	15.66	14.91
11720	-	-	.0270	.0270"	0.686	1/8"	1-1/2"	.081"	15.38	14.71	14.04	13.37
11730	-	-	.0280	.0280"	0.711	1/8"	1-1/2"	.084"	15.38	14.71	14.04	13.37
11740	-	-	.0290	.0290"	0.737	1/8"	1-1/2"	.087"	15.38	14.71	14.04	13.37
11750	-	13750	.0300	.0300"	0.762	1/8"	1-1/2"	.090"	15.38	14.71	14.04	13.37
11010	12010	13010	.0312	1/32"	0.792	1/8"	1-1/2"	3/32"	11.19	10.70	10.22	9.73
45010	37010	46010	.0394		1.000	3.0	38	4	11.75	11.24	10.73	10.22
11020	12020	13020	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"	11.19	10.70	10.22	9.73
45020	37020	46020	.0591		1.500	3.0	38	6	11.75	11.24	10.73	10.22
11030	12030	13030	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	10.38	9.93	9.48	9.03
11040	12040	13040	.0781	5/64"	1.984	1/8"	1-1/2"	1/4"	10.38	9.93	9.48	9.03
45030	37030	46030	.0787		2.000	3.0	38	8	10.89	10.42	9.94	9.47
11050	12050	13050	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	9.82	9.39	8.97	8.54
45040	37040	46040	.0984		2.500	3.0	38	12	10.30	9.86	9.41	8.96
11060	12060	13060	.1094	7/64"	2.779	1/8"	1-1/2"	3/8"	9.82	9.39	8.97	8.54
45050	37050	46050	.1181		3.000	3.0	38	12	9.52	9.11	8.69	8.28
11070	12070	13070	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	9.06	8.67	8.27	7.88
45060	37060	46060	.1378		3.500	4.0	50	12	14.09	13.48	12.86	12.25
11080	12080	13080	.1406	9/64"	3.571	3/16"	2"	9/16"	13.40	12.82	12.23	11.65
11090	12090	13090	.1562	5/32"	3.967	3/16"	2"	9/16"	13.40	12.82	12.23	11.65
45070	37070	46070	.1575		4.000	4.0	50	14	13.36	12.78	12.20	11.62
11100	12100	13100	.1719	11/64"	4.366	3/16"	2"	9/16"	13.40	12.82	12.23	11.65
45080	37080	46080	.1772		4.500	5.0	50	14	16.35	15.64	14.93	14.22
11110	12110	13110	.1875	3/16"	4.763	3/16"	2"	5/8"	12.72	12.17	11.61	11.06
NEW 92070	93070	94070	.1969		5.000	5.0	50	16	15.30	14.63	13.97	13.30
45090	37090	46090	.1969		5.000	5.0	65	16	15.59	14.92	14.24	13.56
11120	12120	13120	.2031	13/64"	5.159	1/4"	2-1/2"	5/8"	16.84	16.10	15.37	14.64
11130	12130	13130	.2188	7/32"	5.558	1/4"	2-1/2"	5/8"	16.84	16.10	15.37	14.64
11140	12140	13140	.2344	15/64"	5.954	1/4"	2-1/2"	3/4"	16.84	16.10	15.37	14.64
45100	37100	46100	.2362		6.000	6.0	65	19	16.09	15.39	14.69	13.99

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MATERIAL HARDNESS (Rc)

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Series 220M, 223M, 230M, 820M, 823M, 830M (continued)

.2500" - 1.250"
(6.350mm - 31.750mm)

GENERAL PURPOSE
END MILLS

(220M/820M) 2 Flute EDP#	(223M/823M) 3 Flute EDP#	(230M/830M) 4 Flute EDP#	$d1$ †		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Diameter								Metric
11150	12150	13150	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	15.32	14.65	13.99	13.32
11160	12160	13160	.2656	17/64"	6.746	5/16"	2-1/2"	7/8"	26.88	25.71	24.54	23.37
45110	37110	46110	.2756		7.000	7.0	65	22	22.10	21.14	20.18	19.22
11170	12170	13170	.2812	9/32"	7.142	5/16"	2-1/2"	7/8"	26.88	25.71	24.54	23.37
11180	12180	13180	.2969	19/64"	7.541	5/16"	2-1/2"	7/8"	26.88	25.71	24.54	23.37
11190	12190	13190	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	21.49	20.56	19.62	18.69
45120	37120	46120	.3150		8.000	8.0	65	22	22.56	21.58	20.60	19.62
11200	12200	13200	.3281	21/64"	8.334	3/8"	2-1/2"	7/8"	31.83	30.45	29.06	27.68
11210	12210	13210	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	31.83	30.45	29.06	27.68
45130	37130	46130	.3543		9.000	9.0	65	22	28.11	26.88	25.66	24.44
11220	12220	13220	.3594	23/64"	9.129	3/8"	2-1/2"	7/8"	31.83	30.45	29.06	27.68
11230	12230	13230	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	26.78	25.62	24.45	23.29
11240	12240	13240	.3906	25/64"	9.921	7/16"	2-3/4"	7/8"	38.07	36.41	34.76	33.10
45140	37140	46140	.3937		10.000	10.0	70	25	32.58	31.16	29.75	28.33
11250	12250	13250	.4062	13/32"	10.317	7/16"	2-3/4"	7/8"	38.07	36.41	34.76	33.10
11260	12260	13260	.4219	27/64"	10.716	7/16"	2-3/4"	7/8"	38.07	36.41	34.76	33.10
45150	37150	46150	.4331		11.000	11.0	75	25	34.30	32.81	31.32	29.83
11270	12270	13270	.4375	7/16"	11.113	7/16"	2-3/4"	1"	32.66	31.24	29.82	28.40
11280	12280	13280	.4531	29/64"	11.509	1/2"	3"	1"	51.27	49.04	46.81	44.58
11290	-	13290	.4688	15/32"	11.908	1/2"	3"	1"	51.27	49.04	46.81	44.58
45160	37160	46160	.4724		12.000	12.0	75	25	45.03	43.08	41.12	39.16
11300	12300	13300	.4844	31/64"	12.304	1/2"	3"	1"	51.27	49.04	46.81	44.58
11310	12310	13310	.5000	1/2"	12.700	1/2"	3"	1"	42.87	41.01	39.14	37.28
45170	37170	46170	.5512		14.000	14.0	88	32	76.89	73.55	70.20	66.86
11320	12320	13320	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	73.24	70.06	66.87	63.69
11330	12330	13330	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	82.69	79.09	75.50	71.90
45180	37180	46180	.6299		16.000	16.0	88	38	86.83	83.05	79.28	75.50
11340	12340	13340	.6875	11/16"	17.463	3/4"	4"	1-1/2"	137.70	131.71	125.73	119.74
45190	37190	46190	.7087		18.000	18.0	100	38	127.31	121.77	116.24	110.70
11350	12350	13350	.7500	3/4"	19.050	3/4"	4"	1-1/2"	121.22	115.95	110.68	105.41
45200	37200	46200	.7874		20.000	20.0	100	38	161.85	154.81	147.78	140.74
45210	37210	46210	.8661		22.000	22.0	100	38	179.86	172.04	164.22	156.40
11360	12360	13360	.8750	7/8"	22.225	7/8"	4"	1-1/2"	174.46	166.87	159.29	151.70
45220	37220	46220	.9843		25.000	25.0	100	38	188.05	179.87	171.70	163.52
11370	12370	13370	1.000	1"	25.400	1"	4"	1-1/2"	181.37	173.48	165.60	157.71
-	-	13390	1.250	1-1/4"	31.750	1-1/4"	4-1/2"	2"	529.49	506.47	483.45	460.43

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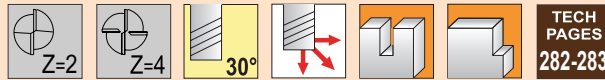
MATERIAL HARDNESS (Rc)

0

Series 220MT, 230MT

TOLERANCES

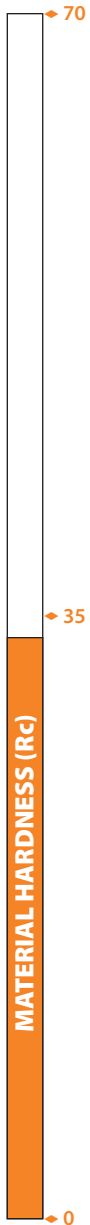
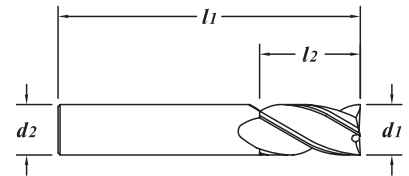
d_1	+0.000" - .002" (+.000 - .050mm)
d_2	h6



Standard Length - Square End

TiN Coating

- Solid submicron grain carbide end mill - center cutting
- Improved lubricity
- Extremely versatile
- Uncoated - page 216
- TiCN Coating - page 219
- TiALN Coating - page 220

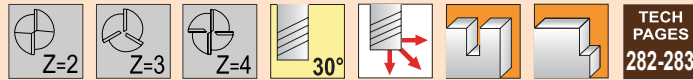


(220MT) 2 Flute EDP#	(230MT) 4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
11073	13073	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	10.66	10.20	9.73	9.27
11113	13113	.1875	3/16"	4.763	3/16"	2"	5/8"	14.28	13.66	13.04	12.42
11153	13153	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	18.53	17.72	16.92	16.11
11193	13193	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	25.79	24.67	23.55	22.43
11233	13233	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	31.08	29.73	28.38	27.03
11273	13273	.4375	7/16"	11.113	7/16"	2-3/4"	1"	37.88	36.23	34.59	32.94
11313	13313	.5000	1/2"	12.700	1/2"	3"	1"	48.10	46.01	43.92	41.83
11333	13333	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	90.70	86.76	82.81	78.87
11353	13353	.7500	3/4"	19.050	3/4"	4"	1-1/2"	130.41	124.74	119.07	113.40
-	13373	1.000	1"	25.400	1"	4"	1-1/2"	197.40	188.82	180.23	171.65

TOLERANCES

d_1	+0.000° -0.002° (+.000 -.050mm)
d_2	h6

Series 220MC, 223MC, 230MC



**GENERAL PURPOSE
END MILLS**

Standard Length - Square End

TiCN Coating

Solid submicron grain carbide end mill - center cutting

Improved abrasion resistance and lubricity

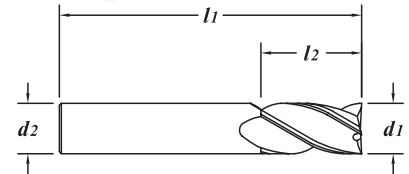
Extremely versatile

Uncoated - page 216

TiN Coating - page 218

TiALN Coating - page 220

Extended length - page 238



(220MC) 2 Flute EDP#	(223MC) 3 Flute EDP#	(230MC) 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								
11014	12014	13014	.0312	1/32"	0.792	1/8"	1-1/2"	3/32"	13.57	12.98	12.39	11.80
11024	12024	13024	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"	13.57	12.98	12.39	11.80
11034	12034	13034	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	12.78	12.22	11.67	11.11
11044	12044	13044	.0781	5/64"	1.984	1/8"	1-1/2"	1/4"	12.78	12.22	11.67	11.11
11054	12054	13054	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	12.20	11.67	11.14	10.61
11064	12064	13064	.1094	7/64"	2.779	1/8"	1-1/2"	3/8"	12.20	11.67	11.14	10.61
11074	12074	13074	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	11.44	10.95	10.45	9.95
11084	12084	13084	.1406	9/64"	3.571	3/16"	2"	9/16"	15.78	15.09	14.41	13.72
11094	12094	13094	.1562	5/32"	3.967	3/16"	2"	9/16"	15.78	15.09	14.41	13.72
11104	12104	13104	.1719	11/64"	4.366	3/16"	2"	9/16"	15.78	15.09	14.41	13.72
11114	12114	13114	.1875	3/16"	4.763	3/16"	2"	5/8"	15.08	14.42	13.77	13.11
11124	12124	13124	.2031	13/64"	5.159	1/4"	2-1/2"	5/8"	21.65	20.71	19.77	18.83
11134	12134	13134	.2188	7/32"	5.558	1/4"	2-1/2"	5/8"	21.65	20.71	19.77	18.83
11144	12144	13144	.2344	15/64"	5.954	1/4"	2-1/2"	3/4"	21.65	20.71	19.77	18.83
11154	12154	13154	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	20.14	19.26	18.39	17.51
11164	12164	13164	.2656	17/64"	6.746	5/16"	2-1/2"	7/8"	33.32	31.87	30.42	28.97
11174	12174	13174	.2812	9/32"	7.142	5/16"	2-1/2"	7/8"	33.32	31.87	30.42	28.97
11184	12184	13184	.2969	19/64"	7.541	5/16"	2-1/2"	7/8"	33.32	31.87	30.42	28.97
11194	12194	13194	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	27.92	26.71	25.49	24.28
11204	12204	13204	.3281	21/64"	8.334	3/8"	2-1/2"	7/8"	38.27	36.61	34.94	33.28
11214	12214	13214	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	38.27	36.61	34.94	33.28
11224	12224	13224	.3594	23/64"	9.129	3/8"	2-1/2"	7/8"	38.27	36.61	34.94	33.28
11234	12234	13234	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	33.20	31.76	30.31	28.87
11244	12244	13244	.3906	25/64"	9.921	7/16"	2-3/4"	7/8"	45.79	43.80	41.81	39.82
11254	12254	13254	.4062	13/32"	10.317	7/16"	2-3/4"	7/8"	45.79	43.80	41.81	39.82
11264	-	13264	.4219	27/64"	10.716	7/16"	2-3/4"	7/8"	45.79	43.80	41.81	39.82
11274	12274	13274	.4375	7/16"	11.113	7/16"	2-3/4"	1"	40.41	38.65	36.90	35.14
11284	-	13284	.4531	29/64"	11.509	1/2"	3"	1"	59.00	56.43	53.87	51.30
11294	12294	13294	.4688	15/32"	11.908	1/2"	3"	1"	59.00	56.43	53.87	51.30
-	12304	13304	.4844	31/64"	12.304	1/2"	3"	1"	59.00	56.43	53.87	51.30
11314	12314	13314	.5000	1/2"	12.700	1/2"	3"	1"	50.62	48.42	46.22	44.02
11324	12324	13324	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	85.28	81.58	77.87	74.16
11334	12334	13334	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	94.73	90.61	86.49	82.37
11344	-	13344	.6875	11/16"	17.463	3/4"	4"	1-1/2"	151.46	144.87	138.29	131.70
11354	12354	13354	.7500	3/4"	19.050	3/4"	4"	1-1/2"	135.01	129.14	123.27	117.40
11364	-	13364	.8750	7/8"	22.225	7/8"	4"	1-1/2"	195.14	186.66	178.17	169.69
11374	12374	13374	1.000	1"	25.400	1"	4"	1-1/2"	202.04	193.26	184.47	175.69
-	-	13394	1.250	1-1/4"	31.750	1-1/4"	4-1/2"	2"	562.93	538.45	513.98	489.50

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MATERIAL HARDNESS (Rc)

0

Series 220MA, 223MA, 230MA, 820MA, 823MA, 830MA

TOLERANCES

d1	+0.000" -0.002" (+0.000 -0.050mm)
d2	h6

.0312" - .3594"
(0.792mm - 9.129mm)



TECH
PAGES
282-283

Standard Length - Square End

TiAlN Coating

Solid submicron grain carbide end mill - center cutting

Dry or semi-dry machining

Extremely versatile

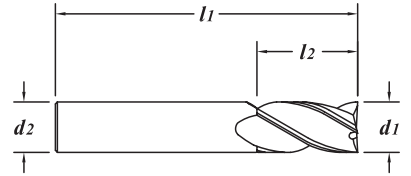
Uncoated - page 216

TiN Coating - page 218

TiCN Coating - page 219

Stub Length - page 209

Extended Length - page 239



(220MA/820MA) 2 Flute EDP#	(223MA/823MA) 3 Flute EDP#	(230MA/830MA) 4 Flute EDP#	d1 † Diameter		d2 Shank Diameter	l1 Overall Length	l2 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"	13.88	13.28	12.67	12.07
45017	37017	46017	.0394		1.000	3.0	38	4	14.44	13.82	13.19	12.56
11027	12027	13027	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"	13.88	13.28	12.67	12.07
45027	37027	46027	.0591		1.500	3.0	38	6	14.44	13.82	13.19	12.56
11037	12037	13037	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	13.09	12.52	11.95	11.38
11047	12047	13047	.0781	5/64"	1.984	1/8"	1-1/2"	1/4"	13.09	12.52	11.95	11.38
45037	37037	46037	.0787		2.000	3.0	38	8	13.58	12.99	12.40	11.81
11057	12057	13057	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	12.51	11.97	11.42	10.88
45047	37047	46047	.0984		2.500	3.0	38	12	13.02	12.45	11.89	11.32
11067	12067	13067	.1094	7/64"	2.779	1/8"	1-1/2"	3/8"	12.51	11.97	11.42	10.88
45057	37057	46057	.1181		3.000	3.0	38	12	12.22	11.69	11.16	10.63
11077	12077	13077	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	11.75	11.24	10.73	10.22
45067	37067	46067	.1378		3.500	4.0	50	12	16.78	16.05	15.32	14.59
11087	12087	13087	.1406	9/64"	3.571	3/16"	2"	9/16"	16.09	15.39	14.69	13.99
11097	12097	13097	.1562	5/32"	3.967	3/16"	2"	9/16"	16.09	15.39	14.69	13.99
45077	37077	46077	.1575		4.000	4.0	50	14	16.05	15.36	14.66	13.96
11107	12107	13107	.1719	11/64"	4.366	3/16"	2"	9/16"	16.09	15.39	14.69	13.99
45087	37087	46087	.1772		4.500	5.0	50	14	20.55	19.66	18.76	17.87
11117	12117	13117	.1875	3/16"	4.763	3/16"	2"	5/8"	15.39	14.72	14.05	13.38
92077	93077	94077	.1969		5.000	5.0	50	16	19.90	19.03	18.17	17.30
45097	37097	46097	.1969		5.000	5.0	65	16	21.15	20.23	19.31	18.39
11127	12127	13127	.2031	13/64"	5.159	1/4"	2-1/2"	5/8"	22.41	21.44	20.46	19.49
11137	12137	13137	.2188	7/32"	5.558	1/4"	2-1/2"	5/8"	22.41	21.44	20.46	19.49
11147	12147	13147	.2344	15/64"	5.954	1/4"	2-1/2"	3/4"	22.41	21.44	20.46	19.49
45107	37107	46107	.2362		6.000	6.0	65	19	21.64	20.70	19.76	18.82
11157	12157	13157	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	20.88	19.98	19.07	18.16
11167	12167	13167	.2656	17/64"	6.746	5/16"	2-1/2"	7/8"	35.20	33.67	32.14	30.61
45117	37117	46117	.2756		7.000	7.0	65	22	30.41	29.08	27.76	26.44
11177	12177	13177	.2812	9/32"	7.142	5/16"	2-1/2"	7/8"	35.20	33.67	32.14	30.61
11187	12187	13187	.2969	19/64"	7.541	5/16"	2-1/2"	7/8"	35.20	33.67	32.14	30.61
11197	12197	13197	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	29.82	28.52	27.23	25.93
45127	37127	46127	.3150		8.000	8.0	65	22	30.89	29.55	28.20	26.86
11207	12207	13207	.3281	21/64"	8.334	3/8"	2-1/2"	7/8"	40.15	38.40	36.66	34.91
11217	12217	13217	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	40.15	38.40	36.66	34.91
45137	37137	46137	.3543		9.000	9.0	65	22	36.42	34.84	33.25	31.67
11227	12227	13227	.3594	23/64"	9.129	3/8"	2-1/2"	7/8"	40.15	38.40	36.66	34.91

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MATERIAL HARDNESS (Rc)

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Series 220MA, 223MA, 230MA, 820MA, 823MA, 830MA (continued)

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

GENERAL PURPOSE
END MILLS

(220MA/820MA) 2 Flute EDP#	(223MA/823MA) 3 Flute EDP#	(230MA/830MA) 4 Flute EDP#		$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ 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"	35.08	33.55	32.03	30.50
11247	12247	13247	.3906	25/64"	9.921	7/16"	2-3/4"	7/8"	47.53	45.46	43.40	41.33
45147	37147	46147	.3937		10.000	10.0	70	25	42.03	40.21	38.38	36.55
11257	12257	13257	.4062	13/32"	10.317	7/16"	2-3/4"	7/8"	47.53	45.46	43.40	41.33
11267	12267	13267	.4219	27/64"	10.716	7/16"	2-3/4"	7/8"	47.53	45.46	43.40	41.33
45157	37157	46157	.4331		11.000	11.0	75	25	43.76	41.86	39.95	38.05
11277	12277	13277	.4375	7/16"	11.113	7/16"	2-3/4"	1"	42.14	40.30	38.47	36.64
11287	12287	13287	.4531	29/64"	11.509	1/2"	3"	1"	60.73	58.09	55.45	52.81
11297	12297	13297	.4688	15/32"	11.908	1/2"	3"	1"	60.73	58.09	55.45	52.81
45167	37167	46167	.4724		12.000	12.0	75	25	54.48	52.11	49.74	47.37
11307	12307	13307	.4844	31/64"	12.304	1/2"	3"	1"	60.73	58.09	55.45	52.81
11317	12317	13317	.5000	1/2"	12.700	1/2"	3"	1"	52.34	50.06	47.79	45.51
45177	37177	46177	.5512		14.000	14.0	88	32	90.56	86.63	82.69	78.75
11327	12327	13327	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	86.91	83.13	79.35	75.57
11337	12337	13337	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	96.37	92.18	87.99	83.80
45187	37187	46187	.6299		16.000	16.0	88	38	100.51	96.14	91.77	87.40
11347	12347	13347	.6875	11/16"	17.463	3/4"	4"	1-1/2"	153.85	147.16	140.47	133.78
45197	37197	46197	.7087		18.000	18.0	100	38	143.44	137.20	130.97	124.73
11357	12357	13357	.7500	3/4"	19.050	3/4"	4"	1-1/2"	137.37	131.40	125.42	119.45
45207	37207	46207	.7874		20.000	20.0	100	38	185.70	177.63	169.55	161.48
45217	37217	46217	.8661		22.000	22.0	100	38	203.69	194.83	185.98	177.12
11367	12367	13367	.8750	7/8"	22.225	7/8"	4"	1-1/2"	198.29	189.67	181.05	172.43
45227	37227	46227	.9843		25.000	25.0	100	38	211.89	202.68	193.46	184.25
11377	12377	13377	1.000	1"	25.400	1"	4"	1-1/2"	205.18	196.26	187.34	178.42
-	-	13397	1.250	1-1/4"	31.750	1-1/4"	4-1/2"	2"	564.03	539.51	514.98	490.46

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MATERIAL HARDNESS (Rc)

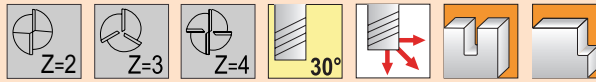
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End Mill Manufacturing

Series 220R, 223R, 230R, 820R, 823R, 830R

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



TECH
PAGES
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TOLERANCES	
d1	+0.000" - .002" (+.000 - .050mm)
d2	h6
r	+0.001" - .001" (+.025 - .025mm)

Standard Length - Corner Radius

Solid submicron grain carbide end mill - center cutting

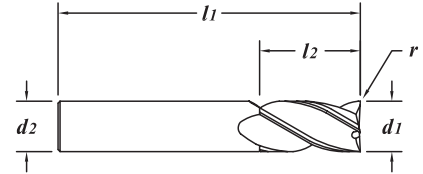
For stronger corners and part radius

Extremely versatile

TiAlN Coating - page 225

Stub Length - page 210

Extended Length - page 241



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MATERIAL HARDNESS (Rc)

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(220R/820R) 2 Flute EDP#	(223R/823R) 3 Flute EDP#	(230R/830R) 4 Flute EDP#	d1 †		d2 Shank Diameter	l1 Overall Length	l2 Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
			Decimal	Metric									
79580	36100	80580	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	.010"	13.40	12.82	12.23	11.65
79590	36102	80590	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	.015"	13.40	12.82	12.23	11.65
79600	36104	80600	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.010"	12.81	12.25	11.70	11.14
79610	36106	80610	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.015"	12.81	12.25	11.70	11.14
79620	36108	80620	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.020"	12.81	12.25	11.70	11.14
36500	36110	24070	.1181		3.000	3.0	38	12	0.20	12.22	11.69	11.16	10.63
36502	36112	24080	.1181		3.000	3.0	38	12	0.50	12.22	11.69	11.16	10.63
79000	36114	80000	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.010"	11.63	11.12	10.62	10.11
79010	36116	80010	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.015"	11.63	11.12	10.62	10.11
79020	36118	80020	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.020"	11.63	11.12	10.62	10.11
79030	36120	80030	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.030"	11.63	11.12	10.62	10.11
-	-	80035	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.040"	11.63	11.12	10.62	10.11
36504	36122	24090	.1575		4.000	4.0	50	14	0.30	16.09	15.39	14.69	13.99
36506	36124	24100	.1575		4.000	4.0	50	14	0.50	16.09	15.39	14.69	13.99
79040	36126	80040	.1875	3/16"	4.763	3/16"	2"	5/8"	.010"	15.32	14.65	13.99	13.32
79050	36128	80050	.1875	3/16"	4.763	3/16"	2"	5/8"	.015"	15.32	14.65	13.99	13.32
79060	36130	80060	.1875	3/16"	4.763	3/16"	2"	5/8"	.020"	15.32	14.65	13.99	13.32
79070	36132	80070	.1875	3/16"	4.763	3/16"	2"	5/8"	.030"	15.32	14.65	13.99	13.32
36508	36134	24110	.1969		5.000	5.0	65	16	0.30	19.50	18.66	17.81	16.96
36510	36136	24120	.1969		5.000	5.0	65	16	0.50	19.50	18.66	17.81	16.96
36512	36138	24170	.2362		6.000	6.0	65	19	0.50	20.00	19.13	18.26	17.39
36514	36140	24180	.2362		6.000	6.0	65	19	0.80	20.00	19.13	18.26	17.39
36516	36142	24190	.2362		6.000	6.0	65	19	1.00	20.00	19.13	18.26	17.39
36518	36144	24200	.2362		6.000	6.0	65	19	1.50	20.00	19.13	18.26	17.39
36520	36146	24210	.2362		6.000	6.0	65	19	2.00	20.00	19.13	18.26	17.39
36522	36148	80090	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"	19.03	18.21	17.38	16.55
79100	36150	80100	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	19.03	18.21	17.38	16.55
79110	36152	80110	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"	19.03	18.21	17.38	16.55
79120	36154	80120	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	19.03	18.21	17.38	16.55
79130	36156	80130	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.045"	19.03	18.21	17.38	16.55
79140	36158	80140	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.060"	19.03	18.21	17.38	16.55
79160	36160	80160	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.015"	24.94	23.86	22.77	21.69
79170	36162	80170	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.020"	24.94	23.86	22.77	21.69
79180	36164	80180	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.030"	24.94	23.86	22.77	21.69
79190	36166	80190	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.045"	24.94	23.86	22.77	21.69
79200	36168	80200	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.060"	24.94	23.86	22.77	21.69

Series 220R, 223R, 230R, 820R, 823R, 830R (continued)

.3150" - .6250"
(8.000mm - 15.875mm)

GENERAL PURPOSE
END MILLS

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MATERIAL HARDNESS (Rc)

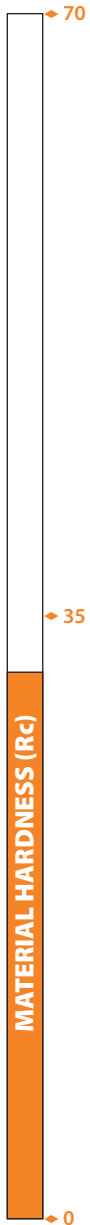
(220R/820R) 2 Flute EDP#	(223R/823R) 3 Flute EDP#	(230R/830R) 4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
			Decimal	Metric									
36524	36170	24220	.3150		8.000	8.0	65	22	0.50	26.25	25.11	23.97	22.83
36526	36172	24230	.3150		8.000	8.0	65	22	0.80	26.25	25.11	23.97	22.83
36528	36174	24240	.3150		8.000	8.0	65	22	1.00	26.25	25.11	23.97	22.83
36530	36176	24250	.3150		8.000	8.0	65	22	1.50	26.25	25.11	23.97	22.83
36532	36178	24260	.3150		8.000	8.0	65	22	2.00	26.25	25.11	23.97	22.83
36534	36180	24270	.3150		8.000	8.0	65	22	2.50	26.25	25.11	23.97	22.83
36536	36182	24280	.3150		8.000	8.0	65	22	3.00	26.25	25.11	23.97	22.83
36538	36184	80220	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.010"	30.53	29.21	27.88	26.55
79230	36186	80230	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.015"	30.53	29.21	27.88	26.55
79240	36188	80240	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.020"	30.53	29.21	27.88	26.55
79250	36190	80250	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	30.53	29.21	27.88	26.55
79260	36192	80260	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.045"	30.53	29.21	27.88	26.55
79270	36194	80270	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.060"	30.53	29.21	27.88	26.55
36540	36196	24290	.3937		10.000	10.0	70	25	0.50	37.48	35.85	34.22	32.59
36542	36198	24300	.3937		10.000	10.0	70	25	0.80	37.48	35.85	34.22	32.59
36544	36200	24310	.3937		10.000	10.0	70	25	1.00	37.48	35.85	34.22	32.59
36546	36202	24320	.3937		10.000	10.0	70	25	1.50	37.48	35.85	34.22	32.59
36548	36204	24330	.3937		10.000	10.0	70	25	2.00	37.48	35.85	34.22	32.59
36550	36206	24340	.3937		10.000	10.0	70	25	2.50	37.48	35.85	34.22	32.59
36552	36208	24350	.3937		10.000	10.0	70	25	3.00	37.48	35.85	34.22	32.59
36554	36210	24360	.3937		10.000	10.0	70	25	3.20	37.48	35.85	34.22	32.59
36556	36212	80700	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.010"	37.58	35.95	34.31	32.68
36558	36214	80705	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.015"	37.58	35.95	34.31	32.68
36560	36216	80710	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.020"	37.58	35.95	34.31	32.68
36562	36218	80715	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.030"	37.58	35.95	34.31	32.68
36564	36220	80720	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.045"	37.58	35.95	34.31	32.68
36566	36222	80725	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.060"	37.58	35.95	34.31	32.68
36568	36224	80730	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.090"	37.58	35.95	34.31	32.68
36570	36226	80735	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.125"	37.58	35.95	34.31	32.68
36572	36228	24370	.4724		12.000	12.0	75	25	0.50	59.70	57.10	54.51	51.91
36574	36230	24380	.4724		12.000	12.0	75	25	0.80	59.70	57.10	54.51	51.91
36576	36232	24390	.4724		12.000	12.0	75	25	1.00	59.70	57.10	54.51	51.91
36578	36234	24400	.4724		12.000	12.0	75	25	1.50	59.70	57.10	54.51	51.91
36580	36236	24410	.4724		12.000	12.0	75	25	2.00	59.70	57.10	54.51	51.91
36582	36238	24420	.4724		12.000	12.0	75	25	2.50	59.70	57.10	54.51	51.91
36584	36240	24430	.4724		12.000	12.0	75	25	3.00	59.70	57.10	54.51	51.91
36586	36242	24440	.4724		12.000	12.0	75	25	3.20	59.70	57.10	54.51	51.91
36588	36244	80290	.5000	1/2"	12.700	1/2"	3"	1"	.010"	56.83	54.36	51.89	49.42
79300	36246	80300	.5000	1/2"	12.700	1/2"	3"	1"	.015"	56.83	54.36	51.89	49.42
79310	36248	80310	.5000	1/2"	12.700	1/2"	3"	1"	.020"	56.83	54.36	51.89	49.42
79320	36250	80320	.5000	1/2"	12.700	1/2"	3"	1"	.030"	56.83	54.36	51.89	49.42
79330	36252	80330	.5000	1/2"	12.700	1/2"	3"	1"	.045"	56.83	54.36	51.89	49.42
79340	36254	80340	.5000	1/2"	12.700	1/2"	3"	1"	.060"	56.83	54.36	51.89	49.42
79350	36256	80350	.5000	1/2"	12.700	1/2"	3"	1"	.090"	56.83	54.36	51.89	49.42
79360	36258	80360	.5000	1/2"	12.700	1/2"	3"	1"	.125"	56.83	54.36	51.89	49.42
79370	36260	80370	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"	91.92	87.92	83.93	79.93
79380	36262	80380	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.020"	91.92	87.92	83.93	79.93
79390	36264	80390	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	91.92	87.92	83.93	79.93
79400	36266	80400	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.045"	91.92	87.92	83.93	79.93
79410	36268	80410	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	91.92	87.92	83.93	79.93
79420	36270	80420	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.090"	91.92	87.92	83.93	79.93

continued →

Series 220R, 223R, 230R, 820R, 823R, 830R (continued)

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

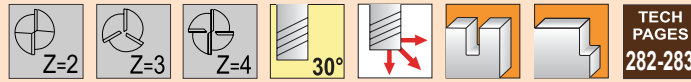
(220R/820R) 2 Flute EDP#	(223R/823R) 3 Flute EDP#	(230R/830R) 4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
			Decimal	Metric									
36590	36272	24450	.6299	16.000	16.0	88	38	0.50	96.50	92.30	88.11	83.91	
36592	36274	24460	.6299	16.000	16.0	88	38	1.00	96.50	92.30	88.11	83.91	
36594	36276	24470	.6299	16.000	16.0	88	38	2.00	96.50	92.30	88.11	83.91	
36596	36278	24480	.6299	16.000	16.0	88	38	2.50	96.50	92.30	88.11	83.91	
36598	36280	24490	.6299	16.000	16.0	88	38	3.00	96.50	92.30	88.11	83.91	
36600	36282	24500	.6299	16.000	16.0	88	38	4.00	96.50	92.30	88.11	83.91	
36602	36284	24510	.6299	16.000	16.0	88	38	5.00	96.50	92.30	88.11	83.91	
79440	36286	80440	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"	135.27	129.39	123.51	117.63
79450	36288	80450	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.020"	135.27	129.39	123.51	117.63
79460	36290	80460	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	135.27	129.39	123.51	117.63
79470	36292	80470	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.045"	135.27	129.39	123.51	117.63
79480	36294	80480	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	135.27	129.39	123.51	117.63
79490	36296	80490	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.090"	135.27	129.39	123.51	117.63
79500	36298	80500	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.125"	135.27	129.39	123.51	117.63
79630	36300	80630	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.250"	135.27	129.39	123.51	117.63
36604	36302	24520	.7874	20.000	20.0	100	38	0.50	190.44	182.16	173.88	165.60	
36606	36304	24530	.7874	20.000	20.0	100	38	1.00	190.44	182.16	173.88	165.60	
36608	36306	24540	.7874	20.000	20.0	100	38	2.00	190.44	182.16	173.88	165.60	
36610	36308	24550	.7874	20.000	20.0	100	38	3.00	190.44	182.16	173.88	165.60	
36612	36310	24560	.7874	20.000	20.0	100	38	5.00	190.44	182.16	173.88	165.60	
79510	36312	80510	1.000	1"	25.400	1"	4"	1-1/2"	.015"	234.65	224.44	214.24	204.04
79520	36314	80520	1.000	1"	25.400	1"	4"	1-1/2"	.020"	234.65	224.44	214.24	204.04
79530	36316	80530	1.000	1"	25.400	1"	4"	1-1/2"	.030"	234.65	224.44	214.24	204.04
79540	36318	80540	1.000	1"	25.400	1"	4"	1-1/2"	.045"	234.65	224.44	214.24	204.04
79550	36320	80550	1.000	1"	25.400	1"	4"	1-1/2"	.060"	234.65	224.44	214.24	204.04
79560	36322	80560	1.000	1"	25.400	1"	4"	1-1/2"	.090"	234.65	224.44	214.24	204.04
79570	36324	80570	1.000	1"	25.400	1"	4"	1-1/2"	.125"	234.65	224.44	214.24	204.04
79640	36326	80640	1.000	1"	25.400	1"	4"	1-1/2"	.250"	234.65	224.44	214.24	204.04



TOLERANCES

d_1	+0.00" -0.002" (+.000 -.050mm)
d_2	h6
r	+0.01" -0.001" (+.025 -.025mm)

Series 220RA, 223RA, 230RA, 823RA, 830RA



TECH PAGES
282-283

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

GENERAL PURPOSE
END MILLS

Standard Length - Corner Radius

TiAlN Coating

Solid submicron grain carbide end mill - center cutting

Dry or semi-dry machining

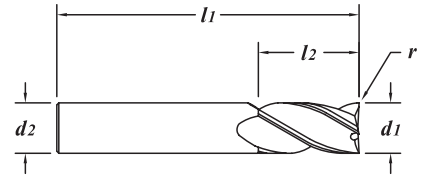
For stronger corners and part radius

Extremely versatile

Uncoated - page 222

Stub Length - page 212

Extended Length - page 244



(220RA) 2 Flute EDP#	(223RA/823RA) 3 Flute EDP#	(230RA/830RA) 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									
79587	36101	80587	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	.010"	16.09	15.39	14.69	13.99
79597	36103	80597	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	.015"	16.09	15.39	14.69	13.99
79607	36105	80607	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.010"	15.50	14.83	14.15	13.48
79617	36107	80617	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.015"	15.50	14.83	14.15	13.48
79627	36109	80627	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.020"	15.50	14.83	14.15	13.48
-	36111	24077	.1181		3.000	3.0	38	12	0.20	14.34	13.72	13.09	12.47
-	36113	24087	.1181		3.000	3.0	38	12	0.50	14.34	13.72	13.09	12.47
79007	36115	80007	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.010"	14.32	13.70	13.07	12.45
79017	36117	80017	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.015"	14.32	13.70	13.07	12.45
79027	36119	80027	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.020"	14.32	13.70	13.07	12.45
79037	36121	80037	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.030"	14.32	13.70	13.07	12.45
-	-	80038	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.040"	14.32	13.70	13.07	12.45
-	36123	24097	.1575		4.000	4.0	50	14	0.30	18.78	17.96	17.15	16.33
-	36125	24107	.1575		4.000	4.0	50	14	0.50	18.78	17.96	17.15	16.33
79047	36127	80047	.1875	3/16"	4.763	3/16"	2"	5/8"	.010"	18.01	17.23	16.44	15.66
79057	36129	80057	.1875	3/16"	4.763	3/16"	2"	5/8"	.015"	18.01	17.23	16.44	15.66
79067	36131	80067	.1875	3/16"	4.763	3/16"	2"	5/8"	.020"	18.01	17.23	16.44	15.66
79077	36133	80077	.1875	3/16"	4.763	3/16"	2"	5/8"	.030"	18.01	17.23	16.44	15.66
-	-	24117	.1969		5.000	5.0	50	16	0.30	25.06	23.97	22.88	21.79
-	36135	24119	.1969		5.000	5.0	65	16	0.30	25.06	23.97	22.88	21.79
-	36137	24127	.1969		5.000	5.0	65	16	0.50	25.06	23.97	22.88	21.79
-	36139	24177	.2362		6.000	6.0	65	19	0.50	25.54	24.43	23.32	22.21
-	36141	24187	.2362		6.000	6.0	65	19	0.80	25.54	24.43	23.32	22.21
-	36143	24197	.2362		6.000	6.0	65	19	1.00	25.54	24.43	23.32	22.21
-	36145	24207	.2362		6.000	6.0	65	19	1.50	25.54	24.43	23.32	22.21
-	36147	24217	.2362		6.000	6.0	65	19	2.00	25.54	24.43	23.32	22.21
-	36149	80097	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"	24.56	23.50	22.43	21.36
79107	36151	80107	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	24.56	23.50	22.43	21.36
79117	36153	80117	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"	24.56	23.50	22.43	21.36
79127	36155	80127	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	24.56	23.50	22.43	21.36
79137	36157	80137	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.045"	24.56	23.50	22.43	21.36
79147	36159	80147	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.060"	24.56	23.50	22.43	21.36
79167	36161	80167	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.015"	33.29	31.85	30.40	28.95
79177	36163	80177	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.020"	33.29	31.85	30.40	28.95
79187	36165	80187	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.030"	33.29	31.85	30.40	28.95
79197	36167	80197	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.045"	33.29	31.85	30.40	28.95
79207	36169	80207	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.060"	33.29	31.85	30.40	28.95

70

35

MATERIAL HARDNESS (Rc)

0

continued →

Series 220RA, 223RA, 230RA, 823RA, 830RA (continued)

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

70
35
0
MATERIAL HARDNESS (Rc)

(220RA) 2 Flute EDP#	(223RA/823RA) 3 Flute EDP#	(230RA/830RA) 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									
-	36171	24227	.3150	8.000	8.0	65	22	0.50	34.55	33.04	31.54	30.04	
-	36173	24237	.3150	8.000	8.0	65	22	0.80	34.55	33.04	31.54	30.04	
-	36175	24247	.3150	8.000	8.0	65	22	1.00	34.55	33.04	31.54	30.04	
-	36177	24257	.3150	8.000	8.0	65	22	1.50	34.55	33.04	31.54	30.04	
-	36179	24267	.3150	8.000	8.0	65	22	2.00	34.55	33.04	31.54	30.04	
-	36181	24277	.3150	8.000	8.0	65	22	2.50	34.55	33.04	31.54	30.04	
-	36183	24287	.3150	8.000	8.0	65	22	3.00	34.55	33.04	31.54	30.04	
-	36185	80227	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.010"	38.88	37.19	35.50	33.81
79237	36187	80237	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.015"	38.88	37.19	35.50	33.81
79247	36189	80247	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.020"	38.88	37.19	35.50	33.81
79257	36191	80257	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	38.88	37.19	35.50	33.81
79267	36193	80267	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.045"	38.88	37.19	35.50	33.81
79277	36195	80277	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.060"	38.88	37.19	35.50	33.81
-	36197	24297	.3937	10.000	10.0	70	25	0.50	46.94	44.90	42.86	40.82	
-	36199	24307	.3937	10.000	10.0	70	25	0.80	46.94	44.90	42.86	40.82	
-	36201	24317	.3937	10.000	10.0	70	25	1.00	46.94	44.90	42.86	40.82	
-	36203	24327	.3937	10.000	10.0	70	25	1.50	46.94	44.90	42.86	40.82	
-	36205	24337	.3937	10.000	10.0	70	25	2.00	46.94	44.90	42.86	40.82	
-	36207	24347	.3937	10.000	10.0	70	25	2.50	46.94	44.90	42.86	40.82	
-	36209	24357	.3937	10.000	10.0	70	25	3.00	46.94	44.90	42.86	40.82	
-	36211	24367	.3937	10.000	10.0	70	25	3.20	46.94	44.90	42.86	40.82	
-	36213	80279	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.010"	47.01	44.97	42.92	40.88
-	36215	80281	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.015"	47.01	44.97	42.92	40.88
-	36217	80283	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.020"	47.01	44.97	42.92	40.88
-	36219	80285	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.030"	47.01	44.97	42.92	40.88
-	36221	80287	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.045"	47.01	44.97	42.92	40.88
-	36223	80289	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.060"	47.01	44.97	42.92	40.88
-	36225	80291	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.090"	47.01	44.97	42.92	40.88
-	36227	80293	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.125"	47.01	44.97	42.92	40.88
-	36229	24377	.4724	12.000	12.0	75	25	0.50	69.13	66.12	63.12	60.11	
-	36231	24387	.4724	12.000	12.0	75	25	0.80	69.13	66.12	63.12	60.11	
-	36233	24397	.4724	12.000	12.0	75	25	1.00	69.13	66.12	63.12	60.11	
-	36235	24407	.4724	12.000	12.0	75	25	1.50	69.13	66.12	63.12	60.11	
-	36237	24417	.4724	12.000	12.0	75	25	2.00	69.13	66.12	63.12	60.11	
-	36239	24427	.4724	12.000	12.0	75	25	2.50	69.13	66.12	63.12	60.11	
-	36241	24437	.4724	12.000	12.0	75	25	3.00	69.13	66.12	63.12	60.11	
-	36243	24447	.4724	12.000	12.0	75	25	3.20	69.13	66.12	63.12	60.11	
-	36245	80297	.5000	1/2"	12.700	1/2"	3"	1"	.010"	66.32	63.44	60.55	57.67
79307	36247	80307	.5000	1/2"	12.700	1/2"	3"	1"	.015"	66.32	63.44	60.55	57.67
79317	36249	80317	.5000	1/2"	12.700	1/2"	3"	1"	.020"	66.32	63.44	60.55	57.67
79327	36251	80327	.5000	1/2"	12.700	1/2"	3"	1"	.030"	66.32	63.44	60.55	57.67
79337	36253	80337	.5000	1/2"	12.700	1/2"	3"	1"	.045"	66.32	63.44	60.55	57.67
79347	36255	80347	.5000	1/2"	12.700	1/2"	3"	1"	.060"	66.32	63.44	60.55	57.67
79357	36257	80357	.5000	1/2"	12.700	1/2"	3"	1"	.090"	66.32	63.44	60.55	57.67
79367	36259	80367	.5000	1/2"	12.700	1/2"	3"	1"	.125"	66.32	63.44	60.55	57.67
79377	36261	80377	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"	105.58	100.99	96.40	91.81
-	36263	80387	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.020"	105.58	100.99	96.40	91.81
79397	36265	80397	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	105.58	100.99	96.40	91.81
79407	36267	80407	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.045"	105.58	100.99	96.40	91.81
79417	36269	80417	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	105.58	100.99	96.40	91.81
79427	36271	80427	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.090"	105.58	100.99	96.40	91.81
-	36273	24457	.6299	16.000	16.0	88	38	0.50	110.17	105.38	100.59	95.80	
-	36275	24467	.6299	16.000	16.0	88	38	1.00	110.17	105.38	100.59	95.80	
-	36277	24477	.6299	16.000	16.0	88	38	2.00	110.17	105.38	100.59	95.80	
-	36279	24487	.6299	16.000	16.0	88	38	2.50	110.17	105.38	100.59	95.80	
-	36281	24497	.6299	16.000	16.0	88	38	3.00	110.17	105.38	100.59	95.80	
-	36283	24507	.6299	16.000	16.0	88	38	4.00	110.17	105.38	100.59	95.80	
-	36285	24517	.6299	16.000	16.0	88	38	5.00	110.17	105.38	100.59	95.80	

Series 220RA, 223RA, 230RA, 823RA, 830RA (continued)

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

GENERAL PURPOSE
END MILLS

(220RA) 2 Flute EDP#	(223RA/823RA) 3 Flute EDP#	(230RA/830RA) 4 Flute EDP#	$d1$ †		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
			Decimal	Diameter Metric									
79447	36287	80447	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"	151.41	144.83	138.24	131.66
79457	36289	80457	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.020"	151.41	144.83	138.24	131.66
79467	36291	80467	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	151.41	144.83	138.24	131.66
79477	36293	80477	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.045"	151.41	144.83	138.24	131.66
79487	36295	80487	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	151.41	144.83	138.24	131.66
79497	36297	80497	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.090"	151.41	144.83	138.24	131.66
79507	36299	80507	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.125"	151.41	144.83	138.24	131.66
79637	36301	80637	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.250"	151.41	144.83	138.24	131.66
-	36303	24527	.7874		20.000	20.0	100	38	0.50	214.29	204.97	195.66	186.34
-	36305	24537	.7874		20.000	20.0	100	38	1.00	214.29	204.97	195.66	186.34
-	36307	24547	.7874		20.000	20.0	100	38	2.00	214.29	204.97	195.66	186.34
-	36309	24557	.7874		20.000	20.0	100	38	3.00	214.29	204.97	195.66	186.34
-	36311	24567	.7874		20.000	20.0	100	38	5.00	214.29	204.97	195.66	186.34
-	36313	80517	1.000	1"	25.400	1"	4"	1-1/2"	.015"	258.50	247.26	236.02	224.78
-	36315	80527	1.000	1"	25.400	1"	4"	1-1/2"	.020"	258.50	247.26	236.02	224.78
79537	36317	80537	1.000	1"	25.400	1"	4"	1-1/2"	.030"	258.50	247.26	236.02	224.78
-	36319	80547	1.000	1"	25.400	1"	4"	1-1/2"	.045"	258.50	247.26	236.02	224.78
79557	36321	80557	1.000	1"	25.400	1"	4"	1-1/2"	.060"	258.50	247.26	236.02	224.78
-	36323	80567	1.000	1"	25.400	1"	4"	1-1/2"	.090"	258.50	247.26	236.02	224.78
79577	36325	80577	1.000	1"	25.400	1"	4"	1-1/2"	.125"	258.50	247.26	236.02	224.78
79647	36327	80647	1.000	1"	25.400	1"	4"	1-1/2"	.250"	258.50	247.26	236.02	224.78

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MATERIAL HARDNESS (Rc)

0



End Mill Manufacturing

Series 320M, 323M, 330M, 920M, 923M, 930M

.0200" - .2656"
(0.508mm - 6.746mm)



TECH
PAGES
282-283

TOLERANCES

d_1	$\leq .030"$	$+0.000" - .001"$ (+.000 - .025mm)
	$\geq 1/32"$	$+0.000" - .002"$ (+.000 - .050mm)
d_2	h6	
ball radius	$+0.000" - .001"$ (+.000 - .025mm)	

Standard Length - Ball End

Solid submicron grain carbide end mill - center cutting

Extremely versatile

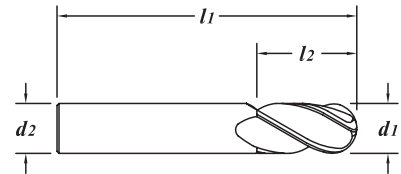
TiN Coating - page 230

TiCN Coating - page 231

TiAlN Coating - page 232

Stub Length - page 214

Extended length - page 247



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MATERIAL HARDNESS (Rc)

