

GARR TOOL[®]

High Performance Solid Carbide



NEW!

INTERACTIVE PDF

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2026

MADE IN MICHIGAN



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 eighty 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.





X3 and G3

Page [121](#)

3 Flute - Small Diameter Tooling

X5 and G5

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5 Flute - All Purpose Workhorse

X7 and G7

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7 Flute - Chip Splitter Option Available

X9 and G9

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9 Flute - Large Diameter Tooling

NEW

GARR Technical Advisor

Features ease of use, including an extensive material list and setup versatility

Uses a dynamic function based on spindle interface, toolholding, stability of workpiece and *most importantly*, specific material condition

Adaptability of the GARR Technical Advisor is beneficial when setup factors are sub-optimal



***CHECK IT OUT
ON OUR WEBSITE***

X3 PAGE 121 NEW S M P K 3 Flute End Mill Variable Flute Grind Honed Cutting Edge Polished Fluting BALIQ® ALCRONOS Coating Up to 50 HRC TECH PG 300-301 SQ, CR 	X5 PAGE 125 NEW S M P K 5 Flute End Mill Variable Flute Grind Honed Cutting Edge Polished Fluting BALIQ® ALCRONOS Coating Up to 50 HRC TECH PG 302-303 SQ, CR 	X7 PAGE 131 NEW S M P K 7 Flute End Mill Variable Flute Grind Honed Cutting Edge Polished Fluting Chip Splitter Option - X7C BALIQ® ALCRONOS Coating Up to 50 HRC TECH PG 304-305 SQ, CR 	X9 PAGE 139 NEW S M P K 9 Flute End Mill Variable Flute Grind Honed Cutting Edge Polished Fluting Chip Splitter Option - X9C BALIQ® ALCRONOS Coating Up to 50 HRC TECH PG 306-307 SQ, CR 
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V4 PAGE 161 S M P K 4 Flute End Mill Variable Flute Geometry Honed Cutting Edge AlCrN Coating TECH PG 310-311 SQ, CR, BN 	A3 PAGE 143 N 3 Flute End Mill Variable Helix Design High RPM and High Feed Rates Superior Wall and Floor Finish Polished Fluting TECH PG 294-295 SQ, CR, BN 	143 PAGE 153 N 3 Flute End Mill BALINIT® MAYURA Coating High Aluminum Removal Rate for Spindles up to 20,000 RPM TECH PG 295 SQ, CR 	VRX-6 PAGE 193 P K H 6 Flute End Mill Variable Flute Geometry AlTiN Coating TECH PG 314-315 SQ, CR 

QUICKLY CALCULATE IDEAL PARAMETERS FOR ANY EDP IN YOUR APPLICATION AND MATERIAL WITH OUR ONLINE CALCULATOR.

NO REGISTRATION REQUIRED.

**CHECK OUT
THE GARR
TECHNICAL
ADVISOR**



HTD

PAGE 19

S M P K



2 Flute Drill
Coolant Through
Double Margin
140° Facet Point
Polished Fluting
BALIQ® ALTINOS Coating
Common Shank
h7 Tolerance

TECH PG 338-339

10xD

1160, 1180

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N



3 Flute Drill
140° Facet Point
No Spot Drilling Required
BALINIT® MAYURA Coating
Straight Shank

TECH PG 342

3xD, 5xD

1550H, 1250H, 1850H

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S M P K



2 Flute Drill
30° Helix for Chip Evacuation
140° Facet Point
Polished Fluting
BALIQ® ALTINOS Coating
3mm - 1/8" Diameter Shanks

TECH PG 336-337

3xD, 5xD, 12xD

1580H, 1280H

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S M P K



2 Flute Drill
30° Helix for Chip Evacuation
140° Facet Point
Honed Cutting Edge
Polished Fluting
BALIQ® ALTINOS Coating
Straight Shank
h7 Tolerance

TECH PG 340-341

3xD, 5xD

1580HD

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S M P K



2 Flute Drill
30° Helix for Chip Evacuation
140° Facet Point
Honed Cutting Edge
Polished Fluting
BALIQ® ALTINOS Coating
Common Shank - 6535 HA
m7 Tolerance

TECH PG 340-341

3xD

1580KD, 1280KD, 1880KD

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S M P K



2 Flute Drill
Coolant Through
30° Helix for Chip Evacuation
140° Facet Point
Honed Cutting Edge
Polished Fluting
BALIQ® ALTINOS Coating
Common Shank - 6535 HA
m7 Tolerance

TECH PG 340-341

3xD, 5xD, 7xD

1580KH, 1280KH, 1880KH

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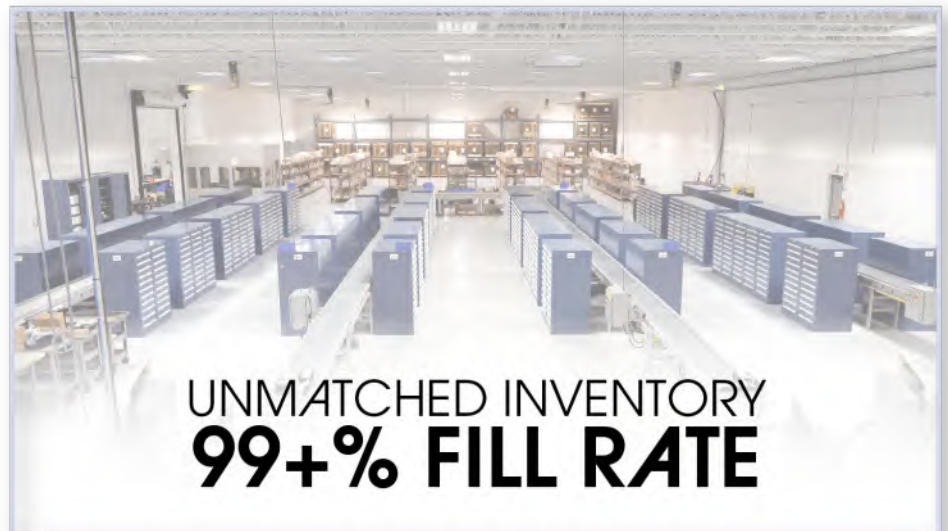
S M P K



2 Flute Drill
Coolant Through
30° Helix for Chip Evacuation
140° Facet Point
Honed Cutting Edge
Polished Fluting
BALIQ® ALTINOS Coating
Straight Shank
h7 Tolerance

TECH PG 340-341

3xD, 5xD, 7xD



UNMATCHED INVENTORY
99+% FILL RATE

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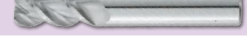
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00***	27	24**0	234	42**3	153	62***	274
01**0	219	24**7	237	42**4	250	62**7	186
01**7	221	24**8	210	42**7	251	63***	275
02**0	219	25**0	270	43**0	259	63***	187
02**7	221	25**1, 25**6	51	43**2	149	64***	131
03**0	226	25**5	41	43**4	261	64***	276
03**7	227	26***	41	43**7	262	65***	136
04**0	226	26**0	270	44**0	259	65***	276
04**7	227	26**0, 26**5	49	44**4	261	66***	277
07***	143	26**1, 26**6	51	44**7	262	67***	277
08**0	195	27***	42	45**0	228	68***	278
09**0	195	27***	182	45**7	232	69***	19
10**0	196	27**0	270	46***	116	69***	278
10**7	196	27**5	41	46**0	228	70***	279
10**8	209	28***	186	46**7	232	70***	22
11**0	228	28***	184	46**8	209	71***	279
11**3	230	28**0	270	47**0	240	72***	280
11**4	231	28**5	41	47**7	244	73***	281
11**7	232	29***	45	48**0	240	74***	282
12**0	228	30***	222	48**0, 48**5	202	77**0, 77**5	71
12**4	231	30**0	266	48**7	244	77**1, 77**6	77
12**7	232	30**7	267	48**8	201	78**1, 78**6	83
13**0	228	31***	125	49***	118	79**0	234
13**3	230	31***	139	49**0	247	79**7	237
13**4	231	31***	141	50***	161	80**0	234
13**7	232	32**0	268	50***	163	80**7	237
13**8	209	32**7	269	50***	171	80**8	210
14**0	208	34***	125	50***	174	81**0	246
15**0	208	34**0	264	50***	180	82**0	246
15**8	211	34**7	264	50**0	247	83**0, 83**7	201
16**0	240	36***	234	51***	174	84**5, 84**7	246
16**3	242	36***	237	51**0	203	84**0, 84**7	202
16**4	243	36**0	265	51**4	203	85**0	195
16**7	244	36**7	265	51**7	203	86**0	196
17**0	240	37**0	228	52**0	199	86**4	196
17**4	243	37**7	232	52**4	199	86**7	196
17**7	244	38**0	240	52**7	199	87***	121
18**0	240	38**7	244	54**0	248	88***	121
18**3	242	38**8	212	54**4	250	89**0, 89**5	71
18**4	243	39***	153	54**7	251	89**1, 89**6	77
18**7	244	39***	153	55**0	259	90**0, 90**5	92
19**0, 19**5	65	39**0	61	55**4	261	90**1, 90**6	83
19**1, 19**6	68	39**1	63	55**7	262	91***	58
20***	33	39**2	149	56**0, 56**5	87	92**0	248
20**0	253	40***	153	56**1, 56**6	90	92**7	251
20**1, 20**6	36	40**0	199	57***	112	93**0	248
20**7	256	40**2	149	57***	114	93**7	251
21***	33	40**7	199	57**0	110	94**0	248
21**0	256	40**8	213	57**7	111	94**7	251
21**0	204	41**0	248	58***	112	94**8	212
21**2	205	41**1	153	58***	113	95***	96
21**4	206	41**2	149	58**0	60	96***	103
21**1, 21**6	36	41**3	153	59**0, 59**5	61	97**0	259
21**7	257	41**4	250	59**1, 59**6	63	97**7	262
22**0, 22**5	51	41**7	251	60***	193	98**0	259
22**1, 22**6	94	42***	149	60***	272	98**7	262
23**0	198	42**0	248	61***	182	99**0	259
23**4	198	42**2	149	61***	273	99**7	262
23**7	198	42**2	149	62***	186	99**8	213

ISO Material Group: **N**

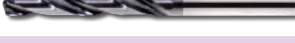
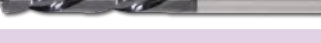
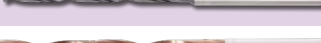
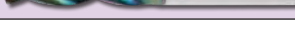
DRILLS

	SERIES	PAGE	COATING	DESCRIPTION
1160, 1180		22	MAYURA	3 flute, High performance
1520, 1205		71	BRIGHT	2 flute, General purpose
1520H, 1205H		77	DURANA	2 flute, General purpose
1800H		94	DURANA	2 flute, Parabolic

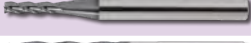
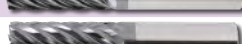
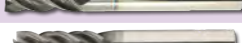
END MILLS

	SERIES	PAGE	COATING	DESCRIPTION
A3		143	BRIGHT	High velocity, 3 flute, High metal removal rate
143M, 143R		153	MAYURA	High velocity, 3 flute, High metal removal rate
142B		149	MAYURA	High velocity, 2 flute, High metal removal rate
142M, 142R		149	MAYURA	High velocity, 2 flute, High metal removal rate
242M, 842M		195	BRIGHT	High performance, 2 flute, For 3000-8000 RPM
ARC		116	BRIGHT	High performance, 3 flute, Staggered helix rougher
253M, 853M		196	BRIGHT	High performance, 3 flute, Profiling and finishing
253MC		196	TiCN	High performance, 3 flute, Profiling and finishing

DRILLS

SERIES		PAGE	COATING	DESCRIPTION
1510H		68	DURANA	2 flute, General purpose, Slow spiral
1550H, 1250H, 1850H		27	ALTINOS	2 flute, High performance, Small diameter, 1/8" or 3mm shank
1580HD		33	ALTINOS	2 flute, High performance, Common shank
1580H, 1280H		36	ALTINOS	2 flute, High performance
1580KD, 1280KD, 1880KD		41	ALTINOS	2 flute, High performance, Coolant fed, Common shank
1580KH, 1280KH, 1880KH		51	ALTINOS	2 flute, High performance, Coolant fed
HTD		19	ALTINOS	2 flute, High performance, Coolant fed, Double margin, Common shank
1520H, 1205H		77	DURANA	2 flute, General purpose
1160, 1180		22	MAYURA	3 flute, High performance

END MILLS

SERIES		PAGE	COATING	DESCRIPTION
X3		121	ALCRONOS	High performance, 3 flute, Variable flute grind
X5		125	ALCRONOS	High performance, 5 flute, Variable flute grind
X7		131	ALCRONOS	High performance, 7 flute, Variable flute grind
X9		139	ALCRONOS	High performance, 9 flute, Variable flute grind
G3		121	TISINOS PRO	High performance, 3 flute, Variable flute grind
G5		125	TISINOS PRO	High performance, 5 flute, Variable flute grind
G7		131	TISINOS PRO	High performance, 7 flute, Variable flute grind
G9		139	TISINOS PRO	High performance, 9 flute, Variable flute grind
V4		161	AlCrN	High performance, 4 flute, Variable helix
V5		174	AlCrN	High performance, 5 flute, Variable helix
VRX		182	AlTiN	High performance, 4 flute, Staggered flute
VRX-6		193	AlTiN	High performance, 6 flute, Staggered flute