0

(320M/920M) 2 Flute EDP#	(323M/923M) 3 Flute EDP#	(330M/930M) 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								
16650	-	-	.0200	.0200"	0.508	1/8"	1-1/2"	.060"	22.99	21.99	20.99	19.99
16700	-	-	.0250	.0250"	0.635	1/8"	1-1/2"	.075"	22.21	21.24	20.28	19.31
16750	-	-	.0300	.0300"	0.762	1/8"	1-1/2"	.090"	19.14	18.30	17.47	16.64
16010	17010	18010	.0312	1/32"	0.792	1/8"	1-1/2"	3/32"	14.19	13.57	12.96	12.34
47010	38010	48010	.0394		1.000	3.0	38	4	14.90	14.26	13.61	12.96
16020	17020	18020	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"	14.19	13.57	12.96	12.34
47020	38020	48020	.0591		1.500	3.0	38	6	14.90	14.26	13.61	12.96
16030	17030	18030	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	13.40	12.82	12.23	11.65
16040	17040	18040	.0781	5/64"	1.984	1/8"	1-1/2"	1/4"	13.40	12.82	12.23	11.65
47030	38030	48030	.0787		2.000	3.0	38	8	14.05	13.44	12.83	12.22
16050	17050	18050	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	12.81	12.25	11.70	11.14
47040	38040	48040	.0984		2.500	3.0	38	12	13.47	12.88	12.30	11.71
16060	17060	18060	.1094	7/64"	2.779	1/8"	1-1/2"	3/8"	12.81	12.25	11.70	11.14
47050	38050	48050	.1181		3.000	3.0	38	12	12.22	11.69	11.16	10.63
16070	17070	18070	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	11.63	11.12	10.62	10.11
47060	38060	48060	.1378		3.500	4.0	50	12	17.94	17.16	16.38	15.60
16080	17080	18080	.1406	9/64"	3.571	3/16"	2"	9/16"	17.05	16.31	15.57	14.83
16090	17090	18090	.1562	5/32"	3.967	3/16"	2"	9/16"	17.05	16.31	15.57	14.83
47070	38070	48070	.1575		4.000	4.0	50	14	16.09	15.39	14.69	13.99
16100	17100	18100	.1719	11/64"	4.366	3/16"	2"	9/16"	17.05	16.31	15.57	14.83
47080	38080	48080	.1772		4.500	5.0	50	14	20.25	19.37	18.49	17.61
16110	17110	18110	.1875	3/16"	4.763	3/16"	2"	5/8"	15.32	14.65	13.99	13.32
97070	98070	99070	.1969		5.000	5.0	50	16	18.61	17.80	16.99	16.18
47090	38090	48090	.1969		5.000	5.0	65	16	19.50	18.66	17.81	16.96
16120	17120	18120	.2031	13/64"	5.159	1/4"	2-1/2"	5/8"	19.84	18.98	18.11	17.25
16130	17130	18130	.2188	7/32"	5.558	1/4"	2-1/2"	5/8"	19.84	18.98	18.11	17.25
16140	17140	18140	.2344	15/64"	5.954	1/4"	2-1/2"	3/4"	19.84	18.98	18.11	17.25
47100	38100	48100	.2362		6.000	6.0	65	19	20.00	19.13	18.26	17.39
16150	17150	18150	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	19.03	18.21	17.38	16.55
16160	17160	18160	.2656	17/64"	6.746	5/16"	2-1/2"	7/8"	29.79	28.49	27.20	25.90

Series 320M, 323M, 330M, 920M, 923M, 930M (continued)

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

GENERAL PURPOSE
END MILLS

(320M/920M) 2 Flute EDP#	(323M/923M) 3 Flute EDP#	(330M/930M) 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
47110	38110	48110	.2756		7.000	7.0	65	22	25.67	24.55	23.44	22.32
16170	17170	18170	.2812	9/32"	7.142	5/16"	2-1/2"	7/8"	29.79	28.49	27.20	25.90
16180	-	18180	.2969	19/64"	7.541	5/16"	2-1/2"	7/8"	29.79	28.49	27.20	25.90
16190	17190	18190	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	24.94	23.86	22.77	21.69
47120	38120	48120	.3150		8.000	8.0	65	22	26.25	25.11	23.97	22.83
16200	17200	18200	.3281	21/64"	8.334	3/8"	2-1/2"	7/8"	35.65	34.10	32.55	31.00
16210	17210	18210	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	35.65	34.10	32.55	31.00
47130	38130	48130	.3543		9.000	9.0	65	22	32.07	30.68	29.28	27.89
16220	-	18220	.3594	23/64"	9.129	3/8"	2-1/2"	7/8"	35.65	34.10	32.55	31.00
16230	17230	18230	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	30.53	29.21	27.88	26.55
16240	17240	18240	.3906	25/64"	9.921	7/16"	2-3/4"	7/8"	43.87	41.97	40.06	38.15
47140	38140	48140	.3937		10.000	10.0	70	25	37.48	35.85	34.22	32.59
16250	17250	18250	.4062	13/32"	10.317	7/16"	2-3/4"	7/8"	43.87	41.97	40.06	38.15
16260	17260	18260	.4219	27/64"	10.716	7/16"	2-3/4"	7/8"	43.87	41.97	40.06	38.15
47150	38150	48150	.4331		11.000	11.0	75	25	39.46	37.74	36.03	34.31
16270	17270	18270	.4375	7/16"	11.113	7/16"	2-3/4"	1"	37.58	35.95	34.31	32.68
16280	-	18280	.4531	29/64"	11.509	1/2"	3"	1"	62.84	60.10	57.37	54.64
16290	17290	18290	.4688	15/32"	11.908	1/2"	3"	1"	62.84	60.10	57.37	54.64
47160	38160	48160	.4724		12.000	12.0	75	25	59.70	57.10	54.51	51.91
16300	-	18300	.4844	31/64"	12.304	1/2"	3"	1"	62.84	60.10	57.37	54.64
16310	17310	18310	.5000	1/2"	12.700	1/2"	3"	1"	56.83	54.36	51.89	49.42
47170	38170	48170	.5512		14.000	14.0	88	32	86.91	83.13	79.35	75.57
16320	17320	18320	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	82.78	79.18	75.58	71.98
16330	17330	18330	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	91.92	87.92	83.93	79.93
47180	38180	48180	.6299		16.000	16.0	88	38	96.50	92.30	88.11	83.91
16340	17340	18340	.6875	11/16"	17.463	3/4"	4"	1-1/2"	153.02	146.37	139.71	133.06
47190	-	48190	.7087		18.000	18.0	100	38	142.01	135.84	129.66	123.49
16350	17350	18350	.7500	3/4"	19.050	3/4"	4"	1-1/2"	135.27	129.39	123.51	117.63
47200	38200	48200	.7874		20.000	20.0	100	38	190.44	182.16	173.88	165.60
47210	-	48210	.8661		22.000	22.0	100	38	211.55	202.36	193.16	183.96
16360	17360	18360	.8750	7/8"	22.225	7/8"	4"	1-1/2"	216.72	207.30	197.87	188.45
47220	-	-	.9843		25.000	25.0	100	38	221.77	212.12	202.48	192.84
16370	17370	18370	1.000	1"	25.400	1"	4"	1-1/2"	234.65	224.44	214.24	204.04

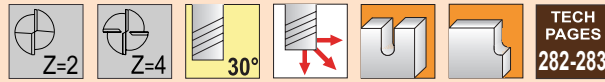
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MATERIAL HARDNESS (Rc)

0

Series 320MT, 330MT



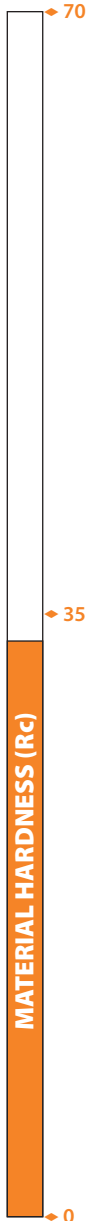
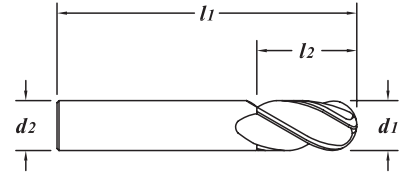
TOLERANCES

d_1	+0.00" - .002" (+.000 - .050mm)
d_2	h6
ball radius	+0.000" - .001" (+.000 - .025mm)

Standard Length - Ball End

TiN Coating

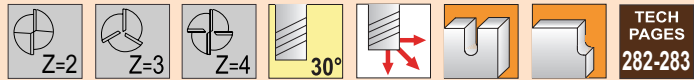
- Solid submicron grain carbide end mill - center cutting
- Improved lubricity
- Extremely versatile
- Uncoated - page 228
- TiCN Coating - page 231
- TiALN Coating - page 232



(320MT) 2 Flute EDP#	(330MT) 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							
16073	18073	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	13.20	12.63	12.05	11.48
16113	18113	.1875	3/16"	4.763	3/16"	2"	5/8"	16.92	16.18	15.45	14.71
16153	18153	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	22.23	21.26	20.30	19.33
16193	18193	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	29.27	28.00	26.72	25.45
16233	18233	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	34.86	33.34	31.83	30.31
16273	18273	.4375	7/16"	11.113	7/16"	2-3/4"	1"	42.78	40.92	39.06	37.20
16313	18313	.5000	1/2"	12.700	1/2"	3"	1"	62.07	59.37	56.67	53.97
16333	18333	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	99.94	95.59	91.25	86.90
16353	18353	.7500	3/4"	19.050	3/4"	4"	1-1/2"	144.44	138.16	131.88	125.60
16373	18373	1.000	1"	25.400	1"	4"	1-1/2"	250.69	239.79	228.89	217.99

TOLERANCES

d_1	+0.000" -0.002" (+0.000 -0.050mm)
d_2	h6
ball radius	+0.000" -0.001" (+0.000 -0.025mm)



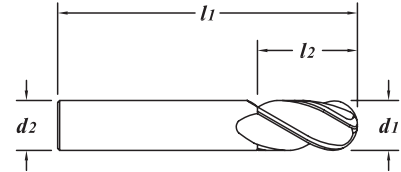
Series 320MC, 323MC, 330MC

**GENERAL PURPOSE
END MILLS**

Standard Length - Ball End

TiCN Coating

- Solid submicron grain carbide end mill - center cutting
- Improved abrasion resistance and lubricity
- Extremely versatile
- Uncoated - page 228
- TiN Coating - page 230
- TiALN Coating - page 232
- Extended length - page 249



(320MC) 2 Flute EDP#	(323MC) 3 Flute EDP#	(330MC) 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"	16.56	15.84	15.12	14.40
16024	17024	18024	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"	16.56	15.84	15.12	14.40
16034	17034	18034	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	15.78	15.09	14.41	13.72
16044	17044	18044	.0781	5/64"	1.984	1/8"	1-1/2"	1/4"	15.78	15.09	14.41	13.72
16054	17054	18054	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	15.18	14.52	13.86	13.20
16064	17064	18064	.1094	7/64"	2.779	1/8"	1-1/2"	3/8"	15.18	14.52	13.86	13.20
16074	17074	18074	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	14.00	13.39	12.78	12.17
16084	17084	18084	.1406	9/64"	3.571	3/16"	2"	9/16"	19.45	18.60	17.76	16.91
16094	17094	18094	.1562	5/32"	3.967	3/16"	2"	9/16"	19.45	18.60	17.76	16.91
16104	-	18104	.1719	11/64"	4.366	3/16"	2"	9/16"	19.45	18.60	17.76	16.91
16114	17114	18114	.1875	3/16"	4.763	3/16"	2"	5/8"	17.69	16.92	16.15	15.38
16124	17124	18124	.2031	13/64"	5.159	1/4"	2-1/2"	5/8"	24.64	23.57	22.50	21.43
16134	17134	18134	.2188	7/32"	5.558	1/4"	2-1/2"	5/8"	24.64	23.57	22.50	21.43
16144	17144	18144	.2344	15/64"	5.954	1/4"	2-1/2"	3/4"	24.64	23.57	22.50	21.43
16154	17154	18154	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	23.84	22.80	21.77	20.73
-	17164	18164	.2656	17/64"	6.746	5/16"	2-1/2"	7/8"	36.21	34.64	33.06	31.49
16174	17174	18174	.2812	9/32"	7.142	5/16"	2-1/2"	7/8"	36.21	34.64	33.06	31.49
-	-	18184	.2969	19/64"	7.541	5/16"	2-1/2"	7/8"	36.21	34.64	33.06	31.49
16194	17194	18194	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	31.42	30.05	28.69	27.32
16204	-	-	.3281	21/64"	8.334	3/8"	2-1/2"	7/8"	42.10	40.27	38.44	36.61
-	17214	18214	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	42.10	40.27	38.44	36.61
16224	-	18224	.3594	23/64"	9.129	3/8"	2-1/2"	7/8"	42.10	40.27	38.44	36.61
16234	17234	18234	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	36.97	35.37	33.76	32.15
16244	-	18244	.3906	25/64"	9.921	7/16"	2-3/4"	7/8"	51.57	49.32	47.08	44.84
16254	17254	18254	.4062	13/32"	10.317	7/16"	2-3/4"	7/8"	51.57	49.32	47.08	44.84
-	-	18264	.4219	27/64"	10.716	7/16"	2-3/4"	7/8"	51.57	49.32	47.08	44.84
16274	17274	18274	.4375	7/16"	11.113	7/16"	2-3/4"	1"	45.31	43.34	41.37	39.40
-	-	18284	.4531	29/64"	11.509	1/2"	3"	1"	70.58	67.51	64.44	61.37
-	17294	18294	.4688	15/32"	11.908	1/2"	3"	1"	70.58	67.51	64.44	61.37
16304	17304	18304	.4844	31/64"	12.304	1/2"	3"	1"	70.58	67.51	64.44	61.37
16314	17314	18314	.5000	1/2"	12.700	1/2"	3"	1"	64.58	61.78	58.97	56.16
16324	17324	18324	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	94.79	90.67	86.55	82.43
16334	17334	18334	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	103.97	99.45	94.93	90.41
-	17344	-	.6875	11/16"	17.463	3/4"	4"	1-1/2"	166.77	159.52	152.27	145.02
16354	17354	18354	.7500	3/4"	19.050	3/4"	4"	1-1/2"	149.03	142.55	136.07	129.59
16364	17364	18364	.8750	7/8"	22.225	7/8"	4"	1-1/2"	237.39	227.07	216.75	206.43
16374	17374	18374	1.000	1"	25.400	1"	4"	1-1/2"	255.33	244.23	233.13	222.03

70

35

MATERIAL HARDNESS (Rc)

0

Series 320MA, 323MA, 330MA, 920MA, 923MA, 930MA

.0312" - .3150"
(0.792mm - 8.000mm)



TECH
PAGES
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TOLERANCES

d_1	+0.00" -0.002" (+.000 - .050mm)
d_2	h6
ball radius	+0.000" -0.001" (+.000 - .025mm)

Standard Length - Ball End

TiAlN Coating

Solid submicron grain carbide end mill - center cutting

Dry or semi-dry machining

Extremely versatile

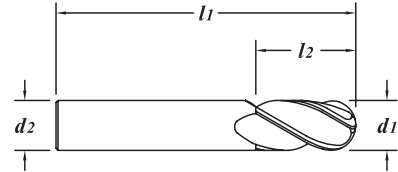
Uncoated - page 228

TiN Coating - page 230

TiCN Coating - page 231

Stub Length - page 215

Extended length - page 250



(320MA/920MA) 2 Flute EDP#	(323MA/923MA) 3 Flute EDP#	(330MA/930MA) 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"	16.87	16.14	15.40	14.67
47017	38017	48017	.0394		1.000	3.0	38	4	17.60	16.83	16.07	15.30
16027	17027	18027	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"	16.87	16.14	15.40	14.67
47027	38027	48027	.0591		1.500	3.0	38	6	17.60	16.83	16.07	15.30
16037	17037	18037	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	16.09	15.39	14.69	13.99
16047	17047	18047	.0781	5/64"	1.984	1/8"	1-1/2"	1/4"	16.09	15.39	14.69	13.99
47037	38037	48037	.0787		2.000	3.0	38	8	16.76	16.03	15.30	14.57
16057	17057	18057	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	15.50	14.83	14.15	13.48
47047	38047	48047	.0984		2.500	3.0	38	12	16.15	15.44	14.74	14.04
16067	17067	18067	.1094	7/64"	2.779	1/8"	1-1/2"	3/8"	15.50	14.83	14.15	13.48
47057	38057	48057	.1181		3.000	3.0	38	12	14.90	14.26	13.61	12.96
16077	17077	18077	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	14.32	13.70	13.07	12.45
47067	38067	48067	.1378		3.500	4.0	50	12	20.62	19.72	18.83	17.93
16087	17087	18087	.1406	9/64"	3.571	3/16"	2"	9/16"	19.77	18.91	18.05	17.19
16097	17097	18097	.1562	5/32"	3.967	3/16"	2"	9/16"	19.77	18.91	18.05	17.19
47077	38077	48077	.1575		4.000	4.0	50	14	18.78	17.96	17.15	16.33
16107	17107	18107	.1719	11/64"	4.366	3/16"	2"	9/16"	19.77	18.91	18.05	17.19
47087	38087	48087	.1772		4.500	5.0	50	14	24.45	23.39	22.32	21.26
16117	17117	18117	.1875	3/16"	4.763	3/16"	2"	5/8"	18.01	17.23	16.44	15.66
97077	98077	99077	.1969		5.000	5.0	50	16	22.80	21.81	20.82	19.83
47097	38097	48097	.1969		5.000	5.0	65	16	25.06	23.97	22.88	21.79
16127	17127	18127	.2031	13/64"	5.159	1/4"	2-1/2"	5/8"	25.40	24.30	23.19	22.09
16137	17137	18137	.2188	7/32"	5.558	1/4"	2-1/2"	5/8"	25.40	24.30	23.19	22.09
16147	17147	18147	.2344	15/64"	5.954	1/4"	2-1/2"	3/4"	25.40	24.30	23.19	22.09
47107	38107	48107	.2362		6.000	6.0	65	19	25.54	24.43	23.32	22.21
16157	17157	18157	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	24.56	23.50	22.43	21.36
16167	17167	18167	.2656	17/64"	6.746	5/16"	2-1/2"	7/8"	38.10	36.44	34.79	33.13
47117	38117	48117	.2756		7.000	7.0	65	22	33.96	32.48	31.01	29.53
16177	17177	18177	.2812	9/32"	7.142	5/16"	2-1/2"	7/8"	38.10	36.44	34.79	33.13
16187	17187	18187	.2969	19/64"	7.541	5/16"	2-1/2"	7/8"	38.10	36.44	34.79	33.13
16197	17197	18197	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	33.29	31.85	30.40	28.95
47127	38127	48127	.3150		8.000	8.0	65	22	34.55	33.04	31.54	30.04

MATERIAL HARDNESS (Rc)

70

35

0

Series 320MA, 323MA, 330MA, 920MA, 923MA, 930MA (continued)

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

GENERAL PURPOSE
END MILLS

(320MA/920MA) 2 Flute EDP#	(323MA/923MA) 3 Flute EDP#	(330MA/930MA) 4 Flute EDP#	$d1$ †		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Diameter Metric								
16207	17207	18207	.3281	21/64"	8.334	3/8"	2-1/2"	7/8"	43.98	42.06	40.15	38.24
16217	17217	18217	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	43.98	42.06	40.15	38.24
47137	38137	48137	.3543		9.000	9.0	65	22	40.38	38.62	36.87	35.11
16227	17227	18227	.3594	23/64"	9.129	3/8"	2-1/2"	7/8"	43.98	42.06	40.15	38.24
16237	17237	18237	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	38.88	37.19	35.50	33.81
16247	17247	18247	.3906	25/64"	9.921	7/16"	2-3/4"	7/8"	53.30	50.99	48.67	46.35
47147	38147	48147	.3937		10.000	10.0	70	25	46.94	44.90	42.86	40.82
16257	17257	18257	.4062	13/32"	10.317	7/16"	2-3/4"	7/8"	53.30	50.99	48.67	46.35
16267	-	18267	.4219	27/64"	10.716	7/16"	2-3/4"	7/8"	53.30	50.99	48.67	46.35
47157	38157	48157	.4331		11.000	11.0	75	25	48.91	46.78	44.66	42.53
16277	17277	18277	.4375	7/16"	11.113	7/16"	2-3/4"	1"	47.01	44.97	42.92	40.88
16287	17287	18287	.4531	29/64"	11.509	1/2"	3"	1"	72.31	69.17	66.02	62.88
16297	17297	18297	.4688	15/32"	11.908	1/2"	3"	1"	72.31	69.17	66.02	62.88
47167	38167	48167	.4724		12.000	12.0	75	25	69.13	66.12	63.12	60.11
16307	17307	18307	.4844	31/64"	12.304	1/2"	3"	1"	72.31	69.17	66.02	62.88
16317	17317	18317	.5000	1/2"	12.700	1/2"	3"	1"	66.32	63.44	60.55	57.67
47177	38177	48177	.5512		14.000	14.0	88	32	100.57	96.20	91.82	87.45
16327	17327	18327	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	96.44	92.25	88.05	83.86
16337	17337	18337	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	105.58	100.99	96.40	91.81
47187	38187	48187	.6299		16.000	16.0	88	38	110.17	105.38	100.59	95.80
16347	17347	18347	.6875	11/16"	17.463	3/4"	4"	1-1/2"	169.14	161.79	154.43	147.08
47197	38197	48197	.7087		18.000	18.0	100	38	158.17	151.29	144.42	137.54
16357	17357	18357	.7500	3/4"	19.050	3/4"	4"	1-1/2"	151.41	144.83	138.24	131.66
47207	38207	48207	.7874		20.000	20.0	100	38	214.29	204.97	195.66	186.34
47217	38217	48217	.8661		22.000	22.0	100	38	235.39	225.16	214.92	204.69
-	17367	18367	.8750	7/8"	22.225	7/8"	4"	1-1/2"	240.57	230.11	219.65	209.19
47227	38227	48227	.9843		25.000	25.0	100	38	245.59	234.92	224.24	213.56
16377	17377	18377	1.000	1"	25.400	1"	4"	1-1/2"	258.50	247.26	236.02	224.78

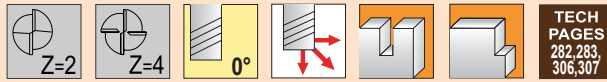
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MATERIAL HARDNESS (Rc)

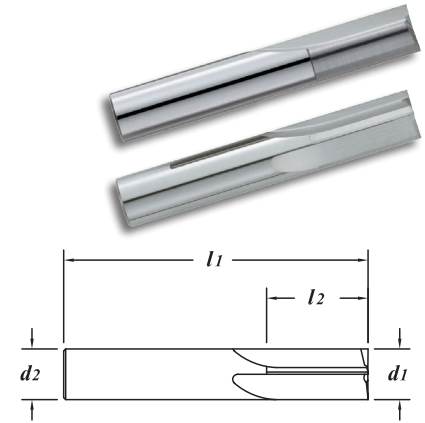
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Series 222M, 234M, 334MA



TOLERANCES

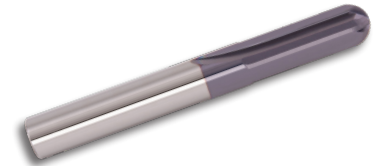
d_1	+0.000" -0.002" (+0.000 -0.050mm)
d_2	h6
ball radius	+0.000" -0.001" (+0.000 -0.025mm)



Standard Length - Straight Flute - Square End

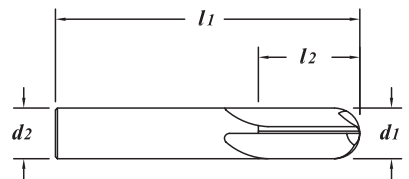
Solid submicron grain carbide end mill - center cutting
For cutting high Rc materials
Helps to hold perpendicularity

(222M) 2 Flute EDP#	(234M) 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								
81070	82070	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	10.07	9.64	9.20	8.76
81110	82110	.1875	3/16"	4.763	3/16"	2"	5/8"	14.12	13.51	12.89	12.28
81150	82150	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	17.03	16.29	15.55	14.81
81190	82190	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	23.87	22.84	21.80	20.76
81230	82230	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	29.74	28.45	27.15	25.86
81270	82270	.4375	7/16"	11.113	7/16"	2-3/4"	1"	36.29	34.72	33.14	31.56
81310	82310	.5000	1/2"	12.700	1/2"	3"	1"	47.60	45.53	43.46	41.39
81330	82330	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	91.87	87.88	83.88	79.89
81350	82350	.7500	3/4"	19.050	3/4"	4"	1-1/2"	134.69	128.83	122.98	117.12
81370	82370	1.000	1"	25.400	1"	4"	1-1/2"	221.62	211.98	202.35	192.71



Standard Length - Straight Flute - Ball End TiAlN Coating

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

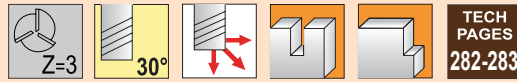


(334MA) 4 Flute EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Diameter Metric								
84077	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	14.89	14.25	13.60	12.95
84115	.1875	3/16"	4.763	3/16"	2"	5/8"	19.02	18.19	17.37	16.54
84157	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	25.19	24.09	23.00	21.90
84237	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	40.01	38.27	36.53	34.79

MATERIAL HARDNESS (Rc) 70
35
0

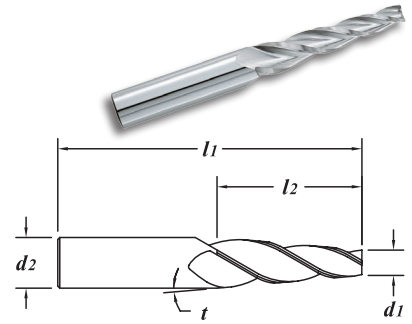
TOLERANCES

$d1$	$+0.003^{+0.000} (-0.075 -0.000\text{mm})$
$d2$	$h6$



Standard Length - Tapered - Square End

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

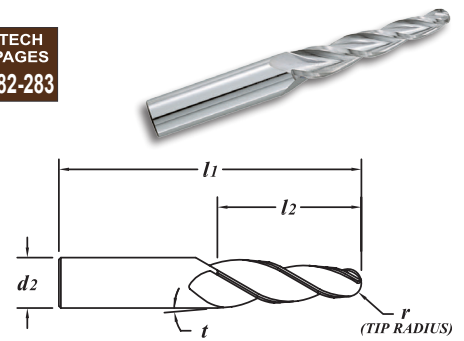


273M EDP#	$d2$ Shank Diameter	t Taper Per Side	$d1$ † Tip Diameter		$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric							
49010	1/4"	1°	.1250	1/8"	3.175	3"	1-1/2"	33.01	31.57	30.14	28.70
49020	1/4"	1° 30'	.1250	1/8"	3.175	3"	1-1/2"	33.01	31.57	30.14	28.70
49030	1/4"	2°	.1250	1/8"	3.175	3"	1"	33.01	31.57	30.14	28.70
49040	1/4"	3°	.1250	1/8"	3.175	3"	1-1/4"	33.01	31.57	30.14	28.70
49050	1/4"	5°	.1250	1/8"	3.175	3"	3/4"	33.01	31.57	30.14	28.70
49060	1/4"	7°	.1250	1/8"	3.175	3"	1/2"	33.01	31.57	30.14	28.70
49070	3/8"	1°	.1875	3/16"	4.763	3-1/2"	1-3/4"	49.58	47.42	45.27	43.11
49080	3/8"	1° 30'	.1875	3/16"	4.763	3-1/2"	1-3/4"	49.58	47.42	45.27	43.11
49090	3/8"	2°	.1875	3/16"	4.763	3-1/2"	1-3/4"	49.58	47.42	45.27	43.11
49100	3/8"	3°	.1562	5/32"	3.967	3-1/2"	1-3/4"	49.58	47.42	45.27	43.11
49110	3/8"	5°	.1250	1/8"	3.175	3-1/2"	1-1/2"	49.58	47.42	45.27	43.11
49120	3/8"	7°	.1562	5/32"	3.967	3-1/2"	1"	49.58	47.42	45.27	43.11
49130	1/2"	3°	.2500	1/4"	6.350	4"	2"	68.29	65.32	62.35	59.38
49140	1/2"	5°	.2500	1/4"	6.350	4"	1-1/2"	68.29	65.32	62.35	59.38
49150	1/2"	7°	.1875	3/16"	4.763	4"	1-5/16"	68.29	65.32	62.35	59.38



Standard Length - Tapered - Ball End

Solid submicron grain carbide end mill - center cutting
Excellent for holding draft angles in mold and die applications
Radius tolerance $+0.003^{+0.000} (-0.075\text{mm} -0.000\text{mm})$



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"	36.62	35.02	33.43	31.84
50020	1/4"	1° 30'	.0620	.062"	1.575	3"	1-1/2"	36.62	35.02	33.43	31.84
50030	1/4"	2°	.0620	.062"	1.575	3"	1"	36.62	35.02	33.43	31.84
50040	1/4"	3°	.0620	.062"	1.575	3"	1-1/4"	36.62	35.02	33.43	31.84
50050	1/4"	5°	.0620	.062"	1.575	3"	3/4"	36.62	35.02	33.43	31.84
50060	1/4"	7°	.0620	.062"	1.575	3"	1/2"	36.62	35.02	33.43	31.84
50070	3/8"	1°	.0930	.093"	2.362	3-1/2"	1-3/4"	55.05	52.66	50.26	47.87
50080	3/8"	1° 30'	.0930	.093"	2.362	3-1/2"	1-3/4"	55.05	52.66	50.26	47.87
50090	3/8"	2°	.0930	.093"	2.362	3-1/2"	1-3/4"	55.05	52.66	50.26	47.87
50100	3/8"	3°	.0780	.078"	1.981	3-1/2"	1-3/4"	55.05	52.66	50.26	47.87
50110	3/8"	5°	.0620	.062"	1.575	3-1/2"	1-1/2"	55.05	52.66	50.26	47.87
50120	3/8"	7°	.0780	.078"	1.981	3-1/2"	1"	55.05	52.66	50.26	47.87
50130	1/2"	3°	.1250	.125"	3.175	4"	2"	78.50	75.09	71.67	68.26
50140	1/2"	5°	.1250	.125"	3.175	4"	1-1/2"	78.50	75.09	71.67	68.26
50150	1/2"	7°	.0930	.093"	2.362	4"	1-5/16"	78.50	75.09	71.67	68.26

70

35

MATERIAL HARDNESS (Rc)

0

Series 620M, 623M, 630M, 640M, 643M, 650M

.1181" - .3150"
(3.000mm - 8.000mm)



TECH
PAGES
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TOLERANCES	
d_1	+0.000" - .002" (+0.000 - .050mm)
d_2	h6

Extra Length

Solid submicron grain carbide end mill - center cutting

Extended reach

Can be modified with a neck within 48 hours

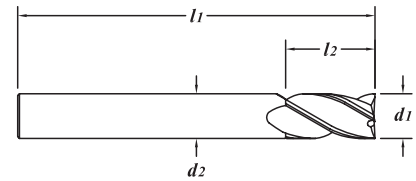
Extremely versatile

TiCN Coating - page 238

TiALN Coating - page 239

Stub Length - page 207

Standard length - page 216



MATERIAL HARDNESS (Rc)
70
35
0

(620M/640M) 2 Flute EDP#	(623M/643M) 3 Flute EDP#	(630M/650M) 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							
92010	93010	94010	.1181	3.000	3.0	50	16	12.72	12.17	11.61	11.06
92020	93020	94020	.1181	3.000	3.0	75	20	21.60	20.66	19.72	18.78
92030	93030	94030	.1181	3.000	3.0	75	25	21.60	20.66	19.72	18.78
41010	54510	42010	.1250	1/8"	3.175	1/8"	2"	13.29	12.72	12.14	11.56
41020	54520	42020	.1250	1/8"	3.175	1/8"	3"	20.53	19.64	18.74	17.85
41030	54530	42030	.1250	1/8"	3.175	1/8"	3"	20.53	19.64	18.74	17.85
92040	93040	94040	.1575	4.000	4.0	50	16	13.36	12.78	12.20	11.62
92050	93050	94050	.1575	4.000	4.0	75	20	22.10	21.14	20.18	19.22
92060	93060	94060	.1575	4.000	4.0	75	25	22.10	21.14	20.18	19.22
41040	54540	42040	.1875	3/16"	4.763	3/16"	3"	22.64	21.66	20.67	19.69
41050	54550	42050	.1875	3/16"	4.763	3/16"	3"	22.64	21.66	20.67	19.69
41060	54560	42060	.1875	3/16"	4.763	3/16"	4"	25.01	23.93	22.84	21.75
92080	93080	94080	.1969	5.000	5.0	75	20	23.84	22.80	21.77	20.73
92090	93090	94090	.1969	5.000	5.0	75	25	23.84	22.80	21.77	20.73
92100	93100	94100	.2362	6.000	6.0	75	25	27.62	26.42	25.22	24.02
92110	93110	94110	.2362	6.000	6.0	100	25	29.14	27.87	26.61	25.34
92120	93120	94120	.2362	6.000	6.0	100	32	29.14	27.87	26.61	25.34
92130	93130	94130	.2362	6.000	6.0	150	38	39.43	37.72	36.00	34.29
41070	54570	42070	.2500	1/4"	6.350	1/4"	3"	26.22	25.08	23.94	22.80
41080	54580	42080	.2500	1/4"	6.350	1/4"	4"	27.69	26.49	25.28	24.08
41090	54590	42090	.2500	1/4"	6.350	1/4"	4"	27.69	26.49	25.28	24.08
41100	54600	42100	.2500	1/4"	6.350	1/4"	6"	37.44	35.82	34.19	32.56
41110	54610	42110	.3125	5/16"	7.938	5/16"	3"	32.36	30.95	29.55	28.14
41120	54620	42120	.3125	5/16"	7.938	5/16"	4"	36.13	34.56	32.99	31.42
41130	54630	42130	.3125	5/16"	7.938	5/16"	4"	36.13	34.56	32.99	31.42
41140	54640	42140	.3125	5/16"	7.938	5/16"	6"	53.58	51.25	48.92	46.59
92140	93140	94140	.3150	8.000	8.0	75	25	34.09	32.60	31.12	29.64
92150	93150	94150	.3150	8.000	8.0	100	25	38.01	36.36	34.70	33.05
92160	93160	94160	.3150	8.000	8.0	100	41	38.01	36.36	34.70	33.05
92170	93170	94170	.3150	8.000	8.0	150	50	54.95	52.56	50.17	47.78

Series 620M, 623M, 630M, 640M, 643M, 650M (continued)

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

GENERAL PURPOSE
END MILLS

(620M/640M) 2 Flute EDP#	(623M/643M) 3 Flute EDP#	(630M/650M) 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
41150	54650	42150	.3750	3/8"	9.525	3/8"	3"	1"	36.41	34.83	33.24	31.66
41160	54660	42160	.3750	3/8"	9.525	3/8"	4"	1"	39.97	38.24	36.50	34.76
41170	54670	42170	.3750	3/8"	9.525	3/8"	4"	2"	39.97	38.24	36.50	34.76
41180	54680	42180	.3750	3/8"	9.525	3/8"	6"	1-1/2"	58.26	55.73	53.19	50.66
41190	54690	42190	.3750	3/8"	9.525	3/8"	6"	3"	58.26	55.73	53.19	50.66
92180	93180	94180	.3937		10.000	10.0	75	25	39.53	37.81	36.09	34.37
92190	93190	94190	.3937		10.000	10.0	100	25	50.96	48.74	46.53	44.31
92200	93200	94200	.3937		10.000	10.0	100	50	50.96	48.74	46.53	44.31
92210	93210	94210	.3937		10.000	10.0	150	38	67.03	64.12	61.20	58.29
92220	93220	94220	.3937		10.000	10.0	150	75	67.03	64.12	61.20	58.29
41200	54700	42200	.4375	7/16"	11.113	7/16"	4"	1"	55.03	52.64	50.24	47.85
41210	54710	42210	.4375	7/16"	11.113	7/16"	4"	2"	55.03	52.64	50.24	47.85
41220	54720	42220	.4375	7/16"	11.113	7/16"	6"	1-1/2"	73.15	69.97	66.79	63.61
41230	54730	42230	.4375	7/16"	11.113	7/16"	6"	3"	73.15	69.97	66.79	63.61
92230	93230	94230	.4724		12.000	12.0	100	25	62.07	59.37	56.67	53.97
92240	93240	94240	.4724		12.000	12.0	100	50	62.07	59.37	56.67	53.97
92250	93250	94250	.4724		12.000	12.0	150	50	84.63	80.95	77.27	73.59
92260	93260	94260	.4724		12.000	12.0	150	75	84.63	80.95	77.27	73.59
41240	54740	42240	.5000	1/2"	12.700	1/2"	4"	1"	58.54	55.99	53.45	50.90
41250	54750	42250	.5000	1/2"	12.700	1/2"	4"	2"	58.54	55.99	53.45	50.90
41260	54760	42260	.5000	1/2"	12.700	1/2"	6"	1-1/2"	84.63	80.95	77.27	73.59
41270	54770	42270	.5000	1/2"	12.700	1/2"	6"	3"	84.63	80.95	77.27	73.59
92270	93270	94270	.5512		14.000	14.0	100	25	85.20	81.50	77.79	74.09
92280	93280	94280	.5512		14.000	14.0	100	50	85.20	81.50	77.79	74.09
92290	93290	94290	.5512		14.000	14.0	150	50	111.09	106.26	101.43	96.60
92300	93300	94300	.5512		14.000	14.0	150	75	111.09	106.26	101.43	96.60
41280	54780	42280	.5625	9/16"	14.288	9/16"	6"	2"	111.10	106.27	101.44	96.61
41290	54790	42290	.5625	9/16"	14.288	9/16"	6"	3"	111.10	106.27	101.44	96.61
41300	54800	42300	.6250	5/8"	15.875	5/8"	6"	2"	120.62	115.38	110.13	104.89
41310	54810	42310	.6250	5/8"	15.875	5/8"	6"	3"	120.62	115.38	110.13	104.89
92310	93310	94310	.6299		16.000	16.0	150	50	120.62	115.38	110.13	104.89
92320	93320	94320	.6299		16.000	16.0	150	75	120.62	115.38	110.13	104.89
92330	93330	94330	.7087		18.000	18.0	150	50	181.37	173.48	165.60	157.71
92340	93340	94340	.7087		18.000	18.0	150	75	181.37	173.48	165.60	157.71
41320	54820	42320	.7500	3/4"	19.050	3/4"	6"	2"	192.17	183.81	175.46	167.10
41330	54830	42330	.7500	3/4"	19.050	3/4"	6"	3"	192.17	183.81	175.46	167.10
92350	93350	94350	.7874		20.000	20.0	150	50	202.43	193.63	184.83	176.03
92360	93360	94360	.7874		20.000	20.0	150	75	202.43	193.63	184.83	176.03
92370	93370	94370	.9843		25.000	25.0	150	50	311.94	298.38	284.81	271.25
-	93380	94380	.9843		25.000	25.0	150	75	311.94	298.38	284.81	271.25
41340	54840	42340	1.000	1"	25.400	1"	6"	2"	326.69	312.49	298.28	284.08
41350	54850	42350	1.000	1"	25.400	1"	6"	3"	326.69	312.49	298.28	284.08
-	-	42360	1.000	1"	25.400	1"	6"	4"	343.87	328.92	313.97	299.02
-	-	42390	1.250	1-1/4"	31.750	1-1/4"	6"	3"	693.11	662.97	632.84	602.70

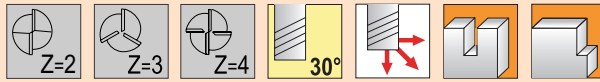
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MATERIAL HARDNESS (Rc)

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Series 620MC, 623MC, 630MC

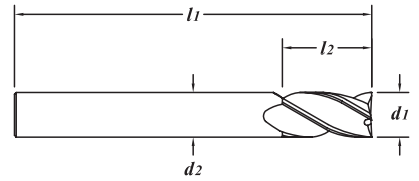


TECH
PAGES
282-283

TOLERANCES	
$d1$	+0.000" -0.002" (+0.000 -0.050mm)
$d2$	h6

Extra Length TiCN Coating

- Solid submicron grain carbide end mill - center cutting
- Extended reach
- Improved abrasion resistance and lubricity
- Can be modified with a neck within 48 hours
- Extremely versatile
- Uncoated - page 236
- TiALN Coating - page 239
- Standard length - page 219



MATERIAL HARDNESS (Rc)

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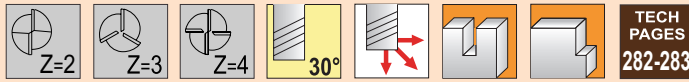
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(620MC) 2 Flute EDP#	(623MC) 3 Flute EDP#	(630MC) 4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
41014	54514	42014	.1250	1/8"	3.175	1/8"	2"	5/8"	15.66	14.98	14.30	13.62
41024	54524	42024	.1250	1/8"	3.175	1/8"	3"	3/4"	23.40	22.39	21.37	20.35
41034	54534	42034	.1250	1/8"	3.175	1/8"	3"	1"	23.40	22.39	21.37	20.35
41044	54544	42044	.1875	3/16"	4.763	3/16"	3"	1"	25.98	24.85	23.72	22.59
41054	54554	42054	.1875	3/16"	4.763	3/16"	3"	1-1/8"	25.98	24.85	23.72	22.59
41064	54564	42064	.1875	3/16"	4.763	3/16"	4"	1"	28.87	27.61	26.36	25.10
41074	54574	42074	.2500	1/4"	6.350	1/4"	3"	1"	31.06	29.71	28.36	27.01
41084	54584	42084	.2500	1/4"	6.350	1/4"	4"	1"	32.90	31.47	30.04	28.61
41094	54594	42094	.2500	1/4"	6.350	1/4"	4"	1-1/2"	32.90	31.47	30.04	28.61
41104	54604	42104	.2500	1/4"	6.350	1/4"	6"	1-1/2"	46.47	44.45	42.43	40.41
41114	54614	42114	.3125	5/16"	7.938	5/16"	3"	1"	38.81	37.13	35.44	33.75
41124	54624	42124	.3125	5/16"	7.938	5/16"	4"	1"	44.11	42.20	40.28	38.36
41134	54634	42134	.3125	5/16"	7.938	5/16"	4"	1-5/8"	44.11	42.20	40.28	38.36
41144	54644	42144	.3125	5/16"	7.938	5/16"	6"	1-1/2"	64.37	61.57	58.77	55.97
41154	54654	42154	.3750	3/8"	9.525	3/8"	3"	1"	42.85	40.99	39.12	37.26
41164	54664	42164	.3750	3/8"	9.525	3/8"	4"	1"	48.01	45.93	43.84	41.75
41174	54674	42174	.3750	3/8"	9.525	3/8"	4"	2"	48.01	45.93	43.84	41.75
41184	54684	42184	.3750	3/8"	9.525	3/8"	6"	1-1/2"	69.07	66.07	63.06	60.06
41194	54694	42194	.3750	3/8"	9.523	3/8"	6"	3"	69.07	66.07	63.06	60.06
41204	54704	42204	.4375	7/16"	11.113	7/16"	4"	1"	64.68	61.86	59.05	56.24
41214	54714	42214	.4375	7/16"	11.113	7/16"	4"	2"	64.68	61.86	59.05	56.24
41224	54724	42224	.4375	7/16"	11.113	7/16"	6"	1-1/2"	86.83	83.05	79.28	75.50
-	54734	42234	.4375	7/16"	11.113	7/16"	6"	3"	86.83	83.05	79.28	75.50
41244	54744	42244	.5000	1/2"	12.700	1/2"	4"	1"	68.17	65.21	62.24	59.28
41254	54754	42254	.5000	1/2"	12.700	1/2"	4"	2"	68.17	65.21	62.24	59.28
41264	54764	42264	.5000	1/2"	12.700	1/2"	6"	1-1/2"	98.30	94.03	89.75	85.48
41274	54774	42274	.5000	1/2"	12.700	1/2"	6"	3"	98.30	94.03	89.75	85.48
41284	54784	42284	.5625	9/16"	14.288	9/16"	6"	2"	127.97	122.41	116.84	111.28
41294	-	42294	.5625	9/16"	14.288	9/16"	6"	3"	127.97	122.41	116.84	111.28
41304	54804	42304	.6250	5/8"	15.875	5/8"	6"	2"	137.49	131.52	125.54	119.56
41314	54814	42314	.6250	5/8"	15.875	5/8"	6"	3"	137.49	131.52	125.54	119.56
41324	54824	42324	.7500	3/4"	19.050	3/4"	6"	2"	211.43	202.24	193.04	183.85
41334	54834	42334	.7500	3/4"	19.050	3/4"	6"	3"	211.43	202.24	193.04	183.85
41344	54844	42344	1.000	1"	25.400	1"	6"	2"	353.97	338.58	323.19	307.80
41354	54854	42354	1.000	1"	25.400	1"	6"	3"	353.97	338.58	323.19	307.80
-	-	42364	1.000	1"	25.400	1"	6"	4"	371.14	355.00	338.87	322.73
-	-	42394	1.250	1-1/4"	31.750	1-1/4"	6"	3"	730.89	699.12	667.34	635.56

TOLERANCES

d_1	+0.00" -0.002" (+.000 -0.050mm)
d_2	h6

Series 620MA, 623MA, 630MA, 640MA, 643MA, 650MA

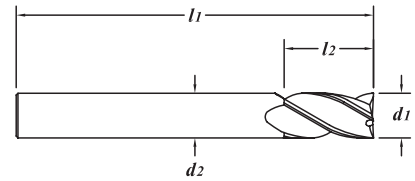


.1181" - .3150"
(3.000mm - 8.000mm)

**GENERAL PURPOSE
END MILLS**

**Extra Length
TiAlN Coating**

- Solid submicron grain carbide end mill - center cutting
- Extended reach
- Dry or semi-dry machining
- Can be modified with a neck within 48 hours
- Extremely versatile
- Uncoated - page 236
- TiCN Coating - page 238
- Stub Length - page 209
- Standard length - page 220



(620MA/640MA) 2 Flute EDP#	(623MA/643MA) 3 Flute EDP#	(630MA/650MA) 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	14.85	14.20	13.56	12.91	
92027	93027	94027	.1181	3.000	3.0	75	20	24.29	23.23	22.18	21.12	
92037	93037	94037	.1181	3.000	3.0	75	25	24.29	23.23	22.18	21.12	
41017	54517	42017	.1250	1/8"	3.175	1/8"	2"	5/8"	16.01	15.31	14.62	13.92
41027	54527	42027	.1250	1/8"	3.175	1/8"	3"	3/4"	23.82	22.78	21.75	20.71
41037	54537	42037	.1250	1/8"	3.175	1/8"	3"	1"	23.82	22.78	21.75	20.71
92047	93047	94047	.1575	4.000	4.0	50	16	16.05	15.36	14.66	13.96	
92057	93057	94057	.1575	4.000	4.0	75	20	26.28	25.14	23.99	22.85	
92067	93067	94067	.1575	4.000	4.0	75	25	26.28	25.14	23.99	22.85	
41047	54547	42047	.1875	3/16"	4.763	3/16"	3"	1"	26.84	25.67	24.51	23.34
41057	54557	42057	.1875	3/16"	4.763	3/16"	3"	1-1/8"	26.84	25.67	24.51	23.34
41067	54567	42067	.1875	3/16"	4.763	3/16"	4"	1"	29.90	28.60	27.30	26.00
92087	93087	94087	.1969	5.000	5.0	75	20	29.37	28.09	26.82	25.54	
92097	93097	94097	.1969	5.000	5.0	75	25	29.37	28.09	26.82	25.54	
92107	93107	94107	.2362	6.000	6.0	75	25	33.15	31.71	30.27	28.83	
92117	93117	94117	.2362	6.000	6.0	100	25	35.65	34.10	32.55	31.00	
92127	93127	94127	.2362	6.000	6.0	100	32	35.65	34.10	32.55	31.00	
92137	93137	94137	.2362	6.000	6.0	150	38	48.61	46.50	44.38	42.27	
41077	54577	42077	.2500	1/4"	6.350	1/4"	3"	1"	31.79	30.40	29.02	27.64
41087	54587	42087	.2500	1/4"	6.350	1/4"	4"	1"	34.19	32.70	31.22	29.73
41097	54597	42097	.2500	1/4"	6.350	1/4"	4"	1-1/2"	34.19	32.70	31.22	29.73
41107	54607	42107	.2500	1/4"	6.350	1/4"	6"	1-1/2"	46.63	44.61	42.58	40.55
41117	54617	42117	.3125	5/16"	7.938	5/16"	3"	1"	40.69	38.92	37.15	35.38
41127	54627	42127	.3125	5/16"	7.938	5/16"	4"	1"	46.68	44.65	42.62	40.59
41137	54637	42137	.3125	5/16"	7.938	5/16"	4"	1-5/8"	46.68	44.65	42.62	40.59
41147	54647	42147	.3125	5/16"	7.938	5/16"	6"	1-1/2"	68.05	65.09	62.13	59.17
92147	93147	94147	.3150	8.000	8.0	75	25	42.38	40.54	38.69	36.85	
92157	93157	94157	.3150	8.000	8.0	100	25	48.58	46.46	44.35	42.24	
92167	93167	94167	.3150	8.000	8.0	100	41	48.58	46.46	44.35	42.24	
92177	93177	94177	.3150	8.000	8.0	150	50	69.41	66.40	63.38	60.36	

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MATERIAL HARDNESS (Rc)

0

continued →

Series 620MA, 623MA, 630MA, 640MA, 643MA, 650MA (continued)

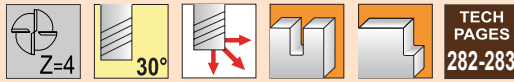
.3750" - 1.250"
(9.525mm - 31.750mm)

(620MA/640MA) 2 Flute EDP#	(623MA/643MA) 3 Flute EDP#	(630MA/650MA) 4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Metric								
41157	54657	42157	.3750	3/8"	9.525	3/8"	3"	1"	44.75	42.80	40.86	38.91
41167	54667	42167	.3750	3/8"	9.525	3/8"	4"	1"	50.55	48.36	46.16	43.96
41177	54677	42177	.3750	3/8"	9.525	3/8"	4"	2"	50.55	48.36	46.16	43.96
41187	54687	42187	.3750	3/8"	9.525	3/8"	6"	1-1/2"	72.73	69.56	66.40	63.24
41197	54697	42197	.3750	3/8"	9.525	3/8"	6"	3"	72.73	69.56	66.40	63.24
92187	93187	94187	.3937		10.000	10.0	75	25	48.98	46.85	44.72	42.59
92197	93197	94197	.3937		10.000	10.0	100	25	63.19	60.45	57.70	54.95
92207	93207	94207	.3937		10.000	10.0	100	50	63.19	60.45	57.70	54.95
92217	93217	94217	.3937		10.000	10.0	150	38	84.24	80.58	76.91	73.25
92227	93227	94227	.3937		10.000	10.0	150	75	84.24	80.58	76.91	73.25
41207	54707	42207	.4375	7/16"	11.113	7/16"	4"	1"	67.26	64.34	61.41	58.49
41217	54717	42217	.4375	7/16"	11.113	7/16"	4"	2"	67.26	64.34	61.41	58.49
41227	54727	42227	.4375	7/16"	11.113	7/16"	6"	1-1/2"	90.37	86.44	82.51	78.58
41237	54737	42237	.4375	7/16"	11.113	7/16"	6"	3"	90.37	86.44	82.51	78.58
92237	93237	94237	.4724		12.000	12.0	100	25	74.29	71.06	67.83	64.60
92247	93247	94247	.4724		12.000	12.0	100	50	74.29	71.06	67.83	64.60
92257	93257	94257	.4724		12.000	12.0	150	50	101.83	97.41	92.98	88.55
92267	93267	94267	.4724		12.000	12.0	150	75	101.83	97.41	92.98	88.55
41247	54747	42247	.5000	1/2"	12.700	1/2"	4"	1"	70.77	67.69	64.62	61.54
41257	54757	42257	.5000	1/2"	12.700	1/2"	4"	2"	70.77	67.69	64.62	61.54
41267	54767	42267	.5000	1/2"	12.700	1/2"	6"	1-1/2"	101.83	97.41	92.98	88.55
41277	54777	42277	.5000	1/2"	12.700	1/2"	6"	3"	101.83	97.41	92.98	88.55
92277	93277	94277	.5512		14.000	14.0	100	25	98.88	94.58	90.28	85.98
92287	93287	94287	.5512		14.000	14.0	100	50	98.88	94.58	90.28	85.98
-	93297	94297	.5512		14.000	14.0	150	50	131.39	125.68	119.96	114.25
92307	93307	94307	.5512		14.000	14.0	150	75	131.39	125.68	119.96	114.25
41287	54787	42287	.5625	9/16"	14.288	9/16"	6"	2"	131.39	125.68	119.96	114.25
-	54797	42297	.5625	9/16"	14.288	9/16"	6"	3"	131.39	125.68	119.96	114.25
41307	54807	42307	.6250	5/8"	15.875	5/8"	6"	2"	140.93	134.81	128.68	122.55
41317	54817	42317	.6250	5/8"	15.875	5/8"	6"	3"	140.93	134.81	128.68	122.55
92317	93317	94317	.6299		16.000	16.0	150	50	140.93	134.81	128.68	122.55
92327	93327	94327	.6299		16.000	16.0	150	75	140.93	134.81	128.68	122.55
-	-	94337	.7087		18.000	18.0	150	50	204.87	195.97	187.06	178.15
-	93347	94347	.7087		18.000	18.0	150	75	204.87	195.97	187.06	178.15
41327	54827	42327	.7500	3/4"	19.050	3/4"	6"	2"	215.67	206.29	196.92	187.54
41337	54837	42337	.7500	3/4"	19.050	3/4"	6"	3"	215.67	206.29	196.92	187.54
92357	93357	94357	.7874		20.000	20.0	150	50	232.97	222.84	212.71	202.58
92367	93367	94367	.7874		20.000	20.0	150	75	232.97	222.84	212.71	202.58
-	93377	94377	.9843		25.000	25.0	150	50	342.46	327.57	312.68	297.79
92387	93387	94387	.9843		25.000	25.0	150	75	342.46	327.57	312.68	297.79
41347	54847	42347	1.000	1"	25.400	1"	6"	2"	357.20	341.67	326.14	310.61
41357	54857	42357	1.000	1"	25.400	1"	6"	3"	357.20	341.67	326.14	310.61
-	-	42367	1.000	1"	25.400	1"	6"	4"	374.39	358.12	341.84	325.56
-	-	42397	1.250	1-1/4"	31.750	1-1/4"	6"	3"	732.22	700.38	668.55	636.71

MATERIAL HARDNESS (Rc)
70
35
0

TOLERANCES

d_1	+0.00" - .002" (+.000 - .050mm)
d_2	h6
r	+0.01" - .001" (+.025 - .025mm)



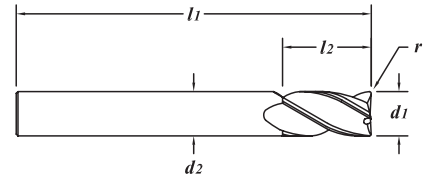
Series 630R

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

**GENERAL PURPOSE
END MILLS**

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 Coating - page 244
- Stub length - page 210
- Standard length - page 222



EDP#	d_1 †		d_2	l_1	l_2	r	1-11	12-24	25-49	50-100	
	Decimal	Diameter									Metric
20100	.1250	1/8"	3.175	1/8"	3"	1"	.010"	24.15	23.10	22.05	21.00
20110	.1250	1/8"	3.175	1/8"	3"	1"	.015"	24.15	23.10	22.05	21.00
20120	.1250	1/8"	3.175	1/8"	3"	1"	.020"	24.15	23.10	22.05	21.00
20130	.1250	1/8"	3.175	1/8"	3"	1"	.030"	24.15	23.10	22.05	21.00
20140	.1250	1/8"	3.175	1/8"	3"	1"	.045"	24.15	23.10	22.05	21.00
20150	.1875	3/16"	4.763	3/16"	3"	1"	.010"	26.63	25.48	24.32	23.16
20160	.1875	3/16"	4.763	3/16"	3"	1"	.015"	26.63	25.48	24.32	23.16
20170	.1875	3/16"	4.763	3/16"	3"	1"	.020"	26.63	25.48	24.32	23.16
20180	.1875	3/16"	4.763	3/16"	3"	1"	.030"	26.63	25.48	24.32	23.16
20190	.1875	3/16"	4.763	3/16"	3"	1"	.045"	26.63	25.48	24.32	23.16
20200	.1875	3/16"	4.763	3/16"	3"	1"	.060"	26.63	25.48	24.32	23.16
20210	.1875	3/16"	4.763	3/16"	4"	1"	.010"	28.67	27.42	26.18	24.93
20220	.1875	3/16"	4.763	3/16"	4"	1"	.015"	28.67	27.42	26.18	24.93
20230	.1875	3/16"	4.763	3/16"	4"	1"	.020"	28.67	27.42	26.18	24.93
20240	.1875	3/16"	4.763	3/16"	4"	1"	.030"	28.67	27.42	26.18	24.93
20250	.1875	3/16"	4.763	3/16"	4"	1"	.045"	28.67	27.42	26.18	24.93
20260	.1875	3/16"	4.763	3/16"	4"	1"	.060"	28.67	27.42	26.18	24.93
20270	.2500	1/4"	6.350	1/4"	3"	1"	.010"	30.83	29.49	28.15	26.81
20280	.2500	1/4"	6.350	1/4"	3"	1"	.020"	30.83	29.49	28.15	26.81
20290	.2500	1/4"	6.350	1/4"	3"	1"	.030"	30.83	29.49	28.15	26.81
20300	.2500	1/4"	6.350	1/4"	3"	1"	.045"	30.83	29.49	28.15	26.81
20310	.2500	1/4"	6.350	1/4"	3"	1"	.060"	30.83	29.49	28.15	26.81
20320	.2500	1/4"	6.350	1/4"	4"	1"	.010"	32.43	31.02	29.61	28.20
20330	.2500	1/4"	6.350	1/4"	4"	1"	.020"	32.43	31.02	29.61	28.20
20340	.2500	1/4"	6.350	1/4"	4"	1"	.030"	32.43	31.02	29.61	28.20
20350	.2500	1/4"	6.350	1/4"	4"	1"	.045"	32.43	31.02	29.61	28.20
20360	.2500	1/4"	6.350	1/4"	4"	1"	.060"	32.43	31.02	29.61	28.20
20370	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.010"	42.17	40.34	38.50	36.67
20380	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.020"	42.17	40.34	38.50	36.67
20390	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.030"	42.17	40.34	38.50	36.67
20400	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.045"	42.17	40.34	38.50	36.67
20410	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.060"	42.17	40.34	38.50	36.67
20420	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.010"	42.49	40.65	38.80	36.95
20430	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.020"	42.49	40.65	38.80	36.95
20440	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.030"	42.49	40.65	38.80	36.95
20450	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.045"	42.49	40.65	38.80	36.95
20460	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.060"	42.49	40.65	38.80	36.95
20470	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.090"	42.49	40.65	38.80	36.95
20480	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.125"	42.49	40.65	38.80	36.95

70

35

MATERIAL HARDNESS (Rc)

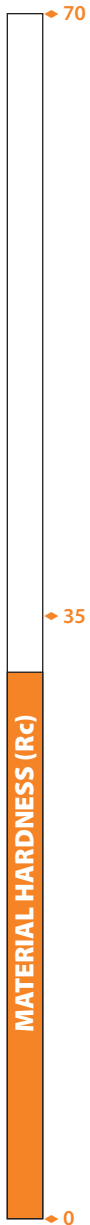
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continued →

Series 630R (continued)

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

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"	47.01	44.97	42.92	40.88
20500	.3750	3/8"	9.525	3/8"	4"	1"	.020"	47.01	44.97	42.92	40.88
20510	.3750	3/8"	9.525	3/8"	4"	1"	.030"	47.01	44.97	42.92	40.88
20520	.3750	3/8"	9.525	3/8"	4"	1"	.045"	47.01	44.97	42.92	40.88
20530	.3750	3/8"	9.525	3/8"	4"	1"	.060"	47.01	44.97	42.92	40.88
20540	.3750	3/8"	9.525	3/8"	4"	1"	.090"	47.01	44.97	42.92	40.88
20550	.3750	3/8"	9.525	3/8"	4"	1"	.125"	47.01	44.97	42.92	40.88
20560	.3750	3/8"	9.525	3/8"	4"	2"	.010"	47.01	44.97	42.92	40.88
20570	.3750	3/8"	9.525	3/8"	4"	2"	.020"	47.01	44.97	42.92	40.88
20580	.3750	3/8"	9.525	3/8"	4"	2"	.030"	47.01	44.97	42.92	40.88
20590	.3750	3/8"	9.525	3/8"	4"	2"	.045"	47.01	44.97	42.92	40.88
20600	.3750	3/8"	9.525	3/8"	4"	2"	.060"	47.01	44.97	42.92	40.88
20610	.3750	3/8"	9.525	3/8"	4"	2"	.090"	47.01	44.97	42.92	40.88
20620	.3750	3/8"	9.525	3/8"	4"	2"	.125"	47.01	44.97	42.92	40.88
20630	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.010"	64.57	61.77	58.96	56.15
20640	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.020"	64.57	61.77	58.96	56.15
20650	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.030"	64.57	61.77	58.96	56.15
20660	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.045"	64.57	61.77	58.96	56.15
20670	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.060"	64.57	61.77	58.96	56.15
20680	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.090"	64.57	61.77	58.96	56.15
20690	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.125"	64.57	61.77	58.96	56.15
20700	.5000	1/2"	12.700	1/2"	4"	1"	.015"	66.11	63.24	60.36	57.49
20710	.5000	1/2"	12.700	1/2"	4"	1"	.020"	66.11	63.24	60.36	57.49
20720	.5000	1/2"	12.700	1/2"	4"	1"	.030"	66.11	63.24	60.36	57.49
20730	.5000	1/2"	12.700	1/2"	4"	1"	.045"	66.11	63.24	60.36	57.49
20740	.5000	1/2"	12.700	1/2"	4"	1"	.060"	66.11	63.24	60.36	57.49
20750	.5000	1/2"	12.700	1/2"	4"	1"	.090"	66.11	63.24	60.36	57.49
20760	.5000	1/2"	12.700	1/2"	4"	1"	.125"	66.11	63.24	60.36	57.49
20770	.5000	1/2"	12.700	1/2"	4"	2"	.015"	66.11	63.24	60.36	57.49
20780	.5000	1/2"	12.700	1/2"	4"	2"	.020"	66.11	63.24	60.36	57.49
20790	.5000	1/2"	12.700	1/2"	4"	2"	.030"	66.11	63.24	60.36	57.49
20800	.5000	1/2"	12.700	1/2"	4"	2"	.045"	66.11	63.24	60.36	57.49
20810	.5000	1/2"	12.700	1/2"	4"	2"	.060"	66.11	63.24	60.36	57.49
20820	.5000	1/2"	12.700	1/2"	4"	2"	.090"	66.11	63.24	60.36	57.49
20830	.5000	1/2"	12.700	1/2"	4"	2"	.125"	66.11	63.24	60.36	57.49
20840	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.015"	93.64	89.57	85.50	81.43
20850	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.020"	93.64	89.57	85.50	81.43
20860	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.030"	93.64	89.57	85.50	81.43
20870	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.045"	93.64	89.57	85.50	81.43
20880	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.060"	93.64	89.57	85.50	81.43
20890	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.090"	93.64	89.57	85.50	81.43
20900	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.125"	93.64	89.57	85.50	81.43
20910	.6250	5/8"	15.875	5/8"	6"	2"	.010"	137.70	131.71	125.73	119.74
20920	.6250	5/8"	15.875	5/8"	6"	2"	.015"	137.70	131.71	125.73	119.74
20930	.6250	5/8"	15.875	5/8"	6"	2"	.020"	137.70	131.71	125.73	119.74
20940	.6250	5/8"	15.875	5/8"	6"	2"	.030"	137.70	131.71	125.73	119.74
20950	.6250	5/8"	15.875	5/8"	6"	2"	.045"	137.70	131.71	125.73	119.74
20960	.6250	5/8"	15.875	5/8"	6"	2"	.060"	137.70	131.71	125.73	119.74
20970	.6250	5/8"	15.875	5/8"	6"	2"	.090"	137.70	131.71	125.73	119.74
20980	.6250	5/8"	15.875	5/8"	6"	2"	.125"	137.70	131.71	125.73	119.74



EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	1-11	12-24	25-49	50-100	
	Decimal	Diameter									Metric
20990	.7500	3/4"	19.050	3/4"	6"	3"	.015"	225.98	216.15	206.33	196.50
21000	.7500	3/4"	19.050	3/4"	6"	3"	.020"	225.98	216.15	206.33	196.50
21010	.7500	3/4"	19.050	3/4"	6"	3"	.030"	225.98	216.15	206.33	196.50
21020	.7500	3/4"	19.050	3/4"	6"	3"	.045"	225.98	216.15	206.33	196.50
21030	.7500	3/4"	19.050	3/4"	6"	3"	.060"	225.98	216.15	206.33	196.50
21040	.7500	3/4"	19.050	3/4"	6"	3"	.090"	225.98	216.15	206.33	196.50
21050	.7500	3/4"	19.050	3/4"	6"	3"	.125"	225.98	216.15	206.33	196.50
21140	.7500	3/4"	19.050	3/4"	6"	3"	.250"	225.98	216.15	206.33	196.50
21060	1.000	1"	25.400	1"	6"	3"	.015"	384.26	367.55	350.85	334.14
21070	1.000	1"	25.400	1"	6"	3"	.020"	384.26	367.55	350.85	334.14
21080	1.000	1"	25.400	1"	6"	3"	.030"	384.26	367.55	350.85	334.14
21090	1.000	1"	25.400	1"	6"	3"	.045"	384.26	367.55	350.85	334.14
21100	1.000	1"	25.400	1"	6"	3"	.060"	384.26	367.55	350.85	334.14
21110	1.000	1"	25.400	1"	6"	3"	.090"	384.26	367.55	350.85	334.14
21120	1.000	1"	25.400	1"	6"	3"	.125"	384.26	367.55	350.85	334.14
21130	1.000	1"	25.400	1"	6"	3"	.250"	384.26	367.55	350.85	334.14



End Mill Reconditioning

70

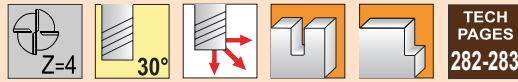
35

MATERIAL HARDNESS (Rc)

0

Series 630RA

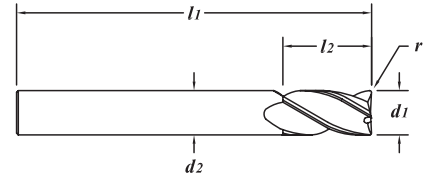
.1250" - .3125"
(3.175mm - 7.938mm)



TOLERANCES	
d_1	+0.000" - .002" (+0.000 - .050mm)
d_2	h6
r	+0.001" - .001" (+0.025 - .025mm)

Extra Length - Corner Radius TiAlN Coating

- Solid submicron grain carbide end mill - center cutting
- Extended reach
- For stronger corners and part radius
- Dry or semi-dry machining
- Can be modified with a neck within 48 hours
- Extremely versatile
- Uncoated - page 241
- Stub length - page 212
- Standard length - page 225



MATERIAL HARDNESS (Rc)
70
35
0

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									
20107	.1250	1/8"	3.175	1/8"	3"	1"	.010"	27.44	26.25	25.05	23.86
20117	.1250	1/8"	3.175	1/8"	3"	1"	.015"	27.44	26.25	25.05	23.86
20127	.1250	1/8"	3.175	1/8"	3"	1"	.020"	27.44	26.25	25.05	23.86
20137	.1250	1/8"	3.175	1/8"	3"	1"	.030"	27.44	26.25	25.05	23.86
20147	.1250	1/8"	3.175	1/8"	3"	1"	.045"	27.44	26.25	25.05	23.86
20157	.1875	3/16"	4.763	3/16"	3"	1"	.010"	30.82	29.48	28.14	26.80
20167	.1875	3/16"	4.763	3/16"	3"	1"	.015"	30.82	29.48	28.14	26.80
20177	.1875	3/16"	4.763	3/16"	3"	1"	.020"	30.82	29.48	28.14	26.80
20187	.1875	3/16"	4.763	3/16"	3"	1"	.030"	30.82	29.48	28.14	26.80
20197	.1875	3/16"	4.763	3/16"	3"	1"	.045"	30.82	29.48	28.14	26.80
20207	.1875	3/16"	4.763	3/16"	3"	1"	.060"	30.82	29.48	28.14	26.80
20217	.1875	3/16"	4.763	3/16"	4"	1"	.010"	33.55	32.09	30.63	29.17
20227	.1875	3/16"	4.763	3/16"	4"	1"	.015"	33.55	32.09	30.63	29.17
20237	.1875	3/16"	4.763	3/16"	4"	1"	.020"	33.55	32.09	30.63	29.17
20247	.1875	3/16"	4.763	3/16"	4"	1"	.030"	33.55	32.09	30.63	29.17
20257	.1875	3/16"	4.763	3/16"	4"	1"	.045"	33.55	32.09	30.63	29.17
20267	.1875	3/16"	4.763	3/16"	4"	1"	.060"	33.55	32.09	30.63	29.17
20277	.2500	1/4"	6.350	1/4"	3"	1"	.010"	36.40	34.82	33.23	31.65
20287	.2500	1/4"	6.350	1/4"	3"	1"	.020"	36.40	34.82	33.23	31.65
20297	.2500	1/4"	6.350	1/4"	3"	1"	.030"	36.40	34.82	33.23	31.65
20307	.2500	1/4"	6.350	1/4"	3"	1"	.045"	36.40	34.82	33.23	31.65
20317	.2500	1/4"	6.350	1/4"	3"	1"	.060"	36.40	34.82	33.23	31.65
20327	.2500	1/4"	6.350	1/4"	4"	1"	.010"	38.96	37.27	35.57	33.88
20337	.2500	1/4"	6.350	1/4"	4"	1"	.020"	38.96	37.27	35.57	33.88
20347	.2500	1/4"	6.350	1/4"	4"	1"	.030"	38.96	37.27	35.57	33.88
20357	.2500	1/4"	6.350	1/4"	4"	1"	.045"	38.96	37.27	35.57	33.88
20367	.2500	1/4"	6.350	1/4"	4"	1"	.060"	38.96	37.27	35.57	33.88
20377	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.010"	51.35	49.12	46.88	44.65
20387	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.020"	51.35	49.12	46.88	44.65
20397	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.030"	51.35	49.12	46.88	44.65
20407	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.045"	51.35	49.12	46.88	44.65
20417	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.060"	51.35	49.12	46.88	44.65
20427	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.010"	53.06	50.75	48.45	46.14
20437	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.020"	53.06	50.75	48.45	46.14
20447	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.030"	53.06	50.75	48.45	46.14
20457	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.045"	53.06	50.75	48.45	46.14
20467	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.060"	53.06	50.75	48.45	46.14
20477	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.090"	53.06	50.75	48.45	46.14
20487	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.125"	53.06	50.75	48.45	46.14

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"	57.58	55.08	52.57	50.07
20507	.3750	3/8"	9.525	3/8"	4"	1"	.020"	57.58	55.08	52.57	50.07
20517	.3750	3/8"	9.525	3/8"	4"	1"	.030"	57.58	55.08	52.57	50.07
20527	.3750	3/8"	9.525	3/8"	4"	1"	.045"	57.58	55.08	52.57	50.07
20537	.3750	3/8"	9.525	3/8"	4"	1"	.060"	57.58	55.08	52.57	50.07
20547	.3750	3/8"	9.525	3/8"	4"	1"	.090"	57.58	55.08	52.57	50.07
20557	.3750	3/8"	9.525	3/8"	4"	1"	.125"	57.58	55.08	52.57	50.07
20567	.3750	3/8"	9.525	3/8"	4"	2"	.010"	57.58	55.08	52.57	50.07
20577	.3750	3/8"	9.525	3/8"	4"	2"	.020"	57.58	55.08	52.57	50.07
20587	.3750	3/8"	9.525	3/8"	4"	2"	.030"	57.58	55.08	52.57	50.07
20597	.3750	3/8"	9.525	3/8"	4"	2"	.045"	57.58	55.08	52.57	50.07
20607	.3750	3/8"	9.525	3/8"	4"	2"	.060"	57.58	55.08	52.57	50.07
20617	.3750	3/8"	9.525	3/8"	4"	2"	.090"	57.58	55.08	52.57	50.07
20627	.3750	3/8"	9.525	3/8"	4"	2"	.125"	57.58	55.08	52.57	50.07
20637	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.010"	79.72	76.25	72.79	69.32
20647	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.020"	79.72	76.25	72.79	69.32
20657	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.030"	79.72	76.25	72.79	69.32
20667	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.045"	79.72	76.25	72.79	69.32
20677	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.060"	79.72	76.25	72.79	69.32
20687	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.090"	79.72	76.25	72.79	69.32
20697	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.125"	79.72	76.25	72.79	69.32
21157	.4375	7/16"	11.113	7/16"	4"	1"	.010"	77.00	73.66	70.31	66.96
21167	.4375	7/16"	11.113	7/16"	4"	1"	.015"	77.00	73.66	70.31	66.96
21177	.4375	7/16"	11.113	7/16"	4"	1"	.020"	77.00	73.66	70.31	66.96
21187	.4375	7/16"	11.113	7/16"	4"	1"	.030"	77.00	73.66	70.31	66.96
21227	.4375	7/16"	11.113	7/16"	4"	1"	.125"	77.00	73.66	70.31	66.96
20707	.5000	1/2"	12.700	1/2"	4"	1"	.015"	78.37	74.97	71.56	68.15
20717	.5000	1/2"	12.700	1/2"	4"	1"	.020"	78.37	74.97	71.56	68.15
20727	.5000	1/2"	12.700	1/2"	4"	1"	.030"	78.37	74.97	71.56	68.15
20737	.5000	1/2"	12.700	1/2"	4"	1"	.045"	78.37	74.97	71.56	68.15
20747	.5000	1/2"	12.700	1/2"	4"	1"	.060"	78.37	74.97	71.56	68.15
20757	.5000	1/2"	12.700	1/2"	4"	1"	.090"	78.37	74.97	71.56	68.15
20767	.5000	1/2"	12.700	1/2"	4"	1"	.125"	78.37	74.97	71.56	68.15
20777	.5000	1/2"	12.700	1/2"	4"	2"	.015"	78.37	74.97	71.56	68.15
20787	.5000	1/2"	12.700	1/2"	4"	2"	.020"	78.37	74.97	71.56	68.15
20797	.5000	1/2"	12.700	1/2"	4"	2"	.030"	78.37	74.97	71.56	68.15
20807	.5000	1/2"	12.700	1/2"	4"	2"	.045"	78.37	74.97	71.56	68.15
20817	.5000	1/2"	12.700	1/2"	4"	2"	.060"	78.37	74.97	71.56	68.15
20827	.5000	1/2"	12.700	1/2"	4"	2"	.090"	78.37	74.97	71.56	68.15
20837	.5000	1/2"	12.700	1/2"	4"	2"	.125"	78.37	74.97	71.56	68.15
20847	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.015"	110.84	106.02	101.20	96.38
20857	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.020"	110.84	106.02	101.20	96.38
20867	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.030"	110.84	106.02	101.20	96.38
20877	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.045"	110.84	106.02	101.20	96.38
20887	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.060"	110.84	106.02	101.20	96.38
20897	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.090"	110.84	106.02	101.20	96.38
20907	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.125"	110.84	106.02	101.20	96.38
20917	.6250	5/8"	15.875	5/8"	6"	2"	.010"	157.99	151.12	144.25	137.38
20927	.6250	5/8"	15.875	5/8"	6"	2"	.015"	157.99	151.12	144.25	137.38
20937	.6250	5/8"	15.875	5/8"	6"	2"	.020"	157.99	151.12	144.25	137.38
20947	.6250	5/8"	15.875	5/8"	6"	2"	.030"	157.99	151.12	144.25	137.38
20957	.6250	5/8"	15.875	5/8"	6"	2"	.045"	157.99	151.12	144.25	137.38
20967	.6250	5/8"	15.875	5/8"	6"	2"	.060"	157.99	151.12	144.25	137.38
20977	.6250	5/8"	15.875	5/8"	6"	2"	.090"	157.99	151.12	144.25	137.38
20987	.6250	5/8"	15.875	5/8"	6"	2"	.125"	157.99	151.12	144.25	137.38

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35

MATERIAL HARDNESS (Rc)

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continued →

Series 630RA (continued)

.7500" - 1.000"
(19.050mm - 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									
20997	.7500	3/4"	19.050	3/4"	6"	3"	.015"	249.47	238.62	227.78	216.93
21007	.7500	3/4"	19.050	3/4"	6"	3"	.020"	249.47	238.62	227.78	216.93
21017	.7500	3/4"	19.050	3/4"	6"	3"	.030"	249.47	238.62	227.78	216.93
21027	.7500	3/4"	19.050	3/4"	6"	3"	.045"	249.47	238.62	227.78	216.93
21037	.7500	3/4"	19.050	3/4"	6"	3"	.060"	249.47	238.62	227.78	216.93
21047	.7500	3/4"	19.050	3/4"	6"	3"	.090"	249.47	238.62	227.78	216.93
21057	.7500	3/4"	19.050	3/4"	6"	3"	.125"	249.47	238.62	227.78	216.93
21147	.7500	3/4"	19.050	3/4"	6"	3"	.250"	249.47	238.62	227.78	216.93
21067	1.000	1"	25.400	1"	6"	3"	.015"	414.81	396.77	378.74	360.70
21077	1.000	1"	25.400	1"	6"	3"	.020"	414.81	396.77	378.74	360.70
21087	1.000	1"	25.400	1"	6"	3"	.030"	414.81	396.77	378.74	360.70
21097	1.000	1"	25.400	1"	6"	3"	.045"	414.81	396.77	378.74	360.70
21107	1.000	1"	25.400	1"	6"	3"	.060"	414.81	396.77	378.74	360.70
21117	1.000	1"	25.400	1"	6"	3"	.090"	414.81	396.77	378.74	360.70
21127	1.000	1"	25.400	1"	6"	3"	.125"	414.81	396.77	378.74	360.70
21137	1.000	1"	25.400	1"	6"	3"	.250"	414.81	396.77	378.74	360.70

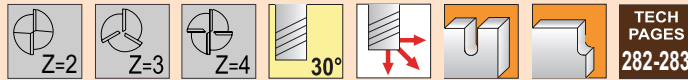
70
35
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MATERIAL HARDNESS (Rc)



TOLERANCES

d_1	+0.000" - .002" (+.000 - .050mm)
d_2	h6
ball radius	+0.000" - .001" (+.000 - .025mm)

Series 720M, 723M, 730M, 740M, 743M, 750M

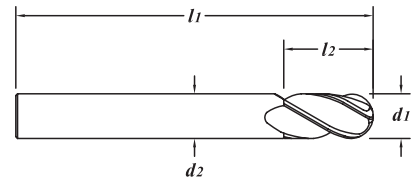


.1181" - .3150"
(3.000mm - 8.000mm)

**GENERAL PURPOSE
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 Coating - page 249
- TiAlN Coating - page 250
- Stub Length - page 214
- Standard length - page 228



(720M/740M) 2 Flute EDP#	(723M/743M) 3 Flute EDP#	(730M/750M) 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
97010	98010	99010	.1181		3.000	3.0	50	16	15.43	14.76	14.09	13.42
97020	98020	99020	.1181		3.000	3.0	75	20	25.42	24.31	23.21	22.10
97030	98030	99030	.1181		3.000	3.0	75	25	25.42	24.31	23.21	22.10
43010	55510	44010	.1250	1/8"	3.175	1/8"	2"	5/8"	15.65	14.97	14.29	13.61
43020	55520	44020	.1250	1/8"	3.175	1/8"	3"	3/4"	24.15	23.10	22.05	21.00
43030	55530	44030	.1250	1/8"	3.175	1/8"	3"	1"	24.15	23.10	22.05	21.00
97040	98040	99040	.1575		4.000	4.0	50	16	16.09	15.39	14.69	13.99
97050	98050	99050	.1575		4.000	4.0	75	20	25.96	24.83	23.70	22.57
97060	98060	99060	.1575		4.000	4.0	75	25	25.96	24.83	23.70	22.57
43040	55540	44040	.1875	3/16"	4.763	3/16"	3"	1"	26.63	25.48	24.32	23.16
43050	55550	44050	.1875	3/16"	4.763	3/16"	3"	1-1/8"	26.63	25.48	24.32	23.16
43060	55560	44060	.1875	3/16"	4.763	3/16"	4"	1"	28.67	27.42	26.18	24.93
97080	98080	99080	.1969		5.000	5.0	75	20	28.04	26.82	25.60	24.38
97090	98090	99090	.1969		5.000	5.0	75	25	28.04	26.82	25.60	24.38
97100	98100	99100	.2362		6.000	6.0	75	25	32.45	31.04	29.63	28.22
97110	98110	99110	.2362		6.000	6.0	100	25	34.16	32.67	31.19	29.70
97120	98120	99120	.2362		6.000	6.0	100	32	34.16	32.67	31.19	29.70
97130	98130	99130	.2362		6.000	6.0	150	38	44.39	42.46	40.53	38.60
43070	55570	44070	.2500	1/4"	6.350	1/4"	3"	1"	30.83	29.49	28.15	26.81
43080	55580	44080	.2500	1/4"	6.350	1/4"	4"	1"	32.43	31.02	29.61	28.20
43090	55590	44090	.2500	1/4"	6.350	1/4"	4"	1-1/2"	32.43	31.02	29.61	28.20
43100	55600	44100	.2500	1/4"	6.350	1/4"	6"	1-1/2"	42.17	40.34	38.50	36.67
43110	55610	44110	.3125	5/16"	7.938	5/16"	3"	1"	38.09	36.43	34.78	33.12
43120	55620	44120	.3125	5/16"	7.938	5/16"	4"	1"	42.49	40.65	38.80	36.95
43130	55630	44130	.3125	5/16"	7.938	5/16"	4"	1-5/8"	42.49	40.65	38.80	36.95
43140	55640	44140	.3125	5/16"	7.938	5/16"	6"	1-1/2"	63.05	60.31	57.57	54.83
97140	98140	99140	.3150		8.000	8.0	75	25	40.09	38.35	36.60	34.86
97150	98150	99150	.3150		8.000	8.0	100	25	44.75	42.80	40.86	38.91
97160	98160	99160	.3150		8.000	8.0	100	41	44.75	42.80	40.86	38.91
97170	98170	99170	.3150		8.000	8.0	150	50	64.70	61.89	59.07	56.26

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MATERIAL HARDNESS (Rc)

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continued →

Series 720M, 723M, 730M, 740M, 743M, 750M (continued)

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

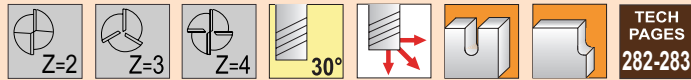
(720M/740M) 2 Flute EDP#	(723M/743M) 3 Flute EDP#	(730M/750M) 4 Flute EDP#	$d1$ †		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Diameter								Metric
43150	55650	44150	.3750	3/8"	9.525	3/8"	3"	1"	42.85	40.99	39.12	37.26
43160	55660	44160	.3750	3/8"	9.525	3/8"	4"	1"	47.01	44.97	42.92	40.88
43170	55670	44170	.3750	3/8"	9.525	3/8"	4"	2"	47.01	44.97	42.92	40.88
43180	55680	44180	.3750	3/8"	9.525	3/8"	6"	1-1/2"	65.26	62.43	59.59	56.75
43190	55690	44190	.3750	3/8"	9.525	3/8"	6"	3"	65.26	62.43	59.59	56.75
97180	98180	99180	.3937		10.000	10.0	75	25	46.30	44.29	42.27	40.26
97190	98190	99190	.3937		10.000	10.0	100	25	60.69	58.05	55.41	52.77
97200	98200	99200	.3937		10.000	10.0	100	50	60.69	58.05	55.41	52.77
97210	98210	99210	.3937		10.000	10.0	150	38	78.06	74.67	71.27	67.88
97220	98220	99220	.3937		10.000	10.0	150	75	78.06	74.67	71.27	67.88
43200	55700	44200	.4375	7/16"	11.113	7/16"	4"	1"	64.72	61.91	59.09	56.28
43210	55710	44210	.4375	7/16"	11.113	7/16"	4"	2"	64.72	61.91	59.09	56.28
43220	-	44220	.4375	7/16"	11.113	7/16"	6"	1-1/2"	84.13	80.48	76.82	73.16
43230	-	44230	.4375	7/16"	11.113	7/16"	6"	3"	84.13	80.48	76.82	73.16
97230	98230	99230	.4724		12.000	12.0	100	25	69.67	66.64	63.61	60.58
97240	98240	99240	.4724		12.000	12.0	100	50	69.67	66.64	63.61	60.58
97250	98250	99250	.4724		12.000	12.0	150	50	93.62	89.55	85.48	81.41
97260	98260	99260	.4724		12.000	12.0	150	75	93.62	89.55	85.48	81.41
43240	55740	44240	.5000	1/2"	12.700	1/2"	4"	1"	66.11	63.24	60.36	57.49
43250	55750	44250	.5000	1/2"	12.700	1/2"	4"	2"	66.11	63.24	60.36	57.49
43260	55760	44260	.5000	1/2"	12.700	1/2"	6"	1-1/2"	93.64	89.57	85.50	81.43
43270	55770	44270	.5000	1/2"	12.700	1/2"	6"	3"	93.64	89.57	85.50	81.43
97270	98270	-	.5512		14.000	14.0	100	25	96.27	92.08	87.90	83.71
97280	-	-	.5512		14.000	14.0	100	50	96.27	92.08	87.90	83.71
97290	-	99290	.5512		14.000	14.0	150	50	130.67	124.99	119.31	113.63
97300	98300	-	.5512		14.000	14.0	150	75	130.67	124.99	119.31	113.63
43280	55780	44280	.5625	9/16"	14.288	9/16"	6"	2"	130.66	124.98	119.30	113.62
-	55790	44290	.5625	9/16"	14.288	9/16"	6"	3"	130.66	124.98	119.30	113.62
43300	55800	44300	.6250	5/8"	15.875	5/8"	6"	2"	137.70	131.71	125.73	119.74
43310	55810	44310	.6250	5/8"	15.875	5/8"	6"	3"	137.70	131.71	125.73	119.74
97310	98310	99310	.6299		16.000	16.0	150	50	137.68	131.69	125.71	119.72
97320	98320	99320	.6299		16.000	16.0	150	75	137.68	131.69	125.71	119.72
97340	98340	99340	.7087		18.000	18.0	150	75	211.80	202.59	193.38	184.17
43320	55820	44320	.7500	3/4"	19.050	3/4"	6"	2"	225.98	216.15	206.33	196.50
43330	55830	44330	.7500	3/4"	19.050	3/4"	6"	3"	225.98	216.15	206.33	196.50
97350	98350	99350	.7874		20.000	20.0	150	50	232.88	222.75	212.63	202.50
97360	98360	99360	.7874		20.000	20.0	150	75	232.88	222.75	212.63	202.50
-	98370	-	.9843		25.000	25.0	150	50	369.52	353.45	337.39	321.32
97380	98380	-	.9843		25.000	25.0	150	75	369.52	353.45	337.39	321.32
43340	55840	44340	1.000	1"	25.400	1"	6"	2"	384.26	367.55	350.85	334.14
43350	55850	44350	1.000	1"	25.400	1"	6"	3"	384.26	367.55	350.85	334.14

MATERIAL HARDNESS (Rc)
70
35
0

TOLERANCES

d_1	+0.000" - .002" (+.000 - .050mm)
d_2	h6
ball radius	+0.000" - .001" (+.000 - .025mm)

Series 720MC, 723MC, 730MC

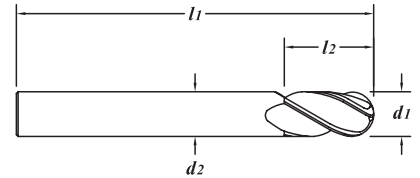


GENERAL PURPOSE
END MILLS

Extra Length - Ball End

TiCN Coating

- Solid submicron grain carbide end mill - center cutting
- Extended reach
- Improved abrasion resistance and lubricity
- Can be modified with a neck within 48 hours
- Extremely versatile
- Uncoated - page 247
- TiALN Coating - page 250
- Standard length - page 231



(720MC) 2 Flute EDP#	(723MC) 3 Flute EDP#	(730MC) 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								
43014	55514	44014	.1250	1/8"	3.175	1/8"	2"	5/8"	18.01	17.23	16.44	15.66
43024	55524	44024	.1250	1/8"	3.175	1/8"	3"	3/4"	27.05	25.87	24.70	23.52
43034	55534	44034	.1250	1/8"	3.175	1/8"	3"	1"	27.05	25.87	24.70	23.52
43044	55544	44044	.1875	3/16"	4.763	3/16"	3"	1"	29.95	28.64	27.34	26.04
43054	55554	44054	.1875	3/16"	4.763	3/16"	3"	1-1/8"	29.95	28.64	27.34	26.04
43064	55564	44064	.1875	3/16"	4.763	3/16"	4"	1"	32.53	31.12	29.70	28.29
43074	55574	44074	.2500	1/4"	6.350	1/4"	3"	1"	35.65	34.10	32.55	31.00
43084	55584	44084	.2500	1/4"	6.350	1/4"	4"	1"	37.65	36.01	34.38	32.74
43094	55594	44094	.2500	1/4"	6.350	1/4"	4"	1-1/2"	37.65	36.01	34.38	32.74
43104	55604	44104	.2500	1/4"	6.350	1/4"	6"	1-1/2"	51.16	48.94	46.71	44.49
43114	55614	44114	.3125	5/16"	7.938	5/16"	3"	1"	44.55	42.61	40.68	38.74
43124	55624	44124	.3125	5/16"	7.938	5/16"	4"	1"	50.52	48.32	46.13	43.93
43134	-	44134	.3125	5/16"	7.938	5/16"	4"	1-5/8"	50.52	48.32	46.13	43.93
43144	55644	44144	.3125	5/16"	7.938	5/16"	6"	1-1/2"	73.85	70.64	67.43	64.22
43154	55654	44154	.3750	3/8"	9.525	3/8"	3"	1"	49.29	47.15	45.00	42.86
43164	55664	44164	.3750	3/8"	9.525	3/8"	4"	1"	55.04	52.65	50.25	47.86
43174	55674	44174	.3750	3/8"	9.525	3/8"	4"	2"	55.04	52.65	50.25	47.86
43184	55684	44184	.3750	3/8"	9.525	3/8"	6"	1-1/2"	76.07	72.77	69.46	66.15
-	55694	44194	.3750	3/8"	9.525	3/8"	6"	3"	76.07	72.77	69.46	66.15
-	-	44204	.4375	7/16"	11.113	7/16"	4"	1"	74.39	71.16	67.92	64.69
-	-	44214	.4375	7/16"	11.113	7/16"	4"	2"	74.39	71.16	67.92	64.69
43224	55724	44224	.4375	7/16"	11.113	7/16"	6"	1-1/2"	97.80	93.54	89.29	85.04
-	-	44234	.4375	7/16"	11.113	7/16"	6"	3"	97.80	93.54	89.29	85.04
43244	55744	44244	.5000	1/2"	12.700	1/2"	4"	1"	75.77	72.48	69.18	65.89
43254	55754	44254	.5000	1/2"	12.700	1/2"	4"	2"	75.77	72.48	69.18	65.89
43264	55764	44264	.5000	1/2"	12.700	1/2"	6"	1-1/2"	107.32	102.65	97.99	93.32
43274	55774	44274	.5000	1/2"	12.700	1/2"	6"	3"	107.32	102.65	97.99	93.32
-	-	44284	.5625	9/16"	14.288	9/16"	6"	2"	147.57	141.15	134.74	128.32
-	-	44294	.5625	9/16"	14.288	9/16"	6"	3"	147.57	141.15	134.74	128.32
43304	55804	44304	.6250	5/8"	15.875	5/8"	6"	2"	154.56	147.84	141.12	134.40
-	-	44314	.6250	5/8"	15.875	5/8"	6"	3"	154.56	147.84	141.12	134.40
43324	55824	44324	.7500	3/4"	19.050	3/4"	6"	2"	245.24	234.58	223.91	213.25
43334	55834	44334	.7500	3/4"	19.050	3/4"	6"	3"	245.24	234.58	223.91	213.25
-	55844	44344	1.000	1"	25.400	1"	6"	2"	411.55	393.66	375.76	357.87
43354	55854	44354	1.000	1"	25.400	1"	6"	3"	411.55	393.66	375.76	357.87

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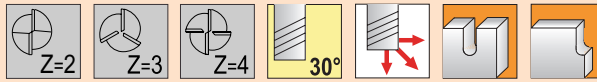
35

MATERIAL HARDNESS (Rc)

0

Series 720MA, 723MA, 730MA, 740MA, 743MA, 750MA

.1181" - .3150"
(3.000mm - 8.000mm)



TECH
PAGES
282-283

TOLERANCES

d_1	+0.000" - .002" (+0.000 - .050mm)
d_2	h6
ball radius	+0.000" - .001" (+0.000 - .025mm)

Extra Length - Ball End

TiAlN Coating

Solid submicron grain carbide end mill - center cutting

Extended reach

Dry or semi-dry machining

Can be modified with a neck within 48 hours

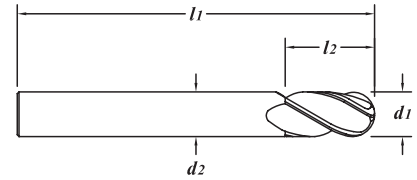
Extremely versatile

Uncoated - page 247

TiCN Coating - page 249

Stub Length - page 215

Standard length - page 232



MATERIAL HARDNESS (Rc)
70
35
0

(720MA/740MA) 2 Flute EDP#	(723MA/743MA) 3 Flute EDP#	(730MA/750MA) 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	17.58	16.82	16.05	15.29	
97027	98027	99027	.1181	3.000	3.0	75	20	28.11	26.88	25.66	24.44	
97037	98037	99037	.1181	3.000	3.0	75	25	28.11	26.88	25.66	24.44	
43017	55517	44017	.1250	1/8"	3.175	1/8"	2"	5/8"	18.32	17.52	16.73	15.93
43027	55527	44027	.1250	1/8"	3.175	1/8"	3"	3/4"	27.44	26.25	25.05	23.86
43037	55537	44037	.1250	1/8"	3.175	1/8"	3"	1"	27.44	26.25	25.05	23.86
97047	98047	99047	.1575	4.000	4.0	50	16	18.78	17.96	17.15	16.33	
97057	98057	99057	.1575	4.000	4.0	75	20	30.15	28.84	27.53	26.22	
97067	98067	99067	.1575	4.000	4.0	75	25	30.15	28.84	27.53	26.22	
43047	55547	44047	.1875	3/16"	4.763	3/16"	3"	1"	30.82	29.48	28.14	26.80
43057	55557	44057	.1875	3/16"	4.763	3/16"	3"	1-1/8"	30.82	29.48	28.14	26.80
43067	55567	44067	.1875	3/16"	4.763	3/16"	4"	1"	33.55	32.09	30.63	29.17
97087	98087	99087	.1969	5.000	5.0	75	20	33.58	32.12	30.66	29.20	
97097	98097	99097	.1969	5.000	5.0	75	25	33.58	32.12	30.66	29.20	
97107	98107	99107	.2362	6.000	6.0	75	25	38.00	36.34	34.69	33.04	
97117	98117	99117	.2362	6.000	6.0	100	25	40.65	38.89	37.12	35.35	
97127	98127	99127	.2362	6.000	6.0	100	32	40.65	38.89	37.12	35.35	
97137	98137	99137	.2362	6.000	6.0	150	38	53.56	51.23	48.90	46.57	
43077	55577	44077	.2500	1/4"	6.350	1/4"	3"	1"	36.40	34.82	33.23	31.65
43087	55587	44087	.2500	1/4"	6.350	1/4"	4"	1"	38.96	37.27	35.57	33.88
43097	55597	44097	.2500	1/4"	6.350	1/4"	4"	1-1/2"	38.96	37.27	35.57	33.88
43107	55607	44107	.2500	1/4"	6.350	1/4"	6"	1-1/2"	51.35	49.12	46.88	44.65
43117	-	44117	.3125	5/16"	7.938	5/16"	3"	1"	46.41	44.40	42.38	40.36
43127	55627	44127	.3125	5/16"	7.938	5/16"	4"	1"	53.06	50.75	48.45	46.14
43137	55637	44137	.3125	5/16"	7.938	5/16"	4"	1-5/8"	53.06	50.75	48.45	46.14
43147	55647	44147	.3125	5/16"	7.938	5/16"	6"	1-1/2"	77.50	74.13	70.76	67.39
97147	98147	99147	.3150	8.000	8.0	75	25	48.39	46.29	44.18	42.08	
97157	98157	99157	.3150	8.000	8.0	100	25	55.28	52.88	50.47	48.07	
97167	98167	99167	.3150	8.000	8.0	100	41	55.28	52.88	50.47	48.07	
97177	98177	99177	.3150	8.000	8.0	150	50	79.15	75.71	72.27	68.83	

Series 720MA, 723MA, 730MA, 740MA, 743MA, 750MA (continued)

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

GENERAL PURPOSE
END MILLS

(720MA/740MA) 2 Flute EDP#	(723MA/743MA) 3 Flute EDP#	(730MA/750MA) 4 Flute EDP#	$d1$ †		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	1-11	12-24	25-49	50-100	
			Decimal	Diameter								Metric
43157	55657	44157	.3750	3/8"	9.525	3/8"	3"	1"	51.16	48.94	46.71	44.49
43167	55667	44167	.3750	3/8"	9.525	3/8"	4"	1"	57.58	55.08	52.57	50.07
43177	55677	44177	.3750	3/8"	9.525	3/8"	4"	2"	57.58	55.08	52.57	50.07
43187	55687	44187	.3750	3/8"	9.525	3/8"	6"	1-1/2"	79.72	76.25	72.79	69.32
43197	55697	44197	.3750	3/8"	9.525	3/8"	6"	3"	79.72	76.25	72.79	69.32
97187	98187	99187	.3937		10.000	10.0	75	25	55.78	53.35	50.93	48.50
97197	98197	99197	.3937		10.000	10.0	100	25	72.90	69.73	66.56	63.39
97207	98207	99207	.3937		10.000	10.0	100	50	72.90	69.73	66.56	63.39
97217	98217	99217	.3937		10.000	10.0	150	38	95.24	91.10	86.96	82.82
97227	98227	99227	.3937		10.000	10.0	150	75	95.24	91.10	86.96	82.82
43207	-	44207	.4375	7/16"	11.113	7/16"	4"	1"	77.00	73.66	70.31	66.96
-	55717	44217	.4375	7/16"	11.113	7/16"	4"	2"	77.00	73.66	70.31	66.96
43227	-	44227	.4375	7/16"	11.113	7/16"	6"	1-1/2"	101.35	96.94	92.54	88.13
43237	55737	44237	.4375	7/16"	11.113	7/16"	6"	3"	101.35	96.94	92.54	88.13
97237	-	99237	.4724		12.000	12.0	100	25	81.89	78.33	74.77	71.21
97247	98247	99247	.4724		12.000	12.0	100	50	81.89	78.33	74.77	71.21
97257	98257	99257	.4724		12.000	12.0	150	50	110.84	106.02	101.20	96.38
97267	98267	99267	.4724		12.000	12.0	150	75	110.84	106.02	101.20	96.38
43247	55747	44247	.5000	1/2"	12.700	1/2"	4"	1"	78.37	74.97	71.56	68.15
43257	55757	44257	.5000	1/2"	12.700	1/2"	4"	2"	78.37	74.97	71.56	68.15
43267	55767	44267	.5000	1/2"	12.700	1/2"	6"	1-1/2"	110.84	106.02	101.20	96.38
43277	55777	44277	.5000	1/2"	12.700	1/2"	6"	3"	110.84	106.02	101.20	96.38
97277	-	99277	.5512		14.000	14.0	100	25	109.96	105.18	100.40	95.62
-	-	99287	.5512		14.000	14.0	100	50	109.96	105.18	100.40	95.62
97297	-	99297	.5512		14.000	14.0	150	50	150.97	144.41	137.84	131.28
-	-	99307	.5512		14.000	14.0	150	75	150.97	144.41	137.84	131.28
43287	-	44287	.5625	9/16"	14.288	9/16"	6"	2"	150.97	144.41	137.84	131.28
43297	-	44297	.5625	9/16"	14.288	9/16"	6"	3"	150.97	144.41	137.84	131.28
43307	55807	44307	.6250	5/8"	15.875	5/8"	6"	2"	157.99	151.12	144.25	137.38
43317	55817	44317	.6250	5/8"	15.875	5/8"	6"	3"	157.99	151.12	144.25	137.38
97317	98317	99317	.6299		16.000	16.0	150	50	157.99	151.12	144.25	137.38
97327	98327	99327	.6299		16.000	16.0	150	75	157.99	151.12	144.25	137.38
-	98337	99337	.7087		18.000	18.0	150	50	235.32	225.09	214.86	204.63
-	-	99347	.7087		18.000	18.0	150	75	235.32	225.09	214.86	204.63
43327	55827	44327	.7500	3/4"	19.050	3/4"	6"	2"	249.47	238.62	227.78	216.93
43337	55837	44337	.7500	3/4"	19.050	3/4"	6"	3"	249.47	238.62	227.78	216.93
97357	98357	99357	.7874		20.000	20.0	150	50	263.43	251.98	240.52	229.07
97367	98367	99367	.7874		20.000	20.0	150	75	263.43	251.98	240.52	229.07
-	-	99377	.9843		25.000	25.0	150	50	400.04	382.65	365.25	347.86
-	-	99387	.9843		25.000	25.0	150	75	400.04	382.65	365.25	347.86
-	55847	44347	1.000	1"	25.400	1"	6"	2"	414.81	396.77	378.74	360.70
43357	55857	44357	1.000	1"	25.400	1"	6"	3"	414.81	396.77	378.74	360.70

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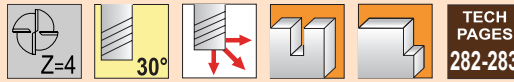
MATERIAL HARDNESS (Rc)

0

Series 435M, 435MA

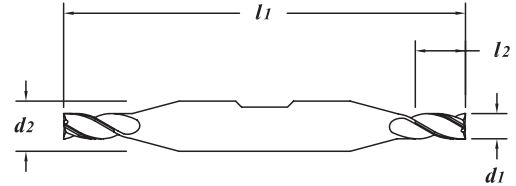
TOLERANCES

d_1	+0.000" -0.002" (+0.000 -0.050mm)
d_2	-0.0001" -0.0005" (-0.0025 -0.0127mm)



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



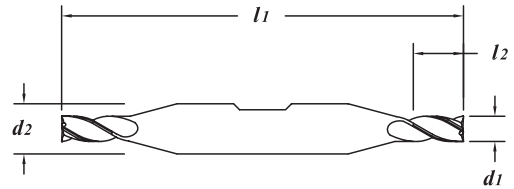
EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
34010	.1250	1/8"	3.175	3/8"	3"	3/8"	39.46	37.74	36.03	34.31
34020	.1562	5/32"	3.967	3/8"	3"	7/16"	39.46	37.74	36.03	34.31
34030	.1875	3/16"	4.763	3/8"	3"	1/2"	39.46	37.74	36.03	34.31
34050	.2500	1/4"	6.350	3/8"	3"	5/8"	39.46	37.74	36.03	34.31
34060	.2812	9/32"	7.142	3/8"	4"	11/16"	45.34	43.37	41.40	39.43
34070	.3125	5/16"	7.938	3/8"	4"	3/4"	45.34	43.37	41.40	39.43
34090	.3750	3/8"	9.525	3/8"	4"	3/4"	45.34	43.37	41.40	39.43