ISO Material Group: **M**

DRILLS

SERIES	PAGE	COATING	DESCRIPTION
1510H	68	DURANA	2 flute, General purpose, Slow spiral
1550H, 1250H, 1850H	27	ALTINOS	2 flute, High performance, Small diameter, 1/8" or 3mm shank
1580HD	33	ALTINOS	2 flute, High performance, Common shank
1580H, 1280H	36	ALTINOS	2 flute, High performance
1580KD, 1280KD, 1880KD	41	ALTINOS	2 flute, High performance, Coolant fed, Common shank
1580KH, 1280KH, 1880KH	51	ALTINOS	2 flute, High performance, Coolant fed
HTD	19	ALTINOS	2 flute, High performance, Coolant fed, Double margin, Common shank
1520H, 1205H	77	DURANA	2 flute, General purpose

END MILLS

SERIES	PAGE	COATING	DESCRIPTION
X3	121	ALCRONOS	High performance, 3 flute, Variable flute grind
X5	125	ALCRONOS	High performance, 5 flute, Variable flute grind
X7	131	ALCRONOS	High performance, 7 flute, Variable flute grind
X9	139	ALCRONOS	High performance, 9 flute, Variable flute grind
G3	121	TISINOS PRO	High performance, 3 flute, Variable flute grind
G5	125	TISINOS PRO	High performance, 5 flute, Variable flute grind
G7	131	TISINOS PRO	High performance, 7 flute, Variable flute grind
G9	139	TISINOS PRO	High performance, 9 flute, Variable flute grind
V4	161	AlCrN	High performance, 4 flute, Variable helix
V5	174	AlCrN	High performance, 5 flute, Variable helix
VRX	182	AlTiN	High performance, 4 flute, Staggered flute
VRX-6	193	AlTiN	High performance, 6 flute, Staggered flute

DRILLS

SERIES	PAGE	COATING	DESCRIPTION
1510H	68	DURANA	2 flute, General purpose, Slow spiral
1550H, 1250H, 1850H	27	ALTINOS	2 flute, High performance, Small diameter, 1/8" or 3mm shank
1580HD	33	ALTINOS	2 flute, High performance, Common shank
1580H, 1280H	36	ALTINOS	2 flute, High performance
1580KD, 1280KD, 1880KD	41	ALTINOS	2 flute, High performance, Coolant fed, Common shank
1580KH, 1280KH, 1880KH	51	ALTINOS	2 flute, High performance, Coolant fed
HTD	19	ALTINOS	2 flute, High performance, Coolant fed, Double margin, Common shank
1520H, 1205H	77	DURANA	2 flute, General purpose

END MILLS

SERIES	PAGE	COATING	DESCRIPTION
G3	121	TISINOS PRO	High performance, 3 flute, Variable flute grind
G5	125	TISINOS PRO	High performance, 5 flute, Variable flute grind
G7	131	TISINOS PRO	High performance, 7 flute, Variable flute grind
G9	139	TISINOS PRO	High performance, 9 flute, Variable flute grind
X3	121	ALCRONOS	High performance, 3 flute, Variable flute grind
X5	125	ALCRONOS	High performance, 5 flute, Variable flute grind
X7	131	ALCRONOS	High performance, 7 flute, Variable flute grind
X9	139	ALCRONOS	High performance, 9 flute, Variable flute grind
V4	161	AlCrN	High performance, 4 flute, Variable helix
VRX	182	AlTiN	High performance, 4 flute, Staggered flute
VRX-6	193	AlTiN	High performance, 6 flute, Staggered flute
V5	174	AlCrN	High performance, 5 flute, Variable helix
VHM	118	AlTiN	High performance, 4 flute, Staggered flute rougher

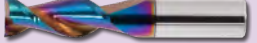
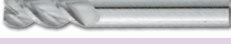
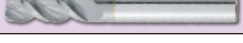
Recommended for: **BRASS, BRONZE, COPPER, MAGNESIUM**

ISO Material Group: **N**

DRILLS

	SERIES	PAGE	COATING	DESCRIPTION
1160, 1180		22	MAYURA	3 flute, High performance
1510H		68	DURANA	2 flute, General purpose, Slow spiral
1520, 1205		71	BRIGHT	2 flute, General purpose
1520H, 1205H		77	DURANA	2 flute, General purpose
1500H		63	DURANA	2 flute, Straight flute
1800H		94	DURANA	2 flute, Parabolic

END MILLS

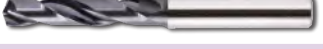
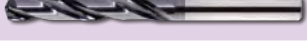
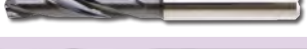
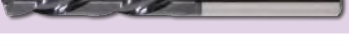
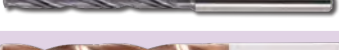
	SERIES	PAGE	COATING	DESCRIPTION
143M, 143R		153	MAYURA	High velocity, 3 flute, High metal removal rate
142B		149	MAYURA	High velocity, 2 flute, High metal removal rate
142M, 142R		149	MAYURA	High velocity, 2 flute, High metal removal rate
ARC		116	BRIGHT	High performance, 3 flute, Staggered helix rougher
242M, 842M		195	BRIGHT	High performance, 2 flute, For 3000-8000 RPM
253M, 853M		196	BRIGHT	High performance, 3 flute, Profiling and finishing
253MC		196	TiCN	High performance, 3 flute, Profiling and finishing

Recommended for: **HARDENED TOOL STEELS**
(generally over 45 Rc)

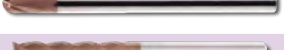
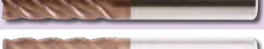
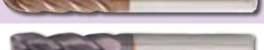
ISO Material Group: **P**

RECOMMENDED
TOOLS

DRILLS

	SERIES	PAGE	COATING	DESCRIPTION
1500H		63	DURANA	2 flute, Straight flute
1510H		68	DURANA	2 flute, General purpose, Slow spiral
1550H, 1250H, 1850H		27	ALTINOS	2 flute, High performance, Small diameter, 1/8" or 3mm shank
1580HD		33	ALTINOS	2 flute, High performance, Common shank
1580H, 1280H		36	ALTINOS	2 flute, High performance
1580KD, 1280KD, 1880KD		41	ALTINOS	2 flute, High performance, Coolant fed, Common shank
1580KH, 1280KH, 1880KH		51	ALTINOS	2 flute, High performance, Coolant fed
HTD		19	ALTINOS	2 flute, High performance, Coolant fed, Double margin, Common shank
1520H, 1205H		77	DURANA	2 flute, General purpose

END MILLS

	SERIES	PAGE	COATING	DESCRIPTION
G3		121	TISINOS PRO	High performance, 3 flute, Variable flute grind
G5		125	TISINOS PRO	High performance, 5 flute, Variable flute grind
G7		131	TISINOS PRO	High performance, 7 flute, Variable flute grind
G9		139	TISINOS PRO	High performance, 9 flute, Variable flute grind
H-45		207	DURANA	High performance, High feed, Corner radius
350MX, 950MX		208	DURANA	High performance, High Rc finisher, Die mold
545MA		204	DURANA	High performance, High Rc finisher, Square end
545RA		205	DURANA	High performance, High Rc finisher, Corner radius
545BA		206	DURANA	High performance, High Rc finisher, Ball end
VRX		182	AlTiN	High performance, 4 flute, Staggered flute
VRX-6		193	AlTiN	High performance, 6 flute, Staggered flute

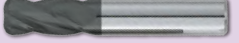
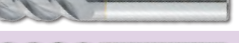
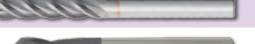
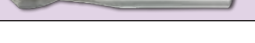
Recommended for: **COMPOSITE MATERIALS**
(Graphite, Plastics, Carbon Fiber)

ISO Material Group: **O**

DRILLS

	SERIES	PAGE	COATING	DESCRIPTION
1160, 1180		22	MAYURA	3 flute, High performance
154MA		113	TiAlN	4 flute, Center cutting angle
1510H		68	DURANA	2 flute, General purpose, Slow spiral
1520H, 1205H		77	DURANA	2 flute, General purpose
1800H		94	DURANA	2 flute, Parabolic
1500H		63	DURANA	2 flute, Straight flute

END MILLS

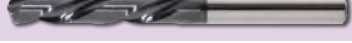
	SERIES	PAGE	COATING	DESCRIPTION
210D		209	DIAMOND	4 flute, Square end
310D		211	DIAMOND	4 flute, Ball end
210RD		210	DIAMOND	4 flute, Corner radius
143M, 143R		153	MAYURA	High velocity, 3 flute, High metal removal rate
142M, 142R		149	MAYURA	High velocity, 2 flute, High metal removal rate
142B		149	MAYURA	High velocity, 2 flute, High metal removal rate
253M, 853M		196	BRIGHT	High performance, 3 flute, Profiling and finishing
253MC		196	TiCN	High performance, 3 flute, Profiling and finishing
255MC		199	TiCN	High performance, 5 flute, Profiling and finishing
154M, 154MA		112, 113	BRIGHT/TiAlN	4 flute, Drill/Mill, Center cutting to a point
152M, 152MA		110, 111	BRIGHT/TiAlN	2 flute, Drill/Mill, Center cutting to a point

Recommended for: **CARBON STEELS, MEDIUM ALLOY STEELS**
(generally under 45 Rc)

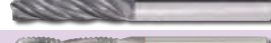
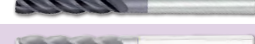
ISO Material Group: **P**

RECOMMENDED
TOOLS

DRILLS

SERIES		PAGE	COATING	DESCRIPTION
1580HD		33	ALTINOS	2 flute, High performance, Common shank
1550H, 1250H, 1850H		27	ALTINOS	2 flute, High performance, Small diameter, 1/8" or 3mm shank
1580H, 1280H		36	ALTINOS	2 flute, High performance
1580KD, 1280KD, 1880KD		41	ALTINOS	2 flute, High performance, Coolant fed, Common shank
1580KH, 1280KH, 1880KH		51	ALTINOS	2 flute, High performance, Coolant fed
HTD		19	ALTINOS	2 flute, High performance, Coolant fed, Double margin, Common shank
1510H		68	DURANA	2 flute, General purpose, Slow spiral
1520H, 1205H		77	DURANA	2 flute, General purpose

END MILLS

SERIES		PAGE	COATING	DESCRIPTION
X3		121	ALCRONOS	High performance, 3 flute, Variable flute grind
X5		125	ALCRONOS	High performance, 5 flute, Variable flute grind
X7		131	ALCRONOS	High performance, 7 flute, Variable flute grind
X9		139	ALCRONOS	High performance, 9 flute, Variable flute grind
V4		161	AlCrN	High performance, 4 flute, Variable helix
V5		174	AlCrN	High performance, 5 flute, Variable helix
VRX		182	AlTiN	High performance, 4 flute, Staggered flute
VRX-6		193	AlTiN	High performance, 6 flute, Staggered flute
VHM		118	AlTiN	High performance, 4 flute, Staggered flute rougher
255MA, 855MA		199	AlTiN	High performance, 5 flute, Square end
255RA, 855RA		201	AlTiN	High performance, 5 flute, Corner radius
253MA, 853MA		196	AlTiN	High performance, 3 flute, Profiling and finishing

DRILLS

SERIES	PAGE	COATING	DESCRIPTION
1120H, 1100H	83	DURANA	3 flute, General purpose
1520H, 1205H	77	DURANA	2 flute, General purpose
1510H	68	DURANA	2 flute, General purpose, Slow spiral
1580H, 1280H	36	ALTINOS	2 flute, High performance
1550H, 1250H, 1850H	27	ALTINOS	2 flute, High performance, Small diameter, 1/8" or 3mm shank
1580HD	33	ALTINOS	2 flute, High performance, Common shank
1580KH, 1280KH, 1880KH	51	ALTINOS	2 flute, High performance, Coolant fed
1580KD, 1280KD, 1880KD	41	ALTINOS	2 flute, High performance, Coolant fed, Common shank

END MILLS

SERIES	PAGE	COATING	DESCRIPTION
VRX	182	AlTiN	High performance, 4 flute, Staggered flute
VRX-6	193	AlTiN	High performance, 6 flute, Staggered flute
V4	161	AlCrN	High performance, 4 flute, Variable helix
X5	125	ALCRONOS	High performance, 5 flute, Variable flute grind
G5	125	TISINOS PRO	High performance, 5 flute, Variable flute grind
V5	174	AlCrN	High performance, 5 flute, Variable helix
X7	131	ALCRONOS	High performance, 7 flute, Variable flute grind
G7	131	TISINOS PRO	High performance, 7 flute, Variable flute grind
255MA, 855MA	199	AlTiN	High performance, 5 flute, Square end
255RA, 855RA	201	AlTiN	High performance, 5 flute, Corner radius
143M, 143R	153	MAYURA	High velocity, 3 flute, High metal removal rate
253MA, 853MA	196	AlTiN	High performance, 3 flute, Profiling and finishing