MATERIAL HARDNESS (Rc) 70
35
0



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

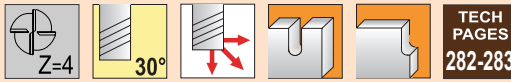


EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
34017	.1250	1/8"	3.175	3/8"	3"	3/8"	51.93	49.68	47.42	45.16
34027	.1562	5/32"	3.967	3/8"	3"	7/16"	51.93	49.68	47.42	45.16
34037	.1875	3/16"	4.763	3/8"	3"	1/2"	51.93	49.68	47.42	45.16
34047	.2188	7/32"	5.558	3/8"	3"	9/16"	51.93	49.68	47.42	45.16
34057	.2500	1/4"	6.350	3/8"	3"	5/8"	51.93	49.68	47.42	45.16
34067	.2812	9/32"	7.142	3/8"	4"	11/16"	61.17	58.51	55.85	53.19
34077	.3125	5/16"	7.938	3/8"	4"	3/4"	61.17	58.51	55.85	53.19
34097	.3750	3/8"	9.525	3/8"	4"	3/4"	61.17	58.51	55.85	53.19

TOLERANCES

d_1	+0.000" -0.002" (+0.000 -0.050mm)
d_2	-0.0001" -0.0005" (-0.0025 -0.127mm)
ball radius	+0.000" -0.001" (+0.000 -0.025mm)

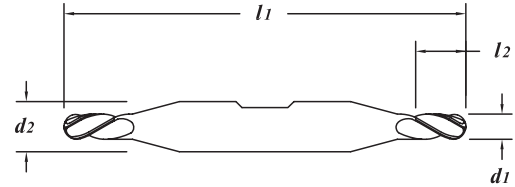
Series 535M, 535MA



GENERAL PURPOSE 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

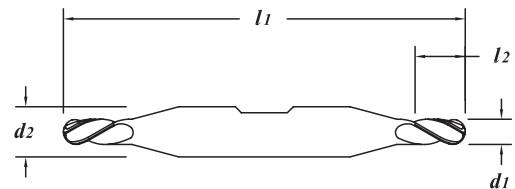
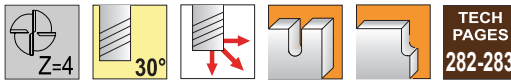


EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
	Decimal	Metric							
36010	.1250	1/8"	3.175	3"	3/8"	46.41	44.40	42.38	40.36
36030	.1875	3/16"	4.763	3"	1/2"	46.41	44.40	42.38	40.36

70
35
0
MATERIAL HARDNESS (Rc)

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

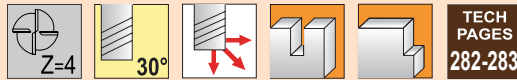
TiALN Coated
 Solid submicron grain carbide end mill - center cutting
 Common 3/8" diameter shank with weldon flat
 For strength and adaptability when converting from high speed steel
 Dry or semi-dry machining



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							
36017	.1250	1/8"	3.175	3"	3/8"	58.88	56.32	53.76	51.20
36027	.1562	5/32"	3.967	3"	7/16"	58.88	56.32	53.76	51.20
36037	.1875	3/16"	4.763	3"	1/2"	58.88	56.32	53.76	51.20
36057	.2500	1/4"	6.350	3"	5/8"	58.88	56.32	53.76	51.20
36077	.3125	5/16"	7.938	4"	3/4"	69.15	66.14	63.14	60.13

TOLERANCES

d_1	+0.000" -0.002" (+0.000 -0.050mm)
d_2	h6

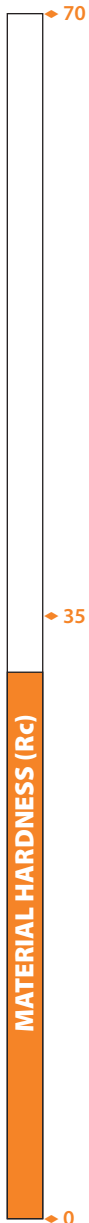
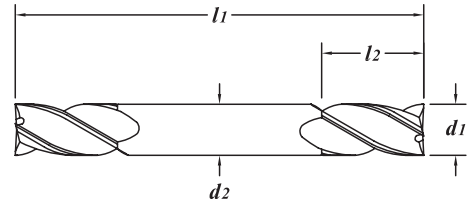


Standard Length - Double End

Solid submicron grain carbide end mill - center cutting

Extremely versatile

TiALN Coating - page 255

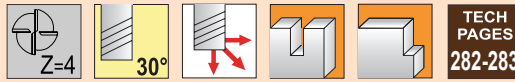


EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
30030	.0625	1/16"	1.588	1/8"	2"	3/16"	23.89	22.85	21.81	20.77
30040	.0938	3/32"	2.383	1/8"	2"	1/4"	23.89	22.85	21.81	20.77
30050	.1250	1/8"	3.175	1/8"	2"	3/8"	17.26	16.51	15.76	15.01
30060	.1562	5/32"	3.967	3/16"	2-1/2"	7/16"	24.66	23.58	22.51	21.44
30070	.1875	3/16"	4.763	3/16"	2-1/2"	1/2"	20.63	19.73	18.84	17.94
30090	.2500	1/4"	6.350	1/4"	2-1/2"	5/8"	25.02	23.94	22.85	21.76
30100	.3125	5/16"	7.938	5/16"	3-1/2"	3/4"	32.66	31.24	29.82	28.40
30110	.3750	3/8"	9.525	3/8"	3-1/2"	3/4"	42.18	40.35	38.51	36.68
30130	.5000	1/2"	12.700	1/2"	4"	1"	67.36	64.43	61.50	58.57

TOLERANCES

d_1	+0.000° -0.002° (+.000 -0.050mm)
d_2	h6

Series 430MA, 450MA



GENERAL PURPOSE END MILLS

Standard Length - Double End

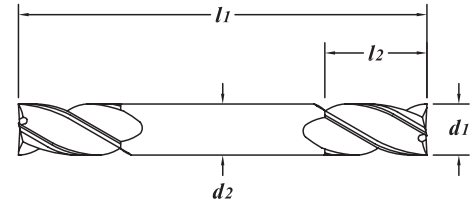
TiALN Coating

Solid submicron grain carbide end mill - center cutting

Dry or semi-dry machining

Extremely versatile

Uncoated - page 254



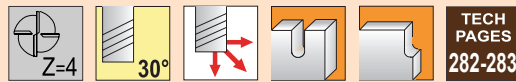
(430MA/450MA) EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
30017	.0312	1/32"	0.792	1/8"	2"	3/32"	27.92	26.71	25.49	24.28
30027	.0469	3/64"	1.191	1/8"	2"	1/8"	27.92	26.71	25.49	24.28
30037	.0625	1/16"	1.588	1/8"	2"	3/16"	27.92	26.71	25.49	24.28
30047	.0938	3/32"	2.383	1/8"	2"	1/4"	27.92	26.71	25.49	24.28
30057	.1250	1/8"	3.175	1/8"	2"	3/8"	21.30	20.37	19.45	18.52
30067	.1562	5/32"	3.967	3/16"	2-1/2"	7/16"	30.94	29.59	28.25	26.90
30077	.1875	3/16"	4.763	3/16"	2-1/2"	1/2"	26.93	25.76	24.59	23.42
30087	.2188	7/32"	5.558	1/4"	2-1/2"	9/16"	35.80	34.24	32.69	31.13
30607	.2362		6.000	6.0	65	16	34.65	33.14	31.64	30.13
30097	.2500	1/4"	6.350	1/4"	2-1/2"	5/8"	33.37	31.92	30.47	29.02
30107	.3125	5/16"	7.938	5/16"	3-1/2"	3/4"	48.50	46.39	44.28	42.17
30117	.3750	3/8"	9.525	3/8"	3-1/2"	3/4"	58.04	55.52	52.99	50.47
30127	.4375	7/16"	11.113	7/16"	4"	7/8"	78.30	74.90	71.49	68.09
30137	.5000	1/2"	12.700	1/2"	4"	1"	85.71	81.98	78.26	74.53

70

35

MATERIAL HARDNESS (Rc)

0



TOLERANCES

d_1	+0.000" - .002" (+0.000 - .050mm)
d_2	h6
ball radius	+0.000" - .001" (+0.000 - .025mm)

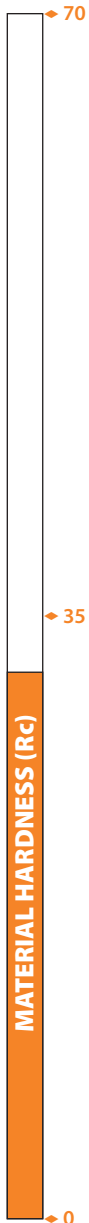
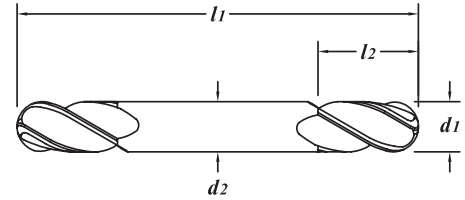
TECH
PAGES
282-283

Standard Length - Double End - Ball End

Solid submicron grain carbide end mill - center cutting

Extremely versatile

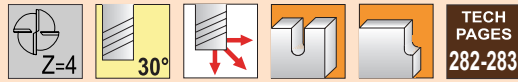
TiAlN Coating - page 257



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								
32050	.1250	1/8"	3.175	1/8"	2"	3/8"	19.83	18.96	18.10	17.24
32070	.1875	3/16"	4.763	3/16"	2-1/2"	1/2"	24.29	23.23	22.18	21.12
32090	.2500	1/4"	6.350	1/4"	2-1/2"	5/8"	28.82	27.57	26.31	25.06
32110	.3750	3/8"	9.525	3/8"	3-1/2"	3/4"	48.54	46.43	44.32	42.21
32130	.5000	1/2"	12.700	1/2"	4"	1"	77.46	74.10	70.73	67.36

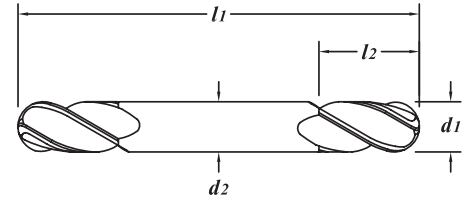
TOLERANCES

d_1	+0.000" - .002" (+.000 - .050mm)
d_2	h6
ball radius	+0.000" - .001" (+.000 - .025mm)



**Standard Length - Double End - Ball End
TiAlN Coating**

Solid submicron grain carbide end mill - center cutting
Dry or semi-dry machining
Extremely versatile
Uncoated - page 256

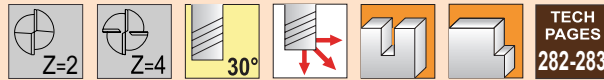


EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
	Decimal	Metric								
32017	.0312	1/32"	0.792	1/8"	2"	3/32"	31.52	30.15	28.78	27.41
32027	.0469	3/64"	1.191	1/8"	2"	1/8"	31.52	30.15	28.78	27.41
32037	.0625	1/16"	1.588	1/8"	2"	3/16"	31.52	30.15	28.78	27.41
32047	.0938	3/32"	2.383	1/8"	2"	1/4"	31.52	30.15	28.78	27.41
32057	.1250	1/8"	3.175	1/8"	2"	3/8"	23.87	22.84	21.80	20.76
32067	.1562	5/32"	3.967	3/16"	2-1/2"	7/16"	34.65	33.14	31.64	30.13
32077	.1875	3/16"	4.763	3/16"	2-1/2"	1/2"	30.58	29.25	27.92	26.59
32097	.2500	1/4"	6.350	1/4"	2-1/2"	5/8"	37.16	35.54	33.93	32.31
32117	.3750	3/8"	9.525	3/8"	3-1/2"	3/4"	64.38	61.58	58.78	55.98
32137	.5000	1/2"	12.700	1/2"	4"	1"	95.82	91.65	87.49	83.32



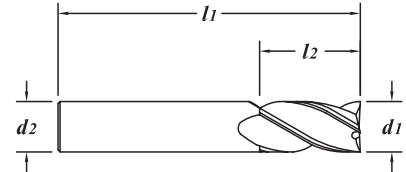
Series 280M, 290M, 380M, 390M

TOLERANCES	
d_1	+0.01" -0.000" (+0.025 -0.000mm)
d_2	h6



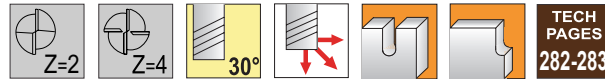
Standard Length - N/C Tolerance - Square End

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



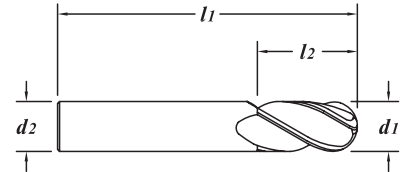
(280M) 2 Flute EDP#	(290M) 4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
25010	26010	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	14.74	14.10	13.46	12.82
25020	26020	.0938	3/32"	2.383	1/8"	1-1/2"	5/16"	13.97	13.37	12.76	12.15
25030	26030	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	13.56	12.97	12.38	11.79
25040	26040	.1875	3/16"	4.763	3/16"	2"	9/16"	18.03	17.25	16.46	15.68
25050	26050	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	20.73	19.83	18.93	18.03
* 25070	* 26070	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	38.10	36.44	34.79	33.13
* 25090	* 26090	.5000	1/2"	12.700	1/2"	3"	1"	61.03	58.38	55.72	53.07
-	* 26100	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	108.64	103.92	99.19	94.47

MATERIAL HARDNESS (Rc) 70
35
0



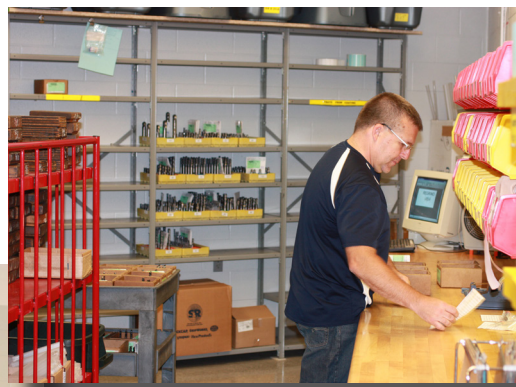
Standard Length - N/C Tolerance - Ball End

Solid submicron grain carbide end mill - center cutting
 Excellent for keyways
 Tight tolerance for precision machining
 For use when matching tools are necessary
 Ball radius tolerance +.0005" -0.0000" (+0.0127mm -0.0000mm)



(380M) 2 Flute EDP#	(390M) 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								
27010	28010	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	16.97	16.24	15.50	14.76
27030	28030	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	15.59	14.92	14.24	13.56
-	28040	.1875	3/16"	4.763	3/16"	2"	9/16"	20.73	19.83	18.93	18.03
27050	28050	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	23.87	22.84	21.80	20.76
-	28060	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	34.12	32.64	31.15	29.67
* 27070	* 28070	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	43.84	41.93	40.03	38.12
-	* 28090	.5000	1/2"	12.700	1/2"	3"	1"	70.21	67.16	64.10	61.05
-	* 28100	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	124.98	119.55	114.11	108.68

* - Tools with weldon flats



*Tool Reconditioning
Prep Area*

SA (1/4" Steel Shank)

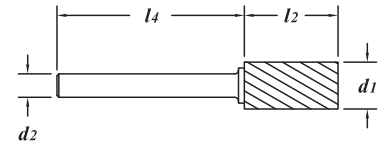
Carbide Rotary Files - Cylindrical Shape

Submicron Grain Carbide

A - Aluminum Cut

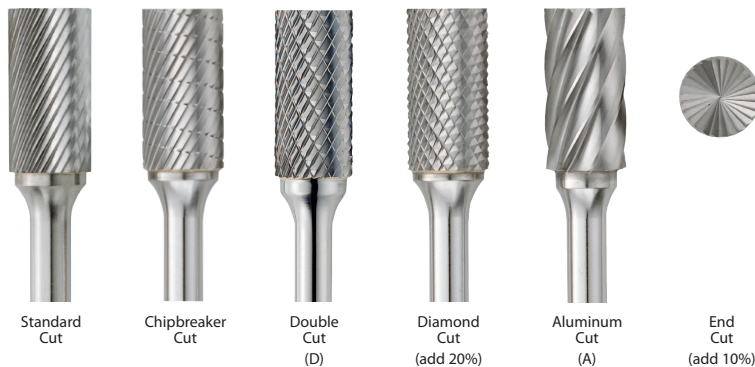
D - Double Cut

* - Solid Carbide



EDP#	TOOL #	$d1$ †		$d2$ Shank Diameter	$l2$ Flute Length	$l4$ Shank Length	1-11	12-24	25-49	50-100	
		Decimal	Diameter Metric								
60010	* SA-14	.1875	3/16"	4.763	1/4"	5/8"	1-3/8"	9.94	9.50	9.07	8.64
60012	* SA-14D	.1875	3/16"	4.763	1/4"	5/8"	1-3/8"	9.94	9.50	9.07	8.64
60020	* SA-1	.2500	1/4"	6.350	1/4"	5/8"	1-3/8"	8.84	8.46	8.07	7.69
60021	* SA-1A	.2500	1/4"	6.350	1/4"	5/8"	1-3/8"	11.10	10.62	10.13	9.65
60022	* SA-1D	.2500	1/4"	6.350	1/4"	5/8"	1-3/8"	8.84	8.46	8.07	7.69
60030	SA-2	.3125	5/16"	7.938	1/4"	3/4"	1-3/4"	12.35	11.81	11.28	10.74
60032	SA-2D	.3125	5/16"	7.938	1/4"	3/4"	1-3/4"	12.35	11.81	11.28	10.74
60040	SA-3	.3750	3/8"	9.525	1/4"	3/4"	1-3/4"	13.32	12.74	12.16	11.58
60041	SA-3A	.3750	3/8"	9.525	1/4"	3/4"	1-3/4"	17.92	17.14	16.36	15.58
60042	SA-3D	.3750	3/8"	9.525	1/4"	3/4"	1-3/4"	13.32	12.74	12.16	11.58
60050	SA-4	.4375	7/16"	11.113	1/4"	1"	1-3/4"	18.38	17.58	16.78	15.98
60052	SA-4D	.4375	7/16"	11.113	1/4"	1"	1-3/4"	18.38	17.58	16.78	15.98
60060	SA-5	.5000	1/2"	12.700	1/4"	1"	1-3/4"	19.62	18.77	17.91	17.06
60061	SA-5A	.5000	1/2"	12.700	1/4"	1"	1-3/4"	25.42	24.31	23.21	22.10
60062	SA-5D	.5000	1/2"	12.700	1/4"	1"	1-3/4"	19.62	18.77	17.91	17.06
60070	SA-6	.6250	5/8"	15.875	1/4"	1"	1-3/4"	23.76	22.73	21.69	20.66
60071	SA-6A	.6250	5/8"	15.875	1/4"	1"	1-3/4"	39.82	38.09	36.36	34.63
60072	SA-6D	.6250	5/8"	15.875	1/4"	1"	1-3/4"	23.76	22.73	21.69	20.66
60080	SA-7	.7500	3/4"	19.050	1/4"	1"	1-3/4"	37.62	35.98	34.35	32.71
60081	SA-7A	.7500	3/4"	19.050	1/4"	1"	1-3/4"	45.13	43.16	41.20	39.24
60082	SA-7D	.7500	3/4"	19.050	1/4"	1"	1-3/4"	37.62	35.98	34.35	32.71
60090	SA-9	1.000	1"	25.400	1/4"	1"	1-3/4"	51.31	49.08	46.85	44.62
60091	SA-9A	1.000	1"	25.400	1/4"	1"	1-3/4"	61.54	58.86	56.19	53.51
60092	SA-9D	1.000	1"	25.400	1/4"	1"	1-3/4"	51.31	49.08	46.85	44.62

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.

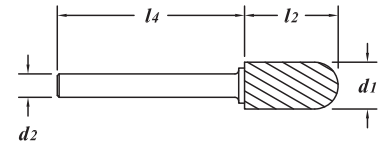
Carbide Rotary Files - Cylindrical-Radius Shape

Submicron Grain Carbide

A - Aluminum Cut

D - Double Cut

* - Solid Carbide



EDP#	TOOL #	$d1$ † Diameter		$d2$ Shank Diameter	$l2$ Flute Length	$l4$ Shank Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
61010	* SC-14	.1875	3/16"	4.763	1/4"	5/8"	1-3/8"	11.25	10.76	10.27	9.78
61012	* SC-14D	.1875	3/16"	4.763	1/4"	5/8"	1-3/8"	11.25	10.76	10.27	9.78
61020	* SC-1	.2500	1/4"	6.350	1/4"	5/8"	1-3/8"	10.58	10.12	9.66	9.20
61021	* SC-1A	.2500	1/4"	6.350	1/4"	5/8"	1-3/8"	13.97	13.37	12.76	12.15
61022	* SC-1D	.2500	1/4"	6.350	1/4"	5/8"	1-3/8"	10.58	10.12	9.66	9.20
61030	SC-2	.3125	5/16"	7.938	1/4"	3/4"	1-3/4"	12.35	11.81	11.28	10.74
61032	SC-2D	.3125	5/16"	7.938	1/4"	3/4"	1-3/4"	12.35	11.81	11.28	10.74
61040	SC-3	.3750	3/8"	9.525	1/4"	3/4"	1-3/4"	14.42	13.79	13.17	12.54
61041	SC-3A	.3750	3/8"	9.525	1/4"	3/4"	1-3/4"	25.00	23.91	22.83	21.74
61042	SC-3D	.3750	3/8"	9.525	1/4"	3/4"	1-3/4"	14.42	13.79	13.17	12.54
61050	SC-4	.4375	7/16"	11.113	1/4"	1"	1-3/4"	20.86	19.95	19.05	18.14
61052	SC-4D	.4375	7/16"	11.113	1/4"	1"	1-3/4"	20.86	19.95	19.05	18.14
61060	SC-5	.5000	1/2"	12.700	1/4"	1"	1-3/4"	21.62	20.68	19.74	18.80
61061	SC-5A	.5000	1/2"	12.700	1/4"	1"	1-3/4"	32.87	31.44	30.01	28.58
61062	SC-5D	.5000	1/2"	12.700	1/4"	1"	1-3/4"	21.62	20.68	19.74	18.80
61070	SC-6	.6250	5/8"	15.875	1/4"	1"	1-3/4"	28.88	27.62	26.37	25.11
61071	SC-6A	.6250	5/8"	15.875	1/4"	1"	1-3/4"	45.02	43.07	41.11	39.15
61072	SC-6D	.6250	5/8"	15.875	1/4"	1"	1-3/4"	28.88	27.62	26.37	25.11
61080	SC-7	.7500	3/4"	19.050	1/4"	1"	1-3/4"	42.49	40.65	38.80	36.95
61081	SC-7A	.7500	3/4"	19.050	1/4"	1"	1-3/4"	62.50	59.79	57.07	54.35
61082	SC-7D	.7500	3/4"	19.050	1/4"	1"	1-3/4"	42.49	40.65	38.80	36.95

SD (1/4" Steel Shank)

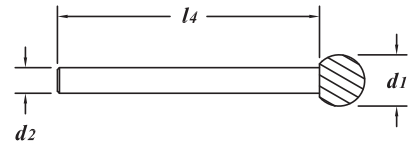
Carbide Rotary Files - Ball Shape

Submicron Grain Carbide

A - Aluminum Cut

D - Double Cut

* - Solid Carbide



EDP#	TOOL #	$d1$ † Diameter		$d2$ Shank Diameter	$l2$ Flute Length	$l4$ Shank Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
62010	* SD-14	.1875	3/16"	4.763	1/4"	-	2"	11.25	10.76	10.27	9.78
62012	* SD-14D	.1875	3/16"	4.763	1/4"	-	2"	11.25	10.76	10.27	9.78
62020	* SD-1	.2500	1/4"	6.350	1/4"	-	2"	11.25	10.76	10.27	9.78
62021	* SD-1A	.2500	1/4"	6.350	1/4"	-	2"	17.83	17.05	16.28	15.50
62022	* SD-1D	.2500	1/4"	6.350	1/4"	-	2"	11.25	10.76	10.27	9.78
62030	SD-2	.3125	5/16"	7.938	1/4"	-	1-3/4"	10.58	10.12	9.66	9.20
62032	SD-2D	.3125	5/16"	7.938	1/4"	-	1-3/4"	10.58	10.12	9.66	9.20
62040	SD-3	.3750	3/8"	9.525	1/4"	-	1-3/4"	11.48	10.98	10.48	9.98
62041	SD-3A	.3750	3/8"	9.525	1/4"	-	1-3/4"	18.57	17.77	16.96	16.15
62042	SD-3D	.3750	3/8"	9.525	1/4"	-	1-3/4"	11.48	10.98	10.48	9.98
62050	SD-4	.4375	7/16"	11.113	1/4"	-	1-3/4"	16.68	15.95	15.23	14.50
62052	SD-4D	.4375	7/16"	11.113	1/4"	-	1-3/4"	16.68	15.95	15.23	14.50
62060	SD-5	.5000	1/2"	12.700	1/4"	-	1-3/4"	17.22	16.47	15.72	14.97
62061	SD-5A	.5000	1/2"	12.700	1/4"	-	1-3/4"	23.01	22.01	21.01	20.01
62062	SD-5D	.5000	1/2"	12.700	1/4"	-	1-3/4"	17.22	16.47	15.72	14.97
62070	SD-6	.6250	5/8"	15.875	1/4"	-	1-3/4"	19.24	18.40	17.57	16.73
62071	SD-6A	.6250	5/8"	15.875	1/4"	-	1-3/4"	39.82	38.09	36.36	34.63
62072	SD-6D	.6250	5/8"	15.875	1/4"	-	1-3/4"	19.24	18.40	17.57	16.73
62080	SD-7	.7500	3/4"	19.050	1/4"	-	1-3/4"	27.40	26.21	25.02	23.83
62082	SD-7D	.7500	3/4"	19.050	1/4"	-	1-3/4"	27.40	26.21	25.02	23.83
62090	SD-9	1.000	1"	25.400	1/4"	-	1-3/4"	50.82	48.61	46.40	44.19
62092	SD-9D	1.000	1"	25.400	1/4"	-	1-3/4"	50.82	48.61	46.40	44.19

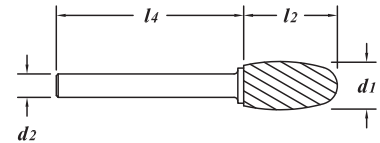
Carbide Rotary Files - Egg Shape

Submicron Grain Carbide

A - Aluminum Cut

D - Double Cut

* - Solid Carbide



EDP#	TOOL #	$d1$ †		$d2$ Shank Diameter	$l2$ Flute Length	$l4$ Shank Length	1-11	12-24	25-49	50-100
		Decimal	Diameter							
63010	* SE-1	.2500	1/4"	6.350	1/4"	2"	11.56	11.06	10.55	10.05
63012	* SE-1D	.2500	1/4"	6.350	1/4"	3/8"	11.56	11.06	10.55	10.05
63020	SE-3	.3750	3/8"	9.525	1/4"	5/8"	16.05	15.36	14.66	13.96
63021	SE-3A	.3750	3/8"	9.525	1/4"	5/8"	23.26	22.25	21.24	20.23
63022	SE-3D	.3750	3/8"	9.525	1/4"	5/8"	16.05	15.36	14.66	13.96
63030	SE-5	.5000	1/2"	12.700	1/4"	7/8"	20.54	19.65	18.75	17.86
63031	SE-5A	.5000	1/2"	12.700	1/4"	7/8"	33.40	31.94	30.49	29.04
63032	SE-5D	.5000	1/2"	12.700	1/4"	7/8"	20.54	19.65	18.75	17.86
63040	SE-6	.6250	5/8"	15.875	1/4"	1"	30.16	28.85	27.54	26.23
63041	SE-6A	.6250	5/8"	15.875	1/4"	1"	49.55	47.40	45.24	43.09
63042	SE-6D	.6250	5/8"	15.875	1/4"	1"	30.16	28.85	27.54	26.23
63050	SE-7	.7500	3/4"	19.050	1/4"	1"	41.57	39.77	37.96	36.15
63052	SE-7D	.7500	3/4"	19.050	1/4"	1"	41.57	39.77	37.96	36.15

SF (1/4" Steel Shank)

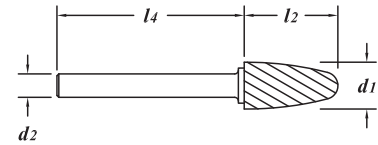
Carbide Rotary Files - Tree-Radius Shape

Submicron Grain Carbide

A - Aluminum Cut

D - Double Cut

* - Solid Carbide



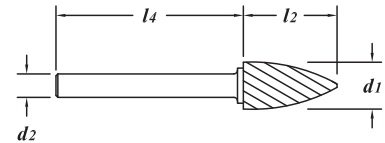
EDP#	TOOL #	$d1$ † Diameter		$d2$ Shank Diameter	$l2$ Flute Length	$l4$ Shank Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
64010	* SF-1	.2500	1/4"	6.350	1/4"	5/8"	2"	11.56	11.06	10.55	10.05
64011	* SF-1A	.2500	1/4"	6.350	1/4"	5/8"	2"	17.83	17.05	16.28	15.50
64012	* SF-1D	.2500	1/4"	6.350	1/4"	5/8"	2"	11.56	11.06	10.55	10.05
64020	SF-3	.3750	3/8"	9.525	1/4"	3/4"	1-3/4"	13.93	13.32	12.72	12.11
64021	SF-3A	.3750	3/8"	9.525	1/4"	3/4"	1-3/4"	22.46	21.48	20.51	19.53
64022	SF-3D	.3750	3/8"	9.525	1/4"	3/4"	1-3/4"	13.93	13.32	12.72	12.11
64030	SF-5	.5000	1/2"	12.700	1/4"	1"	1-3/4"	20.86	19.95	19.05	18.14
64031	SF-5A	.5000	1/2"	12.700	1/4"	1"	1-3/4"	31.79	30.40	29.02	27.64
64032	SF-5D	.5000	1/2"	12.700	1/4"	1"	1-3/4"	20.86	19.95	19.05	18.14
64040	SF-6	.6250	5/8"	15.875	1/4"	1"	1-3/4"	28.88	27.62	26.37	25.11
64041	SF-6A	.6250	5/8"	15.875	1/4"	1"	1-3/4"	44.19	42.27	40.35	38.43
64042	SF-6D	.6250	5/8"	15.875	1/4"	1"	1-3/4"	28.88	27.62	26.37	25.11
64050	SF-14	.7500	3/4"	19.050	1/4"	1-1/4"	1-3/4"	44.48	42.55	40.61	38.68
64052	SF-14D	.7500	3/4"	19.050	1/4"	1-1/4"	1-3/4"	44.48	42.55	40.61	38.68

Carbide Rotary Files - Tree-Pointed Shape

Submicron Grain Carbide

D - Double Cut

* - Solid Carbide



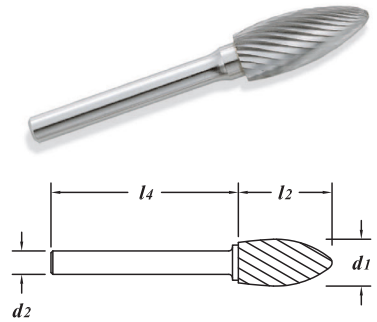
EDP#	TOOL #	$d1$ † Diameter		$d2$ Shank Diameter	$l2$ Flute Length	$l4$ Shank Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
65010	* SG-1	.2500	1/4"	6.350	1/4"	5/8"	2"	11.56	11.06	10.55	10.05
65012	* SG-1D	.2500	1/4"	6.350	1/4"	5/8"	2"	11.56	11.06	10.55	10.05
65020	SG-3	.3750	3/8"	9.525	1/4"	3/4"	1-3/4"	14.86	14.21	13.57	12.92
65022	SG-3D	.3750	3/8"	9.525	1/4"	3/4"	1-3/4"	14.86	14.21	13.57	12.92
65030	SG-13	.5000	1/2"	12.700	1/4"	3/4"	1-3/4"	19.90	19.03	18.17	17.30
65032	SG-13D	.5000	1/2"	12.700	1/4"	3/4"	1-3/4"	19.90	19.03	18.17	17.30
65040	SG-5	.5000	1/2"	12.700	1/4"	1"	1-3/4"	20.57	19.68	18.78	17.89
65042	SG-5D	.5000	1/2"	12.700	1/4"	1"	1-3/4"	20.57	19.68	18.78	17.89
65050	SG-6	.6250	5/8"	15.875	1/4"	1"	1-3/4"	28.88	27.62	26.37	25.11
65052	SG-6D	.6250	5/8"	15.875	1/4"	1"	1-3/4"	28.88	27.62	26.37	25.11
65060	SG-7	.7500	3/4"	19.050	1/4"	1"	1-3/4"	38.19	36.53	34.87	33.21
65062	SG-7D	.7500	3/4"	19.050	1/4"	1"	1-3/4"	38.19	36.53	34.87	33.21

SH (1/4" Steel Shank)

Carbide Rotary Files - Flame Shape

Submicron Grain Carbide

D - Double Cut



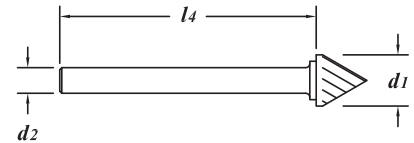
EDP#	TOOL #	d_1 † Diameter		d_2 Shank Diameter	l_2 Flute Length	l_4 Shank Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
66010	SH-2	.3125	5/16"	7.938	1/4"	3/4"	1-3/4"	14.12	13.51	12.89	12.28
66012	SH-2D	.3125	5/16"	7.938	1/4"	3/4"	1-3/4"	14.12	13.51	12.89	12.28
66020	SH-5	.5000	1/2"	12.700	1/4"	1-1/4"	1-3/4"	28.88	27.62	26.37	25.11
66022	SH-5D	.5000	1/2"	12.700	1/4"	1-1/4"	1-3/4"	28.88	27.62	26.37	25.11
66030	SH-6	.6250	5/8"	15.875	1/4"	1-7/16"	1-3/4"	37.86	36.21	34.57	32.92
66032	SH-6D	.6250	5/8"	15.875	1/4"	1-7/16"	1-3/4"	37.86	36.21	34.57	32.92
66040	SH-7	.7500	3/4"	19.050	1/4"	1-5/8"	1-3/4"	46.52	44.50	42.47	40.45
66042	SH-7D	.7500	3/4"	19.050	1/4"	1-5/8"	1-3/4"	46.52	44.50	42.47	40.45

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

Submicron Grain Carbide

D - Double Cut

** - Solid Carbide/Double End



EDP#	TOOL #	$d1$ †		$d2$ Shank Diameter	$l4$ Shank Length	1-11	12-24	25-49	50-100	
		Decimal	Diameter							
67010	**SJ-1	.2500	1/4"	6.350	1/4"	1-11/16"	14.54	13.90	13.27	12.64
67012	**SJ-1D	.2500	1/4"	6.350	1/4"	1-11/16"	14.54	13.90	13.27	12.64
67020	SJ-3	.3750	3/8"	9.525	1/4"	1-3/4"	12.20	11.67	11.14	10.61
67022	SJ-3D	.3750	3/8"	9.525	1/4"	1-3/4"	12.20	11.67	11.14	10.61
67030	SJ-5	.5000	1/2"	12.700	1/4"	1-3/4"	15.04	14.39	13.73	13.08
67032	SJ-5D	.5000	1/2"	12.700	1/4"	1-3/4"	15.04	14.39	13.73	13.08
67040	SJ-6	.6250	5/8"	15.875	1/4"	1-3/4"	20.04	19.17	18.30	17.43
67042	SJ-6D	.6250	5/8"	15.875	1/4"	1-3/4"	20.04	19.17	18.30	17.43
67050	SJ-7	.7500	3/4"	19.050	1/4"	1-3/4"	26.30	25.16	24.01	22.87
67052	SJ-7D	.7500	3/4"	19.050	1/4"	1-3/4"	26.30	25.16	24.01	22.87

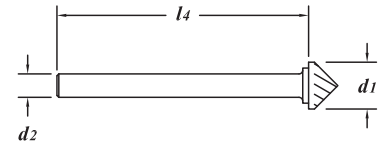
SK (1/4" Steel Shank)

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

Submicron Grain Carbide

D - Double Cut

** - Solid Carbide/Double End



EDP#	TOOL #	$d1$ †		$d2$ Shank Diameter	$l4$ Shank Length	1-11	12-24	25-49	50-100	
		Decimal	Diameter							Metric
68010	**SK-1	.2500	1/4"	6.350	1/4"	1-11/16"	14.54	13.90	13.27	12.64
68012	**SK-1D	.2500	1/4"	6.350	1/4"	1-11/16"	14.54	13.90	13.27	12.64
68020	SK-3	.3750	3/8"	9.525	1/4"	1-3/4"	12.20	11.67	11.14	10.61
68022	SK-3D	.3750	3/8"	9.525	1/4"	1-3/4"	12.20	11.67	11.14	10.61
68030	SK-5	.5000	1/2"	12.700	1/4"	1-3/4"	15.04	14.39	13.73	13.08
68032	SK-5D	.5000	1/2"	12.700	1/4"	1-3/4"	15.04	14.39	13.73	13.08
68040	SK-6	.6250	5/8"	15.875	1/4"	1-3/4"	20.04	19.17	18.30	17.43
68042	SK-6D	.6250	5/8"	15.875	1/4"	1-3/4"	20.04	19.17	18.30	17.43
68050	SK-7	.7500	3/4"	19.050	1/4"	1-3/4"	26.30	25.16	24.01	22.87
68052	SK-7D	.7500	3/4"	19.050	1/4"	1-3/4"	26.30	25.16	24.01	22.87
68070	SK-9	1.000	1"	25.400	1/4"	1-3/4"	42.18	40.35	38.51	36.68
68072	SK-9D	1.000	1"	25.400	1/4"	1-3/4"	42.18	40.35	38.51	36.68

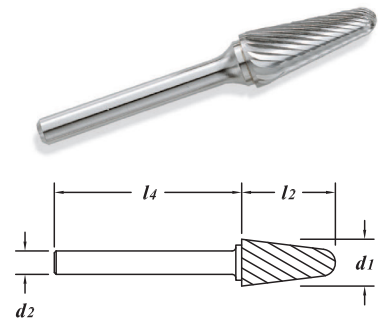
Carbide Rotary Files - Cone-Radius Shape (14° Included Angle)

Submicron Grain Carbide

A - Aluminum Cut

D - Double Cut

* - Solid Carbide



EDP#	TOOL #	$d1$ † Diameter		$d2$ Shank Diameter	$l2$ Flute Length	$l4$ Shank Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
69010	* SL-1	.2500	1/4"	6.350	1/4"	5/8"	2"	11.56	11.06	10.55	10.05
69012	* SL-1D	.2500	1/4"	6.350	1/4"	5/8"	2"	11.56	11.06	10.55	10.05
69020	SL-2	.3125	5/16"	7.938	1/4"	7/8"	1-3/4"	13.80	13.20	12.60	12.00
69022	SL-2D	.3125	5/16"	7.938	1/4"	7/8"	1-3/4"	13.80	13.20	12.60	12.00
69030	SL-3	.3750	3/8"	9.525	1/4"	1-1/16"	1-3/4"	16.36	15.65	14.94	14.23
69031	SL-3A	.3750	3/8"	9.525	1/4"	1-1/16"	1-3/4"	27.27	26.08	24.90	23.71
69032	SL-3D	.3750	3/8"	9.525	1/4"	1-1/16"	1-3/4"	16.36	15.65	14.94	14.23
69040	SL-4	.5000	1/2"	12.700	1/4"	1-1/8"	1-3/4"	19.90	19.03	18.17	17.30
69041	SL-4A	.5000	1/2"	12.700	1/4"	1-1/8"	1-3/4"	33.79	32.32	30.85	29.38
69042	SL-4D	.5000	1/2"	12.700	1/4"	1-1/8"	1-3/4"	19.90	19.03	18.17	17.30
69050	SL-5	.6250	5/8"	15.875	1/4"	1-3/16"	1-3/4"	39.15	37.44	35.74	34.04
69051	SL-5A	.6250	5/8"	15.875	1/4"	1-3/16"	1-3/4"	53.30	50.99	48.67	46.35
69052	SL-5D	.6250	5/8"	15.875	1/4"	1-3/16"	1-3/4"	39.15	37.44	35.74	34.04
69060	SL-7	.7500	3/4"	19.050	1/4"	1-1/2"	1-3/4"	51.67	49.42	47.18	44.93
69062	SL-7D	.7500	3/4"	19.050	1/4"	1-1/2"	1-3/4"	51.67	49.42	47.18	44.93

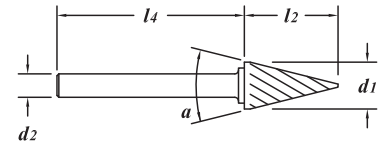
SM (1/4" Steel Shank)

Carbide Rotary Files - Cone Flat Shape (no radius)

Submicron Grain Carbide

D - Double Cut

* - Solid Carbide



EDP#	TOOL #	$d1$ †		$d2$ Shank Diameter	a Included Angle	$l2$ Flute Length	$l4$ Shank Length	1-11	12-24	25-49	50-100	
		Decimal	Diameter									Metric
70010	* SM-1	.2500	1/4"	6.350	1/4"	22°	1/2"	2"	11.56	11.06	10.55	10.05
70012	* SM-1D	.2500	1/4"	6.350	1/4"	22°	1/2"	2"	11.56	11.06	10.55	10.05
70020	SM-4	.3750	3/8"	9.525	1/4"	28°	5/8"	1-3/4"	16.36	15.65	14.94	14.23
70022	SM-4D	.3750	3/8"	9.525	1/4"	28°	5/8"	1-3/4"	16.36	15.65	14.94	14.23
70030	SM-5	.5000	1/2"	12.700	1/4"	28°	7/8"	1-3/4"	20.54	19.65	18.75	17.86
70032	SM-5D	.5000	1/2"	12.700	1/4"	28°	7/8"	1-3/4"	20.54	19.65	18.75	17.86
70040	SM-6	.6250	5/8"	15.875	1/4"	31°	1"	1-3/4"	27.28	26.09	24.91	23.72
70042	SM-6D	.6250	5/8"	15.875	1/4"	31°	1"	1-3/4"	27.28	26.09	24.91	23.72

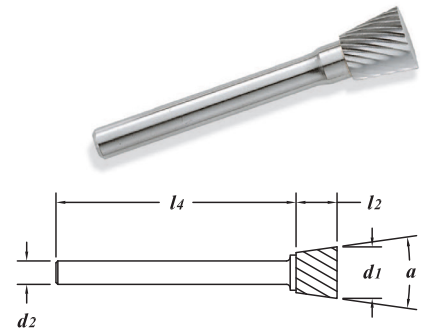


Carbide Rotary Files - Inverted Cone Shape

Submicron Grain Carbide

D - Double Cut

* - Solid Carbide



EDP#	TOOL #	$d1$ †		$d2$ Shank Diameter	a Included Angle	$l2$ Flute Length	$l4$ Shank Length	1-11	12-24	25-49	50-100	
		Decimal	Diameter									Metric
71010	* SN-1	.2500	1/4"	6.350	1/4"	10°	5/16"	2"	11.56	11.06	10.55	10.05
71012	* SN-1D	.2500	1/4"	6.350	1/4"	10°	5/16"	2"	11.56	11.06	10.55	10.05
71020	SN-2	.3750	3/8"	9.525	1/4"	13°	3/8"	1-3/4"	14.42	13.79	13.17	12.54
71022	SN-2D	.3750	3/8"	9.525	1/4"	13°	3/8"	1-3/4"	14.42	13.79	13.17	12.54
71030	SN-3	.5000	1/2"	12.700	1/4"	16°	1/2"	1-3/4"	19.90	19.03	18.17	17.30
71032	SN-3D	.5000	1/2"	12.700	1/4"	16°	1/2"	1-3/4"	19.90	19.03	18.17	17.30

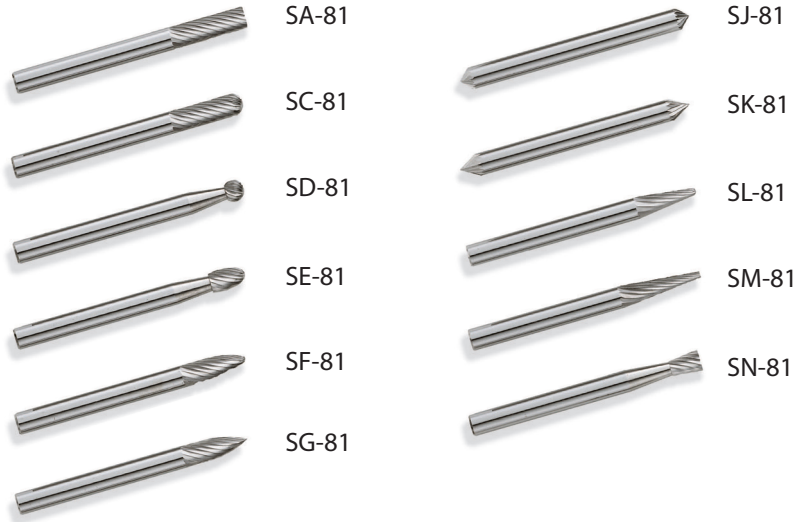


3/16" Diameter (3/16" Shank)

Solid Carbide Rotary Files

Submicron Grain Carbide

D - Double Cut

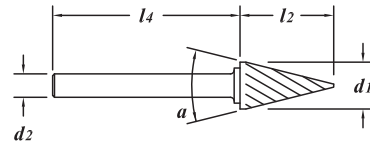
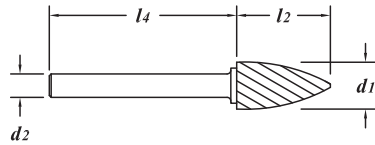


EDP#	TOOL #	d_1 † Diameter		l_1 Overall Length	a Included Angle	l_2 Flute Length	1-11	12-24	25-49	50-100	
		Decimal	Metric								
72010	SA-81	.1875	3/16"	4.763	2"	-	5/8"	12.64	12.09	11.54	10.99
72012	SA-81D	.1875	3/16"	4.763	2"	-	5/8"	12.64	12.09	11.54	10.99
72020	SC-81	.1875	3/16"	4.763	2"	-	5/8"	12.64	12.09	11.54	10.99
72030	SD-81	.1875	3/16"	4.763	2"	-	-	12.64	12.09	11.54	10.99
72032	SD-81D	.1875	3/16"	4.763	2"	-	-	12.64	12.09	11.54	10.99
72040	SE-81	.1875	3/16"	4.763	2"	-	9/32"	12.64	12.09	11.54	10.99
72042	SE-81D	.1875	3/16"	4.763	2"	-	9/32"	12.64	12.09	11.54	10.99
72050	SF-81	.1875	3/16"	4.763	2"	-	1/2"	12.64	12.09	11.54	10.99
72052	SF-81D	.1875	3/16"	4.763	2"	-	1/2"	12.64	12.09	11.54	10.99
72060	SG-81	.1875	3/16"	4.763	2"	-	1/2"	12.64	12.09	11.54	10.99
72062	SG-81D	.1875	3/16"	4.763	2"	-	1/2"	12.64	12.09	11.54	10.99
72070	SJ-81	.1875	3/16"	4.763	2"	60°	-	12.64	12.09	11.54	10.99
72072	SJ-81D	.1875	3/16"	4.763	2"	60°	-	12.64	12.09	11.54	10.99
72080	SK-81	.1875	3/16"	4.763	2"	90°	-	12.64	12.09	11.54	10.99
72082	SK-81D	.1875	3/16"	4.763	2"	90°	-	12.64	12.09	11.54	10.99
72090	SL-81	.1875	3/16"	4.763	2"	14°	1/2"	12.64	12.09	11.54	10.99
72092	SL-81D	.1875	3/16"	4.763	2"	14°	1/2"	12.64	12.09	11.54	10.99
72100	SM-81	.1875	3/16"	4.763	2"	12°	5/8"	12.64	12.09	11.54	10.99
72110	SN-81	.1875	3/16"	4.763	2"	10°	1/4"	12.64	12.09	11.54	10.99
72112	SN-81D	.1875	3/16"	4.763	2"	10°	1/4"	12.64	12.09	11.54	10.99

Carbide Rotary Files

Submicron Grain Carbide

D - Double Cuts



EDP#	TOOL #	$d1$ † Diameter		$d2$ Shank Diameter	a Included Angle	$l2$ Flute Length	$l4$ Shank Length	1-11	12-24	25-49	50-100	
		Decimal	Metric									
73010	SA-51	.2500	1/4"	6.350	1/8"	-	1/2"	1-1/2"	12.06	11.54	11.01	10.49
73012	SA-51D	.2500	1/4"	6.350	1/8"	-	1/2"	1-1/2"	12.06	11.54	11.01	10.49
73020	SB-51	.2500	1/4"	6.350	1/8"	-	3/16"	1-1/2"	12.06	11.54	11.01	10.49
73022	SB-51D	.2500	1/4"	6.350	1/8"	-	3/16"	1-1/2"	12.06	11.54	11.01	10.49
73030	SC-51	.2500	1/4"	6.350	1/8"	-	1/2"	1-1/2"	12.06	11.54	11.01	10.49
73032	SC-51D	.2500	1/4"	6.350	1/8"	-	1/2"	1-1/2"	12.06	11.54	11.01	10.49
73040	SD-51	.2500	1/4"	6.350	1/8"	-	-	1-1/2"	12.06	11.54	11.01	10.49
73042	SD-51D	.2500	1/4"	6.350	1/8"	-	-	1-1/2"	12.06	11.54	11.01	10.49
73050	SE-51	.2500	1/4"	6.350	1/8"	-	3/8"	1-1/2"	12.06	11.54	11.01	10.49
73052	SE-51D	.2500	1/4"	6.350	1/8"	-	3/8"	1-1/2"	12.06	11.54	11.01	10.49
73060	SF-51	.2500	1/4"	6.350	1/8"	-	1/2"	1-1/2"	12.06	11.54	11.01	10.49
73062	SF-51D	.2500	1/4"	6.350	1/8"	-	1/2"	1-1/2"	12.06	11.54	11.01	10.49
73070	SG-51	.2500	1/4"	6.350	1/8"	-	1/2"	1-1/2"	12.06	11.54	11.01	10.49
73072	SG-51D	.2500	1/4"	6.350	1/8"	-	1/2"	1-1/2"	12.06	11.54	11.01	10.49
73080	SM-51	.2500	1/4"	6.350	1/8"	22°	1/2"	1-1/2"	12.06	11.54	11.01	10.49
73082	SM-51D	.2500	1/4"	6.350	1/8"	22°	1/2"	1-1/2"	12.06	11.54	11.01	10.49
73090	SN-51	.2500	1/4"	6.350	1/8"	10°	1/4"	1-1/2"	12.06	11.54	11.01	10.49
73092	SN-51D	.2500	1/4"	6.350	1/8"	10°	1/4"	1-1/2"	12.06	11.54	11.01	10.49

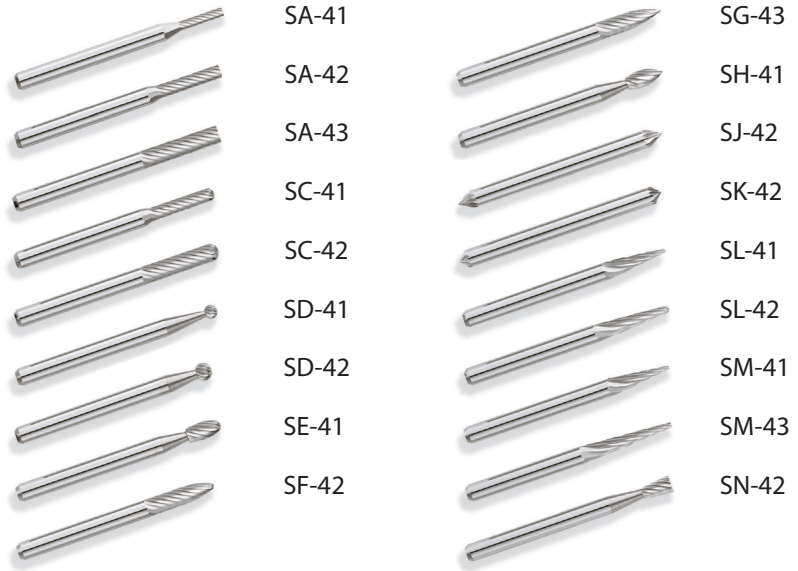
CAD drawings representative for dimension placement

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

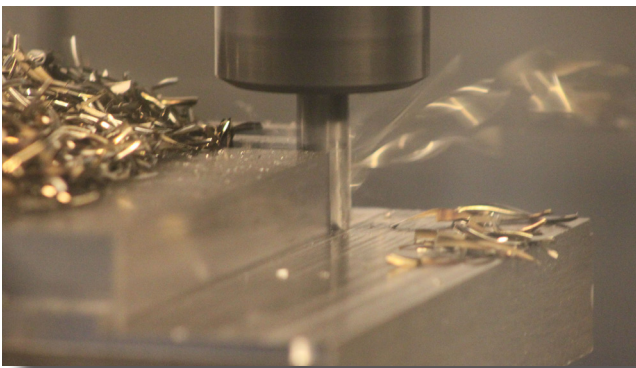
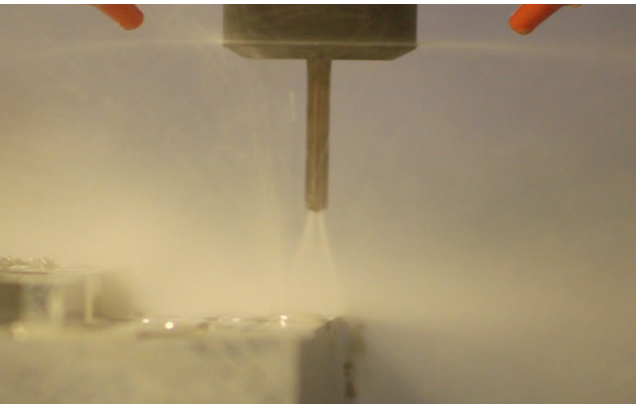
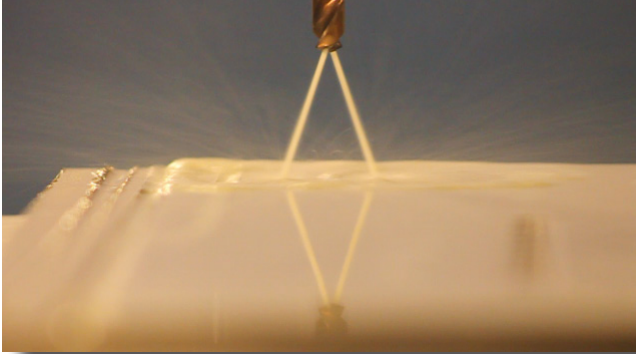
Solid Carbide Rotary Files

Submicron Grain Carbide

D - Double Cut



EDP#	TOOL #	$d1$ †		$l1$	a	$l2$	1-11	12-24	25-49	50-100	
		Decimal	Diameter Metric								Overall Length
74010	SA-41	.0625	1/16"	1.588	1-1/2"	-	1/4"	7.14	6.83	6.52	6.21
74012	SA-41D	.0625	1/16"	1.588	1-1/2"	-	1/4"	7.14	6.83	6.52	6.21
74020	SA-42	.0938	3/32"	2.383	1-1/2"	-	7/16"	7.14	6.83	6.52	6.21
74022	SA-42D	.0938	3/32"	2.383	1-1/2"	-	7/16"	7.14	6.83	6.52	6.21
74030	SA-43	.1250	1/8"	3.175	1-1/2"	-	9/16"	7.14	6.83	6.52	6.21
74032	SA-43D	.1250	1/8"	3.175	1-1/2"	-	9/16"	7.14	6.83	6.52	6.21
74040	SC-41	.0938	3/32"	2.383	1-1/2"	-	7/16"	7.14	6.83	6.52	6.21
74042	SC-41D	.0938	3/32"	2.383	1-1/2"	-	7/16"	7.14	6.83	6.52	6.21
74050	SC-42	.1250	1/8"	3.175	1-1/2"	-	9/16"	7.14	6.83	6.52	6.21
74052	SC-42D	.1250	1/8"	3.175	1-1/2"	-	9/16"	7.14	6.83	6.52	6.21
74060	SD-41	.0938	3/32"	2.383	1-1/2"	-	-	7.14	6.83	6.52	6.21
74062	SD-41D	.0938	3/32"	2.383	1-1/2"	-	-	7.14	6.83	6.52	6.21
74070	SD-42	.1250	1/8"	3.175	1-1/2"	-	-	7.14	6.83	6.52	6.21
74072	SD-42D	.1250	1/8"	3.175	1-1/2"	-	-	7.14	6.83	6.52	6.21
74080	SE-41	.1250	1/8"	3.175	1-1/2"	-	7/32"	7.14	6.83	6.52	6.21
74082	SE-41D	.1250	1/8"	3.175	1-1/2"	-	7/32"	7.14	6.83	6.52	6.21
74090	SF-42	.1250	1/8"	3.175	1-1/2"	-	1/2"	7.14	6.83	6.52	6.21
74092	SF-42D	.1250	1/8"	3.175	1-1/2"	-	1/2"	7.14	6.83	6.52	6.21
74100	SG-43	.1250	1/8"	3.175	1-1/2"	-	3/8"	7.14	6.83	6.52	6.21
74102	SG-43D	.1250	1/8"	3.175	1-1/2"	-	3/8"	7.14	6.83	6.52	6.21
74110	SH-41	.1250	1/8"	3.175	1-1/2"	-	1/4"	7.14	6.83	6.52	6.21
74112	SH-41D	.1250	1/8"	3.175	1-1/2"	-	1/4"	7.14	6.83	6.52	6.21
74120	SJ-42	.1250	1/8"	3.175	1-1/2"	60°	-	7.14	6.83	6.52	6.21
74122	SJ-42D	.1250	1/8"	3.175	1-1/2"	60°	-	7.14	6.83	6.52	6.21
74130	SK-42	.1250	1/8"	3.175	1-1/2"	90°	-	7.14	6.83	6.52	6.21
74132	SK-42D	.1250	1/8"	3.175	1-1/2"	90°	-	7.14	6.83	6.52	6.21
74140	SL-41	.1250	1/8"	3.175	1-1/2"	8°	3/8"	7.14	6.83	6.52	6.21
74142	SL-41D	.1250	1/8"	3.175	1-1/2"	8°	3/8"	7.14	6.83	6.52	6.21
74150	SL-42	.1250	1/8"	3.175	1-1/2"	8°	1/2"	7.14	6.83	6.52	6.21
74152	SL-42D	.1250	1/8"	3.175	1-1/2"	8°	1/2"	7.14	6.83	6.52	6.21
74160	SM-41	.1250	1/8"	3.175	1-1/2"	12°	3/8"	7.14	6.83	6.52	6.21
74162	SM-41D	.1250	1/8"	3.175	1-1/2"	12°	3/8"	7.14	6.83	6.52	6.21
74170	SM-43	.1250	1/8"	3.175	1-1/2"	7°	5/8"	7.14	6.83	6.52	6.21
74172	SM-43D	.1250	1/8"	3.175	1-1/2"	7°	5/8"	7.14	6.83	6.52	6.21
74180	SN-42	.1250	1/8"	3.175	1-1/2"	10°	3/16"	7.14	6.83	6.52	6.21
74182	SN-42D	.1250	1/8"	3.175	1-1/2"	10°	3/16"	7.14	6.83	6.52	6.21



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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
Heavy wear on corners	Check part rigidity
	Increase feed rate
	Check coolant flow and location
	Confirm concentricity of drill in holder
Long, stringy chips	Check part rigidity
	Increase feed rate
	Increase hone relief
	Constant feed rate
Excessive noise	Increase number of peck cycles
	Check drill
	Check part rigidity
Tool life	Check for proper speeds and feeds
	Lower speeds and feeds
	Check coolant flow and location
	Confirm concentricity of drill in holder
Hole too small	Confirm coolant concentration
	Increase feed rate
	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

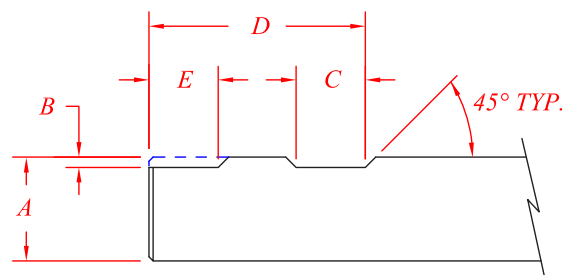
PROBLEM	SUGGESTIONS
Chipping	Check part rigidity
	Verify speeds and feeds
	Confirm concentricity of end mill in holder
	Decrease ramp angle or slow down approach
	Check coolant flow and location
Breakage	Decrease feed rate
	Decrease axial depth
	Use shorter tool or stub holder
	Resharpen earlier
Chattering	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
Chip packing	Check coolant flow and location
	Decrease axial depth
	Adjust speeds and feeds
	Use different style of end mill
Wall not straight	Decrease feed rate
	Decrease axial depth
	Use shorter tool or stub holder
	Use different style of end mill

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

Weldon Flat Specs

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"
1"	1.0000"	.075" - .090"	.515" - .517"	1.398"
1-1/4"	1.2500"	.094" - .109"	.515" - .517"	1.398"



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

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

$$\text{RPM} = \frac{\text{SFM} \times 3.82}{\text{Diameter}}$$

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

Chip Thinning Calculation:

$$\frac{.50 \left(\frac{\text{Diameter}}{\text{Radial Stepover}} \right)}{\sqrt{\left(\frac{\text{Diameter}}{\text{Radial Stepover}} \right) - 1}} \times \text{CPT}_{(\text{Actual})} = \text{CPT}_{(\text{Programmed})}$$

Example below:

$$\frac{.50 \left(\frac{0.50}{.015} \right)}{\sqrt{\left(\frac{0.50}{.015} \right) - 1}} = \frac{16.667}{5.6} = 2.93 \times .0015 = .0045$$

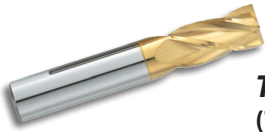
(Chip Thinning reference charts on pages 304-305)

For additional help:

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

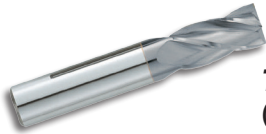
h6 TOLERANCE FOR SHRINK FIT HOLDERS <i>(as taken from the Machinery's Handbook)</i>		
SHANK DIAMETER		TOLERANCE
Decimal	Nominal	
≤ .1181"	≤ 3mm	-.00000" / -.00024"
> .1181" - .2362"	> 3mm - 6mm	-.00000" / -.00032"
> .2362" - .3937"	> 6mm - 10mm	-.00000" / -.00035"
> .3937" - .7087"	> 10mm - 18mm	-.00000"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

Tool Coatings for Standard Products



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
(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.



AlTiN
(Aluminum Titanium Nitride)

A single-layer coating whose hardness, oxidation resistance and thermal stability were optimized for material hardness above 38Rc and high-speed machining of materials that are difficult to work (titanium alloys, Inconel).



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. Excellent choice for cutting graphite and fiberglass. Can be added to a special for milling or drilling applications.



AlCrN
(Aluminum Chromium Nitride)

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



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.



AlTiN-based

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. With its unique nanostructure, AlTiN plus AlCrN, it boosts productivity in various materials.



AlCrN-based

High wear resistance even under severe thermal stress. Revolutionary smooth coating with outstanding adhesion. Prevents sticking and build-up on edges. Precise high-performance coating. Maintains sharp edges. Primarily for high-temp alloys, stainless, and tool steels.

SFM (M/Min.) / RPM Conversion Charts

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

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

GARR TOOL General Purpose Milling Guide

TECHNICAL

ISO Material	HRC	SFM (Vc)	CHIPLOAD PER TOOTH (Fz)									
			1/16"	1/8"	3/16"	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"
COBALT BASE ALLOYS												
Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	60 - 90 50 - 80	.0004"-.0008" .0003"-.0006"	.0004"-.0008" .0003"-.0006"	.0004"-.0008" .0003"-.0006"	.0005"-.0010" .0003"-.0008"	.0008"-.0015" .0005"-.0010"	.0010"-.0018" .0008"-.0015"	.0015"-.0030" .0010"-.0015"	.0020"-.0030" .0015"-.0025"	.0025"-.0035" .0015"-.0020"	.0025"-.0035" .0015"-.0020"
NICKEL BASE ALLOYS												
Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	55 - 90 45 - 80	.0004"-.0008" .0003"-.0006"	.0004"-.0008" .0003"-.0006"	.0004"-.0008" .0003"-.0006"	.0005"-.0010" .0003"-.0008"	.0008"-.0015" .0005"-.0010"	.0010"-.0018" .0008"-.0015"	.0015"-.0030" .0010"-.0015"	.0020"-.0030" .0015"-.0025"	.0025"-.0035" .0015"-.0020"	.0025"-.0035" .0015"-.0020"
IRON BASE ALLOYS												
A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	55 - 90 50 - 80	.0004"-.0008" .0003"-.0006"	.0004"-.0008" .0003"-.0006"	.0004"-.0008" .0003"-.0006"	.0005"-.0010" .0003"-.0008"	.0008"-.0015" .0005"-.0010"	.0010"-.0018" .0008"-.0015"	.0015"-.0030" .0010"-.0015"	.0020"-.0030" .0015"-.0025"	.0025"-.0035" .0015"-.0020"	.0025"-.0035" .0015"-.0020"
TITANIUM ALLOYS												
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		100 - 150	.0003"-.0008"	.0003"-.0008"	.0005"-.0012"	.0005"-.0012"	.0008"-.0015"	.0010"-.0015"	.0013"-.0020"	.0018"-.0025"	.0020"-.0030"	.0025"-.0035"
5553 / Beta Titanium		90 - 120	.0003"-.0008"	.0003"-.0008"	.0004"-.0010"	.0004"-.0010"	.0005"-.0012"	.0008"-.0014"	.0010"-.0016"	.0010"-.0020"	.0015"-.0025"	.0015"-.0025"
STAINLESS STEELS												
13/8, 15/5, 17-4, pH Types	< 40 > 40	100 - 150 80 - 100	.0002"-.0005" .0002"-.0004"	.0003"-.0006" .0002"-.0004"	.0003"-.0007" .0002"-.0006"	.0006"-.0009" .0003"-.0007"	.0008"-.0012" .0004"-.0008"	.0013"-.0018" .0007"-.0012"	.0010"-.0020" .0008"-.0015"	.0012"-.0025" .0010"-.0016"	.0012"-.0020" .0013"-.0017"	.0020"-.0028" .0015"-.0020"
300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	100 - 150 80 - 100	.0003"-.0006" .0002"-.0004"	.0003"-.0007" .0002"-.0005"	.0005"-.0010" .0004"-.0007"	.0008"-.0015" .0005"-.0010"	.0009"-.0013" .0005"-.0010"	.0010"-.0018" .0007"-.0010"	.0015"-.0020" .0009"-.0015"	.0018"-.0022" .0012"-.0018"	.0018"-.0035" .0015"-.0025"	.0023"-.0036" .0020"-.0030"
400 Series - 403, 405, 420, 455	< 40 > 40	150 - 200 100 - 150	.0005"-.0008" .0003"-.0007"	.0007"-.0010" .0004"-.0008"	.0009"-.0015" .0006"-.0010"	.0009"-.0014" .0007"-.0011"	.0011"-.0015" .0008"-.0012"	.0013"-.0018" .0009"-.0015"	.0015"-.0025" .0012"-.0020"	.0020"-.0035" .0018"-.0030"	.0022"-.0040" .0020"-.0035"	.0030"-.0046" .0024"-.0042"
HIGH STRENGTH TOOL STEELS												
A2, D2, P20, H13, S7, O1	< 40 > 40	150 - 200 100 - 150	.0003"-.0008" .0003"-.0005"	.0003"-.0008" .0003"-.0005"	.0005"-.0010" .0003"-.0008"	.0010"-.0015" .0005"-.0010"	.0012"-.0020" .0005"-.0010"	.0012"-.0020" .0005"-.0010"	.0014"-.0024" .0010"-.0015"	.0018"-.0026" .0012"-.0018"	.0020"-.0028" .0014"-.0020"	.0022"-.0030" .0015"-.0022"
MEDIUM ALLOY TOOL STEELS												
4140, 4340, 52100, 6150, 8620	< 40 > 40	150 - 200 100 - 150	.0003"-.0008" .0003"-.0005"	.0003"-.0008" .0003"-.0005"	.0005"-.0010" .0003"-.0008"	.0010"-.0015" .0005"-.0010"	.0012"-.0020" .0005"-.0010"	.0012"-.0020" .0005"-.0010"	.0014"-.0024" .0010"-.0015"	.0018"-.0026" .0012"-.0018"	.0020"-.0028" .0014"-.0020"	.0022"-.0030" .0015"-.0022"
CARBON STEELS												
1000's - 1018, 1020, 12L14	< 40	150 - 200	.0003"-.0008"	.0003"-.0008"	.0005"-.0010"	.0010"-.0015"	.0012"-.0020"	.0012"-.0020"	.0014"-.0024"	.0018"-.0026"	.0020"-.0028"	.0022"-.0030"
CAST MATERIAL												
Ductile Iron		175 - 225	.0005"-.0008"	.0008"-.0012"	.0010"-.0015"	.0015"-.0025"	.0015"-.0025"	.0020"-.0030"	.0025"-.0035"	.0035"-.0045"	.0035"-.0045"	.0045"-.0055"
Gray Iron		175 - 225	.0005"-.0008"	.0008"-.0012"	.0010"-.0015"	.0015"-.0025"	.0015"-.0025"	.0020"-.0030"	.0025"-.0035"	.0035"-.0045"	.0035"-.0045"	.0045"-.0055"
NON-FERROUS												
Aluminum		300 - 500	.0003"-.0005"	.0006"-.0010"	.0008"-.0014"	.0012"-.0020"	.0014"-.0028"	.0020"-.0030"	.0035"-.0048"	.0050"-.0060"	.0058"-.0070"	.0068"-.0090"
Magnesium		300 - 500	.0003"-.0005"	.0006"-.0010"	.0008"-.0014"	.0012"-.0020"	.0014"-.0028"	.0020"-.0030"	.0035"-.0048"	.0050"-.0060"	.0058"-.0070"	.0068"-.0090"
Copper		250 - 450	.0003"-.0005"	.0006"-.0010"	.0008"-.0014"	.0012"-.0020"	.0014"-.0028"	.0020"-.0030"	.0035"-.0048"	.0050"-.0060"	.0058"-.0070"	.0068"-.0090"
Brass, Bronze		200 - 400	.0003"-.0005"	.0006"-.0010"	.0008"-.0014"	.0012"-.0020"	.0014"-.0028"	.0020"-.0030"	.0035"-.0048"	.0050"-.0060"	.0058"-.0070"	.0068"-.0090"
COMPOSITE (non-ISO)												
Fiberglass, Plastics, G10		200 - 400	.0003"-.0005"	.0006"-.0010"	.0008"-.0014"	.0012"-.0020"	.0014"-.0028"	.0020"-.0030"	.0035"-.0048"	.0050"-.0060"	.0058"-.0070"	.0068"-.0090"
Graphite			(See Graphite Chart - page 311)									

When plunging into a solid, drop feed by approximately 50%. 20% of diameter for basic engagement parameters.

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

GARR TOOL General Purpose Milling Guide

TECHNICAL

ISO Material	HRC	M/Min. (Vc)	CHIPLOAD PER TOOTH (Fz)									
			1.5mm	3.0mm	5.0mm	6.0mm	8.0mm	10.0mm	12.0mm	16.0mm	20.0mm	25.0mm
COBALT BASE ALLOYS												
Haynes 25/188, Stellite 21, Cobalt Chrome	< 40	24 - 35	.010 - .020	.010 - .020	.010 - .020	.013 - .025	.020 - .038	.025 - .046	.038 - .076	.051 - .076	.064 - .089	.064 - .089
	> 40	20 - 31	.008 - .015	.008 - .015	.008 - .015	.008 - .020	.013 - .025	.020 - .038	.025 - .038	.038 - .064	.038 - .051	.038 - .051
NICKEL BASE ALLOYS												
Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40	22 - 35	.010 - .020	.010 - .020	.010 - .020	.013 - .025	.020 - .038	.025 - .046	.038 - .076	.051 - .076	.064 - .089	.064 - .089
	> 40	18 - 31	.008 - .015	.008 - .015	.008 - .015	.008 - .020	.013 - .025	.020 - .038	.025 - .038	.038 - .064	.038 - .051	.038 - .051
IRON BASE ALLOYS												
A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40	22 - 35	.010 - .020	.010 - .020	.010 - .020	.013 - .025	.020 - .038	.025 - .046	.038 - .076	.051 - .076	.064 - .089	.064 - .089
	> 40	20 - 31	.008 - .015	.008 - .015	.008 - .015	.008 - .020	.013 - .025	.020 - .038	.025 - .038	.038 - .064	.038 - .051	.038 - .051
TITANIUM ALLOYS												
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si	< 40	39 - 59	.008 - .020	.008 - .020	.013 - .030	.013 - .030	.020 - .038	.025 - .038	.033 - .051	.046 - .064	.051 - .076	.064 - .089
	> 40	35 - 47	.008 - .020	.008 - .020	.010 - .025	.010 - .025	.013 - .030	.020 - .036	.025 - .041	.025 - .051	.038 - .064	.038 - .064
STAINLESS STEELS												
13/8, 15/5, 17-4, pH Types	< 40	39 - 59	.005 - .013	.008 - .015	.008 - .018	.015 - .023	.020 - .030	.033 - .046	.025 - .051	.030 - .064	.030 - .051	.051 - .071
	> 40	31 - 39	.005 - .010	.005 - .010	.005 - .015	.008 - .018	.010 - .020	.018 - .030	.020 - .038	.025 - .041	.033 - .043	.038 - .051
300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40	39 - 59	.008 - .015	.008 - .018	.013 - .025	.020 - .038	.023 - .033	.025 - .046	.038 - .051	.046 - .056	.046 - .089	.058 - .091
	> 40	31 - 39	.005 - .010	.005 - .013	.010 - .018	.013 - .025	.013 - .025	.018 - .025	.023 - .038	.030 - .046	.038 - .064	.051 - .076
400 Series - 403, 405, 420, 455	< 40	59 - 79	.013 - .020	.018 - .025	.023 - .038	.023 - .036	.028 - .038	.033 - .046	.038 - .064	.051 - .089	.056 - .102	.076 - .117
	> 40	39 - 59	.008 - .018	.010 - .020	.015 - .025	.018 - .028	.020 - .030	.023 - .038	.030 - .051	.046 - .076	.051 - .089	.061 - .107
HIGH STRENGTH TOOL STEELS												
A2, D2, P20, H13, S7, O1	< 40	59 - 79	.008 - .020	.008 - .020	.013 - .025	.025 - .038	.030 - .051	.030 - .051	.036 - .061	.046 - .066	.051 - .071	.056 - .076
	> 40	39 - 59	.008 - .013	.008 - .013	.008 - .020	.013 - .025	.013 - .025	.013 - .025	.025 - .038	.030 - .046	.036 - .051	.038 - .056
MEDIUM ALLOY TOOL STEELS												
4140, 4340, 52100, 6150, 8620	< 40	59 - 79	.008 - .020	.008 - .020	.013 - .025	.025 - .038	.030 - .051	.030 - .051	.036 - .061	.046 - .066	.051 - .071	.056 - .076
	> 40	39 - 59	.008 - .013	.008 - .013	.008 - .020	.013 - .025	.013 - .025	.013 - .025	.025 - .038	.030 - .046	.036 - .051	.038 - .056
CARBON STEELS												
1000's - 1018, 1020, 12L14	< 40	59 - 79	.008 - .020	.008 - .020	.013 - .025	.025 - .038	.030 - .051	.030 - .051	.036 - .061	.046 - .066	.051 - .071	.056 - .076
CAST MATERIAL												
Ductile Iron	< 40	69 - 89	.013 - .020	.020 - .031	.025 - .038	.038 - .064	.038 - .064	.051 - .076	.064 - .089	.089 - .114	.089 - .114	.114 - .140
	> 40	69 - 89	.013 - .020	.020 - .031	.025 - .038	.038 - .064	.038 - .064	.051 - .076	.064 - .089	.089 - .114	.089 - .114	.114 - .140
Gray Iron	< 40	69 - 89	.013 - .020	.020 - .031	.025 - .038	.038 - .064	.038 - .064	.051 - .076	.064 - .089	.089 - .114	.089 - .114	.114 - .140
	> 40	69 - 89	.013 - .020	.020 - .031	.025 - .038	.038 - .064	.038 - .064	.051 - .076	.064 - .089	.089 - .114	.089 - .114	.114 - .140
NON-FERROUS												
Aluminum	< 40	118 - 197	.008 - .013	.015 - .025	.020 - .036	.030 - .051	.036 - .071	.051 - .076	.089 - .122	.127 - .152	.147 - .178	.173 - .229
Magnesium	< 40	118 - 197	.008 - .013	.015 - .025	.020 - .036	.030 - .051	.036 - .071	.051 - .076	.089 - .122	.127 - .152	.147 - .178	.173 - .229
Copper	< 40	98 - 177	.008 - .013	.015 - .025	.020 - .036	.030 - .051	.036 - .071	.051 - .076	.089 - .122	.127 - .152	.147 - .178	.173 - .229
Brass, Bronze	< 40	79 - 157	.008 - .013	.015 - .025	.020 - .036	.030 - .051	.036 - .071	.051 - .076	.089 - .122	.127 - .152	.147 - .178	.173 - .229
COMPOSITE (non-ISO)												
Fiberglass, Plastics, G10	< 40	79 - 157	.008 - .013	.015 - .025	.020 - .036	.030 - .051	.036 - .071	.051 - .076	.089 - .122	.127 - .152	.147 - .178	.173 - .229
Graphite	(See Graphite Chart - page 311)											

When plunging into a solid, drop feed by approximately 50%. 20% of diameter for basic engagement parameters.

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

GARR TOOL High Performance Milling Guide for 246MA, 253MA, 255MA, 263MA

	ISO Material	HRC	SFM (Vc)	CHIPLOAD PER TOOTH (Fz)										
				1/8"	3/16"	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"		
S	COBALT BASE ALLOYS													
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	70 - 110 50 - 90	.0008"-.0020" .0005"-.0015"	.0004"-.0010" .0004"-.0007"	.0007"-.0012" .0005"-.0011"	.0010"-.0018" .0008"-.0014"	.0010"-.0020" .0010"-.0017"	.0018"-.0028" .0015"-.0025"	.0023"-.0031" .0021"-.0028"	.0027"-.0034" .0024"-.0030"	.0029"-.0036" .0025"-.0031"		
	NICKEL BASE ALLOYS													
	Inconel-625/718, Waspalloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	65 - 110 55 - 90	.0005"-.0009" .0003"-.0008"	.0005"-.0009" .0004"-.0007"	.0007"-.0013" .0007"-.0012"	.0010"-.0017" .0009"-.0015"	.0010"-.0020" .0010"-.0018"	.0020"-.0028" .0015"-.0025"	.0025"-.0032" .0022"-.0030"	.0029"-.0036" .0026"-.0033"	.0030"-.0038" .0029"-.0035"		
	IRON BASE ALLOYS													
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	65 - 110 55 - 90	.0005"-.0010" .0003"-.0008"	.0008"-.0010" .0004"-.0008"	.0006"-.0012" .0005"-.0010"	.0007"-.0015" .0006"-.0013"	.0011"-.0016" .0008"-.0014"	.0018"-.0026" .0013"-.0023"	.0025"-.0030" .0022"-.0028"	.0026"-.0034" .0025"-.0031"	.0032"-.0038" .0030"-.0035"		
	TITANIUM ALLOYS													
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		125 - 175	.0005"-.0010"	.0005"-.0012"	.0008"-.0015"	.0010"-.0022"	.0018"-.0027"	.0023"-.0032"	.0025"-.0033"	.0027"-.0035"	.0028"-.0037"		
	5553 / Beta Titanium		100 - 150	.0004"-.0010"	.0004"-.0010"	.0006"-.0014"	.0008"-.0017"	.0015"-.0025"	.0022"-.0028"	.0024"-.0030"	.0026"-.0032"	.0028"-.0035"		
	M	STAINLESS STEELS												
13/8, 15/5, 17-4, PH Types		< 40 > 40	175 - 225 135 - 175	.0005"-.0007" .0002"-.0004"	.0004"-.0008" .0002"-.0006"	.0007"-.0010" .0003"-.0007"	.0008"-.0012" .0004"-.0008"	.0013"-.0018" .0007"-.0012"	.0010"-.0020" .0008"-.0015"	.0012"-.0025" .0010"-.0016"	.0012"-.0020" .0013"-.0017"	.0020"-.0028" .0015"-.0020"		
300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic		< 40 > 40	200 - 225 155 - 200	.0003"-.0007" .0002"-.0005"	.0005"-.0010" .0004"-.0007"	.0008"-.0015" .0005"-.0010"	.0009"-.0013" .0005"-.0010"	.0010"-.0018" .0007"-.0010"	.0015"-.0020" .0009"-.0015"	.0018"-.0022" .0012"-.0018"	.0018"-.0035" .0015"-.0025"	.0023"-.0036" .0020"-.0030"		
400 Series - 403, 405, 420, 455		< 40 > 40	200 - 225 150 - 200	.0007"-.0010" .0004"-.0008"	.0009"-.0015" .0006"-.0010"	.0009"-.0014" .0007"-.0011"	.0011"-.0015" .0008"-.0012"	.0013"-.0018" .0009"-.0015"	.0015"-.0025" .0012"-.0020"	.0020"-.0035" .0018"-.0030"	.0022"-.0040" .0020"-.0035"	.0030"-.0046" .0024"-.0042"		
HIGH STRENGTH TOOL STEELS														
A2, D2, P20, H13, S2, O1	< 40 > 40	225 - 325 150 - 225	.0005"-.0008" .0003"-.0005"	.0008"-.0015" .0005"-.0010"	.0015"-.0020" .0008"-.0012"	.0015"-.0023" .0010"-.0015"	.0015"-.0025" .0010"-.0018"	.0020"-.0030" .0015"-.0020"	.0020"-.0030" .0015"-.0020"	.0025"-.0035" .0018"-.0025"	.0030"-.0040" .0020"-.0030"			
P	MEDIUM ALLOY TOOL STEELS													
	4140, 4340, 52100, 6150, 8620	< 40 > 40	225 - 325 150 - 225	.0005"-.0008" .0003"-.0005"	.0008"-.0015" .0005"-.0010"	.0015"-.0020" .0008"-.0012"	.0015"-.0023" .0010"-.0015"	.0015"-.0025" .0010"-.0018"	.0020"-.0030" .0015"-.0020"	.0020"-.0030" .0015"-.0020"	.0025"-.0035" .0018"-.0025"	.0030"-.0040" .0020"-.0030"		
	CARBON STEELS													
1000's - 1018, 1020, 12L14	< 40	225 - 325	.0005"-.0008"	.0008"-.0015"	.0015"-.0020"	.0015"-.0023"	.0015"-.0025"	.0020"-.0030"	.0020"-.0030"	.0025"-.0035"	.0030"-.0040"			
K	CAST MATERIAL													
	Ductile Iron		225 - 325	.0010"-.0015"	.0015"-.0020"	.0020"-.0030"	.0025"-.0035"	.0025"-.0035"	.0030"-.0045"	.0040"-.0050"	.0040"-.0050"	.0050"-.0060"		
	Gray Iron		300 - 400	.0015"-.0025"	.0020"-.0030"	.0025"-.0035"	.0030"-.0040"	.0030"-.0040"	.0040"-.0050"	.0050"-.0060"	.0060"-.0070"	.0060"-.0070"		
N	NON-FERROUS													
	Aluminum		300 - 500	.0006"-.0010"	.0008"-.0014"	.0012"-.0020"	.0014"-.0028"	.0020"-.0030"	.0035"-.0048"	.0050"-.0060"	.0058"-.0070"	.0068"-.0090"		
	Magnesium		300 - 500	.0006"-.0010"	.0008"-.0014"	.0012"-.0020"	.0014"-.0028"	.0020"-.0030"	.0035"-.0048"	.0050"-.0060"	.0058"-.0070"	.0068"-.0090"		
	Copper		250 - 450	.0006"-.0010"	.0008"-.0014"	.0012"-.0020"	.0014"-.0028"	.0020"-.0030"	.0035"-.0048"	.0050"-.0060"	.0058"-.0070"	.0068"-.0090"		
	Brass, Bronze		200 - 400	.0006"-.0010"	.0008"-.0014"	.0012"-.0020"	.0014"-.0028"	.0020"-.0030"	.0035"-.0048"	.0050"-.0060"	.0058"-.0070"	.0068"-.0090"		
O	COMPOSITE (non-ISO)													
	Fiberglass, Plastics, G10		200 - 400	.0006"-.0010"	.0008"-.0014"	.0012"-.0020"	.0014"-.0028"	.0020"-.0030"	.0035"-.0048"	.0050"-.0060"	.0058"-.0070"	.0068"-.0090"		
	Graphite	(See Graphite Chart - page 311)												

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.

GARR TOOL High Performance Milling Guide for 846MA, 853MA, 855MA, 863MA

ISO Material	HRC	M/Min. (Vc)	CHIPLOAD PER TOOTH (Fz)								
			3.0mm	5.0mm	6.0mm	8.0mm	10.0mm	12.0mm	16.0mm	20.0mm	25.0mm
COBALT BASE ALLOYS											
Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	28 - 43 20 - 35	.020 - .051 .013 - .038	.010 - .025 .010 - .018	.018 - .030 .013 - .028	.025 - .046 .020 - .036	.025 - .051 .025 - .043	.046 - .071 .038 - .064	.058 - .079 .053 - .071	.069 - .086 .061 - .076	.074 - .091 .064 - .079
NICKEL BASE ALLOYS											
Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	26 - 43 22 - 35	.013 - .023 .008 - .020	.013 - .023 .010 - .018	.018 - .033 .018 - .030	.025 - .041 .023 - .038	.025 - .051 .025 - .046	.051 - .071 .038 - .064	.064 - .081 .056 - .076	.074 - .091 .066 - .084	.076 - .097 .074 - .089
IRON BASE ALLOYS											
A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascocolloy	< 40 > 40	26 - 43 22 - 35	.013 - .025 .008 - .020	.020 - .025 .010 - .020	.015 - .030 .013 - .025	.018 - .038 .015 - .033	.028 - .041 .020 - .036	.046 - .066 .033 - .058	.064 - .076 .056 - .071	.066 - .086 .064 - .079	.081 - .097 .076 - .089
TITANIUM ALLOYS											
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		49 - 69	.013 - .025	.013 - .030	.020 - .038	.025 - .056	.046 - .069	.058 - .081	.064 - .084	.069 - .089	.071 - .094
5553 / Beta Titanium		39 - 59	.010 - .025	.010 - .025	.015 - .036	.020 - .041	.038 - .064	.056 - .071	.061 - .076	.066 - .081	.071 - .089
STAINLESS STEELS											
13/8, 15/5, 17-4, PH Types	< 40 > 40	69 - 89 53 - 69	.013 - .018 .005 - .010	.010 - .020 .005 - .015	.018 - .025 .007 - .018	.020 - .030 .010 - .020	.033 - .046 .018 - .030	.025 - .051 .020 - .038	.030 - .064 .025 - .041	.030 - .051 .033 - .043	.051 - .071 .038 - .051
300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	79 - 89 61 - 79	.008 - .018 .005 - .013	.013 - .025 .010 - .018	.020 - .038 .013 - .025	.023 - .033 .013 - .025	.025 - .046 .018 - .025	.038 - .051 .023 - .038	.046 - .056 .030 - .046	.046 - .089 .038 - .064	.058 - .091 .051 - .076
400 Series - 403, 405, 420, 455	< 40 > 40	79 - 89 59 - 79	.018 - .025 .010 - .020	.023 - .038 .015 - .025	.023 - .036 .018 - .028	.028 - .038 .020 - .030	.033 - .046 .023 - .038	.038 - .064 .030 - .051	.051 - .089 .046 - .076	.056 - .102 .051 - .089	.076 - .117 .061 - .107
HIGH STRENGTH TOOL STEELS											
A2, D2, P20, H13, S2, O1	< 40 > 40	89 - 128 59 - 89	.013 - .020 .008 - .013	.020 - .038 .013 - .025	.038 - .051 .020 - .030	.038 - .058 .025 - .038	.038 - .064 .025 - .046	.051 - .076 .038 - .051	.051 - .076 .038 - .051	.064 - .089 .046 - .064	.076 - .102 .051 - .076
MEDIUM ALLOY TOOL STEELS											
4140, 4340, 52100, 6150, 8620	< 40 > 40	89 - 128 59 - 89	.013 - .020 .008 - .013	.020 - .038 .013 - .025	.038 - .051 .020 - .030	.038 - .058 .025 - .038	.038 - .064 .025 - .046	.051 - .076 .038 - .051	.051 - .076 .038 - .051	.064 - .089 .046 - .064	.076 - .102 .051 - .076
CARBON STEELS											
1000's - 1018, 1020, 12L14	< 40	89 - 128	.013 - .020	.020 - .038	.038 - .051	.038 - .058	.038 - .064	.051 - .076	.051 - .076	.064 - .089	.076 - .102
CAST MATERIAL											
Ductile Iron		89 - 128	.025 - .038	.038 - .051	.051 - .076	.064 - .089	.064 - .089	.076 - .114	.102 - .127	.102 - .127	.127 - .152
Gray Iron		118 - 157	.038 - .064	.051 - .076	.064 - .089	.076 - .102	.076 - .102	.102 - .127	.127 - .152	.152 - .178	.152 - .178
NON-FERROUS											
Aluminum		118 - 197	.015 - .025	.020 - .036	.030 - .051	.036 - .071	.051 - .076	.089 - .122	.127 - .152	.147 - .178	.173 - .229
Magnesium		118 - 197	.015 - .025	.020 - .036	.030 - .051	.036 - .071	.051 - .076	.089 - .122	.127 - .152	.147 - .178	.173 - .229
Copper		98 - 177	.015 - .025	.020 - .036	.030 - .051	.036 - .071	.051 - .076	.089 - .122	.127 - .152	.147 - .178	.173 - .229
Brass, Bronze		79 - 157	.015 - .025	.020 - .036	.030 - .051	.036 - .071	.051 - .076	.089 - .122	.127 - .152	.147 - .178	.173 - .229
COMPOSITE (non-ISO)											
Fiberglass, Plastics, G10		79 - 157	.015 - .025	.020 - .036	.030 - .051	.036 - .071	.051 - .076	.089 - .122	.127 - .152	.147 - .178	.173 - .229
Graphite		(See Graphite Chart - page 311)									

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.

GARR TOOL Milling Guide for Aluminum (Machining Centers with Low-Range HP/Torque)

Series 242M/842M/A3 End Mills

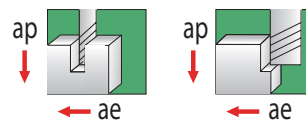
TECHNICAL

NOTES: Spindle interface must be scrutinized when using 5/8" diameter and larger end mills

Diameter	SLOTTING		PROFILING
	Axial = .5xD	Axial = 1xD	Axial ≤ 1xD Radial ≤ .5xD
	SFM = 400 - 600	SFM = 300 - 450	SFM = 500 - 650
	CPT (Fz) = .5% - 1.5% of diameter	CPT (Fz) = .5% - 1% of diameter	CPT (Fz) = 1% - 2% of diameter
1/8"	.0006" - .0018"	.0006" - .0012"	.0012" - .0024"
3/16"	.0009" - .0028"	.0009" - .0018"	.0018" - .0036"
1/4"	.0013" - .0038"	.0013" - .0025"	.0025" - .0050"
5/16"	.0016" - .0047"	.0016" - .0031"	.0031" - .0062"
3/8"	.0019" - .0056"	.0019" - .0037"	.0037" - .0074"
1/2"	.0025" - .0075"	.0025" - .0050"	.0050" - .0100"
5/8"	.0031" - .0094"	.0031" - .0062"	.0062" - .0120"
3/4"	.0038" - .0110"	.0038" - .0075"	.0075" - .0150"
1"	.0050" - .0150"	.0050" - .0100"	.0100" - .0200"

Diameter	SLOTTING		PROFILING
	Axial = .5xD	Axial = 1xD	Axial ≤ 1xD Radial ≤ 0.5xD
	M/Min. = 125 - 180	M/Min. = 90 - 140	M/Min. = 150 - 200
	CPT (Fz) = .5% - 1.5% of diameter	CPT (Fz) = .5% - 1% of diameter	CPT (Fz) = 1% - 2% of diameter
3.0mm	.015 - .045	.015 - .030	.030 - .060
4.0mm	.020 - .060	.020 - .040	.040 - .080
6.0mm	.030 - .090	.030 - .060	.060 - .120
8.0mm	.040 - .120	.040 - .080	.080 - .160
10.0mm	.050 - .150	.050 - .100	.100 - .200
12.0mm	.060 - .180	.060 - .120	.120 - .240
16.0mm	.080 - .240	.080 - .160	.160 - .320
20.0mm	.100 - .300	.100 - .200	.200 - .400
25.0mm	.125 - .375	.125 - .250	.250 - .500

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



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

GARR TOOL Milling Guide for Aluminum (Machining Centers with Mid-Range HP/Torque)

Series 142M/143M/A3 End Mills

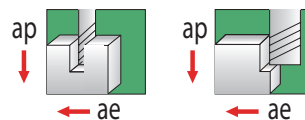
TECHNICAL

NOTES: In cases for tools with slower SFM (M/Min.), reference Series 242M/842M
Spindle interface must be scrutinized when using 5/8" diameter and larger end mills

Diameter	SLOTTING		PROFILING
	Axial = .5xD	Axial = 1xD	Axial ≤ 1xD Radial ≤ .5xD
	SFM = 1500 - 2000	SFM = 750 - 1500	SFM = 1500 - 2000
	CPT (Fz) = 1.5% - 2.5% of diameter	CPT (Fz) = 1% - 2% of diameter	CPT (Fz) = 1.5% - 2.5% of diameter
1/8"	.0019" - .0031"	.0013" - .0025"	.0019" - .0031"
3/16"	.0028" - .0047"	.0018" - .0037"	.0028" - .0047"
1/4"	.0037" - .0062"	.0025" - .0050"	.0037" - .0062"
5/16"	.0052" - .0078"	.0031" - .0062"	.0052" - .0078"
3/8"	.0055" - .0094"	.0037" - .0074"	.0055" - .0094"
1/2"	.0075" - .0125"	.0050" - .0100"	.0075" - .0125"
5/8"	.0093" - .0156"	.0062" - .0125"	.0093" - .0156"
3/4"	.0112" - .0188"	.0075" - .0150"	.0112" - .0188"
1"	.0150" - .0250"	.0100" - .0200"	.0150" - .0250"

Diameter	SLOTTING		PROFILING
	Axial = .5xD	Axial = 1xD	Axial ≤ 1xD Radial ≤ 0.5xD
	M/Min. = 450 - 760	M/Min. = 225 - 450	M/Min. = 450 - 760
	CPT (Fz) = 1.5% - 2.5% of diameter	CPT (Fz) = 1% - 2% of diameter	CPT (Fz) = 1.5% - 2.5% of diameter
3.0mm	.045 - .075	.030 - .060	.045 - .075
4.0mm	.060 - .100	.040 - .080	.060 - .100
6.0mm	.090 - .150	.060 - .120	.090 - .150
8.0mm	.120 - .200	.080 - .160	.120 - .200
10.0mm	.150 - .250	.100 - .200	.150 - .250
12.0mm	.180 - .300	.120 - .240	.180 - .300
16.0mm	.240 - .400	.160 - .320	.240 - .400
20.0mm	.300 - .500	.200 - .400	.300 - .500
25.0mm	.375 - .625	.250 - .500	.375 - .625

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



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

GARR TOOL Milling Guide for Aluminum (Machining Centers with High-Range HP/Torque)

Series A3 End Mills

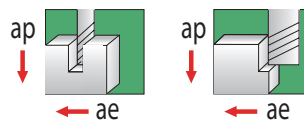
TECHNICAL

NOTES: Contact your OEM for your machine's optimal running parameters
 CPT parameters shown are for 2xD LOC tooling and 2.5xD Reach Lengths
 Spindle interface must be scrutinized when using 5/8" diameter and larger end mills
 Preferred tool holders: Rego Fix powRgrip or Shrink Fit

Diameter	SLOTTING		PROFILING	FINISHING
	Axial = .5xD	Axial = 1xD	Axial = 2xD Radial = 30%-40%xD	Axial = Max LOC Radial = 2.5%xD
	SFM = Maximum RPM	SFM = Maximum RPM	SFM = Maximum RPM	SFM = up to 80% Max RPM
	CPT (Fz) = 1.5% - 3% of diameter	CPT (Fz) = 1% - 2% of diameter	CPT (Fz) = 2% - 3% of diameter	CPT (Fz) = 1% of diameter
3/16"	.0028" - .0056"	.0018" - .0037"	.0037" - .0056"	.0018"
1/4"	.0037" - .0074"	.0025" - .0050"	.0050" - .0075"	.0025"
5/16"	.0052" - .0104"	.0031" - .0062"	.0062" - .0094"	.0031"
3/8"	.0055" - .0110"	.0037" - .0074"	.0075" - .0112"	.0037"
1/2"	.0075" - .0150"	.0050" - .0100"	.0100" - .0150"	.0050"
5/8"	.0093" - .0186"	.0062" - .0125"	.0125" - .0187"	.0062"
3/4"	.0112" - .0224"	.0075" - .0150"	.0150" - .0225"	.0075"
1"	.0150" - .0300"	.0100" - .0200"	.0200" - .0300"	.0100"

Diameter	SLOTTING		PROFILING	FINISHING
	Axial = .5xD	Axial = 1xD	Axial = 2xD Radial = 30%-40%xD	Axial = Max LOC Radial = 2.5%xD
	M/Min. = Maximum RPM	M/Min. = Maximum RPM	M/Min. = Maximum RPM	M/Min. = up to 80% Max RPM
	CPT (Fz) = 1.5% - 3% of diameter	CPT (Fz) = 1% - 2% of diameter	CPT (Fz) = 2% - 3% of diameter	CPT (Fz) = 1% of diameter
4.0mm	.060 - .120	.040 - .080	.080 - .120	.040
6.0mm	.090 - .180	.060 - .120	.120 - .180	.060
8.0mm	.120 - .240	.080 - .160	.160 - .240	.080
10.0mm	.150 - .300	.100 - .200	.200 - .300	.100
12.0mm	.180 - .360	.120 - .240	.240 - .360	.120
16.0mm	.240 - .480	.160 - .320	.320 - .480	.160
20.0mm	.300 - .600	.200 - .400	.400 - .600	.200
25.0mm	.375 - .750	.250 - .500	.500 - .750	.250

	Slotting Pocket Milling	Profiling Side Milling
Axial (ap)	up to 1xD	up to 2xD
Radial (ae)	1xD	up to 50% of Dia.