TOLERANCES

$d1$	h7
$d2$	h6
$l1$	+0.1181" -0.1181" (+3.00 -3.00mm)
$l2$	+0.1181" -0.1181" (+3.00 -3.00mm)
$l4$	+0.0787" -0.0000" (+2.00 -0.00mm)



Series HTD

.1181" - .2188"
(3.000mm - 5.557mm)

HIGH PERFORMANCE
DRILLS

Recommended for high nickel, high temperature alloys, cobalt-based alloys, stainless steels, and tool steels <52 Rc

BALIQ® ALTINOS Coating (AlTiN-based)

High performance solid submicron grain carbide drill with reinforced (HA) shank

h7 drill diameter tolerance

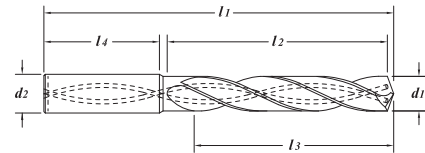
Double margin for true and cleaner holes

Coolant through

Polished flutes

140° Facet point

Pilot drill not required for most applications



EDP#	$d1$ Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	$l3$ Max Drill Depth	$l4$ Shank Length
	Decimal	Metric					
69064	.1181	3.000	6.0	80	40	35	36
69066	.1220	3.100	6.0	80	40	35	36
69068	.1250 1/8"	3.175	6.0	82	42	37	36
69070	.1260	3.200	6.0	82	42	37	36
69072	.1285 #30	3.264	6.0	82	42	37	36
69074	.1299	3.300	6.0	82	42	37	36
69076	.1360 #29	3.454	6.0	85	45	40	36
69078	.1378	3.500	6.0	85	45	40	36
69080	.1417	3.600	6.0	85	45	40	36
69082	.1457	3.700	6.0	90	50	44	36
69084	.1476	3.750	6.0	90	50	44	36
69086	.1496	3.800	6.0	90	50	44	36
69088	.1535	3.900	6.0	90	50	44	36
69090	.1562 5/32"	3.967	6.0	90	50	44	36
69092	.1575	4.000	6.0	95	55	48	36
69094	.1614	4.100	6.0	95	55	48	36
69096	.1654	4.200	6.0	95	55	48	36
69098	.1673	4.250	6.0	95	55	48	36
69100	.1693	4.300	6.0	95	55	48	36
69102	.1719 11/64"	4.366	6.0	95	55	48	36
69104	.1732	4.400	6.0	95	55	48	36
69106	.1772	4.500	6.0	100	60	54	36
69108	.1811	4.600	6.0	100	60	54	36
69110	.1831	4.650	6.0	100	60	54	36
69112	.1850	4.700	6.0	100	60	54	36
69114	.1875 3/16"	4.762	6.0	100	60	54	36
69116	.1890 #12	4.800	6.0	100	60	54	36
69118	.1929	4.900	6.0	100	60	54	36
69120	.1969	5.000	6.0	105	65	58	36
69122	.2010 #7	5.105	6.0	105	65	58	36
69124	.2028	5.150	6.0	105	65	58	36
69126	.2031 13/64"	5.159	6.0	105	65	58	36
69128	.2047	5.200	6.0	110	70	63	36
69130	.2087	5.300	6.0	110	70	63	36
69132	.2165	5.500	6.0	110	70	63	36
69134	.2188 7/32"	5.557	6.0	110	70	63	36

continued →

Series HTD (continued)

.2205" - .3937"
(5.600mm - 10.000mm)

EDP#	<i>d1</i> Diameter		<i>d2</i> Shank Diameter	<i>l1</i> Overall Length	<i>l2</i> Flute Length	<i>l3</i> Max Drill Depth	<i>l4</i> Shank Length
	Decimal	Metric					
69136	.2205	5.600	6.0	115	75	67	36
69138	.2244	5.700	6.0	115	75	67	36
69140	.2283	5.800	6.0	115	75	67	36
69142	.2323	5.900	6.0	115	75	67	36
69144	.2344	15/64"	5.954	6.0	120	80	36
69146	.2362	6.000	6.0	120	80	72	36
69148	.2370	6.020	8.0	120	80	72	36
69150	.2402	6.100	8.0	120	80	72	36
69152	.2441	6.200	8.0	120	80	72	36
69154	.2480	6.300	8.0	120	80	72	36
69156	.2500	1/4"	6.350	8.0	125	85	36
69158	.2520	6.400	8.0	125	85	77	36
69160	.2559	6.500	8.0	125	85	77	36
69162	.2598	6.600	8.0	125	85	77	36
69164	.2638	6.700	8.0	125	85	77	36
69166	.2656	17/64"	6.746	8.0	130	90	36
69168	.2677	6.800	8.0	130	90	81	36
69170	.2717	6.900	8.0	130	90	81	36
69172	.2756	7.000	8.0	130	90	81	36
69174	.2795	7.100	8.0	130	90	81	36
69176	.2812	9/32"	7.142	8.0	135	95	36
69178	.2835	7.200	8.0	135	95	87	36
69180	.2874	7.300	8.0	135	95	87	36
69182	.2913	7.400	8.0	135	95	87	36
69184	.2953	7.500	8.0	135	95	87	36
69186	.2969	19/64"	7.541	8.0	141	101	36
69188	.2992	7.600	8.0	141	101	92	36
69190	.3031	7.700	8.0	141	101	92	36
69192	.3071	7.800	8.0	141	101	92	36
69194	.3125	5/16"	7.937	8.0	141	101	36
69196	.3150	8.000	8.0	141	101	92	36
69198	.3189	8.100	10.0	152	108	97	40
69200	.3228	8.200	10.0	152	108	97	40
69202	.3268	8.300	10.0	152	108	97	40
69204	.3287	8.350	10.0	152	108	97	40
69206	.3307	8.400	10.0	152	108	97	40
69208	.3346	8.500	10.0	152	108	97	40
69210	.3386	8.600	10.0	158	114	104	40
69212	.3425	8.700	10.0	158	114	104	40
69214	.3438	11/32"	8.732	10.0	158	114	40
69216	.3445	8.750	10.0	158	114	104	40
69218	.3465	8.800	10.0	158	114	104	40
69220	.3504	8.900	10.0	158	114	104	40
69222	.3543	9.000	10.0	158	114	104	40
69224	.3583	9.100	10.0	163	119	108	40
69226	.3602	9.150	10.0	163	119	108	40
69228	.3622	9.200	10.0	163	119	108	40
69230	.3661	9.300	10.0	163	119	108	40
69232	.3701	9.400	10.0	163	119	108	40
69234	.3740	9.500	10.0	163	119	108	40
69236	.3750	3/8"	9.525	10.0	172	128	40
69238	.3780	9.600	10.0	172	128	114	40
69240	.3819	9.700	10.0	172	128	114	40
69242	.3858	9.800	10.0	172	128	114	40
69244	.3898	9.900	10.0	172	128	114	40
69246	.3937	10.000	10.0	172	128	114	40

EDP#	<i>d1</i> Diameter		<i>d2</i> Shank Diameter	<i>l1</i> Overall Length	<i>l2</i> Flute Length	<i>l3</i> Max Drill Depth	<i>l4</i> Shank Length
	Decimal	Metric					
69248	.3976	10.100	12.0	185	136	124	45
69250	.4016	10.200	12.0	185	136	124	45
69252	.4062 13/32"	10.317	12.0	185	136	124	45
69254	.4134	10.500	12.0	185	136	124	45
69256	.4213	10.700	12.0	185	136	124	45
69258	.4252	10.800	12.0	185	136	124	45
69260	.4331	11.000	12.0	185	136	124	45
69262	.4375 7/16"	11.112	12.0	196	147	135	45
69264	.4409	11.200	12.0	196	147	135	45
69266	.4488	11.400	12.0	196	147	135	45
69268	.4528	11.500	12.0	196	147	135	45
69270	.4688 15/32"	11.907	12.0	202	153	140	45
69272	.4724	12.000	12.0	202	153	140	45



Series 1160, 1180

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

TOLERANCES

d	+0.000" - .0005" (+0.000 - .0127mm)
l_1	+.125" - .125" (+3.175 - 3.175mm)
l_2	+.125" - .125" (+3.175 - 3.175mm)

Recommended for aluminum and other soft materials <40 Rc

BALINIT® MAYURA Coated

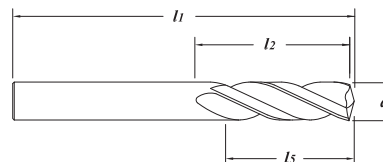
High performance solid submicron grain carbide drill

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#	d † Diameter			l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
Decimal							
70631		.1562	5/32"	3.967	2-1/16"	9/16"	.497"
	70161	.1562	5/32"	3.967	2-1/2"	1"	.809"
70633		.1570	#22	3.988	2-1/8"	5/8"	.500"
	70163	.1570	#22	3.988	2-1/2"	1"	.814"
70635		.1575		4.000	54	16	13
	70166	.1575		4.000	65	24	21
70637		.1590	#21	4.039	2-1/8"	5/8"	.506"
	70177	.1590	#21	4.039	2-1/2"	1"	.824"
70639		.1610	#20	4.089	2-1/8"	5/8"	.512"
	70179	.1610	#20	4.089	2-1/2"	1"	.834"
70641		.1660	#19	4.216	2-1/8"	5/8"	.528"
	70181	.1660	#19	4.216	2-3/4"	1-1/8"	.860"
70643		.1695	#18	4.305	2-1/8"	5/8"	.539"
	70183	.1695	#18	4.305	2-3/4"	1-1/8"	.878"
70645		.1719	11/64"	4.366	2-1/8"	5/8"	.547"
	70185	.1719	11/64"	4.366	2-3/4"	1-1/8"	.891"
70647		.1730	#17	4.394	2-3/16"	11/16"	.551"
	70187	.1730	#17	4.394	2-3/4"	1-1/8"	.897"
70649		.1770	#16	4.496	2-3/16"	11/16"	.563"
	70189	.1770	#16	4.496	2-3/4"	1-1/8"	.917"
70651		.1772		4.500	55	18	14
	70191	.1772		4.500	65	25	23
70653		.1800	#15	4.572	2-3/16"	11/16"	.573"
	70196	.1800	#15	4.572	2-3/4"	1-1/4"	.933"
70655		.1820	#14	4.623	2-3/16"	11/16"	.579"
	70201	.1820	#14	4.623	2-3/4"	1-1/4"	.943"
70657		.1850	#13	4.700	2-3/16"	11/16"	.589"
	70206	.1850	#13	4.700	2-3/4"	1-1/4"	.959"
70659		.1875	3/16"	4.763	2-3/16"	11/16"	.597"
	70211	.1875	3/16"	4.763	2-3/4"	1-1/4"	.972"
70661		.1890	#12	4.801	2-1/4"	3/4"	.601"
	70216	.1890	#12	4.801	2-3/4"	1-1/4"	.979"
70663		.1910	#11	4.851	2-1/4"	3/4"	.608"
	70221	.1910	#11	4.851	2-3/4"	1-1/4"	.990"

3xD (1160) EDP#	5xD (1180) EDP#	d † Diameter			l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
		Decimal		Metric			
70665		.1935	#10	4.914	2-1/4"	3/4"	.616"
	70226	.1935	#10	4.914	2-3/4"	1-1/4"	1.003"
70667		.1960	#9	4.978	2-1/4"	3/4"	.624"
	70229	.1960	#9	4.978	3"	1-5/16"	1.016"
70669		.1969		5.000	57	19	16
	70231	.1969		5.000	75	32	26
70671		.1990	#8	5.055	2-1/4"	3/4"	.633"
	70236	.1990	#8	5.055	3"	1-5/16"	1.031"
70673		.2010	#7	5.105	2-1/4"	3/4"	.640"
	70241	.2010	#7	5.105	3"	1-5/16"	1.042"
70675		.2031	13/64"	5.159	2-1/4"	3/4"	.646"
	70246	.2031	13/64"	5.159	3"	1-5/16"	1.053"
70677		.2040	#6	5.182	2-3/8"	7/8"	.649"
	70251	.2040	#6	5.182	3"	1-3/8"	1.057"
70679		.2055	#5	5.220	2-3/8"	7/8"	.654"
	70256	.2055	#5	5.220	3"	1-3/8"	1.065"
70681		.2090	#4	5.309	2-3/8"	7/8"	.665"
	70261	.2090	#4	5.309	3"	1-3/8"	1.083"
70683		.2130	#3	5.410	2-3/8"	7/8"	.678"
	70266	.2130	#3	5.410	3"	1-3/8"	1.104"
70685		.2165		5.500	60	22	18
	70271	.2165		5.500	75	35	29
70687		.2188	7/32"	5.558	2-3/8"	7/8"	.696"
	70276	.2188	7/32"	5.558	3"	1-3/8"	1.134"
70689		.2210	#2	5.613	2-7/16"	15/16"	.703"
	70281	.2210	#2	5.613	3"	1-3/8"	1.145"
70691		.2280	#1	5.791	2-7/16"	15/16"	.726"
	70286	.2280	#1	5.791	3"	1-3/8"	1.182"
70693		.2340	A	5.944	2-7/16"	15/16"	.745"
	70294	.2340	A	5.944	3-1/4"	1-1/2"	1.213"
70695		.2344	15/64"	5.954	2-7/16"	15/16"	.746"
	70296	.2344	15/64"	5.954	3-1/4"	1-1/2"	1.215"
70697		.2362		6.000	64	26	19
	70301	.2362		6.000	82	38	31
70699		.2380	B	6.045	2-1/2"	1"	.757"
	70306	.2380	B	6.045	3-1/4"	1-5/8"	1.233"
70701		.2420	C	6.147	2-1/2"	1"	.770"
	70311	.2420	C	6.147	3-1/4"	1-5/8"	1.254"
70703		.2460	D	6.248	2-1/2"	1"	.783"
	70316	.2460	D	6.248	3-1/4"	1-5/8"	1.275"
70705		.2500	1/4" / E	6.350	2-1/2"	1"	.796"
	70321	.2500	1/4" / E	6.350	3-1/4"	1-5/8"	1.296"
70707		.2510		6.375	2-1/2"	1"	.799"
	70911	.2510		6.375	3-1/4"	1-5/8"	1.300"
70709		.2559		6.500	66	28	21
	70326	.2559		6.500	82	41	34
70711		.2570	F	6.528	2-5/8"	1-1/8"	.818"
	70331	.2570	F	6.528	3-1/4"	1-11/16"	1.332"

continued →

Series 1160, 1180 (continued)