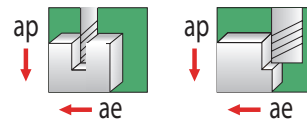
NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL Milling Guide for ARC Series 3-Flute Rougher

ISO Material	SFM (Vc)	CHIPLOAD PER TOOTH (Fz)								
		3/16"	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"	
S	TITANIUM ALLOYS									
	Titanium: 6AL4V, CP	150 - 250	.0005" - .0008"	.0007" - .0010"	.0008" - .0013"	.0012" - .0018"	.0015" - .0023"	.0018" - .0028"	.0020" - .0035"	.0025" - .0045"
N	NON-FERROUS									
	Aluminum	700 - 1000	.0010" - .0020"	.0015" - .0025"	.0020" - .0030"	.0025" - .0035"	.0030" - .0040"	.0040" - .0050"	.0050" - .0060"	.0060" - .0070"
	Copper, Brass, Bronze	300 - 500	.0008" - .0013"	.0012" - .0018"	.0015" - .0023"	.0018" - .0028"	.0020" - .0035"	.0025" - .0045"	.0030" - .0050"	.0040" - .0060"

ISO Material	M/Min. (Vc)	CHIPLOAD PER TOOTH (Fz)								
		4.0mm	6.0mm	8.0mm	10.0mm	12.0mm	16.0mm	20.0mm	25.0mm	
S	TITANIUM ALLOYS									
	Titanium: 6AL4V, CP	40 - 80	.010 - .020	.015 - .025	.020 - .035	.025 - .050	.035 - .055	.045 - .075	.050 - .090	.060 - .115
N	NON-FERROUS									
	Aluminum	200 - 350	.025 - .050	.040 - .065	.050 - .075	.060 - .090	.075 - .100	.100 - .125	.125 - .150	.150 - .180
	Copper, Brass, Bronze	80 - 150	.020 - .035	.025 - .050	.035 - .055	.045 - .075	.050 - .090	.060 - .115	.075 - .125	.100 - .150

	Slotting	Profiling
Axial (ap)	1xD	2xD
Radial (ae)	1xD	0.5xD



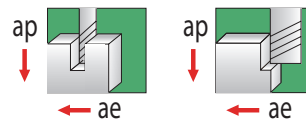
ARC SERIES TOOLS ARE NOT DESIGNED FOR OVER 28Rc MATERIALS

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

GARR TOOL Milling Guide for VHM Series 4-Flute Rougher

ISO Material	SFM (Vc)	CHIPLOAD PER TOOTH (Fz)								
		3/16"	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"	
S	NICKEL BASE ALLOYS									
	High Temperature Alloys: Inconel 625/718, A286	100 - 175	.0007" - .0010"	.0008" - .0010"	.0010" - .0015"	.0010" - .0015"	.0010" - .0015"	.0012" - .0020"	.0015" - .0025"	.0015" - .0025"
S	TITANIUM ALLOYS									
	Titanium: 6AL4V, CP	150 - 200	.0008" - .0010"	.0010" - .0015"	.0010" - .0020"	.0015" - .0020"	.0020" - .0030"	.0025" - .0030"	.0030" - .0035"	.0030" - .0040"
M	STAINLESS STEELS									
	Stainless Steel: 303	290 - 375	.0008" - .0010"	.0010" - .0015"	.0013" - .0020"	.0015" - .0020"	.0020" - .0030"	.0025" - .0035"	.0030" - .0040"	.0035" - .0045"
	Stainless Steel: 304, 316, 400 Series, Kovar, Invar	250 - 300	.0006" - .0010"	.0008" - .0015"	.0010" - .0020"	.0012" - .0020"	.0015" - .0020"	.0020" - .0025"	.0025" - .0030"	.0025" - .0035"
M	STAINLESS STEELS									
	Stainless Steel: 304L, 316L, 8620, 17/4, 15/5, 13/8, PH Mat'l	200 - 250	.0006" - .0008"	.0007" - .0010"	.0008" - .0010"	.0010" - .0015"	.0010" - .0020"	.0015" - .0025"	.0020" - .0030"	.0020" - .0030"
	HIGH STRENGTH TOOL STEELS									
P	High Strength Tool Steel: 4130, 4140, A2, D2, P20, H13	250 - 400	.0006" - .0008"	.0007" - .0010"	.0008" - .0010"	.0010" - .0015"	.0010" - .0020"	.0015" - .0025"	.0020" - .0030"	.0020" - .0030"
	CARBON STEELS									
P	Carbon Steels: 1000 Series	275 - 425	.0006" - .0008"	.0008" - .0012"	.0010" - .0015"	.0010" - .0020"	.0015" - .0025"	.0020" - .0025"	.0020" - .0030"	.0025" - .0035"
	CAST MATERIAL									
K	Cast Iron	400 - 500	.0010" - .0020"	.0010" - .0020"	.0015" - .0020"	.0015" - .0025"	.0020" - .0035"	.0025" - .0035"	.0030" - .0040"	.0040" - .0050"

	Slotting	Profiling
Axial (ap)	0.5xD	2xD
Radial (ae)	1xD	0.2xD

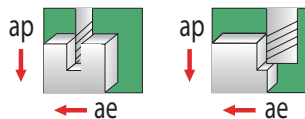


NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL Milling Guide for VHM Series 4-Flute Rougher

ISO Material	M/Min. (Vc)	CHIPLOAD PER TOOTH (Fz)									
		4.0mm	5.0mm	6.0mm	8.0mm	10.0mm	12.0mm	16.0mm	20.0mm	25.0mm	
S	NICKEL BASE ALLOYS										
	High Temperature Alloys: Inconel 625/718, A286	30 - 55	.008 - .015	.018 - .025	.020 - .025	.025 - .038	.025 - .038	.025 - .038	.030 - .050	.038 - .063	.038 - .063
S	TITANIUM ALLOYS										
	Titanium: 6AL4V, CP	45 - 60	.010 - .020	.020 - .025	.025 - .038	.025 - .050	.038 - .050	.050 - .076	.063 - .076	.076 - .089	.076 - .102
M	STAINLESS STEELS										
	Stainless Steel: 303	90 - 115	.010 - .020	.020 - .025	.025 - .038	.033 - .050	.038 - .050	.050 - .076	.063 - .089	.076 - .102	.089 - .114
	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
M	STAINLESS STEELS										
	Stainless Steel: 304L, 316L, 8620, 17/4, 15/5, 13/8, PH Mat'l	60 - 75	.008 - .015	.015 - .020	.018 - .025	.020 - .025	.025 - .038	.025 - .050	.038 - .063	.050 - .076	.050 - .076
	HIGH STRENGTH TOOL STEELS										
P	High Strength Tool Steel: 4130, 4140, A2, D2, P20, H13	75 - 125	.006 - .015	.015 - .020	.018 - .025	.020 - .025	.025 - .038	.025 - .050	.038 - .063	.050 - .076	.050 - .076
	CARBON STEELS										
P	Carbon Steels: 1000 Series	85 - 130	.008 - .015	.015 - .020	.020 - .030	.025 - .038	.025 - .050	.038 - .063	.050 - .063	.050 - .076	.063 - .089
	CAST MATERIAL										
K	Cast Iron	125 - 150	.013 - .025	.025 - .050	.025 - .050	.038 - .050	.038 - .063	.050 - .089	.063 - .089	.076 - .102	.102 - .127

	Slotting	Profiling
Axial (ap)	0.5xD	2xD
Radial (ae)	1xD	0.2xD



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

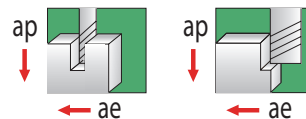
GARR TOOL High Performance Milling Guide for VRX

NOTE - DATA DOES NOT REFLECT CHIP THINNING.

SPINDLE INTERFACE MUST BE SCRUTINIZED WHEN USING 5/8" DIAMETER AND LARGER END MILLS

ISO Material	HRC	SFM (Vc)	CHIPLOAD PER TOOTH (Fz)										
			1/16"	1/8"	3/16"	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"	
COBALT BASE ALLOYS													
Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	75 - 150 60 - 125	.0003" - .0006" .0003" - .0005"	.0004" - .0007" .0003" - .0006"	.0005" - .0008" .0004" - .0007"	.0007" - .0012" .0006" - .0010"	.0008" - .0015" .0007" - .0013"	.0010" - .0019" .0009" - .0017"	.0014" - .0024" .0012" - .0020"	.0016" - .0030" .0014" - .0026"	.0020" - .0038" .0018" - .0034"	.0028" - .0048" .0024" - .0040"	
NICKEL BASE ALLOYS													
Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	75 - 150 60 - 125	.0003" - .0006" .0003" - .0005"	.0004" - .0007" .0003" - .0006"	.0005" - .0008" .0004" - .0007"	.0007" - .0012" .0006" - .0010"	.0008" - .0015" .0007" - .0013"	.0010" - .0019" .0009" - .0017"	.0014" - .0024" .0012" - .0020"	.0016" - .0030" .0014" - .0026"	.0020" - .0038" .0018" - .0034"	.0028" - .0048" .0024" - .0040"	
IRON BASE ALLOYS													
A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	75 - 150 60 - 125	.0003" - .0006" .0003" - .0005"	.0004" - .0007" .0003" - .0006"	.0005" - .0008" .0004" - .0007"	.0007" - .0012" .0006" - .0010"	.0008" - .0015" .0007" - .0013"	.0010" - .0019" .0009" - .0017"	.0014" - .0024" .0012" - .0020"	.0016" - .0030" .0014" - .0026"	.0020" - .0038" .0018" - .0034"	.0028" - .0048" .0024" - .0040"	
TITANIUM ALLOYS													
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		175 - 300	.0003" - .0006"	.0004" - .0007"	.0005" - .0008"	.0007" - .0014"	.0008" - .0017"	.0010" - .0021"	.0014" - .0028"	.0016" - .0034"	.0020" - .0042"	.0028" - .0056"	
5553 / Beta Titanium		125 - 225	.0003" - .0006"	.0003" - .0007"	.0004" - .0008"	.0007" - .0012"	.0008" - .0015"	.0010" - .0019"	.0014" - .0024"	.0016" - .0030"	.0020" - .0038"	.0028" - .0048"	
STAINLESS STEELS													
M	13/8, 15/5, 17-4, pH Types	< 40 > 40	175 - 300 150 - 225	.0003" - .0006" .0003" - .0005"	.0004" - .0007" .0003" - .0006"	.0005" - .0008" .0004" - .0007"	.0007" - .0012" .0006" - .0010"	.0008" - .0015" .0007" - .0013"	.0010" - .0019" .0009" - .0017"	.0014" - .0024" .0012" - .0020"	.0016" - .0030" .0014" - .0026"	.0020" - .0038" .0018" - .0034"	.0028" - .0048" .0022" - .0040"
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	200 - 325 175 - 250	.0003" - .0006" .0003" - .0005"	.0004" - .0007" .0003" - .0006"	.0005" - .0008" .0004" - .0007"	.0007" - .0012" .0006" - .0011"	.0008" - .0015" .0007" - .0014"	.0010" - .0019" .0009" - .0018"	.0014" - .0024" .0012" - .0022"	.0016" - .0030" .0014" - .0028"	.0020" - .0038" .0018" - .0036"	.0028" - .0048" .0024" - .0044"
	400 Series - 403, 405, 420, 455	< 40 > 40	225 - 350 175 - 250	.0003" - .0006" .0003" - .0005"	.0004" - .0007" .0003" - .0006"	.0005" - .0008" .0004" - .0007"	.0007" - .0013" .0006" - .0011"	.0008" - .0016" .0007" - .0014"	.0010" - .0020" .0009" - .0018"	.0014" - .0026" .0012" - .0022"	.0016" - .0032" .0014" - .0028"	.0024" - .0043" .0018" - .0036"	.0028" - .0052" .0024" - .0044"
HIGH STRENGTH TOOL STEELS													
P	A2, D2, P20, H13, S7, O1	< 40 > 40	175 - 300 125 - 275	.0004" - .0007" .0003" - .0005"	.0005" - .0008" .0003" - .0005"	.0006" - .0010" .0005" - .0008"	.0008" - .0013" .0007" - .0010"	.0009" - .0016" .0008" - .0013"	.0011" - .0020" .0010" - .0017"	.0016" - .0026" .0014" - .0020"	.0018" - .0032" .0016" - .0026"	.0022" - .0040" .0020" - .0034"	.0032" - .0052" .0028" - .0040"
	MEDIUM ALLOY TOOL STEELS												
	4140, 4340, 52100, 6150, 8620	< 40 > 40	250 - 400 225 - 300	.0004" - .0007" .0003" - .0005"	.0005" - .0008" .0003" - .0005"	.0006" - .0010" .0005" - .0008"	.0008" - .0014" .0007" - .0011"	.0009" - .0017" .0008" - .0014"	.0011" - .0021" .0010" - .0018"	.0016" - .0026" .0014" - .0022"	.0018" - .0034" .0016" - .0028"	.0022" - .0042" .0020" - .0036"	.0032" - .0056" .0028" - .0044"
CARBON STEELS													
	1000's - 1018, 1020, 12L14	< 40	300 - 425	.0004" - .0007"	.0005" - .0008"	.0006" - .0010"	.0008" - .0015"	.0009" - .0018"	.0011" - .0022"	.0016" - .0030"	.0018" - .0036"	.0022" - .0044"	.0032" - .0060"
CAST MATERIAL													
K	Ductile Iron		300 - 425	.0004" - .0007"	.0005" - .0008"	.0006" - .0010"	.0009" - .0016"	.0010" - .0019"	.0012" - .0023"	.0018" - .0032"	.0020" - .0038"	.0024" - .0046"	.0036" - .0064"
	Gray Iron		325 - 475	.0005" - .0008"	.0007" - .0010"	.0007" - .0012"	.0010" - .0017"	.0011" - .0020"	.0013" - .0024"	.0020" - .0034"	.0022" - .0040"	.0026" - .0048"	.0040" - .0068"

	Slotting Pocket Milling	Profiling Side Milling
Axial (ap)	up to 1.5xD	up to 2xD
Radial (ae)	1xD	5% - 15% of Dia.



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

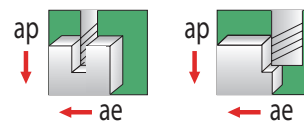
GARR TOOL High Performance Milling Guide for VRX

NOTE - DATA DOES NOT REFLECT CHIP THINNING.

SPINDLE INTERFACE MUST BE SCRUTINIZED WHEN USING 16mm DIAMETER AND LARGER END MILLS

ISO Material	HRC	M/Min. (Vc)	CHIPLOAD PER TOOTH (Fz)										
			1.5mm	3.0mm	5.0mm	6.0mm	8.0mm	10.0mm	12.0mm	16.0mm	20.0mm	25.0mm	
COBALT BASE ALLOYS													
Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	25 - 45 20 - 40	.008 - .015 .008 - .012	.010 - .018 .008 - .015	.013 - .020 .010 - .018	.018 - .030 .015 - .025	.020 - .038 .018 - .033	.025 - .048 .023 - .043	.036 - .061 .030 - .051	.041 - .076 .036 - .066	.051 - .097 .046 - .086	.071 - .122 .061 - .102	
NICKEL BASE ALLOYS													
Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	25 - 45 20 - 40	.008 - .015 .008 - .012	.010 - .018 .008 - .015	.013 - .020 .010 - .018	.018 - .030 .015 - .025	.020 - .038 .018 - .033	.025 - .048 .023 - .043	.036 - .061 .030 - .051	.041 - .076 .036 - .066	.051 - .097 .046 - .086	.071 - .122 .061 - .102	
IRON BASE ALLOYS													
A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	25 - 45 20 - 40	.008 - .015 .008 - .012	.010 - .018 .008 - .015	.013 - .020 .010 - .018	.018 - .030 .015 - .025	.020 - .038 .018 - .033	.025 - .048 .023 - .043	.036 - .061 .030 - .051	.041 - .076 .036 - .066	.051 - .097 .046 - .086	.071 - .122 .061 - .102	
TITANIUM ALLOYS													
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		55 - 90	.008 - .015	.010 - .018	.013 - .020	.018 - .036	.020 - .043	.025 - .053	.036 - .071	.041 - .086	.051 - .107	.071 - .142	
5553 / Beta Titanium		40 - 70	.008 - .015	.008 - .018	.010 - .020	.018 - .030	.020 - .038	.025 - .048	.036 - .061	.041 - .076	.051 - .097	.071 - .122	
STAINLESS STEELS													
13/8, 15/5, 17-4, pH Types	< 40 > 40	55 - 90 45 - 70	.008 - .015 .008 - .013	.010 - .018 .008 - .015	.013 - .020 .010 - .018	.018 - .030 .015 - .025	.020 - .038 .018 - .033	.025 - .048 .023 - .043	.036 - .061 .030 - .051	.041 - .076 .036 - .066	.051 - .097 .046 - .086	.071 - .122 .056 - .102	
300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	60 - 100 55 - 75	.008 - .015 .008 - .013	.010 - .018 .008 - .015	.013 - .020 .010 - .018	.018 - .030 .015 - .028	.020 - .038 .018 - .036	.025 - .048 .023 - .046	.036 - .061 .030 - .056	.041 - .076 .036 - .071	.051 - .097 .046 - .091	.071 - .122 .061 - .112	
400 Series - 403, 405, 420, 455	< 40 > 40	70 - 110 55 - 75	.008 - .015 .008 - .013	.010 - .018 .008 - .015	.013 - .020 .010 - .018	.018 - .033 .015 - .028	.020 - .041 .018 - .036	.025 - .051 .023 - .046	.036 - .066 .030 - .056	.041 - .081 .036 - .071	.061 - .109 .046 - .091	.071 - .132 .061 - .112	
HIGH STRENGTH TOOL STEELS													
A2, D2, P20, H13, S7, O1	< 40 > 40	55 - 90 40 - 85	.010 - .018 .008 - .013	.013 - .020 .008 - .013	.015 - .025 .013 - .020	.020 - .033 .018 - .025	.023 - .041 .020 - .033	.028 - .051 .025 - .043	.041 - .066 .036 - .051	.046 - .081 .041 - .066	.056 - .102 .051 - .086	.081 - .132 .071 - .102	
MEDIUM ALLOY TOOL STEELS													
4140, 4340, 52100, 6150, 8620	< 40 > 40	75 - 120 70 - 90	.010 - .018 .008 - .013	.013 - .020 .008 - .013	.015 - .025 .013 - .020	.020 - .036 .018 - .028	.023 - .043 .020 - .036	.028 - .053 .025 - .046	.041 - .071 .036 - .056	.046 - .086 .041 - .071	.056 - .107 .051 - .091	.081 - .142 .071 - .112	
CARBON STEELS													
1000's - 1018, 1020, 12L14	< 40	90 - 130	.010 - .018	.013 - .020	.015 - .025	.020 - .038	.023 - .046	.028 - .056	.041 - .076	.046 - .091	.056 - .112	.081 - .152	
CAST MATERIAL													
Ductile Iron		90 - 130	.010 - .018	.013 - .020	.015 - .025	.023 - .041	.025 - .048	.030 - .058	.046 - .081	.051 - .097	.061 - .117	.091 - .163	
Gray Iron		100 - 145	.013 - .020	.018 - .025	.018 - .030	.025 - .043	.028 - .051	.033 - .061	.051 - .086	.056 - .102	.066 - .122	.102 - .173	

	Slotting Pocket Milling	Profiling Side Milling
Axial (ap)	up to 1.5xD	up to 2xD
Radial (ae)	1xD	5% - 15% of Dia.



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

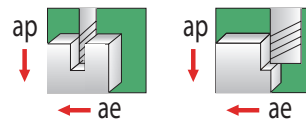
GARR TOOL High Performance Milling Guide for V4

NOTE - DATA DOES NOT REFLECT CHIP THINNING.

SPINDLE INTERFACE MUST BE SCRUTINIZED WHEN USING 5/8" DIAMETER AND LARGER END MILLS

ISO Material	HRC	SFM (Vc)	CHIPLOAD PER TOOTH (Fz)						
			1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"
COBALT BASE ALLOYS									
Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	90 - 185 75 - 150	.0008" - .0015" .0006" - .0013"	.0009" - .0018" .0007" - .0016"	.0011" - .0022" .0009" - .0020"	.0016" - .0030" .0012" - .0026"	.0018" - .0036" .0014" - .0032"	.0022" - .0044" .0018" - .0040"	.0032" - .0060" .0024" - .0052"
NICKEL BASE ALLOYS									
Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	90 - 185 75 - 150	.0008" - .0015" .0006" - .0013"	.0009" - .0018" .0007" - .0016"	.0011" - .0022" .0009" - .0020"	.0016" - .0030" .0012" - .0026"	.0018" - .0036" .0014" - .0032"	.0022" - .0044" .0018" - .0040"	.0032" - .0060" .0024" - .0052"
IRON BASE ALLOYS									
A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascocolly	< 40 > 40	90 - 185 75 - 150	.0008" - .0015" .0006" - .0013"	.0009" - .0018" .0007" - .0016"	.0011" - .0022" .0009" - .0020"	.0016" - .0030" .0012" - .0026"	.0018" - .0036" .0014" - .0032"	.0022" - .0044" .0018" - .0040"	.0032" - .0060" .0024" - .0052"
TITANIUM ALLOYS									
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		200 - 375	.0009" - .0017"	.0010" - .0020"	.0012" - .0024"	.0018" - .0034"	.0020" - .0040"	.0024" - .0048"	.0036" - .0068"
5553 / Beta Titanium		150 - 280	.0009" - .0015"	.0010" - .0018"	.0012" - .0022"	.0018" - .0030"	.0020" - .0036"	.0024" - .0044"	.0032" - .0060"
STAINLESS STEELS									
13/8, 15/5, 17-4, pH Types	< 40 > 40	225 - 375 175 - 275	.0008" - .0015" .0006" - .0013"	.0009" - .0018" .0007" - .0016"	.0011" - .0022" .0009" - .0020"	.0016" - .0030" .0012" - .0026"	.0018" - .0036" .0014" - .0032"	.0022" - .0044" .0018" - .0040"	.0032" - .0060" .0024" - .0052"
300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	250 - 400 175 - 275	.0008" - .0016" .0006" - .0013"	.0009" - .0018" .0007" - .0016"	.0011" - .0022" .0009" - .0020"	.0016" - .0030" .0012" - .0026"	.0018" - .0036" .0014" - .0032"	.0022" - .0044" .0018" - .0040"	.0032" - .0060" .0024" - .0052"
400 Series - 403, 405, 420, 455	< 40 > 40	225 - 425 175 - 325	.0008" - .0016" .0006" - .0014"	.0009" - .0019" .0007" - .0017"	.0011" - .0023" .0009" - .0021"	.0016" - .0032" .0012" - .0028"	.0018" - .0038" .0014" - .0034"	.0022" - .0046" .0018" - .0042"	.0032" - .0064" .0024" - .0056"
HIGH STRENGTH TOOL STEELS									
A2, D2, P20, H13, S7, O1	< 40 > 40	225 - 400 150 - 325	.0008" - .0016" .0006" - .0013"	.0011" - .0019" .0010" - .0016"	.0013" - .0023" .0012" - .0020"	.0016" - .0032" .0012" - .0026"	.0022" - .0038" .0020" - .0032"	.0026" - .0056" .0024" - .0040"	.0040" - .0064" .0036" - .0052"
MEDIUM ALLOY TOOL STEELS									
4140, 4340, 52100, 6150, 8620	< 40 > 40	350 - 500 250 - 375	.0008" - .0017" .0006" - .0014"	.0011" - .0020" .0010" - .0017"	.0013" - .0024" .0012" - .0020"	.0016" - .0034" .0012" - .0028"	.0022" - .0040" .0020" - .0034"	.0026" - .0048" .0024" - .0040"	.0040" - .0068" .0036" - .0056"
CARBON STEELS									
1000's - 1018, 1020, 12L14	< 40	375 - 600	.0010" - .0018"	.0011" - .0021"	.0013" - .0025"	.0020" - .0036"	.0022" - .0042"	.0026" - .0050"	.0040" - .0072"
CAST MATERIAL									
Ductile Iron		350 - 525	.0010" - .0018"	.0013" - .0022"	.0015" - .0026"	.0020" - .0036"	.0026" - .0044"	.0030" - .0052"	.0040" - .0072"
Gray Iron		450 - 590	.0011" - .0020"	.0014" - .0023"	.0016" - .0027"	.0022" - .0040"	.0028" - .0046"	.0032" - .0054"	.0044" - .0080"

	Slotting Pocket Milling	Profiling Side Milling
Axial (ap)	up to 1.5xD	up to 2xD
Radial (ae)	1xD	5% - 15% of Dia.



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

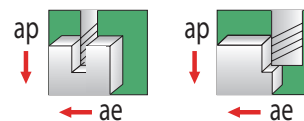
GARR TOOL High Performance Milling Guide for V4

NOTE - DATA DOES NOT REFLECT CHIP THINNING.

SPINDLE INTERFACE MUST BE SCRUTINIZED WHEN USING 16mm DIAMETER AND LARGER END MILLS

	ISO Material	HRC	M/Min. (Vc)	CHIPLOAD PER TOOTH (Fz)							
				6.0mm	8.0mm	10.0mm	12.0mm	16.0mm	20.0mm	25.0mm	
S	COBALT BASE ALLOYS										
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	27 - 57 25 - 45	.020 - .038 .015 - .033	.023 - .046 .018 - .041	.028 - .056 .023 - .051	.041 - .076 .030 - .066	.046 - .091 .036 - .081	.056 - .112 .046 - .102	.081 - .152 .061 - .132	
	NICKEL BASE ALLOYS										
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	27 - 57 25 - 45	.020 - .038 .015 - .033	.023 - .046 .018 - .041	.028 - .056 .023 - .051	.041 - .076 .030 - .066	.046 - .091 .036 - .081	.056 - .112 .046 - .102	.081 - .152 .061 - .132	
	IRON BASE ALLOYS										
A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascocolloy	< 40 > 40	27 - 57 25 - 45	.020 - .038 .015 - .033	.023 - .046 .018 - .041	.028 - .056 .023 - .051	.041 - .076 .030 - .066	.046 - .091 .036 - .081	.056 - .112 .046 - .102	.081 - .152 .061 - .132		
TITANIUM ALLOYS											
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si 5553 / Beta Titanium		60 - 115 45 - 85	.023 - .043 .023 - .038	.025 - .051 .025 - .046	.030 - .061 .030 - .056	.046 - .086 .046 - .076	.051 - .102 .051 - .091	.061 - .122 .061 - .112	.091 - .173 .081 - .152		
M	STAINLESS STEELS										
	13/8, 15/5, 17-4, pH Types	< 40 > 40	70 - 115 55 - 85	.020 - .038 .015 - .033	.023 - .046 .018 - .041	.028 - .056 .023 - .051	.041 - .076 .030 - .066	.046 - .091 .036 - .081	.056 - .112 .046 - .102	.081 - .152 .061 - .132	
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	75 - 120 55 - 85	.020 - .038 .015 - .033	.023 - .046 .018 - .041	.028 - .056 .023 - .051	.041 - .076 .030 - .066	.046 - .091 .036 - .081	.056 - .112 .046 - .102	.081 - .152 .061 - .132	
	400 Series - 403, 405, 420, 455	< 40 > 40	70 - 130 55 - 100	.020 - .041 .015 - .036	.023 - .048 .018 - .043	.028 - .058 .023 - .053	.041 - .081 .030 - .071	.046 - .097 .036 - .086	.056 - .117 .046 - .107	.081 - .163 .061 - .142	
	HIGH STRENGTH TOOL STEELS										
A2, D2, P20, H13, S7, O1	< 40 > 40	70 - 120 45 - 100	.020 - .041 .015 - .033	.028 - .048 .025 - .041	.033 - .058 .030 - .051	.041 - .081 .030 - .066	.056 - .097 .051 - .081	.066 - .142 .061 - .102	.102 - .163 .091 - .132		
MEDIUM ALLOY TOOL STEELS											
4140, 4340, 52100, 6150, 8620	< 40 > 40	110 - 150 75 - 115	.020 - .043 .015 - .036	.028 - .051 .025 - .043	.033 - .061 .030 - .051	.041 - .086 .030 - .071	.056 - .102 .051 - .086	.066 - .122 .061 - .102	.102 - .173 .091 - .142		
CARBON STEELS											
1000's - 1018, 1020, 12L14	< 40	115 - 180	.025 - .046	.028 - .053	.033 - .064	.051 - .091	.056 - .107	.066 - .127	.102 - .183		
K	CAST MATERIAL										
	Ductile Iron		110 - 160	.025 - .046	.033 - .056	.038 - .066	.051 - .091	.066 - .112	.076 - .132	.102 - .183	
Gray Iron		135 - 180	.028 - .051	.036 - .058	.041 - .069	.056 - .102	.071 - .117	.081 - .137	.112 - .203		

	Slotting Pocket Milling	Profiling Side Milling
Axial (ap)	up to 1.5xD	up to 2xD
Radial (ae)	1xD	5% - 15% of Dia.



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

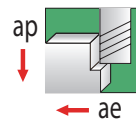
GARR TOOL High Performance Milling Guide for V5, V5C (HIGH EFFICIENCY MILLING)

NOTE - DATA DOES NOT REFLECT CHIP THINNING.

SPINDLE INTERFACE MUST BE SCRUTINIZED WHEN USING 5/8" DIAMETER AND LARGER END MILLS

	ISO Material	HRC	SFM (Vc)	CHIPLOAD PER TOOTH (Fz)								
				1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"		
S	COBALT BASE ALLOYS											
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	105 - 220 90 - 180	.0009" - .0016" .0007" - .0014"	.0010" - .0019" .0008" - .0017"	.0012" - .0023" .0010" - .0021"	.0018" - .0032" .0014" - .0028"	.0020" - .0038" .0016" - .0034"	.0024" - .0046" .0020" - .0042"	.0036" - .0064" .0028" - .0056"		
	NICKEL BASE ALLOYS											
	Inconel-625/718, Waspalloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	105 - 220 90 - 180	.0009" - .0016" .0007" - .0014"	.0010" - .0019" .0008" - .0017"	.0012" - .0023" .0010" - .0021"	.0018" - .0032" .0014" - .0028"	.0020" - .0038" .0016" - .0034"	.0024" - .0046" .0020" - .0042"	.0036" - .0064" .0028" - .0056"		
	IRON BASE ALLOYS											
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascocolly	< 40 > 40	105 - 220 90 - 180	.0009" - .0016" .0007" - .0014"	.0010" - .0019" .0008" - .0017"	.0012" - .0023" .0010" - .0021"	.0018" - .0032" .0014" - .0028"	.0020" - .0038" .0016" - .0034"	.0024" - .0046" .0020" - .0042"	.0036" - .0064" .0028" - .0056"		
M	TITANIUM ALLOYS											
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		240 - 450	.0010" - .0018"	.0011" - .0021"	.0013" - .0025"	.0020" - .0036"	.0022" - .0042"	.0026" - .0050"	.0040" - .0072"		
	5553 / Beta Titanium		180 - 340	.0010" - .0016"	.0011" - .0019"	.0013" - .0023"	.0020" - .0032"	.0022" - .0038"	.0026" - .0046"	.0040" - .0064"		
P	STAINLESS STEELS											
	13/8, 15/5, 17-4, pH Types	< 40 > 40	300 - 450 210 - 330	.0009" - .0016" .0007" - .0014"	.0010" - .0019" .0008" - .0017"	.0012" - .0023" .0010" - .0021"	.0018" - .0032" .0014" - .0028"	.0020" - .0038" .0016" - .0034"	.0024" - .0046" .0020" - .0042"	.0036" - .0064" .0028" - .0056"		
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	300 - 480 210 - 330	.0009" - .0016" .0007" - .0014"	.0010" - .0019" .0008" - .0017"	.0012" - .0023" .0010" - .0021"	.0018" - .0032" .0014" - .0028"	.0020" - .0038" .0016" - .0034"	.0024" - .0046" .0020" - .0042"	.0036" - .0064" .0028" - .0056"		
	400 Series - 403, 405, 420, 455	< 40 > 40	270 - 510 210 - 390	.0009" - .0017" .0007" - .0015"	.0010" - .0020" .0008" - .0018"	.0012" - .0024" .0010" - .0022"	.0018" - .0034" .0014" - .0030"	.0020" - .0040" .0016" - .0036"	.0024" - .0048" .0020" - .0044"	.0036" - .0068" .0028" - .0060"		
	HIGH STRENGTH TOOL STEELS											
A2, D2, P20, H13, S7, O1	< 40 > 40	270 - 480 180 - 390	.0009" - .0017" .0007" - .0014"	.0010" - .0020" .0008" - .0017"	.0012" - .0024" .0010" - .0021"	.0018" - .0034" .0014" - .0028"	.0020" - .0040" .0016" - .0034"	.0024" - .0048" .0020" - .0042"	.0036" - .0068" .0028" - .0056"			
K	MEDIUM ALLOY TOOL STEELS											
	4140, 4340, 52100, 6150, 8620	< 40 > 40	420 - 600 300 - 450	.0009" - .0018" .0007" - .0015"	.0010" - .0021" .0008" - .0018"	.0012" - .0025" .0010" - .0022"	.0018" - .0036" .0014" - .0030"	.0020" - .0042" .0016" - .0036"	.0024" - .0050" .0020" - .0044"	.0036" - .0072" .0028" - .0060"		
	CARBON STEELS											
1000's - 1018, 1020, 12L14	< 40	450 - 720	.0011" - .0019"	.0012" - .0022"	.0014" - .0026"	.0022" - .0038"	.0024" - .0044"	.0028" - .0052"	.0044" - .0076"			
K	CAST MATERIAL											
	Ductile Iron		420 - 630	.0011" - .0019"	.0012" - .0022"	.0014" - .0026"	.0022" - .0038"	.0024" - .0044"	.0028" - .0052"	.0044" - .0076"		
	Gray Iron		540 - 710	.0012" - .0021"	.0013" - .0024"	.0015" - .0028"	.0024" - .0042"	.0026" - .0048"	.0030" - .0056"	.0048" - .0084"		

	Profile/Trochoidal Milling
Axial (ap)	up to 2xD
Radial (ae)	5% - 15% of Dia.



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

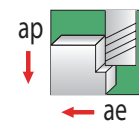
GARR TOOL High Performance Milling Guide for V5, V5C (HIGH EFFICIENCY MILLING)

NOTE - DATA DOES NOT REFLECT CHIP THINNING.

SPINDLE INTERFACE MUST BE SCRUTINIZED WHEN USING 16mm DIAMETER AND LARGER END MILLS

ISO Material	HRC	M/Min. (Vc)	CHIPLOAD PER TOOTH (Fz)						
			6.0mm	8.0mm	10.0mm	12.0mm	16.0mm	20.0mm	25.0mm
COBALT BASE ALLOYS									
Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	30 - 70 27 - 55	.023 - .041 .018 - .036	.025 - .048 .020 - .043	.030 - .058 .025 - .053	.046 - .081 .036 - .071	.051 - .097 .041 - .086	.061 - .117 .051 - .107	.091 - .163 .071 - .142
NICKEL BASE ALLOYS									
Inconel-625/718, Waspalloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	30 - 70 27 - 55	.023 - .041 .018 - .036	.025 - .048 .020 - .043	.030 - .058 .025 - .053	.046 - .081 .036 - .071	.051 - .097 .041 - .086	.061 - .117 .051 - .107	.091 - .163 .071 - .142
IRON BASE ALLOYS									
A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	30 - 70 27 - 55	.023 - .041 .018 - .036	.025 - .048 .020 - .043	.030 - .058 .025 - .053	.046 - .081 .036 - .071	.051 - .097 .041 - .086	.061 - .117 .051 - .107	.091 - .163 .071 - .142
TITANIUM ALLOYS									
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		75 - 135	.025 - .046	.028 - .053	.033 - .064	.051 - .091	.056 - .107	.066 - .127	.102 - .183
5553 / Beta Titanium		55 - 105	.025 - .041	.028 - .048	.033 - .058	.051 - .081	.056 - .097	.066 - .117	.102 - .163
STAINLESS STEELS									
13/8, 15/5, 17-4, pH Types	< 40 > 40	90 - 135 65 - 100	.023 - .041 .018 - .036	.025 - .048 .020 - .043	.030 - .058 .025 - .053	.046 - .081 .036 - .071	.051 - .097 .041 - .086	.061 - .117 .051 - .107	.091 - .163 .071 - .142
300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	90 - 145 65 - 100	.023 - .041 .018 - .036	.025 - .048 .020 - .043	.030 - .058 .025 - .053	.046 - .081 .036 - .071	.051 - .097 .041 - .086	.061 - .117 .051 - .107	.091 - .163 .071 - .142
400 Series - 403, 405, 420, 455	< 40 > 40	85 - 155 65 - 120	.023 - .043 .018 - .038	.025 - .051 .020 - .046	.030 - .061 .025 - .056	.046 - .086 .036 - .076	.051 - .102 .041 - .091	.061 - .122 .051 - .112	.091 - .173 .071 - .152
HIGH STRENGTH TOOL STEELS									
A2, D2, P20, H13, S7, O1	< 40 > 40	85 - 145 55 - 120	.023 - .043 .018 - .036	.025 - .051 .020 - .043	.030 - .061 .025 - .053	.046 - .086 .036 - .071	.051 - .102 .041 - .086	.061 - .122 .051 - .107	.091 - .173 .071 - .142
MEDIUM ALLOY TOOL STEELS									
4140, 4340, 52100, 6150, 8620	< 40 > 40	130 - 180 90 - 135	.023 - .046 .018 - .038	.025 - .053 .020 - .046	.030 - .064 .025 - .056	.046 - .091 .036 - .076	.051 - .107 .041 - .091	.061 - .127 .051 - .112	.091 - .183 .071 - .152
CARBON STEELS									
1000's - 1018, 1020, 12L14	< 40	135 - 220	.028 - .048	.030 - .056	.036 - .066	.056 - .097	.061 - .112	.071 - .132	.112 - .193
CAST MATERIAL									
Ductile Iron		130 - 190	.028 - .048	.030 - .056	.036 - .066	.056 - .097	.061 - .112	.071 - .132	.112 - .193
Gray Iron		170 - 215	.030 - .053	.033 - .061	.038 - .071	.061 - .107	.066 - .122	.076 - .142	.122 - .213

	Profile/Trochoidal Milling
Axial (ap)	up to 2xD
Radial (ae)	5% - 15% of Dia.



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

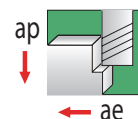
GARR TOOL High Performance Milling Guide for VRX-6 (HIGH EFFICIENCY MILLING)

NOTE - DATA DOES NOT REFLECT CHIP THINNING.

SPINDLE INTERFACE MUST BE SCRUTINIZED WHEN USING 5/8" DIAMETER AND LARGER END MILLS

	ISO Material	HRC	SFM (Vc)	CHIPLOAD PER TOOTH (Fz)						
				1/4"	3/8"	1/2"	5/8"	3/4"	1"	
S	COBALT BASE ALLOYS									
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	115 - 230 95 - 190	.0006" - .0012" .0004" - .0010"	.0006" - .0014" .0005" - .0013"	.0011" - .0023" .0008" - .0020"	.0011" - .0023" .0009" - .0021"	.0012" - .0028" .0010" - .0026"	.0022" - .0046" .0016" - .0040"	
	NICKEL BASE ALLOYS									
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	115 - 230 95 - 190	.0006" - .0013" .0003" - .0007"	.0008" - .0016" .0007" - .0015"	.0012" - .0024" .0008" - .0020"	.0012" - .0025" .0011" - .0022"	.0016" - .0032" .0014" - .0030"	.0024" - .0048" .0016" - .0040"	
	IRON BASE ALLOYS									
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	115 - 230 95 - 190	.0006" - .0012" .0003" - .0007"	.0008" - .0014" .0005" - .0013"	.0011" - .0023" .0007" - .0019"	.0012" - .0024" .0010" - .0022"	.0016" - .0028" .0010" - .0026"	.0022" - .0046" .0014" - .0038"	
M	TITANIUM ALLOYS									
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		250 - 470	.0010" - .0015"	.0015" - .0025"	.0020" - .0030"	.0025" - .0035"	.0030" - .0050"	.0040" - .0060"	
	5553 / Beta Titanium		185 - 350	.0008" - .0014"	.0012" - .0022"	.0016" - .0028"	.0023" - .0034"	.0024" - .0044"	.0032" - .0056"	
	STAINLESS STEELS									
13/8, 15/5, 17-4, pH Types	< 40 > 40	280 - 470 215 - 345	.0008" - .0015" .0006" - .0013"	.0010" - .0017" .0009" - .0016"	.0016" - .0030" .0012" - .0026"	.0018" - .0031" .0013" - .0028"	.0020" - .0034" .0018" - .0032"	.0032" - .0060" .0024" - .0052"		
300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	310 - 500 215 - 345	.0008" - .0015" .0006" - .0013"	.0010" - .0017" .0008" - .0015"	.0016" - .0030" .0012" - .0026"	.0017" - .0028" .0014" - .0024"	.0020" - .0034" .0016" - .0030"	.0032" - .0060" .0022" - .0038"		
400 Series - 403, 405, 420, 455	< 40 > 40	280 - 530 215 - 405	.0008" - .0016" .0006" - .0014"	.0010" - .0018" .0009" - .0017"	.0016" - .0032" .0012" - .0028"	.0020" - .0035" .0013" - .0030"	.0020" - .0036" .0018" - .0034"	.0032" - .0064" .0024" - .0056"		
P	HIGH STRENGTH TOOL STEELS									
	A2, D2, P20, H13, S7, O1	< 40 > 40	280 - 500 185 - 410	.0008" - .0015" .0006" - .0013"	.0013" - .0023" .0012" - .0020"	.0018" - .0029" .0014" - .0022"	.0024" - .0034" .0020" - .0028"	.0034" - .0044" .0024" - .0032"	.0036" - .0048" .0030" - .0040"	
	MEDIUM ALLOY TOOL STEELS									
	4140, 4340, 52100, 6150, 8620	< 40 > 40	435 - 625 310 - 470	.0010" - .0016" .0007" - .0012"	.0013" - .0024" .0012" - .0020"	.0018" - .0029" .0014" - .0022"	.0024" - .0034" .0020" - .0028"	.0034" - .0044" .0024" - .0032"	.0036" - .0048" .0030" - .0040"	
CARBON STEELS										
1000's - 1018, 1020, 12L14	< 40	465 - 750	.0010" - .0017"	.0013" - .0025"	.0018" - .0029"	.0024" - .0034"	.0034" - .0044"	.0036" - .0048"		
K	CAST MATERIAL									
	Ductile Iron		435 - 660	.0012" - .0019"	.0015" - .0026"	.0024" - .0038"	.0026" - .0050"	.0030" - .0052"	.0048" - .0076"	
	Gray Iron		560 - 740	.0013" - .0021"	.0016" - .0027"	.0026" - .0042"	.0028" - .0052"	.0032" - .0064"	.0052" - .0084"	

	Profile/Trochoidal Milling
Axial (ap)	up to 2xD
Radial (ae)	5% - 15% of Dia.



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

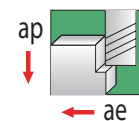
GARR TOOL High Performance Milling Guide for VRX-6 (HIGH EFFICIENCY MILLING)

NOTE - DATA DOES NOT REFLECT CHIP THINNING.

SPINDLE INTERFACE MUST BE SCRUTINIZED WHEN USING 16mm DIAMETER AND LARGER END MILLS

	ISO Material	HRC	M/Min. (Vc)	CHIPLOAD PER TOOTH (Fz)						
				6.0mm	8.0mm	10.0mm	12.0mm	16.0mm	20.0mm	25.0mm
S	COBALT BASE ALLOYS									
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	35 - 70 30 - 57	.015 - .030 .010 - .025	.015 - .033 .010 - .030	.015 - .036 .013 - .033	.028 - .058 .020 - .051	.028 - .058 .023 - .053	.030 - .071 .025 - .066	.056 - .117 .041 - .102
	NICKEL BASE ALLOYS									
	Inconel-625/718, Waspalloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	35 - 70 30 - 57	.015 - .033 .008 - .018	.020 - .035 .013 - .028	.020 - .041 .018 - .038	.030 - .061 .020 - .051	.030 - .064 .028 - .056	.041 - .081 .036 - .076	.061 - .122 .041 - .102
	IRON BASE ALLOYS									
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascocolloy	< 40 > 40	35 - 70 30 - 57	.015 - .030 .008 - .018	.020 - .033 .010 - .025	.020 - .036 .013 - .033	.028 - .058 .018 - .048	.030 - .061 .025 - .056	.041 - .071 .025 - .066	.056 - .117 .036 - .097
	TITANIUM ALLOYS									
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		75 - 140	.025 - .038	.030 - .050	.038 - .064	.051 - .076	.064 - .089	.076 - .127	.102 - .152
	5553 / Beta Titanium		57 - 110	.020 - .036	.025 - .046	.030 - .056	.041 - .071	.058 - .086	.061 - .112	.081 - .142
	M	STAINLESS STEELS								
13/8, 15/5, 17-4, pH Types		< 40 > 40	85 - 140 65 - 105	.020 - .038 .015 - .033	.023 - .040 .020 - .038	.025 - .043 .023 - .041	.041 - .076 .030 - .066	.046 - .079 .033 - .071	.051 - .086 .046 - .081	.081 - .152 .061 - .132
300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic		< 40 > 40	95 - 150 65 - 105	.020 - .038 .015 - .033	.023 - .040 .018 - .035	.025 - .043 .020 - .038	.041 - .076 .030 - .066	.043 - .071 .036 - .061	.051 - .086 .041 - .076	.081 - .152 .056 - .097
400 Series - 403, 405, 420, 455		< 40 > 40	85 - 160 65 - 125	.020 - .041 .015 - .036	.023 - .043 .020 - .040	.025 - .046 .023 - .043	.041 - .081 .030 - .071	.051 - .089 .033 - .076	.051 - .091 .046 - .086	.081 - .163 .061 - .142
HIGH STRENGTH TOOL STEELS										
A2, D2, P20, H13, S7, O1	< 40 > 40	85 - 150 57 - 125	.020 - .038 .015 - .033	.025 - .048 .022 - .042	.033 - .058 .030 - .051	.046 - .061 .041 - .056	.061 - .086 .051 - .071	.086 - .112 .061 - .081	.091 - .122 .076 - .102	
P	MEDIUM ALLOY TOOL STEELS									
	4140, 4340, 52100, 6150, 8620	< 40 > 40	130 - 190 95 - 140	.025 - .041 .018 - .030	.029 - .051 .025 - .041	.033 - .061 .030 - .051	.046 - .061 .041 - .056	.061 - .086 .051 - .071	.086 - .112 .061 - .081	.091 - .122 .076 - .102
	CARBON STEELS									
1000's - 1018, 1020, 12L14	< 40	140 - 230	.025 - .043	.029 - .053	.033 - .064	.046 - .061	.061 - .086	.086 - .112	.091 - .122	
K	CAST MATERIAL									
	Ductile Iron		130 - 200	.030 - .048	.034 - .056	.038 - .066	.061 - .097	.066 - .127	.076 - .132	.122 - .193
	Gray Iron		170 - 225	.033 - .053	.037 - .061	.041 - .069	.066 - .107	.071 - .132	.081 - .163	.132 - .213

	Profile/Trochoidal Milling
Axial (ap)	up to 2xD
Radial (ae)	5% - 15% of Dia.



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

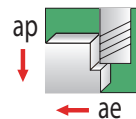
GARR TOOL High Performance Milling Guide for VX-7, VX-7C (HIGH EFFICIENCY MILLING)

NOTE - DATA DOES NOT REFLECT CHIP THINNING.

SPINDLE INTERFACE MUST BE SCRUTINIZED WHEN USING 5/8" DIAMETER AND LARGER END MILLS

	ISO Material	HRC	SFM (Vc)	CHIPLOAD PER TOOTH (Fz)				
				3/8"	1/2"	5/8"	3/4"	1"
S	COBALT BASE ALLOYS							
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	120 - 240 100 - 195	.0013" - .0026" .0010" - .0024"	.0019" - .0036" .0014" - .0031"	.0021" - .0043" .0017" - .0038"	.0026" - .0052" .0020" - .0048"	.0038" - .0072" .0028" - .0062"
	NICKEL BASE ALLOYS							
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	120 - 240 100 - 195	.0013" - .0026" .0010" - .0024"	.0019" - .0036" .0014" - .0031"	.0021" - .0043" .0017" - .0038"	.0026" - .0052" .0020" - .0048"	.0038" - .0072" .0028" - .0062"
	IRON BASE ALLOYS							
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascocolloy	< 40 > 40	120 - 240 100 - 195	.0013" - .0026" .0010" - .0024"	.0019" - .0036" .0014" - .0031"	.0021" - .0043" .0017" - .0038"	.0026" - .0052" .0020" - .0048"	.0038" - .0072" .0028" - .0062"
	TITANIUM ALLOYS							
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		260 - 490	.0014" - .0028"	.0021" - .0040"	.0026" - .0048"	.0028" - .0056"	.0042" - .0080"
	5553 / Beta Titanium		195 - 365	.0014" - .0026"	.0021" - .0036"	.0026" - .0043"	.0028" - .0052"	.0042" - .0072"
	M	STAINLESS STEELS						
13/8, 15/5, 17-4, pH Types		< 40 > 40	290 - 490 225 - 360	.0013" - .0026" .0010" - .0024"	.0019" - .0036" .0014" - .0031"	.0022" - .0043" .0017" - .0039"	.0026" - .0052" .0020" - .0048"	.0038" - .0072" .0028" - .0062"
300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic		< 40 > 40	325 - 520 225 - 360	.0013" - .0026" .0010" - .0024"	.0019" - .0036" .0014" - .0031"	.0022" - .0043" .0017" - .0039"	.0026" - .0052" .0020" - .0048"	.0038" - .0072" .0028" - .0062"
400 Series - 403, 405, 420, 455		< 40 > 40	290 - 555 225 - 425	.0013" - .0028" .0010" - .0025"	.0019" - .0038" .0014" - .0034"	.0022" - .0046" .0017" - .0041"	.0026" - .0056" .0020" - .0050"	.0038" - .0076" .0028" - .0068"
HIGH STRENGTH TOOL STEELS								
A2, D2, P20, H13, S7, O1	< 40 > 40	290 - 520 195 - 425	.0016" - .0028" .0014" - .0024"	.0024" - .0038" .0022" - .0031"	.0026" - .0046" .0024" - .0038"	.0032" - .0056" .0028" - .0048"	.0048" - .0076" .0044" - .0062"	
P	MEDIUM ALLOY TOOL STEELS							
	4140, 4340, 52100, 6150, 8620	< 40 > 40	455 - 650 325 - 490	.0016" - .0029" .0014" - .0024"	.0024" - .0040" .0022" - .0033"	.0026" - .0048" .0024" - .0040"	.0032" - .0058" .0028" - .0048"	.0048" - .0080" .0044" - .0066"
	CARBON STEELS							
1000's - 1018, 1020, 12L14	< 40	490 - 780	.0016" - .0030"	.0024" - .0043"	.0026" - .0050"	.0032" - .0060"	.0048" - .0086"	
K	CAST MATERIAL							
	Ductile Iron		455 - 685	.0018" - .0031"	.0029" - .0046"	.0031" - .0053"	.0036" - .0062"	.0058" - .0092"
	Gray Iron		585 - 770	.0019" - .0032"	.0031" - .0048"	.0034" - .0055"	.0038" - .0064"	.0062" - .0096"

	Profile/Trochoidal Milling
Axial (ap)	up to 2xD
Radial (ae)	5% - 15% of Dia.



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

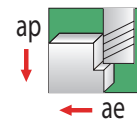
GARR TOOL High Performance Milling Guide for VX-7, VX-7C (HIGH EFFICIENCY MILLING)

NOTE - DATA DOES NOT REFLECT CHIP THINNING.

SPINDLE INTERFACE MUST BE SCRUTINIZED WHEN USING 16mm DIAMETER AND LARGER END MILLS

	ISO Material	HRC	M/Min. (Vc)	CHIPLOAD PER TOOTH (Fz)					
				8.0mm	10.0mm	12.0mm	16.0mm	20.0mm	25.0mm
S	COBALT BASE ALLOYS								
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	35 - 75 30 - 60	.024 - .046 .018 - .040	.033 - .066 .025 - .061	.048 - .091 .036 - .079	.053 - .109 .043 - .097	.066 - .132 .051 - .122	.097 - .183 .071 - .157
	NICKEL BASE ALLOYS								
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	35 - 75 30 - 60	.024 - .046 .018 - .040	.033 - .066 .025 - .061	.048 - .091 .036 - .079	.053 - .109 .043 - .097	.066 - .132 .051 - .122	.097 - .183 .071 - .157
	IRON BASE ALLOYS								
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	35 - 75 30 - 60	.024 - .046 .018 - .040	.033 - .066 .025 - .061	.048 - .091 .036 - .079	.053 - .109 .043 - .097	.066 - .132 .051 - .122	.097 - .183 .071 - .157
	TITANIUM ALLOYS								
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		80 - 150	.026 - .051	.036 - .071	.053 - .102	.066 - .122	.071 - .142	.107 - .203
	5553 / Beta Titanium		60 - 110	.026 - .046	.036 - .066	.053 - .091	.066 - .109	.071 - .132	.107 - .183
	M	STAINLESS STEELS							
13/8, 15/5, 17-4, pH Types		< 40 > 40	90 - 150 70 - 110	.024 - .046 .018 - .040	.033 - .066 .025 - .061	.048 - .091 .036 - .079	.056 - .109 .043 - .099	.066 - .132 .051 - .122	.097 - .183 .071 - .157
300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic		< 40 > 40	100 - 160 70 - 110	.024 - .052 .018 - .040	.033 - .066 .025 - .061	.048 - .091 .036 - .079	.056 - .109 .043 - .099	.066 - .132 .051 - .122	.097 - .183 .071 - .157
400 Series - 403, 405, 420, 455		< 40 > 40	90 - 170 70 - 130	.024 - .051 .018 - .043	.033 - .071 .025 - .064	.048 - .097 .036 - .086	.056 - .117 .043 - .104	.066 - .142 .051 - .127	.097 - .193 .071 - .173
HIGH STRENGTH TOOL STEELS									
A2, D2, P20, H13, S7, O1		< 40 > 40	90 - 160 60 - 130	.032 - .051 .026 - .040	.041 - .071 .036 - .061	.061 - .097 .056 - .079	.066 - .117 .061 - .097	.081 - .142 .071 - .122	.122 - .193 .112 - .157
P	MEDIUM ALLOY TOOL STEELS								
	4140, 4340, 52100, 6150, 8620	< 40 > 40	140 - 200 100 - 150	.032 - .053 .026 - .040	.041 - .074 .036 - .061	.061 - .102 .056 - .084	.066 - .122 .061 - .102	.081 - .147 .071 - .122	.122 - .203 .112 - .168
	CARBON STEELS								
1000's - 1018, 1020, 12L14	< 40	150 - 240	.032 - .053	.041 - .076	.061 - .109	.066 - .127	.081 - .152	.122 - .218	
K	CAST MATERIAL								
	Ductile Iron		140 - 210	.035 - .057	.046 - .079	.074 - .117	.079 - .135	.091 - .157	.147 - .234
	Gray Iron		180 - 235	.036 - .060	.048 - .081	.079 - .122	.086 - .140	.097 - .163	.157 - .244

	Profile/Trochoidal Milling
Axial (ap)	up to 2xD
Radial (ae)	5% - 15% of Dia.