.2610" - .3594"
(6.629mm - 9.129mm)

3xD (1160) EDP#	5xD (1180) EDP#	$d^{\dagger}$ Diameter		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
		Decimal	Metric			
70713		.2610	G	6.629	2-5/8"	1-1/8"
	70336	.2610	G	6.629	3-1/2"	1-11/16"
70715		.2656	17/64"	6.746	2-5/8"	1-1/8"
	70341	.2656	17/64"	6.746	3-1/2"	1-11/16"
70717		.2660	H	6.756	2-11/16"	1-3/16"
	70346	.2660	H	6.756	3-1/2"	1-11/16"
70719		.2720	I	6.909	2-11/16"	1-3/16"
	70351	.2720	I	6.909	3-1/2"	1-11/16"
70721		.2756		7.000	68	30
	70356	.2756		7.000	88	43
70723		.2770	J	7.036	2-11/16"	1-3/16"
	70361	.2770	J	7.036	3-1/2"	1-11/16"
70725		.2812	9/32"	7.142	2-11/16"	1-3/16"
	70371	.2812	9/32"	7.142	3-1/2"	1-3/4"
70727		.2900	L	7.366	2-3/4"	1-1/4"
	70376	.2900	L	7.366	3-1/2"	1-3/4"
70728		.2950	M	7.493	2-3/4"	1-1/4"
	70378	.2950	M	7.493	3-3/4"	1-7/8"
70729		.2953		7.500	70	32
	70381	.2953		7.500	95	44
70731		.2969	19/64"	7.541	2-3/4"	1-1/4"
	70386	.2969	19/64"	7.541	3-3/4"	1-7/8"
70733		.3020	N	7.671	2-15/16"	1-7/16"
	70391	.3020	N	7.671	3-3/4"	1-7/8"
70735		.3125	5/16"	7.938	2-15/16"	1-7/16"
	70396	.3125	5/16"	7.938	3-3/4"	1-7/8"
70737		.3150		8.000	76	36
	70401	.3150		8.000	95	48
70739		.3160	O	8.026	2-15/16"	1-7/16"
	70406	.3160	O	8.026	3-3/4"	1-7/8"
70741		.3230	P	8.204	2-15/16"	1-7/16"
	70411	.3230	P	8.204	3-3/4"	2-3/32"
70743		.3281	21/64"	8.334	2-15/16"	1-7/16"
	70416	.3281	21/64"	8.334	4"	2-3/32"
70745		.3320	Q	8.433	3"	1-7/16"
	70421	.3320	Q	8.433	4"	2-3/32"
70747		.3346		8.500	76	36
	70426	.3346		8.500	100	53
70749		.3390	R	8.611	3"	1-7/16"
	70431	.3390	R	8.611	4"	2-3/32"
70751		.3438	11/32"	8.733	3"	1-7/16"
	70436	.3438	11/32"	8.733	4"	2-3/16"
70753		.3480	S	8.839	3-1/16"	1-1/2"
	70441	.3480	S	8.839	4"	2-3/16"
70755		.3543		9.000	78	38
	70446	.3543		9.000	100	55
70757		.3580	T	9.093	3-1/16"	1-1/2"
	70451	.3580	T	9.093	4-1/4"	2-9/32"
70759		.3594	23/64"	9.129	3-1/16"	1-1/2"
	70456	.3594	23/64"	9.129	4-1/4"	2-9/32"

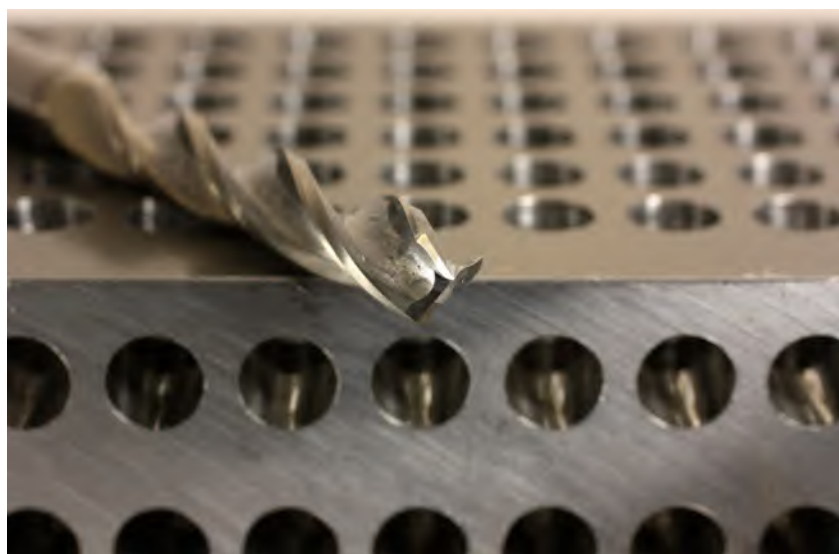
3xD (1160) EDP#	5xD (1180) EDP#	$d^{\dagger}$ Diameter			l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
		Decimal		Metric			
70761		.3680	U	9.347	3-1/8"	1-9/16"	1.171"
	70461	.3680	U	9.347	4-1/4"	2-9/32"	1.907"
70763		.3740		9.500	79	39	30
	70466	.3740		9.500	108	58	49
70765		.3750	3/8"	9.525	3-1/8"	1-9/16"	1.193"
	70471	.3750	3/8"	9.525	4-1/4"	2-3/8"	1.943"
70767		.3760		9.550	3-1/8"	1-9/16"	1.196"
	70913	.3760		9.550	4-1/4"	2-3/8"	1.948"
70769		.3770	V	9.576	3-1/4"	1-5/8"	1.200"
	70476	.3770	V	9.576	4-1/4"	2-3/8"	1.954"
70771		.3860	W	9.804	3-1/4"	1-5/8"	1.228"
	70481	.3860	W	9.804	4-1/2"	2-3/8"	2.000"
70773		.3906	25/64"	9.921	3-1/4"	1-5/8"	1.243"
	70486	.3906	25/64"	9.921	4-1/2"	2-3/8"	2.024"
70775		.3937		10.000	84	43	32
	70491	.3937		10.000	114	60	52
70777		.3970	X	10.084	3-5/16"	1-11/16"	1.263"
	70496	.3970	X	10.084	4-1/2"	2-1/2"	2.057"
70779		.4040	Y	10.262	3-5/16"	1-11/16"	1.286"
	70501	.4040	Y	10.262	4-1/2"	2-9/16"	2.094"
70781		.4062	13/32"	10.317	3-5/16"	1-11/16"	1.293"
	70506	.4062	13/32"	10.317	4-1/2"	2-9/16"	2.105"
70783		.4134		10.500	85	43	33
	70511	.4134		10.500	114	67	54
70785		.4219	27/64"	10.716	3-3/8"	1-11/16"	1.343"
	70516	.4219	27/64"	10.716	4-1/2"	2-11/16"	2.186"
70787		.4331		11.000	87	45	35
	70521	.4331		11.000	114	68	57
70789		.4375	7/16"	11.113	3-7/16"	1-3/4"	1.392"
	70526	.4375	7/16"	11.113	4-3/4"	2-13/16"	2.267"
70791		.4528		11.500	90	47	37
	70531	.4528		11.500	120	70	60
70793		.4531	29/64"	11.509	3-9/16"	1-13/16"	1.442"
	70536	.4531	29/64"	11.509	4-3/4"	2-7/8"	2.348"
70795		.4688	15/32"	11.909	3-11/16"	2-1/16"	1.491"
	70541	.4688	15/32"	11.909	4-3/4"	2-7/8"	2.429"
70797		.4724		12.000	93	53	38
	70546	.4724		12.000	120	73	62
70799		.4844	31/64"	12.304	3-11/16"	2-1/16"	1.541"
	70551	.4844	31/64"	12.304	5-5/16"	3"	2.510"
70801		.4921		12.500	95	53	40
	70556	.4921		12.500	135	75	65
70803		.5000	1/2"	12.700	3-3/4"	2-1/16"	1.591"
	70561	.5000	1/2"	12.700	5-3/8"	3-1/16"	2.591"
70805		.5010		12.725	3-3/4"	2-1/16"	1.594"
	70915	.5010		12.725	5-3/8"	3-1/16"	2.596"
70807		.5118		13.000	107	55	41
	70566	.5118		13.000	136	78	67

continued →

Series 1160, 1180 (continued)

.5156" - .6299"
(13.096mm - 16.000mm)

3xD (1160) EDP#	5xD (1180) EDP#	$d^{\dagger}$ Diameter			l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
		Decimal		Metric			
70809		.5156	33/64"	13.096	4-1/4"	2-3/16"	1.641"
	70571	.5156	33/64"	13.096	5-3/8"	3-1/8"	2.672"
70811		.5312	17/32"	13.492	4-1/4"	2-1/4"	1.690"
	70576	.5312	17/32"	13.492	5-11/16"	3-5/16"	2.753"
70813		.5469	35/64"	13.891	4-1/4"	2-1/4"	1.740"
	70581	.5469	35/64"	13.891	5-13/16"	3-3/8"	2.834"
70815		.5512		14.000	107	59	45
	70586	.5512		14.000	148	86	73
70817		.5625	9/16"	14.287	4-1/2"	2-3/8"	1.790"
	70591	.5625	9/16"	14.287	5-15/16"	3-1/2"	2.915"
70819		.5781	37/64"	14.683	4-1/2"	2-1/2"	1.840"
	70596	.5781	37/64"	14.683	6"	3-1/2"	2.996"
70821		.5906		15.000	115	64	48
	70601	.5906		15.000	152	90	78
70823		.5938	19/32"	15.082	4-1/2"	2-1/2"	1.890"
	70606	.5938	19/32"	15.082	6"	3-9/16"	3.077"
70825		.6094	39/64"	15.478	4-1/2"	2-9/16"	1.939"
	70611	.6094	39/64"	15.478	6-3/16"	3-11/16"	3.158"
70827		.6250	5/8"	15.875	4-1/2"	2-5/8"	1.989"
	70616	.6250	5/8"	15.875	6-5/16"	3-3/4"	3.239"
70829		.6299		16.000	115	66	51
	70621	.6299		16.000	160	95	83



*1180 Series
High Performance Drill in aluminum*

TOLERANCES

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



Series 1550H, 1250H, 1850H

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

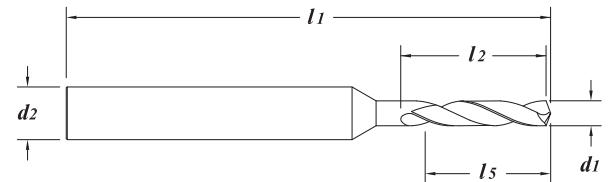
Recommended for high nickel, high temperature alloys, cobalt-based alloys, stainless steels, and tool steels >40 Rc

BALIQ® ALTINOS Coating (AlTiN-based)

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	l_5 Max Drill Depth
Decimal				Metric				
00100			.0312	1/32"	0.792	1/8"	2"	5/32"
	00304		.0312	1/32"	0.792	1/8"	2"	15/64"
		00510	.0312	1/32"	0.792	1/8"	2"	7/16"
	00306		.0315		0.800	3.0	50	6.0
		00512	.0315		0.800	3.0	50	12.0
	00308		.0319		0.810	3.0	50	6.0
00106			.0320	#67	0.812	1/8"	2"	11/64"
	00310		.0320	#67	0.812	1/8"	2"	15/64"
		00516	.0320	#67	0.812	1/8"	2"	7/16"
		00518	.0323		0.820	3.0	50	12.0
00112			.0330	#66	0.838	1/8"	2"	11/64"
	00316		.0330	#66	0.838	1/8"	2"	15/64"
		00522	.0330	#66	0.838	1/8"	2"	7/16"
	00318		.0331		0.840	3.0	50	6.0
		00524	.0331		0.840	3.0	50	12.0
00116			.0335		0.850	3.0	50	4.5
		00526	.0335		0.850	3.0	50	12.0
	00322		.0339		0.860	3.0	50	6.5
		00528	.0339		0.860	3.0	50	13.0
00120			.0343		0.870	3.0	50	4.5
		00530	.0343		0.870	3.0	50	13.0
00122			.0346		0.880	3.0	50	4.5
00124			.0350	#65	0.890	3.0	50	4.5
	00328		.0350	#65	0.890	3.0	50	6.5
		00534	.0350	#65	0.890	3.0	50	13.0
	00330		.0354		0.900	3.0	50	6.5
		00536	.0354		0.900	3.0	50	13.0

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	l_5 Max Drill Depth
			Decimal	Metric				
	00332		.0358	0.910	3.0	50	6.5	5
00130			.0360	#64	0.914	1/8"	2"	.115"
	00334		.0360	#64	0.914	1/8"	2"	.187"
		00540	.0360	#64	0.914	1/8"	2"	.439"
00134			.0366		0.930	3.0	50	5.0
00136			.0370	#63	0.940	3.0	50	5.0
	00340		.0370	#63	0.940	3.0	50	7.0
		00546	.0370	#63	0.940	3.0	50	14.0
00138			.0374		0.950	3.0	50	5.0
00142			.0380	#62	0.965	1/8"	2"	.120"
	00346		.0380	#62	0.965	1/8"	2"	.197"
		00552	.0380	#62	0.965	1/8"	2"	.463"
		00556	.0386		0.980	3.0	50	14.0
00148			.0390	#61	0.990	3.0	50	5.0
		00558	.0390	#61	0.990	3.0	50	14.0
00150			.0394		1.000	3.0	50	5.0
	00354		.0394		1.000	3.0	50	7.0
		00560	.0394		1.000	3.0	50	14.0
00152			.0400	#60	1.016	1/8"	2"	.127"
	00356		.0400	#60	1.016	1/8"	2"	.207"
		00562	.0400	#60	1.016	1/8"	2"	.487"
00154			.0410	#59	1.041	1/8"	2"	.131"
	00358		.0410	#59	1.041	1/8"	2"	.213"
		00564	.0410	#59	1.041	1/8"	2"	.500"
00156			.0413		1.050	3.0	50	5.5
	00360		.0413		1.050	3.0	50	7.5
		00566	.0413		1.050	3.0	50	15.0
00158			.0420	#58	1.066	1/8"	2"	.134"
	00362		.0420	#58	1.066	1/8"	2"	.218"
00160			.0430	#57	1.092	1/8"	2"	.137"
	00364		.0430	#57	1.092	1/8"	2"	.223"
		00570	.0430	#57	1.092	1/8"	2"	.524"
00162			.0433		1.100	3.0	50	5.5
	00366		.0433		1.100	3.0	50	8.0
		00572	.0433		1.100	3.0	50	16.0
00164			.0453		1.150	3.0	50	6.0
	00368		.0453		1.150	3.0	50	8.0
		00574	.0453		1.150	3.0	50	16.0
00166			.0465	#56	1.181	1/8"	2"	.148"
	00370		.0465	#56	1.181	1/8"	2"	.241"
		00576	.0465	#56	1.181	1/8"	2"	.567"

3xD (1550H) EDP#	5xD (1250H) EDP#	12xD (1850H) EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	$l5$ Max Drill Depth
			Decimal	Metric				
00168			.0469	3/64"	1.191	1/8"	2"	.149"
	00372		.0469	3/64"	1.191	1/8"	2"	.243"
		00578	.0469	3/64"	1.191	1/8"	5/8"	.571"
00170			.0472		1.200	3.0	6.0	4
	00374		.0472		1.200	3.0	50	6
		00580	.0472		1.200	3.0	50	15
00172			.0492		1.250	3.0	50	4
	00376		.0492		1.250	3.0	50	6
		00582	.0492		1.250	3.0	50	15
00174			.0512		1.300	3.0	50	4
	00378		.0512		1.300	3.0	50	7
		00584	.0512		1.300	3.0	50	16
00176			.0520	#55	1.320	1/8"	2"	.166"
	00380		.0520	#55	1.320	1/8"	2"	.270"
		00586	.0520	#55	1.320	1/8"	2"	.634"
00178			.0531		1.350	3.0	50	4
	00382		.0531		1.350	3.0	50	7
		00588	.0531		1.350	3.0	50	16
00180			.0550	#54	1.397	1/8"	2"	.175"
	00384		.0550	#54	1.397	1/8"	2"	.285"
		00590	.0550	#54	1.397	1/8"	2"	.670"
00182			.0551		1.400	3.0	50	4
	00386		.0551		1.400	3.0	50	7
		00592	.0551		1.400	3.0	65	17
00184			.0571		1.450	3.0	50	5
	00388		.0571		1.450	3.0	50	8
		00594	.0571		1.450	3.0	65	18
00186			.0591		1.500	3.0	50	5
	00390		.0591		1.500	3.0	50	8
		00596	.0591		1.500	3.0	65	18
00188			.0595	#53	1.511	1/8"	2"	.189"
	00392		.0595	#53	1.511	1/8"	2"	.308"
		00598	.0595	#53	1.511	1/8"	2-1/2"	.725"
00190			.0610		1.550	3.0	50	5
	00394		.0610		1.550	3.0	50	8
		00600	.0610		1.550	3.0	65	19
00192			.0625	1/16"	1.587	1/8"	2"	.199"
	00396		.0625	1/16"	1.587	1/8"	2"	.324"
		00602	.0625	1/16"	1.587	1/8"	2-1/2"	.761"
00194			.0630		1.600	3.0	50	6
	00398		.0630		1.600	3.0	50	8
		00604	.0630		1.600	3.0	65	19
00196			.0635	#52	1.613	1/8"	2"	.202"
	00400		.0635	#52	1.613	1/8"	2"	.329"
		00606	.0635	#52	1.613	1/8"	2-1/2"	.774"
00198			.0650		1.650	3.0	50	5
	00402		.0650		1.650	3.0	50	9
		00608	.0650		1.650	3.0	65	20
00200			.0669		1.700	3.0	50	5
	00404		.0669		1.700	3.0	50	9
		00610	.0669		1.700	3.0	65	21
00202			.0670	#51	1.702	1/8"	2"	.213"
	00406		.0670	#51	1.702	1/8"	2"	.347"
		00612	.0670	#51	1.702	1/8"	2-1/2"	.816"
00204			.0689		1.750	3.0	50	6
	00408		.0689		1.750	3.0	50	9
		00614	.0689		1.750	3.0	65	21

continued →

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

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



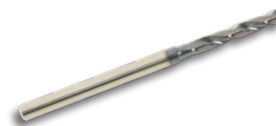
TOLERANCES

$d1$	+0.000" - .0004" (+.000 - .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

BALIQ® ALTINOS Coating (AlTiN-based)

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	$l5$ Max Drill Depth
			Decimal	Metric				
00206			.0700	#50 1.778	1/8"	2"	23/64"	.223"
	00410		.0700	#50 1.778	1/8"	2"	1/2"	.363"
		00616	.0700	#50 1.778	1/8"	2-1/2"	1"	.853"
00208			.0709	1.800	3.0	50	9.0	6
	00412		.0709	1.800	3.0	50	13.0	9
		00618	.0709	1.800	3.0	65	26.0	22
00210			.0728	1.850	3.0	50	9.5	6
		00620	.0728	1.850	3.0	65	26.0	23
00212			.0730	#49 1.854	1/8"	2"	3/8"	.232"
	00416		.0730	#49 1.854	1/8"	2"	1/2"	.378"
		00622	.0730	#49 1.854	1/8"	2-1/2"	1"	.889"
00214			.0748	1.900	3.0	50	9.5	6
	00418		.0748	1.900	3.0	50	13.5	10
		00624	.0748	1.900	3.0	65	27.0	23
00216			.0760	#48 1.930	1/8"	2"	3/8"	.242"
	00420		.0760	#48 1.930	1/8"	2"	17/32"	.394"
		00626	.0760	#48 1.930	1/8"	2-1/2"	1-1/8"	.926"
00218			.0768	1.950	3.0	50	10.0	6
	00422		.0768	1.950	3.0	50	14.0	10
		00628	.0768	1.950	3.0	65	28.0	24
00220			.0781	5/64" 1.983	1/8"	2"	13/32"	.249"
	00424		.0781	5/64" 1.983	1/8"	2"	9/16"	.405"
		00630	.0781	5/64" 1.983	1/8"	2-1/2"	1-1/8"	.951"
00222			.0785	#47 1.994	1/8"	2"	13/32"	.250"
	00426		.0785	#47 1.994	1/8"	2"	9/16"	.407"
		00632	.0785	#47 1.994	1/8"	2-1/2"	1-1/8"	.956"
00224			.0787	2.000	3.0	50	10.0	6
	00428		.0787	2.000	3.0	50	14.0	10
		00634	.0787	2.000	3.0	65	28.0	24
00226			.0807	2.050	3.0	50	10.5	7
	00430		.0807	2.050	3.0	50	14.0	11
		00636	.0807	2.050	3.0	65	28.0	25
00228			.0810	#46 2.057	1/8"	2"	27/64"	.258"
	00432		.0810	#46 2.057	1/8"	2"	9/16"	.420"
		00638	.0810	#46 2.057	1/8"	2-1/2"	1-1/8"	.987"
00230			.0820	#45 2.083	1/8"	2"	27/64"	.261"
	00434		.0820	#45 2.083	1/8"	2"	9/16"	.425"
		00640	.0820	#45 2.083	1/8"	2-1/2"	1-1/8"	.999"
00232			.0827	2.100	3.0	50	10.5	7
	00436		.0827	2.100	3.0	50	14.5	11
		00642	.0827	2.100	3.0	65	29.0	26
00234			.0846	2.150	3.0	50	11.0	7
	00438		.0846	2.150	3.0	50	14.5	11
		00644	.0846	2.150	3.0	65	29.0	26

3xD (1550H) EDP#	5xD (1250H) EDP#	12xD (1850H) EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	$l5$ Max Drill Depth
			Decimal	Metric				
00236			.0860	#44	2.184	1/8"	2"	.274"
	00440		.0860	#44	2.184	1/8"	2"	.446"
		00646	.0860	#44	2.184	1/8"	2-1/2"	1.048"
00238			.0866		2.200	3.0	50	7
	00442		.0866		2.200	3.0	50	11
		00648	.0866		2.200	3.0	65	27
00240			.0886		2.250	3.0	50	7
00242			.0890	#43	2.260	1/8"	2"	.283"
	00446		.0890	#43	2.260	1/8"	2"	.461"
		00652	.0890	#43	2.260	1/8"	2-1/2"	1.084"
00244			.0906		2.300	3.0	50	7
	00448		.0906		2.300	3.0	50	12
		00654	.0906		2.300	3.0	65	28
00246			.0925		2.350	3.0	50	7
	00450		.0925		2.350	3.0	50	12
		00656	.0925		2.350	3.0	65	29
00248			.0935	#42	2.375	1/8"	2"	.298"
	00452		.0935	#42	2.375	1/8"	2"	.485"
		00658	.0935	#42	2.375	1/8"	3"	1-5/16"
00250			.0938	3/32"	2.382	1/8"	2"	.299"
	00454		.0938	3/32"	2.382	1/8"	2"	.486"
		00660	.0938	3/32"	2.382	1/8"	3"	1-5/16"
00252			.0945		2.400	3.0	50	8
	00456		.0945		2.400	3.0	50	12
		00662	.0945		2.400	3.0	75	29
00254			.0960	#41	2.438	1/8"	2"	.306"
	00458		.0960	#41	2.438	1/8"	2"	.498"
		00664	.0960	#41	2.438	1/8"	3"	1-11/32"
00256			.0965		2.450	3.0	50	8
00258			.0980	#40	2.489	1/8"	2"	.312"
	00462		.0980	#40	2.489	1/8"	2"	.508"
		00668	.0980	#40	2.489	1/8"	3"	1-3/8"
00260			.0984		2.500	3.0	50	8
	00464		.0984		2.500	3.0	50	13
		00670	.0984		2.500	3.0	75	30
00262			.0995	#39	2.527	1/8"	2"	.317"
	00466		.0995	#39	2.527	1/8"	2"	.516"
		00672	.0995	#39	2.527	1/8"	3"	1-3/8"
00264			.1004		2.550	3.0	50	8
	00468		.1004		2.550	3.0	50	13
		00674	.1004		2.550	3.0	75	31
00266			.1015	#38	2.578	1/8"	2"	.323"
	00470		.1015	#38	2.578	1/8"	2"	.526"
		00676	.1015	#38	2.578	1/8"	3"	1-13/32"
00268			.1024		2.600	3.0	50	8
	00472		.1024		2.600	3.0	50	13
		00678	.1024		2.600	3.0	75	32
00270			.1040	#37	2.641	1/8"	2"	.331"
	00474		.1040	#37	2.641	1/8"	2"	.539"
		00680	.1040	#37	2.641	1/8"	3"	1-7/16"
00272			.1043		2.650	3.0	50	8
	00476		.1043		2.650	3.0	50	14
		00682	.1043		2.650	3.0	75	32