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

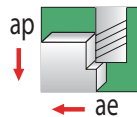
GARR TOOL Milling Guide for TMS / TMR (HIGH EFFICIENCY MILLING)

NOTE - CHIP THINNING CALCULATION ALREADY APPLIED

CHIPLOAD PER TOOTH (Fz) AT 2% RADIAL ENGAGEMENT (USING PROGRAMMED CALCULATION - SEE PAGE 304)

SPINDLE INTERFACE MUST BE SCRUTINIZED WHEN USING 5/8" DIAMETER AND LARGER END MILLS

ISO Material	SFM (Vc)	CHIPLOAD PER TOOTH (Fz)							
		1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"	
S	TITANIUM ALLOYS								
	6Al-4V	250 - 400	.0020" - .0042"	.0030" - .0052"	.0035" - .0065"	.0043" - .0078"	.0052" - .0095"	.0065" - .0115"	.0080" - .0143"
	5553	150 - 250	.0015" - .0028"	.0018" - .0035"	.0025" - .0043"	.0030" - .0055"	.0035" - .0065"	.0042" - .0080"	.0052" - .0095"
M	STAINLESS STEELS								
	Free Machining (303)	300 - 400	.0020" - .0042"	.0027" - .0052"	.0035" - .0065"	.0043" - .0078"	.0052" - .0095"	.0065" - .0115"	.0080" - .0143"
	Austenitic (304 / 304L)	225 - 350	.0017" - .0035"	.0025" - .0043"	.0030" - .0052"	.0035" - .0065"	.0043" - .0078"	.0052" - .0095"	.0065" - .0115"
Martensitic (17-4 / 416)	200 - 250	.0015" - .0028"	.0018" - .0035"	.0025" - .0043"	.0030" - .0055"	.0035" - .0065"	.0042" - .0080"	.0052" - .0095"	
P	MEDIUM ALLOY TOOL STEELS								
	8620	250 - 400	.0017" - .0035"	.0025" - .0043"	.0030" - .0052"	.0035" - .0065"	.0043" - .0078"	.0052" - .0095"	.0065" - .0115"
	4140, D2, S7	250 - 350	.0015" - .0028"	.0018" - .0035"	.0025" - .0043"	.0030" - .0055"	.0035" - .0065"	.0042" - .0080"	.0052" - .0095"
	CARBON STEELS								
	1000 Series, A36, 12L14	300 - 500	.0020" - .0042"	.0027" - .0052"	.0035" - .0065"	.0043" - .0078"	.0052" - .0095"	.0065" - .0115"	.0080" - .0143"
	CAST STEELS								
Steel	250 - 350	.0020" - .0042"	.0027" - .0052"	.0035" - .0065"	.0043" - .0078"	.0052" - .0095"	.0065" - .0115"	.0080" - .0143"	
K	CAST MATERIAL								
	Ductile Iron	250 - 350	.0020" - .0042"	.0027" - .0052"	.0035" - .0065"	.0043" - .0078"	.0052" - .0095"	.0065" - .0115"	.0080" - .0143"
	Gray Iron	250 - 350	.0020" - .0042"	.0027" - .0052"	.0035" - .0065"	.0043" - .0078"	.0052" - .0095"	.0065" - .0115"	.0080" - .0143"
N	NON-FERROUS								
	Aluminum (6061-T6)	300 - 500	.0020" - .0042"	.0027" - .0052"	.0035" - .0065"	.0043" - .0078"	.0052" - .0095"	.0065" - .0115"	.0080" - .0143"
	Copper, Brass	175 - 350	.0017" - .0042"	.0025" - .0052"	.0030" - .0065"	.0035" - .0078"	.0043" - .0095"	.0052" - .0115"	.0065" - .0143"



ap = full flute length

ae = 2%

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

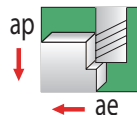
GARR TOOL Milling Guide for TMS / TMR (HIGH EFFICIENCY MILLING)

NOTE - CHIP THINNING CALCULATION ALREADY APPLIED

CHIPLOAD PER TOOTH (Fz) AT 2% RADIAL ENGAGEMENT (USING PROGRAMMED CALCULATION - SEE PAGE 305)

SPINDLE INTERFACE MUST BE SCRUTINIZED WHEN USING 16mm DIAMETER AND LARGER END MILLS

ISO Material	M/Min. (Vc)	CHIPLOAD PER TOOTH (Fz)							
		6.0mm	8.0mm	10.0mm	12.0mm	16.0mm	20.0mm	25.0mm	
S	TITANIUM ALLOYS								
	6Al-4V	98 - 157	.051 - .107	.076 - .132	.089 - .165	.109 - .198	.132 - .241	.165 - .292	.132 - .363
	5553	59 - 98	.038 - .071	.046 - .089	.064 - .109	.076 - .140	.089 - .165	.107 - .203	.132 - .241
M	STAINLESS STEELS								
	Free Machining (303)	118 - 157	.051 - .107	.069 - .132	.089 - .165	.109 - .198	.132 - .241	.165 - .292	.132 - .363
	Austenitic (304 / 304L)	89 - 138	.043 - .089	.064 - .109	.076 - .132	.089 - .165	.109 - .198	.132 - .241	.165 - .292
	Martensitic (17-4 / 416)	79 - 98	.038 - .071	.046 - .089	.064 - .109	.076 - .140	.089 - .165	.107 - .203	.132 - .241
P	MEDIUM ALLOY TOOL STEELS								
	8620	98 - 157	.043 - .089	.064 - .109	.076 - .132	.089 - .165	.109 - .198	.132 - .241	.165 - .292
	4140, D2, S7	98 - 138	.038 - .071	.046 - .089	.064 - .109	.076 - .140	.089 - .165	.107 - .203	.132 - .241
	CARBON STEELS								
	1000 Series, A36, 12L14	118 - 197	.051 - .107	.069 - .132	.089 - .165	.109 - .198	.132 - .241	.165 - .292	.203 - .363
	CAST STEELS								
	Steel	98 - 138	.051 - .107	.069 - .132	.089 - .165	.109 - .198	.132 - .241	.165 - .292	.203 - .363
K	CAST MATERIAL								
	Ductile Iron	98 - 138	.051 - .107	.069 - .132	.089 - .165	.109 - .198	.132 - .241	.165 - .292	.203 - .363
	Gray Iron	98 - 138	.051 - .107	.069 - .132	.089 - .165	.109 - .198	.132 - .241	.165 - .292	.203 - .363
N	NON-FERROUS								
	Aluminum (6061-T6)	90 - 150	.050 - .105	.075 - .130	.090 - .165	.105 - .200	.130 - .240	.165 - .292	.203 - .363
	Copper, Brass	60 - 110	.043 - .105	.064 - .130	.076 - .165	.089 - .200	.109 - .240	.132 - .292	.165 - .363



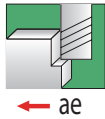
ap = full flute length

ae = 2%

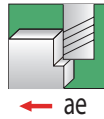
NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

Chip Thinning Calculations for TMS / TMR End Mills

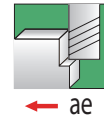
ae = 3%



ae = 2%



ae = 1%



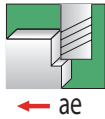
3% Radial Engagement (.03 x d)	
Actual (CPT)	Programmed (CPT)
.0002"	.0005"
.0003"	.0010"
.0005"	.0015"
.0007"	.0020"
.0009"	.0025"
.0010"	.0030"
.0012"	.0035"
.0014"	.0040"
.0015"	.0045"
.0017"	.0050"
.0019"	.0055"
.0020"	.0060"
.0022"	.0065"
.0024"	.0070"
.0026"	.0075"
.0027"	.0080"
.0029"	.0085"
.0031"	.0090"
.0032"	.0095"
.0034"	.0100"
.0036"	.0105"
.0037"	.0110"
.0039"	.0115"
.0041"	.0120"
.0043"	.0125"
.0044"	.0130"
.0046"	.0135"
.0048"	.0140"
.0049"	.0145"
.0051"	.0150"
.0053"	.0155"
.0054"	.0160"
.0056"	.0165"
.0058"	.0170"
.0060"	.0175"
.0061"	.0180"
.0063"	.0185"
.0065"	.0190"
.0066"	.0195"
.0068"	.0200"

2% Radial Engagement (.02 x d)	
Actual (CPT)	Programmed (CPT)
.0001"	.0005"
.0003"	.0010"
.0004"	.0015"
.0006"	.0020"
.0007"	.0025"
.0008"	.0030"
.0010"	.0035"
.0011"	.0040"
.0013"	.0045"
.0014"	.0050"
.0015"	.0055"
.0017"	.0060"
.0018"	.0065"
.0020"	.0070"
.0021"	.0075"
.0022"	.0080"
.0024"	.0085"
.0025"	.0090"
.0027"	.0095"
.0028"	.0100"
.0029"	.0105"
.0031"	.0110"
.0032"	.0115"
.0034"	.0120"
.0035"	.0125"
.0036"	.0130"
.0038"	.0135"
.0039"	.0140"
.0041"	.0145"
.0042"	.0150"
.0043"	.0155"
.0045"	.0160"
.0046"	.0165"
.0048"	.0170"
.0049"	.0175"
.0050"	.0180"
.0052"	.0185"
.0053"	.0190"
.0055"	.0195"
.0056"	.0200"

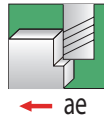
1% Radial Engagement (.01 x d)	
Actual (CPT)	Programmed (CPT)
.0001"	.0005"
.0002"	.0010"
.0003"	.0015"
.0004"	.0020"
.0005"	.0025"
.0006"	.0030"
.0007"	.0035"
.0008"	.0040"
.0009"	.0045"
.0010"	.0050"
.0011"	.0055"
.0012"	.0060"
.0013"	.0065"
.0014"	.0070"
.0015"	.0075"
.0016"	.0080"
.0017"	.0085"
.0018"	.0090"
.0019"	.0095"
.0020"	.0100"
.0021"	.0105"
.0022"	.0110"
.0023"	.0115"
.0024"	.0120"
.0025"	.0125"
.0026"	.0130"
.0027"	.0135"
.0028"	.0140"
.0029"	.0145"
.0030"	.0150"
.0031"	.0155"
.0032"	.0160"
.0033"	.0165"
.0034"	.0170"
.0035"	.0175"
.0036"	.0180"
.0037"	.0185"
.0038"	.0190"
.0039"	.0195"
.0040"	.0200"

Chip Thinning Calculations for TMS / TMR End Mills

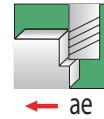
ae = 3%



ae = 2%



ae = 1%



3% Radial Engagement (.03 x d)	
Actual (CPT)	Programmed (CPT)
.0043mm	.0127mm
.0086mm	.0254mm
.0130mm	.0381mm
.0173mm	.0508mm
.0216mm	.0635mm
.0259mm	.0762mm
.0302mm	.0889mm
.0345mm	.1016mm
.0389mm	.1143mm
.0432mm	.1270mm
.0475mm	.1397mm
.0518mm	.1524mm
.0561mm	.1651mm
.0605mm	.1778mm
.0648mm	.1905mm
.0691mm	.2032mm
.0734mm	.2159mm
.0777mm	.2286mm
.0820mm	.2413mm
.0864mm	.2540mm
.0907mm	.2667mm
.0950mm	.2794mm
.0993mm	.2921mm
.1036mm	.3048mm
.1080mm	.3175mm
.1123mm	.3302mm
.1166mm	.3429mm
.1209mm	.3556mm
.1252mm	.3683mm
.1295mm	.3810mm
.1339mm	.3937mm
.1382mm	.4064mm
.1425mm	.4191mm
.1468mm	.4318mm
.1511mm	.4445mm
.1554mm	.4572mm
.1598mm	.4699mm
.1641mm	.4826mm
.1684mm	.4953mm
.1727mm	.5080mm

2% Radial Engagement (.02 x d)	
Actual (CPT)	Programmed (CPT)
.0036mm	.0127mm
.0071mm	.0254mm
.0107mm	.0381mm
.0142mm	.0508mm
.0178mm	.0635mm
.0213mm	.0762mm
.0249mm	.0889mm
.0284mm	.1016mm
.0320mm	.1143mm
.0356mm	.1270mm
.0391mm	.1397mm
.0427mm	.1524mm
.0462mm	.1651mm
.0498mm	.1778mm
.0533mm	.1905mm
.0569mm	.2032mm
.0605mm	.2159mm
.0640mm	.2286mm
.0676mm	.2413mm
.0711mm	.2540mm
.0747mm	.2667mm
.0782mm	.2794mm
.0818mm	.2921mm
.0853mm	.3048mm
.0889mm	.3175mm
.0925mm	.3302mm
.0960mm	.3429mm
.0996mm	.3556mm
.1031mm	.3683mm
.1067mm	.3810mm
.1102mm	.3937mm
.1138mm	.4064mm
.1173mm	.4191mm
.1209mm	.4318mm
.1245mm	.4445mm
.1280mm	.4572mm
.1316mm	.4699mm
.1351mm	.4826mm
.1387mm	.4953mm
.1422mm	.5080mm

1% Radial Engagement (.01 x d)	
Actual (CPT)	Programmed (CPT)
.0025mm	.0127mm
.0051mm	.0254mm
.0076mm	.0381mm
.0102mm	.0508mm
.0127mm	.0635mm
.0152mm	.0762mm
.0178mm	.0889mm
.0203mm	.1016mm
.0229mm	.1143mm
.0254mm	.1270mm
.0279mm	.1397mm
.0305mm	.1524mm
.0330mm	.1651mm
.0356mm	.1778mm
.0381mm	.1905mm
.0406mm	.2032mm
.0432mm	.2159mm
.0457mm	.2286mm
.0483mm	.2413mm
.0508mm	.2540mm
.0533mm	.2667mm
.0559mm	.2794mm
.0584mm	.2921mm
.0610mm	.3048mm
.0635mm	.3175mm
.0660mm	.3302mm
.0686mm	.3429mm
.0711mm	.3556mm
.0737mm	.3683mm
.0762mm	.3810mm
.0787mm	.3937mm
.0813mm	.4064mm
.0838mm	.4191mm
.0864mm	.4318mm
.0889mm	.4445mm
.0914mm	.4572mm
.0940mm	.4699mm
.0965mm	.4826mm
.0991mm	.4953mm
.1016mm	.5080mm

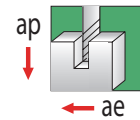
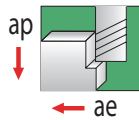
GARR TOOL Milling Guide for High Rc Finishers in Hardened Steel

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

Slotting / Pocket Milling	
Axial (ap)	5% of Dia.
Radial (ae)	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 Milling	
Axial (ap)	1xD
Radial (ae)	2% of Dia.

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

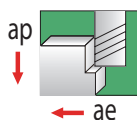
NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL Milling Guide for High Rc Finishers in Hardened Steel

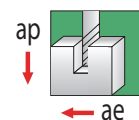
(Reference Series: 545MA, 545BA, 545RA, VRX)

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

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



Slotting / Pocket Milling	
Axial (ap)	5% of Dia.
Radial (ae)	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. = 240	M/Min. = 180	M/Min. = 135	M/Min. = 115						
	RPM	CPT (Fz)	RPM	CPT (Fz)	RPM	CPT (Fz)	RPM	CPT (Fz)	RPM	CPT (Fz)	RPM	CPT (Fz)
3.0mm	38800	.020	32300	.015	25800	.008	19400	.008	14500	.007	12100	.005
4.0mm	29100	.025	24200	.020	19400	.015	14500	.010	10900	.008	9100	.007
6.0mm	19400	.030	16100	.025	12900	.020	9700	.015	7300	.010	6050	.008
8.0mm	14500	.035	12100	.030	9700	.025	7250	.020	5450	.015	4500	.010
12.0mm	9700	.045	8075	.035	6450	.030	4850	.025	3650	.020	3000	.015
16.0mm	7250	.055	6050	.045	4850	.035	3600	.030	2700	.025	2300	.020
18.0mm	6450	.065	5400	.055	4300	.050	3200	.045	2400	.030	2000	.025
20.0mm	5800	.070	4850	.060	3850	.055	2900	.050	2150	.040	1800	.028
25.0mm	4650	.075	3870	.065	3100	.060	2300	.055	1750	.045	1450	.030

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

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

GARR TOOL Milling Guide for Die Mold Cutters

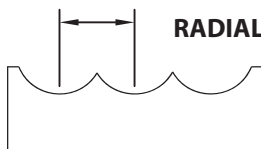
Roughing

(Reference series: 350MX)

DIAMETER	RPM		CHIPLOAD PER TOOTH (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 TOOTH (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 (ae)

AXIAL DEPTH OF CUT (ap)



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

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

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

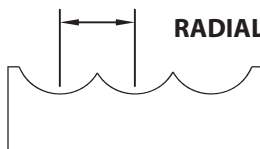
Roughing

(Reference series: 950MX)

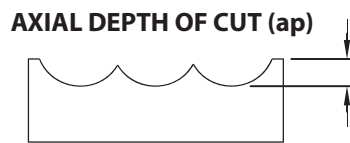
DIAMETER	RPM		CHIPLOAD PER TOOTH (Fz)	
	40 - 50 HRC	50 - 60 HRC	40 - 50 HRC	50 - 60 HRC
1.0mm	20,000 - 40,000	20,000 - 40,000	.013 - .018	.010 - .013
1.5mm	20,000 - 40,000	20,000 - 40,000	.025 - .038	.020 - .025
2.0mm	20,000 - 32,000	20,000 - 30,000	.038 - .050	.025 - .038
3.0mm	18,000 - 24,000	15,000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

Semi-Finishing and Finishing

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



RADIAL STEP OVER (ae)



AXIAL DEPTH OF CUT (ap)

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

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

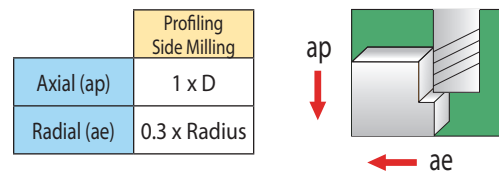
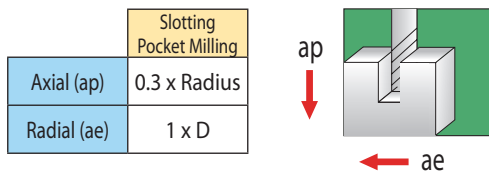
Finishing	
Axial (ap)	1% - 3% of Dia.
Radial (ae)	.5% - 1% of Dia.

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.

GARR TOOL Milling Guide for H-45 High Feed End Mills

DIAMETER	UP TO 40 HRC			40 - 45 HRC			45 - 55 HRC			55 - 60 HRC		
	SPEED RPM	FEED IN/MIN	FEED MM/MIN	SPEED RPM	FEED IN/MIN	FEED MM/MIN	SPEED RPM	FEED IN/MIN	FEED MM/MIN	SPEED RPM	FEED IN/MIN	FEED MM/MIN
3.0mm	16000	-	3100	13000	-	2032	11300	-	1778	9700	-	889
1/8"	15200	120	-	12000	80	-	10700	70	-	9200	35	-
4.0mm	12100	-	3700	9700	-	2540	8500	-	2159	7300	-	1016
3/16"	10200	160	-	8200	110	-	7100	90	-	6100	45	-
5.0mm	9700	-	4000	7700	-	2667	6800	-	2286	5800	-	1143
6.0mm	8100	-	4600	6500	-	3048	5700	-	2540	4900	-	1270
1/4"	7650	180	-	6100	120	-	5400	100	-	4600	50	-
5/16"	6100	195	-	4900	130	-	4300	110	-	3700	55	-
8.0mm	6050	-	4950	4850	-	3302	4300	-	2794	3650	-	1397
3/8"	5100	200	-	4100	135	-	3600	115	-	3100	60	-
10.0mm	4850	-	5100	3900	-	3429	3400	-	2921	2900	-	1524
12.0mm	4050	-	6400	3200	-	4064	2800	-	3429	2400	-	1651
1/2"	3800	240	-	3100	160	-	2700	135	-	2300	65	-



D = Tool Diameter

Example: Axial = 0.3 x radius, when D = 1/2" with .060" corner radius (.3 x .060") = .018" per pass

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

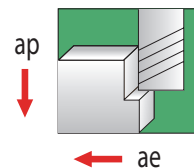
GARR TOOL Milling Guide for Diamond Coated End Mills in Graphite

DIAMETER	RPM	CHIPLOAD PER TOOTH (Fz)
1/32" - 1/16"	15,000 - 35,000	.0005" - .0010"
1/16" - 1/8"	8,000 - 31,000	.0008" - .0015"
1/8" - 3/16"	8,000 - 31,000	.0010" - .0020"
3/16" - 1/4"	8,000 - 25,000	.0010" - .0020"
1/4" - 5/16"	6,000 - 23,000	.0020" - .0040"
5/16" - 3/8"	6,000 - 20,000	.0020" - .0040"
3/8" - 1/2"	6,000 - 20,000	.0030" - .0050"
1/2" - 5/8"	4,500 - 15,000	.0050" - .0060"
5/8" - 3/4"	4,500 - 12,000	.0060" - .0070"
3/4" - 1"	4,500 - 12,000	.0070" - .0080"

DIAMETER	RPM	CHIPLOAD PER TOOTH (Fz)
1.0 - 3.0mm	15,000 - 35,000	.015 - .030
3.0 - 6.0mm	8,000 - 31,000	.030 - .050
6.0 - 10.0mm	6,000 - 31,000	.050 - .100
10.0 - 12.0mm	6,000 - 25,000	.080 - .130
16.0 - 20.0mm	4,500 - 15,000	.130 - .150
20.0 - 25.0mm	4,500 - 12,000	.150 - .200

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

	Slotting	Profiling
Axial (ap)	5% of Dia.	1xD
Radial (ae)	1xD	10% of Dia.



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

	ISO Material	HRC	SFM (Vc)	CHIPLOAD PER TOOTH (Fz)			
				.0590" - .1250"	.1251" - .2500"	.2501" - .3750"	.3751" - .5020"
S	COBALT BASE ALLOYS						
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	80 - 120 60 - 80	.0003" - .0008"	.0005" - .0010"	.0008" - .0012"	.0010" - .0015"
	NICKEL BASE ALLOYS						
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	100 - 125 80 - 110	.0003" - .0008"	.0005" - .0010"	.0008" - .0012"	.0010" - .0015"
	IRON BASE ALLOYS						
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	150 - 175 120 - 150	.0004" - .0009"	.0006" - .0012"	.0009" - .0013"	.0010" - .0017"
TITANIUM ALLOYS							
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		120 - 150	.0004" - .0009"	.0006" - .0012"	.0009" - .0013"	.0010" - .0017"	
5553 / Beta Titanium		90 - 110	.0004" - .0007"	.0006" - .0010"	.0009" - .0011"	.0010" - .0015"	
M	STAINLESS STEELS						
	13/8, 15/5, 17-4, pH Types	< 40 > 40	100 - 125 80 - 110	.0004" - .0009"	.0006" - .0012"	.0009" - .0013"	.0010" - .0017"
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	100 - 125 80 - 110	.0004" - .0009"	.0006" - .0012"	.0009" - .0013"	.0010" - .0017"
	400 Series - 403, 405, 420, 455	< 40 > 40	100 - 125 80 - 110	.0004" - .0009"	.0006" - .0012"	.0009" - .0013"	.0010" - .0017"
P	HIGH STRENGTH TOOL STEELS						
	A2, D2, P20, H13, S7, O1	< 40 > 40	100 - 125 80 - 110	.0003" - .0008"	.0005" - .0010"	.0008" - .0012"	.0010" - .0015"
	MEDIUM ALLOY TOOL STEELS						
	4140, 4340, 52100, 6150, 8620	< 40 > 40	100 - 125 80 - 110	.0004" - .0009"	.0006" - .0012"	.0009" - .0013"	.0010" - .0017"
CARBON STEELS							
1000's - 1018, 1020, 12L14	< 40	100 - 125	.0004" - .0009"	.0006" - .0012"	.0009" - .0013"	.0010" - .0017"	
K	CAST MATERIAL						
	Ductile Iron		150 - 225	.0005" - .0010"	.0007" - .0012"	.0010" - .0015"	.0010" - .0018"
	Gray Iron		125 - 200	.0005" - .0010"	.0007" - .0012"	.0010" - .0015"	.0010" - .0018"
N	NON-FERROUS						
	Aluminum (6061, 7075)		225	.0005" - .0010"	.0007" - .0012"	.0010" - .0015"	.0010" - .0018"
	Magnesium		225	.0005" - .0010"	.0007" - .0012"	.0010" - .0015"	.0010" - .0018"
	Copper		225	.0005" - .0010"	.0007" - .0012"	.0010" - .0015"	.0010" - .0018"
	Brass, Bronze		125 - 200	.0005" - .0010"	.0007" - .0012"	.0010" - .0015"	.0010" - .0018"
O	COMPOSITE (non-ISO)						
	Glass Epoxy, Fiberglass, Plastics, Graphite, G10		150	.0003" - .0008"	.0005" - .0010"	.0008" - .0012"	.0010" - .0015"

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

	ISO Material	HRC	M/Min. (Vc)	CHIPLOAD PER TOOTH (Fz)			
				1.50 - 3.00mm	3.01 - 6.00mm	6.01 - 9.00mm	9.01 - 13.00mm
S	COBALT BASE ALLOYS						
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	25 - 40 15 - 25	.008 - .020	.013 - .025	.020 - .030	.025 - .040
	NICKEL BASE ALLOYS						
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	30 - 40 25 - 35	.008 - .020	.013 - .025	.020 - .030	.025 - .040
	IRON BASE ALLOYS						
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	45 - 50 35 - 45	.010 - .023	.015 - .030	.023 - .035	.025 - .045
	TITANIUM ALLOYS						
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		40 - 45	.010 - .023	.015 - .030	.023 - .035	.025 - .045
	5553 / Beta Titanium		30 - 35	.010 - .020	.015 - .025	.023 - .030	.025 - .040
M	STAINLESS STEELS						
	13/8, 15/5, 17-4, pH Types	< 40 > 40	30 - 40 25 - 35	.010 - .023	.015 - .030	.023 - .035	.025 - .045
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	30 - 40 25 - 35	.010 - .023	.015 - .030	.023 - .035	.025 - .045
	400 Series - 403, 405, 420, 455	< 40 > 40	30 - 40 25 - 35	.010 - .023	.015 - .030	.023 - .035	.025 - .045
P	HIGH STRENGTH TOOL STEELS						
	A2, D2, P20, H13, S7, O1	< 40 > 40	30 - 40 25 - 35	.008 - .020	.013 - .025	.020 - .030	.025 - .040
	MEDIUM ALLOY TOOL STEELS						
	4140, 4340, 52100, 6150, 8620	< 40 > 40	30 - 40 25 - 35	.010 - .023	.015 - .030	.023 - .035	.025 - .045
	CARBON STEELS						
	1000's - 1018, 1020, 12L14	< 40	30 - 40	.010 - .023	.015 - .030	.023 - .035	.025 - .045
	CAST MATERIAL						
K	Ductile Iron		45 - 70	.013 - .025	.018 - .025	.025 - .040	.025 - .050
	Gray Iron		35 - 70	.013 - .025	.018 - .025	.025 - .040	.025 - .050
N	NON-FERROUS						
	Aluminum (6061, 7075)		70	.013 - .025	.018 - .025	.025 - .040	.025 - .050
	Magnesium		70	.013 - .025	.018 - .025	.025 - .040	.025 - .050
	Copper		70	.013 - .025	.018 - .025	.025 - .040	.025 - .050
	Brass, Bronze		40 - 60	.013 - .025	.018 - .025	.025 - .040	.025 - .050
O	COMPOSITE (non-ISO)						
	Glass Epoxy, Fiberglass, Plastics, Graphite, G10		40 - 45	.008 - .020	.013 - .025	.020 - .030	.025 - .040

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

GARR TOOL Milling Guide for Drill Mills

* Chamfering *

TECHNICAL

ISO Material	HRC	SFM (Vc) 154M, 154MA 152M, 152MA	CHIPLOAD PER TOOTH (Fz)								
			1/8"	3/16"	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	
COBALT BASE ALLOYS											
Haynes 25/188, Stellite 21, Cobalt Chrome	< 40	60 - 90	.0004" - .0008"	.0004" - .0008"	.0005" - .0010"	.0008" - .0015"	.0010" - .0018"	.0015" - .0030"	.0020" - .0030"	.0025" - .0035"	
	> 40	50 - 80	.0003" - .0006"	.0003" - .0006"	.0003" - .0008"	.0005" - .0010"	.0008" - .0015"	.0010" - .0015"	.0015" - .0025"	.0015" - .0020"	
NICKEL BASE ALLOYS											
Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40	55 - 90	.0004" - .0008"	.0004" - .0008"	.0005" - .0010"	.0008" - .0015"	.0010" - .0018"	.0015" - .0030"	.0020" - .0030"	.0025" - .0035"	
	> 40	45 - 80	.0003" - .0006"	.0003" - .0006"	.0003" - .0008"	.0005" - .0010"	.0008" - .0015"	.0010" - .0015"	.0015" - .0025"	.0015" - .0020"	
IRON BASE ALLOYS											
A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40	55 - 90	.0004" - .0008"	.0004" - .0008"	.0005" - .0010"	.0008" - .0015"	.0010" - .0018"	.0015" - .0030"	.0020" - .0030"	.0025" - .0035"	
	> 40	50 - 80	.0003" - .0006"	.0003" - .0006"	.0003" - .0008"	.0005" - .0010"	.0008" - .0015"	.0010" - .0015"	.0015" - .0025"	.0015" - .0020"	
TITANIUM ALLOYS											
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si	< 40	100 - 150	.0003" - .0008"	.0005" - .0012"	.0005" - .0012"	.0008" - .0015"	.0010" - .0015"	.0013" - .0020"	.0018" - .0025"	.0025" - .0035"	
	> 40	90 - 120	.0003" - .0008"	.0004" - .0010"	.0004" - .0010"	.0005" - .0012"	.0008" - .0014"	.0010" - .0016"	.0010" - .0020"	.0015" - .0025"	
STAINLESS STEELS											
13/8, 15/5, 17-4, pH Types	< 40	100 - 150	.0003" - .0006"	.0003" - .0007"	.0006" - .0009"	.0008" - .0012"	.0013" - .0018"	.0010" - .0020"	.0012" - .0025"	.0012" - .0020"	
	> 40	80 - 100	.0002" - .0004"	.0002" - .0006"	.0003" - .0007"	.0004" - .0008"	.0007" - .0012"	.0008" - .0015"	.0010" - .0016"	.0013" - .0017"	
	< 40	150 - 225	.0002" - .0006"	.0005" - .0008"	.0008" - .0015"	.0010" - .0018"	.0010" - .0018"	.0015" - .0025"	.0018" - .0028"	.0022" - .0032"	
	> 40	125 - 220	.0003" - .0005"	.0003" - .0007"	.0005" - .0010"	.0008" - .0012"	.0009" - .0015"	.0013" - .0018"	.0013" - .0018"	.0017" - .0025"	
300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40	150 - 200	.0007" - .0010"	.0009" - .0015"	.0009" - .0014"	.0011" - .0015"	.0013" - .0018"	.0015" - .0025"	.0020" - .0035"	.0030" - .0046"	
	> 40	100 - 150	.0004" - .0008"	.0006" - .0010"	.0007" - .0011"	.0008" - .0012"	.0009" - .0015"	.0012" - .0020"	.0018" - .0030"	.0024" - .0042"	
400 Series - 403, 405, 420, 455											
< 40	150 - 200	.0007" - .0010"	.0009" - .0015"	.0009" - .0014"	.0011" - .0015"	.0013" - .0018"	.0015" - .0025"	.0020" - .0035"	.0030" - .0046"	.0030" - .0046"	
> 40	100 - 150	.0004" - .0008"	.0006" - .0010"	.0007" - .0011"	.0008" - .0012"	.0009" - .0015"	.0012" - .0020"	.0018" - .0030"	.0024" - .0042"	.0024" - .0042"	
HIGH STRENGTH TOOL STEELS											
A2, D2, P20, H13, S7, O1	< 40	150 - 200	.0003" - .0008"	.0005" - .0010"	.0010" - .0015"	.0012" - .0020"	.0012" - .0020"	.0014" - .0024"	.0018" - .0026"	.0020" - .0028"	
	> 40	100 - 150	.0003" - .0005"	.0003" - .0008"	.0005" - .0010"	.0005" - .0010"	.0005" - .0010"	.0010" - .0015"	.0012" - .0018"	.0015" - .0022"	
MEDIUM ALLOY TOOL STEELS											
4140, 4340, 52100, 6150, 8620	< 40	150 - 200	.0003" - .0008"	.0005" - .0010"	.0010" - .0015"	.0012" - .0020"	.0012" - .0020"	.0014" - .0024"	.0018" - .0026"	.0020" - .0028"	
	> 40	100 - 150	.0003" - .0005"	.0003" - .0008"	.0005" - .0010"	.0005" - .0010"	.0005" - .0010"	.0010" - .0015"	.0012" - .0018"	.0015" - .0022"	
CARBON STEELS											
1000's - 1018, 1020, 12L14	< 40	150 - 200	.0003" - .0008"	.0005" - .0010"	.0010" - .0015"	.0012" - .0020"	.0012" - .0020"	.0014" - .0024"	.0018" - .0026"	.0020" - .0028"	
CAST MATERIAL											
Ductile Iron	< 40	175 - 225	.0008" - .0012"	.0010" - .0015"	.0015" - .0025"	.0015" - .0025"	.0020" - .0030"	.0025" - .0035"	.0035" - .0045"	.0035" - .0045"	
	> 40	175 - 225	.0008" - .0012"	.0010" - .0015"	.0015" - .0025"	.0015" - .0025"	.0020" - .0030"	.0025" - .0035"	.0035" - .0045"	.0035" - .0045"	
Gray Iron	< 40	175 - 225	.0008" - .0012"	.0010" - .0015"	.0015" - .0025"	.0015" - .0025"	.0020" - .0030"	.0025" - .0035"	.0035" - .0045"	.0035" - .0045"	
NON-FERROUS											
Aluminum (6061, 7075)	< 40	300 - 500	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"	
	> 40	300 - 500	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"	
	< 40	250 - 450	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"	
	> 40	200 - 400	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"	
Magnesium	< 40	300 - 500	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"	
Copper	< 40	250 - 450	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"	
Brass, Bronze	< 40	200 - 400	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"	
COMPOSITE (non-ISO)											
Glass Epoxy, Fiberglass, Plastics	< 40	200 - 400	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"	

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

GARR TOOL Milling Guide for Drill Mills

* Chamfering *

ISO Material	HRC	M/Min. (Vc) 154M, 154MA 152M, 152MA	CHIPLOAD PER TOOTH (Fz)								
			3.0mm	4.0mm	5.0mm	6.0mm	8.0mm	10.0mm	12.0mm	16.00mm	20.0mm
COBALT BASE ALLOYS											
Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	24 - 35 20 - 31	.010 - .020 .008 - .015	.010 - .020 .008 - .015	.010 - .020 .008 - .015	.013 - .025 .008 - .020	.020 - .038 .013 - .025	.025 - .046 .020 - .038	.038 - .076 .025 - .038	.051 - .076 .038 - .064	.064 - .089 .038 - .051
NICKEL BASE ALLOYS											
Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	22 - 35 18 - 31	.010 - .020 .008 - .015	.010 - .020 .008 - .015	.010 - .020 .008 - .015	.013 - .025 .008 - .020	.020 - .038 .013 - .025	.025 - .046 .020 - .038	.038 - .076 .025 - .038	.051 - .076 .038 - .064	.064 - .089 .038 - .051
IRON BASE ALLOYS											
A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascocolloy	< 40 > 40	22 - 35 20 - 31	.010 - .020 .008 - .015	.010 - .020 .008 - .015	.010 - .020 .008 - .015	.013 - .025 .008 - .020	.020 - .038 .013 - .025	.025 - .046 .020 - .038	.038 - .076 .025 - .038	.051 - .076 .038 - .064	.064 - .089 .038 - .051
TITANIUM ALLOYS											
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		20 - 31	.008 - .020	.008 - .020	.013 - .030	.013 - .030	.020 - .038	.025 - .038	.033 - .051	.046 - .064	.051 - .076
5553 / Beta Titanium		35 - 47	.008 - .020	.008 - .020	.010 - .025	.010 - .025	.013 - .030	.020 - .036	.025 - .041	.025 - .051	.038 - .064
STAINLESS STEELS											
13/8, 15/5, 17-4, pH Types	< 40 > 40	39 - 59 31 - 39	.008 - .015 .005 - .010	.008 - .015 .005 - .010	.008 - .018 .005 - .015	.015 - .023 .008 - .018	.020 - .030 .010 - .020	.033 - .046 .018 - .030	.025 - .051 .020 - .038	.030 - .064 .025 - .041	.030 - .051 .033 - .043
300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	59 - 89 49 - 87	.005 - .015 .008 - .013	.005 - .015 .008 - .013	.013 - .020 .008 - .018	.020 - .038 .013 - .025	.038 - .046 .020 - .030	.025 - .046 .018 - .030	.038 - .064 .033 - .046	.046 - .071 .038 - .058	.056 - .081 .043 - .064
400 Series - 403, 405, 420, 455	< 40 > 40	59 - 79 39 - 59	.018 - .025 .010 - .020	.018 - .025 .010 - .020	.023 - .038 .015 - .025	.023 - .036 .018 - .028	.028 - .038 .020 - .030	.033 - .046 .023 - .038	.038 - .064 .030 - .051	.051 - .089 .046 - .076	.056 - .102 .051 - .089
HIGH STRENGTH TOOL STEELS											
A2, D2, P20, H13, S7, O1	< 40 > 40	59 - 79 39 - 59	.008 - .020 .008 - .013	.008 - .020 .008 - .013	.013 - .025 .008 - .020	.025 - .038 .013 - .025	.030 - .051 .013 - .025	.030 - .051 .013 - .025	.036 - .061 .025 - .038	.046 - .066 .030 - .046	.051 - .071 .036 - .051
MEDIUM ALLOY TOOL STEELS											
4140, 4340, 52100, 6150, 8620	< 40 > 40	59 - 79 39 - 59	.008 - .020 .008 - .013	.008 - .020 .008 - .013	.013 - .025 .008 - .020	.025 - .038 .013 - .025	.030 - .051 .013 - .025	.030 - .051 .013 - .025	.036 - .061 .025 - .038	.046 - .066 .030 - .046	.051 - .071 .036 - .051
CARBON STEELS											
1000's - 1018, 1020, 12L14	< 40	59 - 79	.008 - .020	.008 - .020	.013 - .025	.025 - .038	.030 - .051	.030 - .051	.036 - .061	.046 - .066	.051 - .071
CAST MATERIAL											
Ductile Iron		69 - 89	.020 - .031	.023 - .035	.025 - .038	.038 - .064	.038 - .064	.051 - .076	.064 - .089	.089 - .114	.089 - .114
Gray Iron		69 - 89	.020 - .031	.023 - .035	.025 - .038	.038 - .064	.038 - .064	.051 - .076	.064 - .089	.089 - .114	.089 - .114
NON-FERROUS											
Aluminum (6061, 7075)		118 - 197	.015 - .025	.015 - .025	.020 - .036	.030 - .051	.036 - .071	.051 - .076	.089 - .122	.127 - .152	.147 - .178
Magnesium		118 - 197	.015 - .025	.015 - .025	.020 - .036	.030 - .051	.036 - .071	.051 - .076	.089 - .122	.127 - .152	.147 - .178
Copper		98 - 177	.015 - .025	.015 - .025	.020 - .036	.030 - .051	.036 - .071	.051 - .076	.089 - .122	.127 - .152	.147 - .178
Brass, Bronze		98 - 157	.015 - .025	.015 - .025	.020 - .036	.030 - .051	.036 - .071	.051 - .076	.089 - .122	.127 - .152	.147 - .178
COMPOSITE (non-ISO)											
Glass Epoxy, Fiberglass, Plastics		79 - 157	.015 - .025	.015 - .025	.020 - .036	.030 - .051	.036 - .071	.051 - .076	.089 - .122	.127 - .152	.147 - .178

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

GARR TOOL Drilling Guide for Drill Mills

* Through Hole *

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ISO Material	HRC	SFM (Vc) 152DA	CHIPLOAD PER TOOTH (Fz)								
			1/8"	3/16"	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	
COBALT BASE ALLOYS											
Haynes 25/188, Stellite 21, Cobalt Chrome	< 40	60 - 90	.0004" - .0008"	.0004" - .0008"	.0005" - .0010"	.0008" - .0015"	.0010" - .0018"	.0015" - .0030"	.0020" - .0030"	.0025" - .0035"	
	> 40	50 - 80	.0003" - .0006"	.0003" - .0006"	.0003" - .0008"	.0005" - .0010"	.0008" - .0015"	.0010" - .0015"	.0015" - .0025"	.0015" - .0020"	
NICKEL BASE ALLOYS											
Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40	55 - 90	.0004" - .0008"	.0004" - .0008"	.0005" - .0010"	.0008" - .0015"	.0010" - .0018"	.0015" - .0030"	.0020" - .0030"	.0025" - .0035"	
	> 40	45 - 80	.0003" - .0006"	.0003" - .0006"	.0003" - .0008"	.0005" - .0010"	.0008" - .0015"	.0010" - .0015"	.0015" - .0025"	.0015" - .0020"	
IRON BASE ALLOYS											
A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40	55 - 90	.0004" - .0008"	.0004" - .0008"	.0005" - .0010"	.0008" - .0015"	.0010" - .0018"	.0015" - .0030"	.0020" - .0030"	.0025" - .0035"	
	> 40	50 - 80	.0003" - .0006"	.0003" - .0006"	.0003" - .0008"	.0005" - .0010"	.0008" - .0015"	.0010" - .0015"	.0015" - .0025"	.0015" - .0020"	
TITANIUM ALLOYS											
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si	< 40	100 - 150	.0003" - .0008"	.0005" - .0012"	.0005" - .0012"	.0008" - .0015"	.0010" - .0015"	.0013" - .0020"	.0018" - .0025"	.0025" - .0035"	
	> 40	90 - 120	.0003" - .0008"	.0004" - .0010"	.0004" - .0010"	.0005" - .0012"	.0008" - .0014"	.0010" - .0016"	.0010" - .0020"	.0015" - .0025"	
STAINLESS STEELS											
13/8, 15/5, 17-4, pH Types	< 40	100 - 150	.0003" - .0006"	.0003" - .0007"	.0006" - .0009"	.0008" - .0012"	.0013" - .0018"	.0010" - .0020"	.0012" - .0025"	.0012" - .0020"	
	> 40	80 - 100	.0002" - .0004"	.0002" - .0006"	.0003" - .0007"	.0004" - .0008"	.0007" - .0012"	.0008" - .0015"	.0010" - .0016"	.0013" - .0017"	
	< 40	150 - 225	.0002" - .0006"	.0005" - .0008"	.0008" - .0015"	.0010" - .0018"	.0010" - .0018"	.0015" - .0025"	.0018" - .0028"	.0022" - .0032"	
	> 40	125 - 220	.0003" - .0005"	.0003" - .0007"	.0005" - .0010"	.0008" - .0012"	.0009" - .0015"	.0013" - .0018"	.0013" - .0018"	.0017" - .0025"	
300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40	150 - 200	.0007" - .0010"	.0009" - .0015"	.0009" - .0014"	.0011" - .0015"	.0013" - .0018"	.0015" - .0025"	.0020" - .0035"	.0030" - .0046"	
	> 40	100 - 150	.0004" - .0008"	.0006" - .0010"	.0007" - .0011"	.0008" - .0012"	.0009" - .0015"	.0012" - .0020"	.0018" - .0030"	.0024" - .0042"	
HIGH STRENGTH TOOL STEELS											
A2, D2, P20, H13, S7, O1	< 40	150 - 200	.0003" - .0008"	.0005" - .0010"	.0010" - .0015"	.0012" - .0020"	.0012" - .0020"	.0014" - .0024"	.0018" - .0026"	.0020" - .0028"	
	> 40	100 - 150	.0003" - .0005"	.0003" - .0008"	.0005" - .0010"	.0005" - .0010"	.0005" - .0010"	.0010" - .0015"	.0012" - .0018"	.0015" - .0022"	
MEDIUM ALLOY TOOL STEELS											
4140, 4340, 52100, 6150, 8620	< 40	150 - 200	.0003" - .0008"	.0005" - .0010"	.0010" - .0015"	.0012" - .0020"	.0012" - .0020"	.0014" - .0024"	.0018" - .0026"	.0020" - .0028"	
	> 40	100 - 150	.0003" - .0005"	.0003" - .0008"	.0005" - .0010"	.0005" - .0010"	.0005" - .0010"	.0010" - .0015"	.0012" - .0018"	.0015" - .0022"	
CARBON STEELS											
1000's - 1018, 1020, 12L14	< 40	150 - 200	.0003" - .0008"	.0005" - .0010"	.0010" - .0015"	.0012" - .0020"	.0012" - .0020"	.0014" - .0024"	.0018" - .0026"	.0020" - .0028"	
CAST MATERIAL											
Ductile Iron	< 40	175 - 225	.0008" - .0012"	.0010" - .0015"	.0015" - .0025"	.0015" - .0025"	.0020" - .0030"	.0025" - .0035"	.0035" - .0045"	.0035" - .0045"	
	> 40	175 - 225	.0008" - .0012"	.0010" - .0015"	.0015" - .0025"	.0015" - .0025"	.0020" - .0030"	.0025" - .0035"	.0035" - .0045"	.0035" - .0045"	
Gray Iron	< 40	175 - 225	.0008" - .0012"	.0010" - .0015"	.0015" - .0025"	.0015" - .0025"	.0020" - .0030"	.0025" - .0035"	.0035" - .0045"	.0035" - .0045"	
NON-FERROUS											
Aluminum (6061, 7075)	< 40	300 - 500	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"	
	> 40	300 - 500	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"	
	< 40	250 - 450	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"	
	> 40	200 - 400	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"	
COMPOSITE (non-ISO)											
Glass Epoxy, Fiberglass, Plastics	< 40	200 - 400	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"	

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GARR TOOL Drilling Guide for Drill Mills

* Through Hole *

TECHNICAL

ISO Material	HRC	M/Min. (Vc)	CHIPLOAD PER TOOTH (Fz)									
		152DA	3.0mm	4.0mm	5.0mm	6.0mm	8.0mm	10.0mm	12.0mm	16.00mm	20.0mm	
COBALT BASE ALLOYS												
Haynes 25/188, Stellite 21, Cobalt Chrome	< 40	24 - 35	.010 - .020	.010 - .020	.010 - .020	.013 - .025	.020 - .038	.025 - .046	.038 - .076	.051 - .076	.064 - .089	
	> 40	20 - 31	.008 - .015	.008 - .015	.008 - .015	.008 - .020	.013 - .025	.020 - .038	.025 - .038	.038 - .064	.038 - .051	
NICKEL BASE ALLOYS												
Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40	22 - 35	.010 - .020	.010 - .020	.010 - .020	.013 - .025	.020 - .038	.025 - .046	.038 - .076	.051 - .076	.064 - .089	
	> 40	18 - 31	.008 - .015	.008 - .015	.008 - .015	.008 - .020	.013 - .025	.020 - .038	.025 - .038	.038 - .064	.038 - .051	
IRON BASE ALLOYS												
A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascocolloy	< 40	22 - 35	.010 - .020	.010 - .020	.010 - .020	.013 - .025	.020 - .038	.025 - .046	.038 - .076	.051 - .076	.064 - .089	
	> 40	20 - 31	.008 - .015	.008 - .015	.008 - .015	.008 - .020	.013 - .025	.020 - .038	.025 - .038	.038 - .064	.038 - .051	
TITANIUM ALLOYS												
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si	< 40	20 - 31	.008 - .020	.008 - .020	.013 - .030	.013 - .030	.020 - .038	.025 - .038	.033 - .051	.046 - .064	.051 - .076	
	> 40	35 - 47	.008 - .020	.008 - .020	.010 - .025	.010 - .025	.013 - .030	.020 - .036	.025 - .041	.025 - .051	.038 - .064	
STAINLESS STEELS												
13/8, 15/5, 17-4, pH Types	< 40	39 - 59	.008 - .015	.008 - .015	.008 - .018	.015 - .023	.020 - .030	.033 - .046	.025 - .051	.030 - .064	.030 - .051	
	> 40	31 - 39	.005 - .010	.005 - .010	.005 - .015	.008 - .018	.010 - .020	.018 - .030	.020 - .038	.025 - .041	.033 - .043	
300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40	59 - 89	.005 - .015	.005 - .015	.013 - .020	.020 - .038	.038 - .046	.025 - .046	.038 - .064	.046 - .071	.056 - .081	
	> 40	49 - 87	.008 - .013	.008 - .013	.008 - .018	.013 - .025	.020 - .030	.018 - .030	.033 - .046	.038 - .058	.043 - .064	
400 Series - 403, 405, 420, 455	< 40	59 - 79	.018 - .025	.018 - .025	.023 - .038	.023 - .036	.028 - .038	.033 - .046	.038 - .064	.051 - .089	.056 - .102	
	> 40	39 - 59	.010 - .020	.010 - .020	.015 - .025	.018 - .028	.020 - .030	.023 - .038	.030 - .051	.046 - .076	.051 - .089	
HIGH STRENGTH TOOL STEELS												
A2, D2, P20, H13, S7, O1	< 40	59 - 79	.008 - .020	.008 - .020	.013 - .025	.025 - .038	.030 - .051	.030 - .051	.036 - .061	.046 - .066	.051 - .071	
	> 40	39 - 59	.008 - .013	.008 - .013	.008 - .020	.013 - .025	.013 - .025	.013 - .025	.025 - .038	.030 - .046	.036 - .051	
MEDIUM ALLOY TOOL STEELS												
4140, 4340, 52100, 6150, 8620	< 40	59 - 79	.008 - .020	.008 - .020	.013 - .025	.025 - .038	.030 - .051	.030 - .051	.036 - .061	.046 - .066	.051 - .071	
	> 40	39 - 59	.008 - .013	.008 - .013	.008 - .020	.013 - .025	.013 - .025	.013 - .025	.025 - .038	.030 - .046	.036 - .051	
CARBON STEELS												
1000's - 1018, 1020, 12L14	< 40	59 - 79	.008 - .020	.008 - .020	.013 - .025	.025 - .038	.030 - .051	.030 - .051	.036 - .061	.046 - .066	.051 - .071	
CAST MATERIAL												
Ductile Iron	< 40	69 - 89	.020 - .031	.023 - .035	.025 - .038	.038 - .064	.038 - .064	.051 - .076	.064 - .089	.089 - .114	.089 - .114	
	> 40	69 - 89	.020 - .031	.023 - .035	.025 - .038	.038 - .064	.038 - .064	.051 - .076	.064 - .089	.089 - .114	.089 - .114	
Gray Iron	< 40	69 - 89	.020 - .031	.023 - .035	.025 - .038	.038 - .064	.038 - .064	.051 - .076	.064 - .089	.089 - .114	.089 - .114	
	> 40	69 - 89	.020 - .031	.023 - .035	.025 - .038	.038 - .064	.038 - .064	.051 - .076	.064 - .089	.089 - .114	.089 - .114	
NON-FERROUS												
Aluminum (6061, 7075)	< 40	118 - 197	.015 - .025	.015 - .025	.020 - .036	.030 - .051	.036 - .071	.051 - .076	.089 - .122	.127 - .152	.147 - .178	
	> 40	118 - 197	.015 - .025	.015 - .025	.020 - .036	.030 - .051	.036 - .071	.051 - .076	.089 - .122	.127 - .152	.147 - .178	
	< 40	98 - 177	.015 - .025	.015 - .025	.020 - .036	.030 - .051	.036 - .071	.051 - .076	.089 - .122	.127 - .152	.147 - .178	
	> 40	98 - 157	.015 - .025	.015 - .025	.020 - .036	.030 - .051	.036 - .071	.051 - .076	.089 - .122	.127 - .152	.147 - .178	
COMPOSITE (non-ISO)												
Glass Epoxy, Fiberglass, Plastics	< 40	79 - 157	.015 - .025	.015 - .025	.020 - .036	.030 - .051	.036 - .071	.051 - .076	.089 - .122	.127 - .152	.147 - .178	