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	l_5 Max Drill Depth
			Decimal	Metric				
00274			.1063	2.700	3.0	50	13.5	9
	00478		.1063	2.700	3.0	50	19.0	14
		00684	.1063	2.700	3.0	75	38.0	33
00276			.1065	#36 2.705	1/8"	2"	17/32"	.339"
	00480		.1065	#36 2.705	1/8"	2"	3/4"	.552"
		00686	.1065	#36 2.705	1/8"	3"	1-1/2"	1.297"
00278			.1083	2.750	3.0	50	14.0	9
	00482		.1083	2.750	3.0	50	19.5	14
		00688	.1083	2.750	3.0	75	39.0	34
00280			.1094	7/64" 2.778	1/8"	2"	9/16"	.348"
	00484		.1094	7/64" 2.778	1/8"	2"	49/64"	.567"
		00690	.1094	7/64" 2.778	1/8"	3"	1-9/16"	1.333"
00282			.1100	#35 2.794	1/8"	2"	9/16"	.350"
	00486		.1100	#35 2.794	1/8"	2"	49/64"	.570"
		00692	.1100	#35 2.794	1/8"	3"	1-9/16"	1.340"
00284			.1102	2.800	3.0	50	14.0	9
	00488		.1102	2.800	3.0	50	19.5	15
		00694	.1102	2.800	3.0	75	39.0	34
00286			.1110	#34 2.819	1/8"	2"	9/16"	.353"
	00490		.1110	#34 2.819	1/8"	2"	25/32"	.575"
		00696	.1110	#34 2.819	1/8"	3"	1-5/8"	1.352"
00288			.1122	2.850	3.0	50	14.5	9
		00698	.1122	2.850	3.0	75	40.0	35
00290			.1130	#33 2.870	1/8"	2"	19/32"	.356"
	00494		.1130	#33 2.870	1/8"	2"	51/64"	.586"
		00700	.1130	#33 2.870	1/8"	3"	1-5/8"	1.377"
00292			.1142	2.900	3.0	50	14.5	9
	00496		.1142	2.900	3.0	50	20.0	15
		00702	.1142	2.900	3.0	75	40.0	35
00294			.1160	#32 2.946	1/8"	2"	19/32"	.369"
	00498		.1160	#32 2.946	1/8"	2"	13/16"	.601"
		00704	.1160	#32 2.946	1/8"	3"	1-5/8"	1.413"
00296			.1161	2.950	3.0	50	15.0	9
		00706	.1161	2.950	3.0	75	42.0	36
00298			.1181	3.000	3.0	50	15.0	10
	00502		.1181	3.000	3.0	50	21.0	16
		00708	.1181	3.000	3.0	75	42.0	37
00300			.1200	#31 3.048	1/8"	2"	5/8"	.382"
	00504		.1200	#31 3.048	1/8"	2"	7/8"	.622"
		00710	.1200	#31 3.048	1/8"	3"	1-3/4"	1.462"
00302			.1250	1/8" 3.175	1/8"	2"	5/8"	.398"
	00506		.1250	1/8" 3.175	1/8"	2"	7/8"	.648"
		00712	.1250	1/8" 3.175	1/8"	3"	1-3/4"	1.523"

TOLERANCES

$d1^*$	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")
$d2$	h6	
$l1$	+3.175mm -3.175mm (+.125" -.125")	
$l2$	+3.175mm -3.175mm (+.125" -.125")	
$l4$	+1.980mm -.000mm (+.078" -.000")	



Series 1580HD

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

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

BALIQ® ALTINOS Coating (AlTiN-based)

High performance solid submicron grain carbide drill with reinforced shank

Up to 50% faster than standard carbide drills

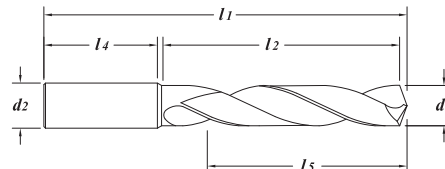
30° helix for better chip evacuation

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#	$d1^+$ Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	$l5$ Max Drill Depth	$l4$ Shank Length
	Decimal	Metric					
20085	.1181	3.000	6.0	62	20	16	36
20095	.1220	3.100	6.0	62	20	15	36
20105	.1248	3.170	6.0	62	20	15	36
20115	.1260	3.200	6.0	62	20	15	36
20125	.1280	3.250	6.0	62	20	15	36
20135	.1299	3.300	6.0	62	20	15	36
20145	.1339	3.400	6.0	62	20	15	36
20155	.1378	3.500	6.0	62	20	15	36
20165	.1417	3.600	6.0	62	20	15	36
20175	.1457	3.700	6.0	62	20	14	36
20185	.1476	3.750	6.0	62	20	14	36
20195	.1496	3.800	6.0	66	24	18	36
20205	.1535	3.900	6.0	66	24	18	36
20215	.1575	4.000	6.0	66	24	18	36
20225	.1614	4.100	6.0	66	24	18	36
20235	.1654	4.200	6.0	66	24	18	36
20245	.1673	4.250	6.0	66	24	18	36
20255	.1693	4.300	6.0	66	24	18	36
20265	.1732	4.400	6.0	66	24	17	36
20275	.1772	4.500	6.0	66	24	17	36
20285	.1811	4.600	6.0	66	24	17	36
20295	.1831	4.650	6.0	66	24	17	36
20305	.1850	4.700	6.0	66	24	17	36
20315	.1870	4.750	6.0	66	24	17	36
20325	.1890	4.800	6.0	66	28	21	36
20335	.1929	4.900	6.0	66	28	21	36
20345	.1969	5.000	6.0	66	28	21	36
20355	.2008	5.100	6.0	66	28	20	36
20365	.2027	5.150	6.0	66	28	20	36
20375	.2047	5.200	6.0	66	28	20	36
20385	.2087	5.300	6.0	66	28	20	36
20395	.2165	5.500	6.0	66	28	20	36
20405	.2185	5.550	6.0	66	28	20	36
20408	.2205	5.600	6.0	66	28	20	36
20412	.2244	5.700	6.0	66	28	19	36
20415	.2283	5.800	6.0	66	28	19	36
20425	.2323	5.900	6.0	66	28	19	36
20435	.2342	5.950	6.0	66	28	19	36

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_5 Max Drill Depth	l_4 Shank Length
	Decimal	Metric					
20445	.2362	6.000	6.0	66	28	19	36
20448	.2402	6.100	8.0	79	34	25	36
20452	.2441	6.200	8.0	79	34	25	36
20454	.2480	6.300	8.0	79	34	25	36
20455	.2500	6.350	8.0	79	34	24	36
20462	.2520	6.400	8.0	79	34	24	36
20465	.2559	6.500	8.0	79	34	24	36
20468	.2571	6.530	8.0	79	34	24	36
20472	.2598	6.600	8.0	79	34	24	36
20473	.2638	6.700	8.0	79	34	24	36
20475	.2657	6.750	8.0	79	34	24	36
20485	.2677	6.800	8.0	79	34	24	36
20495	.2717	6.900	8.0	79	34	24	36
20505	.2756	7.000	8.0	79	34	24	36
20515	.2795	7.100	8.0	79	41	30	36
20525	.2815	7.150	8.0	79	41	30	36
20535	.2835	7.200	8.0	79	41	30	36
20542	.2874	7.300	8.0	79	41	30	36
20545	.2913	7.400	8.0	79	41	30	36
20555	.2953	7.500	8.0	79	41	30	36
20565	.2972	7.550	8.0	79	41	30	36
20575	.2992	7.600	8.0	79	41	30	36
20585	.3031	7.700	8.0	79	41	29	36
20595	.3071	7.800	8.0	79	41	29	36
20605	.3130	7.950	8.0	79	41	29	36
20615	.3150	8.000	8.0	79	41	29	36
20622	.3189	8.100	10.0	89	47	35	40
20625	.3228	8.200	10.0	89	47	35	40
20635	.3268	8.300	10.0	89	47	35	40
20645	.3287	8.350	10.0	89	47	34	40
20652	.3307	8.400	10.0	89	47	34	40
20655	.3346	8.500	10.0	89	47	34	40
20665	.3386	8.600	10.0	89	47	34	40
20675	.3425	8.700	10.0	89	47	34	40
20685	.3445	8.750	10.0	89	47	34	40
20695	.3465	8.800	10.0	89	47	34	40
20705	.3504	8.900	10.0	89	47	34	40
20715	.3543	9.000	10.0	89	47	34	40
20725	.3583	9.100	10.0	89	47	33	40
20735	.3602	9.150	10.0	89	47	33	40
20745	.3622	9.200	10.0	89	47	33	40
20755	.3661	9.300	10.0	89	47	33	40
20762	.3701	9.400	10.0	89	47	33	40
20765	.3740	9.500	10.0	89	47	33	40
20775	.3760	9.550	10.0	89	47	33	40
20778	.3780	9.600	10.0	89	47	33	40
20782	.3819	9.700	10.0	89	47	32	40
20785	.3858	9.800	10.0	89	47	32	40
20795	.3898	9.900	10.0	89	47	32	40
20805	.3937	10.000	10.0	89	47	32	40
20812	.3976	10.100	12.0	102	55	40	45
20815	.4016	10.200	12.0	102	55	40	45
20825	.4055	10.300	12.0	102	55	40	45
20835	.4134	10.500	12.0	102	55	39	45
20842	.4173	10.600	12.0	102	55	39	45
20845	.4213	10.700	12.0	102	55	39	45
20855	.4252	10.800	12.0	102	55	39	45

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth	l_4 Shank Length
	Decimal	Metric					
20865	.4331	11.000	12.0	102	55	38	45
20875	.4370	11.100	12.0	102	55	38	45
20885	.4409	11.200	12.0	102	55	38	45
20892	.4488	11.400	12.0	102	55	38	45
20895	.4528	11.500	12.0	102	55	38	45
20905	.4606	11.700	12.0	102	55	37	45
20915	.4685	11.900	12.0	102	55	37	45
20925	.4724	12.000	12.0	102	55	37	45
20935	.4764	12.100	14.0	107	60	42	45
20941	.4803	12.200	14.0	107	60	42	45
20945	.4842	12.300	14.0	107	60	42	45
20955	.4921	12.500	14.0	107	60	41	45
20961	.4961	12.600	14.0	107	60	41	45
20965	.5000	12.700	14.0	107	60	41	45
20975	.5039	12.800	14.0	107	60	41	45
20978	.5051	12.830	14.0	107	60	41	45
20981	.5079	12.900	14.0	107	60	41	45
20982	.5098	12.950	14.0	107	60	41	45
20985	.5118	13.000	14.0	107	60	41	45
20995	.5157	13.100	14.0	107	60	40	45
20998	.5236	13.300	14.0	107	60	40	45
21005	.5315	13.500	14.0	107	60	40	45
21015	.5394	13.700	14.0	107	60	39	45
21025	.5433	13.800	14.0	107	60	39	45
21035	.5512	14.000	14.0	107	60	39	45
21045	.5551	14.100	16.0	115	65	44	48
21053	.5591	14.200	16.0	115	65	44	48
21055	.5610	14.250	16.0	115	65	44	48
21065	.5630	14.300	16.0	115	65	44	48
21075	.5709	14.500	16.0	115	65	43	48
21085	.5787	14.700	16.0	115	65	43	48
21105	.5906	15.000	16.0	115	65	43	48
21115	.5945	15.100	16.0	115	65	42	48
21125	.6102	15.500	16.0	115	65	42	48
21135	.6181	15.700	16.0	115	65	41	48
21145	.6220	15.800	16.0	115	65	41	48
21155	.6299	16.000	16.0	115	65	41	48
21159	.6331	16.080	18.0	123	73	49	48
21175	.6496	16.500	18.0	123	73	48	48
21185	.6555	16.650	18.0	123	73	48	48
21195	.6693	17.000	18.0	123	73	48	48
21215	.6870	17.450	18.0	123	73	47	48
21225	.6890	17.500	18.0	123	73	47	48
21235	.7027	17.850	18.0	123	73	46	48
21245	.7087	18.000	18.0	123	73	46	48
21255	.7185	18.250	20.0	131	79	52	50
21265	.7283	18.500	20.0	131	79	51	50
21275	.7342	18.650	20.0	131	79	51	50
21295	.7500	19.050	20.0	131	79	50	50
21304	.7598	19.300	20.0	131	79	50	50
21315	.7677	19.500	20.0	131	79	50	50
21325	.7815	19.850	20.0	131	79	49	50
21335	.7874	20.000	20.0	131	79	49	50

Series 1580H, 1280H

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



TOLERANCES

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

BALIQ® ALTINOS Coating (AlTiN-based)

High performance - high penetration solid submicron grain carbide drill

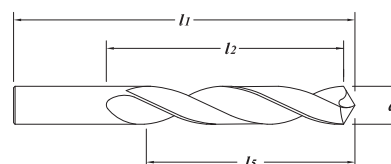
Extended tool life and greater surface finish through faster SFM rates

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#	$d^{\dagger}$ Diameter		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
		Decimal	Metric			
20301		.1181	3.000	46	16	10
	21301	.1181	3.000	50	19	16
20306		.1200	#31	3.048	1-13/16"	5/8"
	21306	.1200	#31	3.048	2"	3/4"
20311		.1250	1/8"	3.175	1-15/16"	11/16"
	21311	.1250	1/8"	3.175	2"	3/4"
20316		.1285	#30	3.264	1-15/16"	11/16"
	21316	.1285	#30	3.264	2-1/4"	3/4"
20321		.1360	#29	3.454	2-1/16"	3/4"
	21321	.1360	#29	3.454	2-1/4"	7/8"
20326		.1378		3.500	52	19
	21326	.1378		3.500	57	22
20331		.1405	#28	3.569	2-1/16"	3/4"
	21331	.1405	#28	3.569	2-1/4"	7/8"
20336		.1406	9/64"	3.571	2-1/16"	3/4"
	21336	.1406	9/64"	3.571	2-1/4"	7/8"
20341		.1440	#27	3.658	2-1/16"	3/4"
	21341	.1440	#27	3.658	2-1/4"	7/8"
20346		.1470	#26	3.734	2-3/16"	13/16"
	21346	.1470	#26	3.734	2-1/4"	7/8"
20351		.1495	#25	3.797	2-3/16"	13/16"
	21351	.1495	#25	3.797	2-1/4"	15/16"
20356		.1520	#24	3.861	2-3/16"	13/16"
	21356	.1520	#24	3.861	2-1/4"	15/16"
20361		.1540	#23	3.912	2-3/16"	13/16"
	21361	.1540	#23	3.912	2-1/4"	15/16"
20366		.1562	5/32"	3.967	2-3/16"	13/16"
	21366	.1562	5/32"	3.967	2-1/2"	15/16"
20371		.1570	#22	3.988	2-3/16"	13/16"
	21371	.1570	#22	3.988	2-1/2"	15/16"
20376		.1575		4.000	56	21
	21376	.1575		4.000	65	24
20381		.1590	#21	4.039	2-3/16"	13/16"
	21381	.1590	#21	4.039	2-1/2"	15/16"
20386		.1610	#20	4.089	2-3/16"	13/16"
	21386	.1610	#20	4.089	2-1/2"	15/16"
20391		.1660	#19	4.216	2-9/32"	15/16"
	21391	.1660	#19	4.216	2-1/2"	1"
20396		.1695	#18	4.305	2-9/32"	15/16"
	21396	.1695	#18	4.305	2-1/2"	1"
20401		.1719	11/64"	4.366	2-9/32"	15/16"
	21401	.1719	11/64"	4.366	2-1/2"	1"

3xD (1580H) EDP#	5xD (1280H) EDP#	$d^{\dagger}$			l_1	l_2	l_3
		Decimal	Diameter	Metric	Overall Length	Flute Length	Max Drill Depth
20406		.1730	#17	4.394	2-9/32"	15/16"	.551"
	21406	.1730	#17	4.394	2-1/2"	1"	.897"
20411		.1770	#16	4.496	2-9/32"	15/16"	.563"
	21411	.1770	#16	4.496	2-1/2"	1"	.917"
20416		.1772		4.500	58	24	14
	21416	.1772		4.500	65	25	23
20421		.1800	#15	4.572	2-9/32"	15/16"	.573"
	21421	.1800	#15	4.572	2-3/4"	1"	.933"
20426		.1820	#14	4.623	2-9/32"	15/16"	.579"
	21426	.1820	#14	4.623	2-3/4"	1"	.943"
20431		.1850	#13	4.700	2-9/32"	15/16"	.589"
	21431	.1850	#13	4.700	2-3/4"	1-1/4"	.959"
20436		.1875	3/16"	4.763	2-13/32"	1"	.597"
	21436	.1875	3/16"	4.763	2-3/4"	1-1/4"	.972"
20441		.1890	#12	4.801	2-13/32"	1"	.601"
	21441	.1890	#12	4.801	2-3/4"	1-1/4"	.979"
20446		.1910	#11	4.851	2-13/32"	1"	.608"
	21446	.1910	#11	4.851	2-3/4"	1-1/4"	.990"
20451		.1935	#10	4.915	2-13/32"	1"	.616"
	21451	.1935	#10	4.915	2-3/4"	1-1/4"	1.003"
20456		.1960	#9	4.978	2-13/32"	1"	.624"
	21456	.1960	#9	4.978	3"	1-5/16"	1.016"
20461		.1969		5.000	61	25	16
	21461	.1969		5.000	75	33	26
20466		.1990	#8	5.055	2-13/32"	1"	.633"
	21466	.1990	#8	5.055	3"	1-5/16"	1.031"
20471		.2010	#7	5.105	2-13/32"	1"	.640"
	21471	.2010	#7	5.105	3"	1-5/16"	1.042"
20476		.2031	13/64"	5.159	2-13/32"	1"	.646"
	21476	.2031	13/64"	5.159	3"	1-5/16"	1.053"
20481		.2040	#6	5.182	2-13/32"	1"	.649"
	21481	.2040	#6	5.182	3"	1-3/8"	1.057"
20486		.2055	#5	5.220	2-13/32"	1"	.654"
	21486	.2055	#5	5.220	3"	1-3/8"	1.065"
20491		.2090	#4	5.309	2-13/32"	1"	.665"
	21491	.2090	#4	5.309	3"	1-3/8"	1.083"
20496		.2130	#3	5.410	2-5/8"	1-3/32"	.678"
	21496	.2130	#3	5.410	3"	1-3/8"	1.104"
20501		.2165		5.500	67	28	18
	21501	.2165		5.500	75	35	29
20506		.2188	7/32"	5.558	2-5/8"	1-3/32"	.696"
	21506	.2188	7/32"	5.558	3"	1-3/8"	1.134"
20511		.2210	#2	5.613	2-5/8"	1-3/32"	.703"
	21511	.2210	#2	5.613	3"	1-3/8"	1.145"
20516		.2280	#1	5.791	2-5/8"	1-3/32"	.726"
	21516	.2280	#1	5.791	3"	1-3/8"	1.182"
20521		.2340	A	5.944	2-5/8"	1-3/32"	.745"
	21521	.2340	A	5.944	3-1/4"	1-1/2"	1.213"
20526		.2344	15/64"	5.954	2-5/8"	1-3/32"	.746"
	21526	.2344	15/64"	5.954	3-1/4"	1-1/2"	1.215"
20531		.2362		6.000	67	28	19
	21531	.2362		6.000	80	38	31
20536		.2380	B	6.045	2-3/4"	1-7/32"	.757"
	21536	.2380	B	6.045	3-1/4"	1-5/8"	1.233"

continued →

Series 1580H, 1280H (continued)

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

3xD (1580H) EDP#	5xD (1280H) EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
		Decimal	Metric			
20541		.2420	C	6.147	2-3/4"	1-7/32"
	21541	.2420	C	6.147	3-1/4"	1-5/8"
20546		.2460	D	6.248	2-3/4"	1-7/32"
	21546	.2460	D	6.248	3-1/4"	1-5/8"
20551		.2500	1/4" / E	6.350	2-3/4"	1-7/32"
	21551	.2500	1/4" / E	6.350	3-1/4"	1-5/8"
20556		.2559		6.500	70	31
	21556	.2559		6.500	80	41
20561		.2570	F	6.528	2-3/4"	1-7/32"
	21561	.2570	F	6.528	3-1/4"	1-11/16"
20566		.2610	G	6.629	2-3/4"	1-7/32"
	21566	.2610	G	6.629	3-1/2"	1-11/16"
20571		.2656	17/64"	6.746	2-15/16"	1-11/32"
	21571	.2656	17/64"	6.746	3-1/2"	1-11/16"
20576		.2660	H	6.756	2-15/16"	1-11/32"
	21576	.2660	H	6.756	3-1/2"	1-11/16"
20581		.2720	I	6.909	2-15/16"	1-11/32"
	21581	.2720	I	6.909	3-1/2"	1-11/16"
20586		.2756		7.000	75	34
	21586	.2756		7.000	88	43
20591		.2770	J	7.036	2-15/16"	1-11/32"
	21591	.2770	J	7.036	3-1/2"	1-11/16"
20596		.2810	K	7.137	2-15/16"	1-11/32"
	21596	.2810	K	7.137	3-1/2"	1-3/4"
20601		.2812	9/32"	7.142	2-15/16"	1-11/32"
	21601	.2812	9/32"	7.142	3-1/2"	1-3/4"
20606		.2900	L	7.366	2-15/16"	1-11/32"
	21606	.2900	L	7.366	3-1/2"	1-3/4"
20611		.2950	M	7.493	2-15/16"	1-11/32"
	21611	.2950	M	7.493	3-3/4"	1-3/4"
20616		.2953		7.500	75	34
	21616	.2953		7.500	95	44
20621		.2969	19/64"	7.541	3-3/32"	1-15/32"
	21621	.2969	19/64"	7.541	3-3/4"	1-7/8"
20626		.3020	N	7.671	3-3/32"	1-15/32"
	21626	.3020	N	7.671	3-3/4"	1-7/8"
20631		.3125	5/16"	7.938	3-3/32"	1-15/32"
	21631	.3125	5/16"	7.938	3-3/4"	1-7/8"
20636		.3150		8.000	79	37
	21636	.3150		8.000	95	48
20641		.3160	O	8.026	3-3/32"	1-15/32"
	21641	.3160	O	8.026	3-3/4"	1-7/8"
20646		.3230	P	8.204	3-3/32"	1-15/32"
	21646	.3230	P	8.204	3-3/4"	2-3/32"
20651		.3281	21/64"	8.334	3-3/32"	1-15/32"
	21651	.3281	21/64"	8.334	4"	2-3/32"
20656		.3320	Q	8.433	3-3/32"	1-15/32"
	21656	.3320	Q	8.433	4"	2-3/32"
20661		.3346		8.500	79	37
	21661	.3346		8.500	100	53
20666		.3390	R	8.611	3-5/16"	1-9/16"
	21666	.3390	R	8.611	4"	2-3/32"
20671		.3438	11/32"	8.733	3-5/16"	1-9/16"
	21671	.3438	11/32"	8.733	4"	2-3/16"

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)



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

BALIQ® ALTINOS Coating (AlTiN-based)

High performance - high penetration solid submicron grain carbide drill



HIGH PERFORMANCE
DRILLS

3xD (1580H) EDP#	5xD (1280H) EDP#	d + Diameter		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
		Decimal	Metric			
20676		.3480	S	8.839	3-5/16"	1.107"
	21676	.3480	S	8.839	4"	1.803"
20681		.3543		9.000	84	29
	21681	.3543		9.000	100	47
20686		.3580	T	9.093	3-5/16"	1.139"
	21686	.3580	T	9.093	4-1/4"	1.855"
20691		.3594	23/64"	9.129	3-5/16"	1.144"
	21691	.3594	23/64"	9.129	4-1/4"	1.862"
20696		.3680	U	9.347	3-5/16"	1.171"
	21696	.3680	U	9.347	4-1/4"	1.907"
20701		.3740		9.500	84	30
	21701	.3740		9.500	105	49
20706		.3750	3/8"	9.525	3-1/2"	1.193"
	21706	.3750	3/8"	9.525	4-1/4"	1.943"
20711		.3770	V	9.576	3-1/2"	1.200"
	21711	.3770	V	9.576	4-1/4"	1.954"
20716		.3860	W	9.804	3-1/2"	1.228"
	21716	.3860	W	9.804	4-1/2"	2.000"
20721		.3906	25/64"	9.921	3-1/2"	1.243"
	21721	.3906	25/64"	9.921	4-1/2"	2.024"
20726		.3937		10.000	89	32
	21726	.3937		10.000	115	52
20731		.3970	X	10.084	3-1/2"	1.263"
	21731	.3970	X	10.084	4-1/2"	2.057"
20736		.4040	Y	10.262	3-1/2"	1.286"
	21736	.4040	Y	10.262	4-1/2"	2.094"
20741		.4062	13/32"	10.317	3-1/2"	1.293"
	21741	.4062	13/32"	10.317	4-1/2"	2.105"
20746		.4130	Z	10.490	3-1/2"	1.314"
	21746	.4130	Z	10.490	4-1/2"	2.140"
20751		.4134		10.500	89	33
	21751	.4134		10.500	115	54
20756		.4219	27/64"	10.716	3-3/4"	1.343"
	21756	.4219	27/64"	10.716	4-1/2"	2.186"
20761		.4331		11.000	95	35
	21761	.4331		11.000	115	57
20766		.4375	7/16"	11.113	3-3/4"	1.392"
	21766	.4375	7/16"	11.113	4-3/4"	2.267"
20771		.4528		11.500	95	37
	21771	.4528		11.500	120	60
20776		.4531	29/64"	11.509	3-3/4"	1.442"
	21776	.4531	29/64"	11.509	4-3/4"	2.348"