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GARR TOOL General Purpose Drilling Guide (Uncoated)

	ISO Material	HRC	SFM (by Series)			
			1100	1200, 1205, 1520	1500, 1510	1600
S	COBALT BASE ALLOYS					
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	- -	45 - 70 35 - 60	45 - 70 35 - 60	30 - 55 20 - 45
	NICKEL BASE ALLOYS					
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	- -	45 - 70 35 - 60	45 - 70 35 - 60	30 - 55 20 - 45
	IRON BASE ALLOYS					
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	- -	45 - 70 35 - 60	45 - 70 35 - 60	30 - 55 20 - 45
	TITANIUM ALLOYS					
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		-	60 - 90	60 - 90	45 - 75
	5553 / Beta Titanium		-	45 - 65	45 - 65	30 - 50
	M	STAINLESS STEELS				
13/8, 15/5, 17-4, pH Types		< 40 > 40	- -	50 - 80 35 - 60	50 - 80 35 - 60	35 - 65 20 - 45
300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic		< 40 > 40	- -	45 - 75 35 - 55	45 - 75 35 - 55	30 - 60 20 - 40
400 Series - 403, 405, 420, 455		< 40 > 40	- -	60 - 90 40 - 65	60 - 90 40 - 65	45 - 75 25 - 50
HIGH STRENGTH TOOL STEELS						
A2, D2, P20, H13, S7, O1	< 40 > 40	- -	80 - 130 60 - 110	80 - 130 60 - 110	65 - 110 45 - 90	
Thompson Shaft, Armor Plate (Class 1)	> 50	-	-	45 - 80	30 - 60	
P	MEDIUM ALLOY TOOL STEELS					
	4140, 4340, 52100, 6150, 8620	< 40 > 40	- -	100 - 140 70 - 120	100 - 140 70 - 120	65 - 120 55 - 100
	CARBON STEELS					
	1000's - 1018, 1020, 12L14	< 40	-	120 - 170	120 - 170	105 - 150
K	CAST MATERIAL					
	Ductile Iron		70 - 140	120 - 170	120 - 170	105 - 150
	Gray Iron		70 - 165	120 - 190	120 - 190	105 - 170
N	NON-FERROUS					
	Aluminum (6061, 7075)		-	200 - 300	-	160 - 250
	Magnesium		-	120 - 215	-	80 - 165
	Copper		-	100 - 165	-	60 - 125
	Brass, Bronze		-	120 - 215	-	80 - 165
O	COMPOSITE (non-ISO)					
	Glass Epoxy, Fiberglass, Plastics, Graphite, G10		140	100 - 230	105 - 230	-

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GARR TOOL General Purpose Drilling Guide

ISO Material	HRC	CHIPLOAD PER TOOTH (Fz)				
		1/16" - 1/8"	1/8" - 1/4"	1/4" - 3/8"	3/8" - 1/2"	1/2" - 5/8"
COBALT BASE ALLOYS						
Haynes 25/188, Stellite 21, Cobalt Chrome	< 40	.0003" - .0008"	.0006" - .0011"	.0010" - .0017"	.0014" - .0024"	.0019" - .0032"
	> 40	.0002" - .0006"	.0004" - .0009"	.0008" - .0015"	.0012" - .0022"	.0017" - .0030"
NICKEL BASE ALLOYS						
Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40	.0003" - .0008"	.0006" - .0011"	.0010" - .0017"	.0014" - .0024"	.0019" - .0032"
	> 40	.0002" - .0006"	.0004" - .0009"	.0008" - .0015"	.0012" - .0022"	.0017" - .0030"
IRON BASE ALLOYS						
A286, Dicaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40	.0003" - .0008"	.0006" - .0011"	.0010" - .0017"	.0014" - .0024"	.0019" - .0032"
	> 40	.0002" - .0006"	.0004" - .0009"	.0008" - .0015"	.0012" - .0022"	.0017" - .0030"
TITANIUM ALLOYS						
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si 5553 / Beta Titanium	< 40	.0004" - .0009"	.0008" - .0014"	.0012" - .0020"	.0016" - .0027"	.0021" - .0033"
	> 40	.0003" - .0007"	.0006" - .0011"	.0010" - .0017"	.0014" - .0024"	.0019" - .0030"
STAINLESS STEELS						
13/8, 15/5, 17-4, pH Types	< 40	.0004" - .0009"	.0007" - .0013"	.0011" - .0019"	.0015" - .0026"	.0020" - .0032"
	> 40	.0003" - .0007"	.0006" - .0011"	.0010" - .0017"	.0014" - .0024"	.0019" - .0030"
300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40	.0004" - .0009"	.0007" - .0013"	.0011" - .0019"	.0015" - .0026"	.0020" - .0032"
	> 40	.0003" - .0007"	.0006" - .0011"	.0010" - .0017"	.0014" - .0024"	.0019" - .0030"
400 Series - 403, 405, 420, 455	< 40	.0004" - .0009"	.0007" - .0013"	.0011" - .0019"	.0015" - .0026"	.0020" - .0032"
	> 40	.0003" - .0007"	.0006" - .0011"	.0010" - .0017"	.0014" - .0024"	.0019" - .0030"
HIGH STRENGTH TOOL STEELS						
A2, D2, P20, H13, S7, O1	< 40	.0004" - .0009"	.0007" - .0013"	.0011" - .0019"	.0015" - .0026"	.0020" - .0032"
	> 40	.0003" - .0007"	.0006" - .0011"	.0010" - .0017"	.0014" - .0024"	.0019" - .0030"
Thompson Shaft, Armor Plate (Class 1)	> 50	.0002" - .0006"	.0005" - .0009"	.0009" - .0015"	.0013" - .0022"	.0018" - .0028"
MEDIUM ALLOY TOOL STEELS						
4140, 4340, 52100, 6150, 8620	< 40	.0004" - .0009"	.0007" - .0013"	.0011" - .0019"	.0015" - .0026"	.0020" - .0032"
	> 40	.0003" - .0007"	.0006" - .0011"	.0010" - .0017"	.0014" - .0024"	.0019" - .0030"
CARBON STEELS						
1000's - 1018, 1020, 12L14	< 40	.0005" - .0010"	.0008" - .0014"	.0012" - .0020"	.0016" - .0027"	.0021" - .0033"
CAST MATERIAL						
Ductile Iron		.0005" - .0010"	.0008" - .0014"	.0012" - .0020"	.0016" - .0027"	.0021" - .0033"
Gray Iron		.0005" - .0010"	.0008" - .0014"	.0012" - .0020"	.0016" - .0027"	.0021" - .0033"
NON-FERROUS						
Aluminum (6061, 7075)		.0006" - .0011"	.0009" - .0015"	.0013" - .0021"	.0017" - .0028"	.0022" - .0034"
Magnesium		.0005" - .0010"	.0009" - .0014"	.0013" - .0020"	.0017" - .0027"	.0022" - .0033"
Copper		.0004" - .0008"	.0008" - .0012"	.0012" - .0018"	.0016" - .0025"	.0021" - .0031"
Brass, Bronze		.0005" - .0009"	.0009" - .0013"	.0013" - .0019"	.0017" - .0026"	.0022" - .0032"
COMPOSITE (non-ISO)						
Glass Epoxy, Fiberglass, Plastics, Graphite, G10		.0003" - .0008"	.0007" - .0012"	.0011" - .0018"	.0015" - .0025"	.0020" - .0031"

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

GARR TOOL General Purpose Drilling Guide (Uncoated)

	ISO Material	HRC	M/Min. (by Series)			
			1100	1200, 1205, 1520	1500, 1510	1600
S	COBALT BASE ALLOYS					
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	- -	14 - 21 10 - 18	14 - 21 10 - 18	10 - 17 6 - 14
	NICKEL BASE ALLOYS					
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	- -	14 - 21 10 - 18	14 - 21 10 - 18	10 - 17 6 - 14
	IRON BASE ALLOYS					
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	- -	14 - 21 10 - 18	14 - 21 10 - 18	10 - 17 6 - 14
	TITANIUM ALLOYS					
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		-	18 - 27	18 - 27	14 - 23
	5553 / Beta Titanium		-	14 - 20	14 - 20	10 - 15
	M	STAINLESS STEELS				
13/8, 15/5, 17-4, pH Types		< 40 > 40	- -	15 - 25 10 - 18	15 - 25 10 - 18	10 - 20 6 - 14
300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic		< 40 > 40	- -	14 - 23 10 - 17	14 - 23 10 - 17	10 - 18 6 - 12
400 Series - 403, 405, 420, 455		< 40 > 40	- -	18 - 27 12 - 20	18 - 27 12 - 20	14 - 23 8 - 15
HIGH STRENGTH TOOL STEELS						
A2, D2, P20, H13, S7, O1	< 40 > 40	- -	25 - 40 18 - 34	25 - 40 18 - 34	20 - 34 14 - 27	
Thompson Shaft, Armor Plate (Class 1)	> 50	-	-	14 - 25	10 - 20	
P	MEDIUM ALLOY TOOL STEELS					
	4140, 4340, 52100, 6150, 8620	< 40 > 40	-	30 - 43 21 - 37	30 - 43 21 - 37	20 - 37 17 - 30
	CARBON STEELS					
	1000's - 1018, 1020, 12L14	< 40	-	37 - 52	37 - 52	32 - 45
K	CAST MATERIAL					
	Ductile Iron		21 - 43	37 - 52	37 - 52	32 - 45
	Gray Iron		21 - 50	37 - 58	37 - 58	32 - 52
N	NON-FERROUS					
	Aluminum (6061, 7075)		-	60 - 90	-	50 - 75
	Magnesium		-	37 - 65	-	25 - 50
	Copper		-	30 - 50	-	18 - 38
	Brass, Bronze		-	37 - 65	-	25 - 50
O	COMPOSITE (non-ISO)					
	Glass Epoxy, Fiberglass, Plastics, Graphite, G10		43	30 - 70	32 - 70	-

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

GARR TOOL General Purpose Drilling Guide

	ISO Material	HRC	CHIPLOAD PER TOOTH (Fz)				
			2.0 - 3.0mm	3.0 - 6.0mm	6.0 - 10.0mm	10.0 - 13.0mm	13.0 - 16.0mm
S	COBALT BASE ALLOYS						
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40	.008 - .020	.015 - .028	.025 - .043	.036 - .061	.048 - .081
		> 40	.005 - .015	.010 - .023	.020 - .038	.030 - .056	.043 - .076
	NICKEL BASE ALLOYS						
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40	.008 - .020	.015 - .028	.025 - .043	.036 - .061	.048 - .081
		> 40	.005 - .015	.010 - .023	.020 - .038	.030 - .056	.043 - .076
	IRON BASE ALLOYS						
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40	.008 - .020	.015 - .028	.025 - .043	.036 - .061	.048 - .081
		> 40	.005 - .015	.010 - .023	.020 - .038	.030 - .056	.043 - .076
	TITANIUM ALLOYS						
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		.010 - .023	.020 - .036	.030 - .051	.041 - .069	.053 - .084	
5553 / Beta Titanium		.008 - .018	.015 - .028	.025 - .043	.036 - .061	.048 - .076	
M	STAINLESS STEELS						
	13/8, 15/5, 17-4, pH Types	< 40	.010 - .023	.018 - .033	.028 - .048	.038 - .066	.051 - .081
		> 40	.008 - .018	.015 - .028	.025 - .043	.036 - .061	.048 - .076
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40	.010 - .023	.018 - .033	.028 - .048	.038 - .066	.051 - .081
		> 40	.008 - .018	.015 - .028	.025 - .043	.036 - .061	.048 - .076
	400 Series - 403, 405, 420, 455	< 40	.010 - .023	.018 - .033	.028 - .048	.038 - .066	.051 - .081
	> 40	.008 - .018	.015 - .028	.025 - .043	.036 - .061	.048 - .076	
P	HIGH STRENGTH TOOL STEELS						
	A2, D2, P20, H13, S7, O1	< 40	.010 - .023	.018 - .033	.028 - .048	.038 - .066	.051 - .081
		> 40	.008 - .018	.015 - .028	.025 - .043	.036 - .061	.048 - .076
	Thompson Shaft, Armor Plate (Class 1)	> 50	.005 - .015	.013 - .023	.023 - .038	.033 - .056	.046 - .071
	MEDIUM ALLOY TOOL STEELS						
	4140, 4340, 52100, 6150, 8620	< 40	.010 - .023	.018 - .033	.028 - .048	.038 - .066	.051 - .081
	> 40	.008 - .018	.015 - .028	.025 - .043	.036 - .061	.048 - .076	
CARBON STEELS							
1000's - 1018, 1020, 12L14	< 40	.013 - .025	.020 - .036	.030 - .051	.041 - .069	.053 - .084	
K	CAST MATERIAL						
	Ductile Iron		.013 - .025	.020 - .036	.030 - .051	.041 - .069	.053 - .084
	Gray Iron		.013 - .025	.020 - .036	.030 - .051	.041 - .069	.053 - .084
N	NON-FERROUS						
	Aluminum (6061, 7075)		.015 - .028	.023 - .038	.033 - .053	.043 - .071	.056 - .086
	Magnesium		.013 - .025	.023 - .036	.033 - .051	.043 - .069	.056 - .084
	Copper		.010 - .020	.020 - .030	.030 - .046	.041 - .064	.053 - .079
	Brass, Bronze		.013 - .023	.023 - .033	.033 - .048	.043 - .066	.056 - .081
O	COMPOSITE (non-ISO)						
	Glass Epoxy, Fiberglass, Plastics, Graphite, G10		.008 - .020	.018 - .030	.028 - .046	.038 - .064	.051 - .079

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

GARR TOOL General Purpose Drilling Guide (Hardlube Coated)

	ISO Material	HRC	SFM (by Series)			
			1100H, 1120H	1200H, 1205H, 1520H	1500H, 1510H	1800H
S	COBALT BASE ALLOYS					
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40	-	55 - 75	55 - 75	-
		> 40	-	45 - 65	45 - 65	-
	NICKEL BASE ALLOYS					
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40	-	55 - 80	55 - 80	-
		> 40	-	45 - 70	45 - 70	-
	IRON BASE ALLOYS					
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40	-	55 - 80	55 - 80	-
		> 40	-	45 - 70	45 - 70	-
	TITANIUM ALLOYS					
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		-	70 - 100	70 - 100	-	
5553 / Beta Titanium		-	55 - 75	55 - 75	-	
M	STAINLESS STEELS					
	13/8, 15/5, 17-4, pH Types	< 40	-	60 - 90	60 - 90	-
		> 40	-	45 - 70	45 - 70	-
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40	-	55 - 85	55 - 85	-
		> 40	-	45 - 65	45 - 65	-
400 Series - 403, 405, 420, 455	< 40	-	70 - 100	70 - 100	-	
	> 40	-	50 - 75	50 - 75	-	
P	HIGH STRENGTH TOOL STEELS					
	A2, D2, P20, H13, S7, O1	< 40	-	90 - 140	90 - 140	-
		> 40	-	70 - 120	70 - 120	-
	Thompson Shaft, Armor Plate (Class 1)	> 50	-	-	55 - 90	-
	MEDIUM ALLOY TOOL STEELS					
	4140, 4340, 52100, 6150, 8620	< 40	-	110 - 150	110 - 150	-
		> 40	-	80 - 130	80 - 130	-
CARBON STEELS						
1000's - 1018, 1020, 12L14	< 40	-	130 - 180	130 - 180	-	
K	CAST MATERIAL					
	Ductile Iron		80 - 150	130 - 180	130 - 180	-
	Gray Iron		80 - 175	130 - 200	130 - 200	-
N	NON-FERROUS					
	Aluminum (6061, 7075)		-	200 - 300	-	200 - 300
	Magnesium		-	130 - 225	-	130 - 225
	Copper		-	110 - 175	-	110 - 175
	Brass, Bronze		-	130 - 225	-	130 - 225
O	COMPOSITE (non-ISO)					
	Glass Epoxy, Fiberglass, Plastics, Graphite, G10		160	125 - 250	125 - 250	-

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GARR TOOL General Purpose Drilling Guide

ISO Material	HRC	CHIPLOAD PER TOOTH (Fz)					
		1/16" - 1/8"	1/8" - 1/4"	1/4" - 3/8"	3/8" - 1/2"	1/2" - 5/8"	
S	COBALT BASE ALLOYS						
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40	.0003" - .0008"	.0006" - .0011"	.0010" - .0017"	.0014" - .0024"	.0019" - .0032"
		> 40	.0002" - .0006"	.0004" - .0009"	.0008" - .0015"	.0012" - .0022"	.0017" - .0030"
	NICKEL BASE ALLOYS						
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40	.0003" - .0008"	.0006" - .0011"	.0010" - .0017"	.0014" - .0024"	.0019" - .0032"
		> 40	.0002" - .0006"	.0004" - .0009"	.0008" - .0015"	.0012" - .0022"	.0017" - .0030"
	IRON BASE ALLOYS						
	A286, Dicaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40	.0003" - .0008"	.0006" - .0011"	.0010" - .0017"	.0014" - .0024"	.0019" - .0032"
		> 40	.0002" - .0006"	.0004" - .0009"	.0008" - .0015"	.0012" - .0022"	.0017" - .0030"
	TITANIUM ALLOYS						
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		.0004" - .0009"	.0008" - .0014"	.0012" - .0020"	.0016" - .0027"	.0021" - .0033"	
5553 / Beta Titanium		.0003" - .0007"	.0006" - .0011"	.0010" - .0017"	.0014" - .0024"	.0019" - .0030"	
M	STAINLESS STEELS						
	13/8, 15/5, 17-4, pH Types	< 40	.0004" - .0009"	.0007" - .0013"	.0011" - .0019"	.0015" - .0026"	.0020" - .0032"
		> 40	.0003" - .0007"	.0006" - .0011"	.0010" - .0017"	.0014" - .0024"	.0019" - .0030"
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40	.0004" - .0009"	.0007" - .0013"	.0011" - .0019"	.0015" - .0026"	.0020" - .0032"
		> 40	.0003" - .0007"	.0006" - .0011"	.0010" - .0017"	.0014" - .0024"	.0019" - .0030"
400 Series - 403, 405, 420, 455	< 40	.0004" - .0009"	.0007" - .0013"	.0011" - .0019"	.0015" - .0026"	.0020" - .0032"	
	> 40	.0003" - .0007"	.0006" - .0011"	.0010" - .0017"	.0014" - .0024"	.0019" - .0030"	
P	HIGH STRENGTH TOOL STEELS						
	A2, D2, P20, H13, S7, O1	< 40	.0004" - .0009"	.0007" - .0013"	.0011" - .0019"	.0015" - .0026"	.0020" - .0032"
		> 40	.0003" - .0007"	.0006" - .0011"	.0010" - .0017"	.0014" - .0024"	.0019" - .0030"
	Thompson Shaft, Armor Plate (Class 1)	> 50	.0002" - .0006"	.0005" - .0009"	.0009" - .0015"	.0013" - .0022"	.0018" - .0028"
	MEDIUM ALLOY TOOL STEELS						
	4140, 4340, 52100, 6150, 8620	< 40	.0004" - .0009"	.0007" - .0013"	.0011" - .0019"	.0015" - .0026"	.0020" - .0032"
	> 40	.0003" - .0007"	.0006" - .0011"	.0010" - .0017"	.0014" - .0024"	.0019" - .0030"	
CARBON STEELS							
1000's - 1018, 1020, 12L14	< 40	.0005" - .0010"	.0008" - .0014"	.0012" - .0020"	.0016" - .0027"	.0021" - .0033"	
K	CAST MATERIAL						
	Ductile Iron		.0005" - .0010"	.0008" - .0014"	.0012" - .0020"	.0016" - .0027"	.0021" - .0033"
	Gray Iron		.0005" - .0010"	.0008" - .0014"	.0012" - .0020"	.0016" - .0027"	.0021" - .0033"
N	NON-FERROUS						
	Aluminum (6061, 7075)		.0006" - .0011"	.0009" - .0015"	.0013" - .0021"	.0017" - .0028"	.0022" - .0034"
	Magnesium		.0005" - .0010"	.0009" - .0014"	.0013" - .0020"	.0017" - .0027"	.0022" - .0033"
	Copper		.0004" - .0008"	.0008" - .0012"	.0012" - .0018"	.0016" - .0025"	.0021" - .0031"
	Brass, Bronze		.0005" - .0009"	.0009" - .0013"	.0013" - .0019"	.0017" - .0026"	.0022" - .0032"
O	COMPOSITE (non-ISO)						
	Glass Epoxy, Fiberglass, Plastics, Graphite, G10		.0003" - .0008"	.0007" - .0012"	.0011" - .0018"	.0015" - .0025"	.0020" - .0031"

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

GARR TOOL General Purpose Drilling Guide (Hardlube Coated)

	ISO Material	HRC	M/Min. (by Series)			
			1100H, 1120H	1200H, 1205H, 1520H	1500H, 1510H	1800H
S	COBALT BASE ALLOYS					
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40	-	17 - 23	17 - 23	-
		> 40	-	13 - 20	13 - 20	-
	NICKEL BASE ALLOYS					
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40	-	17 - 25	17 - 25	-
		> 40	-	13 - 21	13 - 21	-
	IRON BASE ALLOYS					
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40	-	17 - 25	17 - 25	-
		> 40	-	13 - 21	13 - 21	-
	TITANIUM ALLOYS					
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		-	21 - 30	21 - 30	-	
5553 / Beta Titanium		-	17 - 23	17 - 23	-	
M	STAINLESS STEELS					
	13/8, 15/5, 17-4, pH Types	< 40	-	18 - 27	18 - 27	-
		> 40	-	13 - 21	13 - 21	-
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40	-	17 - 26	17 - 26	-
		> 40	-	13 - 20	13 - 20	-
	400 Series - 403, 405, 420, 455	< 40	-	21 - 30	21 - 30	-
	> 40	-	15 - 23	15 - 23	-	
P	HIGH STRENGTH TOOL STEELS					
	A2, D2, P20, H13, S7, O1	< 40	-	27 - 43	27 - 43	-
		> 40	-	21 - 37	21 - 37	-
	Thompson Shaft, Armor Plate (Class 1)	> 50	-	-	17 - 27	-
	MEDIUM ALLOY TOOL STEELS					
	4140, 4340, 52100, 6150, 8620	< 40	-	34 - 45	34 - 45	-
		> 40	-	25 - 40	25 - 40	-
CARBON STEELS						
1000's - 1018, 1020, 12L14	< 40	-	40 - 55	40 - 55	-	
K	CAST MATERIAL					
	Ductile Iron		25 - 45	40 - 55	40 - 55	-
	Gray Iron		25 - 53	40 - 60	40 - 60	-
N	NON-FERROUS					
	Aluminum (6061, 7075)		-	60 - 90	-	60 - 90
	Magnesium		-	40 - 68	-	40 - 68
	Copper		-	34 - 53	-	34 - 53
	Brass, Bronze		-	40 - 68	-	40 - 68
O	COMPOSITE (non-ISO)					
	Glass Epoxy, Fiberglass, Plastics, Graphite, G10		50	38 - 75	-	-

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

GARR TOOL General Purpose Drilling Guide

	ISO Material	HRC	CHIPLOAD PER TOOTH (Fz)				
			2.0 - 3.0mm	3.0 - 6.0mm	6.0 - 10.0mm	10.0 - 13.0mm	13.0 - 16.0mm
S	COBALT BASE ALLOYS						
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40	.008 - .020	.015 - .028	.025 - .043	.036 - .061	.048 - .081
		> 40	.005 - .015	.010 - .023	.020 - .038	.030 - .056	.043 - .076
	NICKEL BASE ALLOYS						
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40	.008 - .020	.015 - .028	.025 - .043	.036 - .061	.048 - .081
		> 40	.005 - .015	.010 - .023	.020 - .038	.030 - .056	.043 - .076
	IRON BASE ALLOYS						
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40	.008 - .020	.015 - .028	.025 - .043	.036 - .061	.048 - .081
		> 40	.005 - .015	.010 - .023	.020 - .038	.030 - .056	.043 - .076
	TITANIUM ALLOYS						
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		.010 - .023	.020 - .036	.030 - .051	.041 - .069	.053 - .084	
5553 / Beta Titanium		.008 - .018	.015 - .028	.025 - .043	.036 - .061	.048 - .076	
M	STAINLESS STEELS						
	13/8, 15/5, 17-4, pH Types	< 40	.010 - .023	.018 - .033	.028 - .048	.038 - .066	.051 - .081
		> 40	.008 - .018	.015 - .028	.025 - .043	.036 - .061	.048 - .076
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40	.010 - .023	.018 - .033	.028 - .048	.038 - .066	.051 - .081
		> 40	.008 - .018	.015 - .028	.025 - .043	.036 - .061	.048 - .076
	400 Series - 403, 405, 420, 455	< 40	.010 - .023	.018 - .033	.028 - .048	.038 - .066	.051 - .081
	> 40	.008 - .018	.015 - .028	.025 - .043	.036 - .061	.048 - .076	
P	HIGH STRENGTH TOOL STEELS						
	A2, D2, P20, H13, S7, O1	< 40	.010 - .023	.018 - .033	.028 - .048	.038 - .066	.051 - .081
		> 40	.008 - .018	.015 - .028	.025 - .043	.036 - .061	.048 - .076
	Thompson Shaft, Armor Plate (Class 1)	> 50	.005 - .015	.013 - .023	.023 - .038	.033 - .056	.046 - .071
	MEDIUM ALLOY TOOL STEELS						
	4140, 4340, 52100, 6150, 8620	< 40	.010 - .023	.018 - .033	.028 - .048	.038 - .066	.051 - .081
	> 40	.008 - .018	.015 - .028	.025 - .043	.036 - .061	.048 - .076	
CARBON STEELS							
1000's - 1018, 1020, 12L14	< 40	.013 - .025	.020 - .036	.030 - .051	.041 - .069	.053 - .084	
K	CAST MATERIAL						
	Ductile Iron		.013 - .025	.020 - .036	.030 - .051	.041 - .069	.053 - .084
	Gray Iron		.013 - .025	.020 - .036	.030 - .051	.041 - .069	.053 - .084
N	NON-FERROUS						
	Aluminum (6061, 7075)		.015 - .028	.023 - .038	.033 - .053	.043 - .071	.056 - .086
	Magnesium		.013 - .025	.023 - .036	.033 - .051	.043 - .069	.056 - .084
	Copper		.010 - .020	.020 - .030	.030 - .046	.041 - .064	.053 - .079
	Brass, Bronze		.013 - .023	.023 - .033	.033 - .048	.043 - .066	.056 - .081
O	COMPOSITE (non-ISO)						
	Glass Epoxy, Fiberglass, Plastics, Graphite, G10		.008 - .020	.018 - .030	.028 - .046	.038 - .064	.051 - .079

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

GARR TOOL High Performance Drilling Guide for Mini Drills

(Series 1550H,1250H,1850H)

TECHNICAL

	ISO Material	HRC	SFM (Vc)	CHIPLOAD PER TOOTH (Fz)		
				.0312" - .0390"	.0394" - .0787"	.0791" - .1250"
S	COBALT BASE ALLOYS					
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	70 - 100 50 - 85	.0002" - .0004" .0002" - .0004"	.0004" - .0007" .0003" - .0006"	.0006" - .0010" .0005" - .0009"
	NICKEL BASE ALLOYS					
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	70 - 100 50 - 85	.0002" - .0004" .0002" - .0004"	.0004" - .0007" .0003" - .0006"	.0006" - .0010" .0005" - .0009"
	IRON BASE ALLOYS					
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	70 - 100 50 - 85	.0002" - .0004" .0002" - .0004"	.0004" - .0007" .0003" - .0006"	.0006" - .0010" .0005" - .0009"
	TITANIUM ALLOYS					
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		90 - 130	.0003" - .0006"	.0004" - .0008"	.0006" - .0012"
	5553 / Beta Titanium		75 - 115	.0002" - .0004"	.0003" - .0006"	.0005" - .0010"
	M	STAINLESS STEELS				
13/8, 15/5, 17-4, pH Types		< 40 > 40	95 - 135 80 - 125	.0002" - .0004" .0002" - .0004"	.0004" - .0007" .0003" - .0006"	.0006" - .0010" .0005" - .0009"
300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic		< 40 > 40	90 - 125 80 - 115	.0002" - .0004" .0002" - .0004"	.0004" - .0007" .0003" - .0006"	.0006" - .0010" .0005" - .0009"
400 Series - 403, 405, 420, 455		< 40 > 40	100 - 150 80 - 125	.0002" - .0004" .0002" - .0004"	.0004" - .0007" .0003" - .0006"	.0006" - .0010" .0005" - .0009"
HIGH STRENGTH TOOL STEELS						
A2, D2, P20, H13, S7, O1		< 40 > 40	100 - 175 60 - 80	.0003" - .0006" .0002" - .0004"	.0004" - .0008" .0003" - .0006"	.0006" - .0012" .0005" - .0010"
P	MEDIUM ALLOY TOOL STEELS					
	4140, 4340, 52100, 6150, 8620	< 40 > 40	125 - 175 80 - 125	.0004" - .0008" .0003" - .0005"	.0006" - .0012" .0004" - .0008"	.0008" - .0015" .0006" - .0012"
	CARBON STEELS					
	1000's - 1018, 1020, 12L14	< 40	125 - 175	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
K	CAST MATERIAL					
	Ductile Iron		100 - 200	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
	Gray Iron		80 - 175	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
N	NON-FERROUS					
	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		125 - 250	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
	Brass		100 - 250	.0003" - .0008"	.0004" - .0012"	.0006" - .0015"
	Bronze		80 - 250	.0003" - .0008"	.0004" - .0012"	.0006" - .0015"

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

GARR TOOL High Performance Drilling Guide for Mini Drills

(Series 1550H,1250H,1850H)

	ISO Material	HRC	M/Min. (Vc)	CHIPLOAD PER TOOTH (Fz)		
				0.79 - 0.99mm	1.00 - 2.00mm	2.01 - 3.17mm
S	COBALT BASE ALLOYS					
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	20 - 30 15 - 25	.005 - .010 .005 - .010	.010 - .018 .008 - .015	.015 - .025 .013 - .023
	NICKEL BASE ALLOYS					
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	20 - 30 15 - 25	.008 - .013 .005 - .010	.010 - .018 .008 - .015	.015 - .025 .013 - .023
	IRON BASE ALLOYS					
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	20 - 30 15 - 25	.005 - .013 .005 - .010	.010 - .020 .008 - .018	.013 - .025 .010 - .023
	TITANIUM ALLOYS					
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		25 - 40	.008 - .015	.010 - .020	.015 - .030	
5553 / Beta Titanium		20 - 35	.005 - .010	.008 - .015	.013 - .025	
M	STAINLESS STEELS					
	13/8, 15/5, 17-4, pH Types	< 40 > 40	30 - 40 25 - 40	.005 - .010 .005 - .010	.010 - .018 .008 - .015	.015 - .025 .013 - .023
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	25 - 40 25 - 35	.005 - .010 .005 - .010	.010 - .018 .008 - .015	.015 - .025 .013 - .023
	400 Series - 403, 405, 420, 455	< 40 > 40	30 - 45 25 - 40	.005 - .010 .005 - .010	.010 - .018 .008 - .015	.015 - .025 .013 - .023
	HIGH STRENGTH TOOL STEELS					
A2, D2, P20, H13, S7, O1	< 40 > 40	30 - 50 20 - 25	.008 - .015 .005 - .010	.010 - .020 .008 - .015	.015 - .030 .013 - .025	
P	MEDIUM ALLOY TOOL STEELS					
	4140, 4340, 52100, 6150, 8620	< 40 > 40	40 - 50 25 - 40	.010 - .020 .008 - .013	.015 - .030 .010 - .020	.020 - .038 .015 - .030
	CARBON STEELS					
1000's - 1018, 1020, 12L14	< 40	40 - 50	.010 - .020	.015 - .030	.020 - .038	
K	CAST MATERIAL					
	Ductile Iron		30 - 60	.010 - .020	.015 - .030	.020 - .038
Gray Iron		25 - 50	.010 - .020	.015 - .030	.020 - .038	
N	NON-FERROUS					
	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		40 - 75	.010 - .020	.015 - .030	.020 - .038
	Brass		30 - 75	.008 - .020	.010 - .030	.015 - .038
Bronze		25 - 75	.008 - .020	.010 - .030	.015 - .038	

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

GARR TOOL High Performance Drilling Guide

	ISO Material	HRC	SFM (Vc)		CHIPLOAD PER TOOTH (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"	
S	COBALT BASE ALLOYS									
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	80 60	100 75	.0008" - .0015" .0005" - .0012"	.0012" - .0020" .0009" - .0017"	.0017" - .0026" .0014" - .0023"	.0022" - .0032" .0019" - .0029"	.0027" - .0038" .0024" - .0035"	
	NICKEL BASE ALLOYS									
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	90 70	110 75	.0008" - .0015" .0005" - .0012"	.0012" - .0020" .0009" - .0017"	.0017" - .0026" .0014" - .0023"	.0022" - .0032" .0019" - .0029"	.0027" - .0038" .0024" - .0035"	
	IRON BASE ALLOYS									
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	90 60	115 75	.0008" - .0015" .0005" - .0012"	.0012" - .0020" .0009" - .0017"	.0017" - .0026" .0014" - .0023"	.0022" - .0032" .0019" - .0029"	.0027" - .0038" .0024" - .0035"	
TITANIUM ALLOYS										
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si			110 135	.0010" - .0018" .0015" - .0023"	.0015" - .0023" .0020" - .0029"	.0020" - .0029" .0025" - .0035"	.0025" - .0035" .0030" - .0041"	.0030" - .0041" .0035" - .0046"		
5553 / Beta Titanium		70	100	.0008" - .0015" .0012" - .0020"	.0012" - .0020" .0017" - .0026"	.0017" - .0026" .0022" - .0032"	.0022" - .0032" .0027" - .0038"	.0027" - .0038" .0032" - .0043"		
M	STAINLESS STEELS									
	13/8, 15/5, 17-4, pH Types	< 40 > 40	100 80	120 90	.0010" - .0017" .0007" - .0015"	.0014" - .0022" .0011" - .0020"	.0019" - .0028" .0016" - .0026"	.0024" - .0034" .0021" - .0032"	.0029" - .0040" .0026" - .0038"	
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	90 70	110 80	.0010" - .0017" .0007" - .0015"	.0014" - .0022" .0011" - .0020"	.0019" - .0028" .0016" - .0026"	.0024" - .0034" .0021" - .0032"	.0029" - .0040" .0026" - .0038"	
	400 Series - 403, 405, 420, 455	< 40 > 40	110 80	130 105	.0010" - .0017" .0007" - .0015"	.0014" - .0022" .0011" - .0020"	.0019" - .0028" .0016" - .0026"	.0024" - .0034" .0021" - .0032"	.0029" - .0040" .0026" - .0038"	
P	HIGH STRENGTH TOOL STEELS									
	A2, D2, P20, H13, S7, O1	< 40 > 40	160 130	200 150	.0011" - .0020" .0007" - .0014"	.0015" - .0025" .0011" - .0019"	.0020" - .0031" .0016" - .0025"	.0025" - .0037" .0021" - .0031"	.0030" - .0043" .0026" - .0037"	
	MEDIUM ALLOY TOOL STEELS									
	4140, 4340, 52100, 6150, 8620	< 40 > 40	175 145	215 170	.0011" - .0020" .0007" - .0014"	.0015" - .0025" .0011" - .0019"	.0020" - .0031" .0016" - .0025"	.0025" - .0037" .0021" - .0031"	.0030" - .0043" .0026" - .0037"	
CARBON STEELS										
1000's - 1018, 1020, 12L14	< 40	225	275	.0014" - .0023" .0018" - .0027"	.0018" - .0027" .0023" - .0033"	.0023" - .0033" .0028" - .0039"	.0028" - .0039" .0033" - .0045"	.0033" - .0045" .0038" - .0050"		
K	CAST MATERIAL									
	Ductile Iron		250	350	.0015" - .0023" .0019" - .0028"	.0019" - .0028" .0024" - .0034"	.0024" - .0034" .0029" - .0040"	.0029" - .0040" .0034" - .0046"	.0034" - .0046" .0039" - .0051"	
	Gray Iron		275	375	.0016" - .0024" .0020" - .0029"	.0020" - .0029" .0025" - .0035"	.0025" - .0035" .0030" - .0041"	.0030" - .0041" .0035" - .0047"	.0035" - .0047" .0040" - .0052"	
N	NON-FERROUS									
	Aluminum 2014, 2024, 6061-(T1-T6), 7075		350	425	.0023" - .0033" .0027" - .0038"	.0027" - .0038" .0033" - .0044"	.0033" - .0044" .0038" - .0050"	.0038" - .0050" .0043" - .0056"	.0043" - .0056" .0048" - .0061"	
	Aluminum Die Cast		300	375	.0018" - .0028" .0022" - .0033"	.0022" - .0033" .0027" - .0039"	.0027" - .0039" .0032" - .0045"	.0032" - .0045" .0037" - .0051"	.0037" - .0051" .0042" - .0056"	
	Magnesium		275	350	.0020" - .0030" .0024" - .0035"	.0024" - .0035" .0029" - .0041"	.0029" - .0041" .0034" - .0047"	.0034" - .0047" .0039" - .0053"	.0039" - .0053" .0044" - .0058"	
	Copper		200	300	.0017" - .0025" .0021" - .0030"	.0021" - .0030" .0026" - .0036"	.0026" - .0036" .0031" - .0042"	.0031" - .0042" .0036" - .0048"	.0036" - .0048" .0041" - .0054"	
	Brass		250	350	.0020" - .0032" .0024" - .0037"	.0024" - .0037" .0029" - .0043"	.0029" - .0043" .0034" - .0049"	.0034" - .0049" .0039" - .0055"	.0039" - .0055" .0044" - .0060"	
Bronze		200	275	.0018" - .0025" .0022" - .0030"	.0022" - .0030" .0027" - .0036"	.0027" - .0036" .0032" - .0042"	.0032" - .0042" .0037" - .0048"	.0037" - .0048" .0042" - .0054"		

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

GARR TOOL High Performance Drilling Guide

ISO Material	HRC	M/Min. (Vc)		CHIPLOAD PER TOOTH (Fz)					
		NON-COOLANT	COOLANT FED	3.0 - 6.0mm	6.0 - 10.0mm	10.0 - 13.0mm	13.0 - 16.0mm	16.0 - 20.0mm	
S	COBALT BASE ALLOYS								
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	25 20	30 25	.020 - .038 .013 - .030	.030 - .051 .023 - .043	.043 - .066 .036 - .058	.056 - .081 .048 - .074	.069 - .097 .061 - .089
	NICKEL BASE ALLOYS								
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	25 20	35 25	.020 - .038 .013 - .030	.030 - .051 .023 - .043	.043 - .066 .036 - .058	.056 - .081 .048 - .074	.069 - .097 .061 - .089
	IRON BASE ALLOYS								
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	25 20	35 25	.020 - .038 .013 - .030	.030 - .051 .023 - .043	.043 - .066 .036 - .058	.056 - .081 .048 - .074	.069 - .097 .061 - .089
	TITANIUM ALLOYS								
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si			35 40	.025 - .046	.038 - .058	.051 - .074	.064 - .089	.076 - .104
	5553 / Beta Titanium		20	30	.020 - .038	.030 - .051	.043 - .066	.056 - .081	.069 - .097
	M	STAINLESS STEELS							
13/8, 15/5, 17-4, pH Types		< 40 > 40	30 25	35 25	.025 - .043 .018 - .038	.036 - .056 .028 - .051	.048 - .071 .041 - .066	.061 - .086 .053 - .081	.074 - .102 .066 - .097
300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic		< 40 > 40	25 20	35 25	.025 - .043 .018 - .038	.036 - .056 .028 - .051	.048 - .071 .041 - .066	.061 - .086 .053 - .081	.074 - .102 .066 - .097
400 Series - 403, 405, 420, 455		< 40 > 40	35 25	40 30	.025 - .043 .018 - .038	.036 - .056 .028 - .051	.048 - .071 .041 - .066	.061 - .086 .053 - .081	.074 - .102 .066 - .097
HIGH STRENGTH TOOL STEELS									
A2, D2, P20, H13, S7, O1	< 40 > 40	50 40	60 45	.028 - .051 .018 - .036	.038 - .064 .028 - .048	.051 - .079 .041 - .064	.064 - .094 .053 - .079	.076 - .109 .066 - .094	
P	MEDIUM ALLOY TOOL STEELS								
	4140, 4340, 52100, 6150, 8620	< 40 > 40	55 45	65 50	.028 - .051 .018 - .036	.038 - .064 .028 - .048	.051 - .079 .041 - .064	.064 - .094 .053 - .079	.076 - .109 .066 - .094
	CARBON STEELS								
1000's - 1018, 1020, 12L14	< 40	70	85	.036 - .058	.048 - .069	.058 - .064	.071 - .099	.084 - .114	
K	CAST MATERIAL								
	Ductile Iron		75	105	.038 - .058	.048 - .071	.061 - .086	.074 - .102	.086 - .117
	Gray Iron		85	115	.041 - .061	.051 - .074	.064 - .089	.076 - .104	.089 - .119
N	NON-FERROUS								
	Aluminum 2014, 2024, 6061-(T1-T6), 7075		105	130	.058 - .084	.069 - .097	.084 - .112	.097 - .127	.109 - .142
	Aluminum Die Cast		90	115	.046 - .071	.056 - .084	.069 - .099	.081 - .114	.094 - .130
	Magnesium		85	105	.051 - .076	.061 - .089	.074 - .104	.086 - .119	.099 - .135
	Copper		60	90	.043 - .064	.053 - .076	.066 - .091	.079 - .107	.091 - .122
	Brass		75	105	.051 - .081	.061 - .094	.074 - .109	.086 - .124	.099 - .140
Bronze		60	85	.048 - .064	.056 - .076	.069 - .091	.081 - .107	.094 - .122	

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

GARR TOOL Drilling Guide for Aluminum Series 3-Flute Drills

			CHIPLOAD PER TOOTH (Fz)						
ISO Material	Type	SFM (Vc)	3/16"	1/4"	5/16"	3/8"	1/2"	5/8"	
N	NON-FERROUS								
	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"

			CHIPLOAD PER TOOTH (Fz)						
ISO Material	Type	M/Min. (Vc)	4.0mm	6.0mm	8.0mm	10.0mm	12.0mm	16.0mm	
N	NON-FERROUS								
	Aluminum Alloy	6061	140 - 200	.050 - .100	.065 - .125	.090 - .150	.115 - .175	.150 - .200	.165 - .250
	Cast Aluminum	380	90 - 150	.038 - .075	.050 - .100	.075 - .125	.075 - .150	.090 - .175	.100 - .200
	Magnesium		75 - 150	.038 - .075	.050 - .100	.075 - .125	.075 - .150	.090 - .175	.100 - .200
	Copper, Brass		75 - 120	.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



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

OPERATING PARAMETERS		
TOOL DIAMETER	Vc	
	1500 SFM	3000 SFM
	RPM (n)	
1/16"	45,000	90,000
1/8"	45,000	90,000
3/16"	30,000	60,000
1/4"	23,000	45,000
3/8"	15,000	30,000
1/2"	11,000	22,000
3/4"	7,500	15,000
1"	5,500	10,000

Speeds and Feeds

Carbide burrs typically operate between 1500 and 3000 SFM. Solid carbide burrs that are 1/8" diameter or less can typically be run at speeds up to 75,000 RPM (n). Burrs ranging in size from 3/16" to 3/8" diameter can utilize a 30,000 RPM (n) grinder. Burrs ranging in size from 1/4" to 1/2" diameter can utilize a 22,000 RPM (n) grinder. These are general speed recommendations that may need to be adjusted for optimal performance.

Safety Information

Always wear the appropriate personal protective equipment, such as safety glasses and protective clothing, when using solid carbide or HSS cutting tools. Machines should be fully guarded. Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

BURR TROUBLESHOOTING OPTIONS	
PROBLEM	POSSIBLE SOLUTIONS
Broken Braze	Excessive Force Heat from rubbing shank Dull tool
Chatter	Improper location in collet Bad grinder bearings Bent shank Unstable control of process Lack of rigid setup
Plugged Flutes	Use coarser burr Working in soft material Use an anti-stick agent Faster RPM Slower RPM Lighter cuts
Excessive Vibration	Improper location in collet Bad grinder bearings Bent shank Unstable control of process Faster RPM Slower RPM Faster feed Slower feed Lack of rigid setup
Poor Finish	Improper location in collet Bad grinder bearings Bent shank Unstable control of process Faster RPM Slower RPM Switch to finer cut Don't use double cut Faster feed Lack of rigid setup
Poor Tool Life	Heat from rubbing shank Improper location in collet Bad grinder bearings Bent shank Unstable control of process Faster RPM Slower RPM Don't use double cut Faster feed Slower feed Cutting abrasive material Lack of rigid setup

Hardness Conversion Chart

ROCKWELL HARDNESS (HRb)	ROCKWELL HARDNESS (HRc)	BRINELL HARDNESS (HB)	VICKERS HARDNESS (HV)	TENSILE STRENGTH (N/mm ²)	PSI (1000 lb/in ²)
67	-	116	122	401	58
70	-	121	127	432	63
73	-	126	132	448	65
75	-	131	137	455	66
77	-	137	143	463	67
80	-	143	150	479	69
82	-	149	156	494	72
84	-	156	163	525	76
86	-	163	171	540	78
89	-	170	178	556	81
91	-	179	188	602	88
93	-	187	196	632	92
96	-	197	212	664	97
97	-	207	218	695	101
98	-	212	222	710	103
-	20	217	228	741	107
-	21	223	234	756	110
-	22	229	241	772	112
-	23	235	247	787	114
-	24	241	255	818	118
-	25	248	261	849	123
-	27	255	269	865	125
-	28	262	275	895	130
-	29	269	284	911	132
-	30	277	292	942	136
-	31	285	300	973	141
-	32	293	308	988	143
-	33	302	318	1019	147
-	34	311	327	1050	152
-	35	321	337	1096	159
-	37	331	349	1127	163
-	38	341	359	1158	168
-	39	352	370	1189	172
-	40	363	381	1235	179
-	41	375	395	1266	183
-	42	388	408	1312	190
-	44	401	422	1359	197
-	45	415	437	1420	206
-	46	429	452	1467	212
-	48	444	470	1513	219
-	50	461	497	1559	226
-	51	477	517	1621	235
-	52	495	532	1668	241
-	54	543	572	1729	250
-	56	514	609	1807	262
-	57	555	630	1884	273
-	59	578	670	1961	284
-	60	601	698	2039	295
-	61	-	720	-	-
-	62	-	746	-	-
-	63	-	772	-	-
-	64	-	800	-	-
-	65	-	832	-	-
-	66	-	865	-	-
-	67	-	900	-	-
-	68	-	940	-	-

Conversions from each scale are approximate

Decimal Equivalent Chart

Diameter	Decimal Equiv.
#80	.0135
0.35mm	.0138
#79	.0145
1/64"	.0156
0.40mm	.0158
#78	.0160
0.45mm	.0177
#77	.0180
0.50mm	.0197
#76	.0200
#75	.0210
0.55mm	.0217
#74	.0225
0.60mm	.0236
#73	.0240
#72	.0250
0.65mm	.0256
#71	.0260
0.70mm	.0276
#70	.0280
#69	.0292
0.75mm	.0295
#68	.0310
1/32"	.0312
0.80mm	.0315
#67	.0320
#66	.0330
0.85mm	.0335
#65	.0350
0.90mm	.0354
#64	.0360
#63	.0370
0.95mm	.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



GARR TOOL TRAINING CENTER

Standards

Every GARR carbide cutting tool is manufactured from premium submicron grain carbide, unless otherwise noted.

Each of our styles of end mills is center cutting, unless otherwise noted.

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 - 12 pieces or less. 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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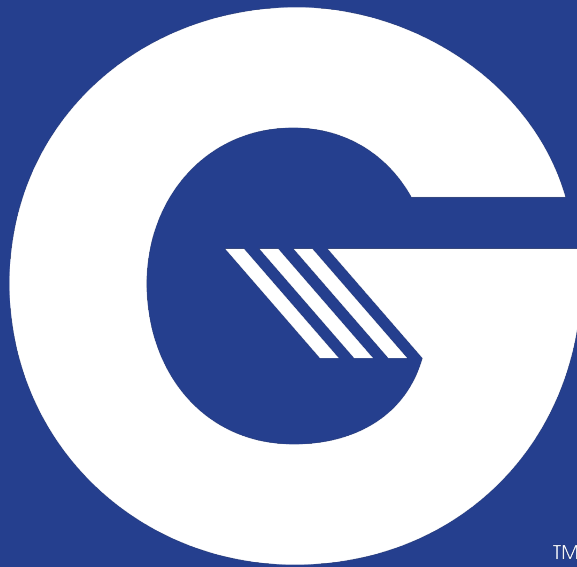
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 **WARNING:** Our products can expose you to chemicals including cobalt, which is known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov
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