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	l_5 Max Drill Depth
		Decimal				
20781		.4688	15/32"	11.908	4"	1-15/16"
	21781	.4688	15/32"	11.908	4-3/4"	2-7/8"
20786		.4724		12.000	102	38
	21786	.4724		12.000	120	62
20791		.4844	31/64"	12.304	4"	1-15/16"
	21791	.4844	31/64"	12.304	5-5/16"	3"
20796		.4921		12.500	102	49
	21796	.4921		12.500	135	76
20801		.5000	1/2"	12.700	4"	1-15/16"
	21801	.5000	1/2"	12.700	5-3/8"	3-1/16"
20806		.5118		13.000	107	53
	21806	.5118		13.000	135	78
20811		.5156	33/64"	13.096	4-7/32"	2-3/32"
	21811	.5156	33/64"	13.096	5-3/8"	3-1/8"
20816		.5312	17/32"	13.492	4-7/32"	2-3/32"
	21816	.5312	17/32"	13.492	5-11/16"	3-5/16"
20821		.5315		13.500	110	56
	21821	.5315		13.500	145	84
20826		.5469	35/64"	13.891	4-5/16"	2-7/32"
	21826	.5469	35/64"	13.891	5-13/16"	3-3/8"
20831		.5512		14.000	110	56
	21831	.5512		14.000	145	86
20836		.5625	9/16"	14.288	4-9/16"	2-15/32"
	21836	.5625	9/16"	14.288	5-15/16"	3-1/2"
20841		.5709		14.500	116	63
	21841	.5709		14.500	150	89
20846		.5781	37/64"	14.684	4-15/16"	2-9/16"
	21846	.5781	37/64"	14.684	6"	3-1/2"
20851		.5906		15.000	125	65
	21851	.5906		15.000	150	90
20856		.5938	19/32"	15.083	4-15/16"	2-9/16"
	21856	.5938	19/32"	15.083	6"	3-9/16"
20861		.6094	39/64"	15.479	5-1/16"	2-13/16"
	21861	.6094	39/64"	15.479	6-3/16"	3-11/16"
20866		.6102		15.500	129	71
	21866	.6102		15.500	160	94
20871		.6250	5/8"	15.875	5-1/4"	3-1/8"
	21871	.6250	5/8"	15.875	6-5/16"	3-3/4"
20876		.6299		16.000	133	79
	21876	.6299		16.000	160	95



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")	



Series 1580KD, 1280KD, 1880KD

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

TECH
PAGES
340-341

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

BALIQ® ALTINOS Coating (AlTiN-based)

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

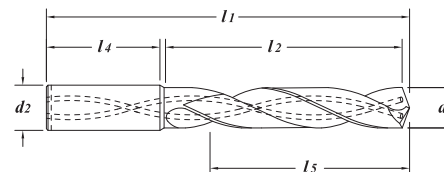
30° helix for better chip evacuation

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#	<i>d1</i> Diameter		<i>d2</i> Shank Diameter	<i>l1</i> Overall Length	<i>l2</i> Flute Length	<i>l5</i> Max Drill Depth	<i>l4</i> Shank Length	
			Decimal	Metric						
27995			.1181	3.000	6.0	62	20	16	36	
	25065		.1181	3.000	6.0	66	28	24	36	
		26942	.1181	3.000	6.0	70	30	26	36	
28005			.1220	3.100	6.0	62	20	15	36	
	25075		.1220	3.100	6.0	66	28	23	36	
28015			.1248	3.170	6.0	62	20	15	36	
	25085		.1248	3.170	6.0	66	28	23	36	
		26946	.1248	3.170	6.0	70	30	25	36	
28018			.1250	1/8"	3.175	6.0	62	20	15	36
	25088		.1250	1/8"	3.175	6.0	66	28	23	36
		26948	.1250	1/8"	3.175	6.0	70	30	25	36
28025			.1260	3.200	6.0	62	20	15	36	
	25095		.1260	3.200	6.0	66	28	23	36	
		26950	.1260	3.200	6.0	70	30	25	36	
28035			.1280	3.250	6.0	62	20	15	36	
	25105		.1280	3.250	6.0	66	28	23	36	
		26952	.1280	3.250	6.0	70	30	25	36	
28038			.1285	#30	3.264	6.0	62	20	15	36
	25108		.1285	#30	3.264	6.0	66	28	23	36
		26954	.1285	#30	3.264	6.0	70	30	25	36
28045			.1299	3.300	6.0	62	20	15	36	
	25115		.1299	3.300	6.0	66	28	23	36	
		26956	.1299	3.300	6.0	70	30	25	36	
28055			.1339	3.400	6.0	62	20	15	36	
	25125		.1339	3.400	6.0	66	28	23	36	
28058			.1360	#29	3.454	6.0	62	20	15	36
	25128		.1360	#29	3.454	6.0	66	28	23	36
		26960	.1360	#29	3.454	6.0	70	30	25	36
28065			.1378	3.500	6.0	62	20	15	36	
	25135		.1378	3.500	6.0	66	28	23	36	
		26962	.1378	3.500	6.0	75	37	32	36	
28075			.1417	3.600	6.0	62	20	15	36	
	25145		.1417	3.600	6.0	66	28	23	36	
28085			.1457	3.700	6.0	62	20	14	36	
	25155		.1457	3.700	6.0	66	28	22	36	
28088			.1470	#26	3.734	6.0	62	20	14	36
	25158		.1470	#26	3.734	6.0	66	28	22	36
		26968	.1470	#26	3.734	6.0	75	37	31	36

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	$l5$ Max Drill Depth	$l4$ Shank Length
			Decimal	Metric					
28095			.1476	3.750	6.0	62	20	14	36
	25165		.1476	3.750	6.0	66	28	22	36
		26972	.1476	3.750	6.0	75	37	31	36
28098			.1495	#25 3.797	6.0	62	20	14	36
	25172		.1495	#25 3.797	6.0	66	28	22	36
		26978	.1495	#25 3.797	6.0	75	37	31	36
28105			.1496	3.800	6.0	66	24	18	36
	25175		.1496	3.800	6.0	74	36	30	36
28115			.1535	3.900	6.0	66	24	18	36
	25185		.1535	3.900	6.0	74	36	30	36
		26982	.1535	3.900	6.0	75	37	31	36
28118			.1562	5/32" 3.967	6.0	66	24	18	36
	25192		.1562	5/32" 3.967	6.0	74	36	30	36
		26984	.1562	5/32" 3.967	6.0	75	37	31	36
28125			.1563	3.970	6.0	66	24	18	36
	25195		.1563	3.970	6.0	74	36	30	36
28135			.1575	4.000	6.0	66	24	18	36
	25205		.1575	4.000	6.0	74	36	30	36
		26986	.1575	4.000	6.0	75	37	31	36
28138			.1590	#21 4.038	6.0	66	24	18	36
	25208		.1590	#21 4.038	6.0	74	36	30	36
		26988	.1590	#21 4.038	6.0	75	37	31	36
28140			.1610	#20 4.089	6.0	66	24	18	36
	25212		.1610	#20 4.089	6.0	74	36	30	36
		26990	.1610	#20 4.089	6.0	75	37	31	36
28145			.1614	4.100	6.0	66	24	18	36
	25215		.1614	4.100	6.0	74	36	30	36
		26992	.1614	4.100	6.0	75	37	31	36
28155			.1654	4.200	6.0	66	24	18	36
	25225		.1654	4.200	6.0	74	36	30	36
		26994	.1654	4.200	6.0	75	37	31	36
28158			.1660	#19 4.216	6.0	66	24	18	36
	25228		.1660	#19 4.216	6.0	74	36	30	36
		26996	.1660	#19 4.216	6.0	85	45	39	36
28165			.1673	4.250	6.0	66	24	18	36
	25235		.1673	4.250	6.0	74	36	30	36
		26998	.1673	4.250	6.0	85	45	39	36
28175			.1693	4.300	6.0	66	24	18	36
	25245		.1693	4.300	6.0	74	36	30	36
28178			.1719	11/64" 4.366	6.0	66	24	17	36
	25248		.1719	11/64" 4.366	6.0	74	36	29	36
		27002	.1719	11/64" 4.366	6.0	85	45	38	36
28185			.1732	4.400	6.0	66	24	17	36
	25255		.1732	4.400	6.0	74	36	29	36
		27004	.1732	4.400	6.0	85	45	38	36
28188			.1770	#16 4.496	6.0	66	24	17	36
	25262		.1770	#16 4.496	6.0	74	36	29	36
		27006	.1770	#16 4.496	6.0	85	45	38	36
28195			.1772	4.500	6.0	66	24	17	36
	25265		.1772	4.500	6.0	74	36	29	36
		27008	.1772	4.500	6.0	85	45	38	36
28205			.1811	4.600	6.0	66	24	17	36
	25275		.1811	4.600	6.0	74	36	29	36
		27011	.1811	4.600	6.0	85	45	38	36
28208			.1820	#14 4.622	6.0	66	24	17	36
	25280		.1820	#14 4.622	6.0	74	36	29	36
		27012	.1820	#14 4.622	6.0	90	50	43	36

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

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

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>l5</i> Max Drill Depth	<i>l4</i> Shank Length	
			Decimal	Metric						
	25285		.1831	4.650	6.0	74	36	29	36	
		27014	.1831	4.650	6.0	90	50	43	36	
28225			.1850	4.700	6.0	66	24	17	36	
	25295		.1850	4.700	6.0	74	36	29	36	
28235			.1870	4.750	6.0	66	24	17	36	
	25305		.1870	4.750	6.0	74	36	29	36	
		27016	.1870	4.750	6.0	90	50	43	36	
28238			.1875	3/16"	4.762	6.0	66	28	21	36
	25310		.1875	3/16"	4.762	6.0	74	36	29	36
		27018	.1875	3/16"	4.762	6.0	90	50	43	36
28245			.1890	#12	4.800	6.0	66	28	21	36
	25315		.1890	#12	4.800	6.0	82	44	37	36
		27021	.1890	#12	4.800	6.0	90	50	43	36
28255			.1929	4.900	6.0	66	28	21	36	
	25325		.1929	4.900	6.0	82	44	37	36	
		27022	.1929	4.900	6.0	90	50	43	36	
28258			.1960	#9	4.978	6.0	66	28	21	36
	25330		.1960	#9	4.978	6.0	82	44	37	36
		27024	.1960	#9	4.978	6.0	90	50	43	36
28265			.1969	5.000	6.0	66	28	21	36	
	25335		.1969	5.000	6.0	82	44	37	36	
		27026	.1969	5.000	6.0	90	50	43	36	
28275			.2008	5.100	6.0	66	28	20	36	
	25345		.2008	5.100	6.0	82	44	36	36	
28278			.2010	#7	5.105	6.0	66	28	20	36
	25348		.2010	#7	5.105	6.0	82	44	36	36
		27031	.2010	#7	5.105	6.0	97	57	49	36
28285			.2027	5.150	6.0	66	28	20	36	
	25355		.2027	5.150	6.0	82	44	36	36	
28295			.2047	5.200	6.0	66	28	20	36	
	25365		.2047	5.200	6.0	82	44	36	36	
28305			.2087	5.300	6.0	66	28	20	36	
	25375		.2087	5.300	6.0	82	44	36	36	
28308			.2130	#3	5.410	6.0	66	28	20	36
	25380		.2130	#3	5.410	6.0	82	44	36	36
		27036	.2130	#3	5.410	6.0	97	57	49	36
28315			.2165	5.500	6.0	66	28	20	36	
	25385		.2165	5.500	6.0	82	44	36	36	
		27038	.2165	5.500	6.0	97	57	49	36	
28325			.2185	5.550	6.0	66	28	20	36	
	25395		.2185	5.550	6.0	82	44	36	36	
28328			.2188	7/32"	5.557	6.0	66	28	20	36
	25398		.2188	7/32"	5.557	6.0	82	44	36	36
		27041	.2188	7/32"	5.557	6.0	97	57	49	36
28335			.2205	5.600	6.0	66	28	20	36	
	25397		.2205	5.600	6.0	82	44	36	36	
		27042	.2205	5.600	6.0	97	57	49	36	
28345			.2244	5.700	6.0	66	28	19	36	
	25400		.2244	5.700	6.0	82	44	35	36	
		27044	.2244	5.700	6.0	97	57	48	36	
28348			.2280	#1	5.791	6.0	66	28	19	36
	25403		.2280	#1	5.791	6.0	82	44	35	36
		27046	.2280	#1	5.791	6.0	97	57	48	36
28355			.2283	5.800	6.0	66	28	19	36	
	25405		.2283	5.800	6.0	82	44	35	36	
		27048	.2283	5.800	6.0	97	57	48	36	

continued →

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

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

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>l5</i> Max Drill Depth	<i>l4</i> Shank Length
			Decimal	Metric					
28365			.2323	5.900	6.0	66	28	19	36
	25415		.2323	5.900	6.0	82	44	35	36
		27051	.2323	5.900	6.0	97	57	48	36
28375			.2342	5.950	6.0	66	28	19	36
	25425		.2342	5.950	6.0	82	44	35	36
		27052	.2342	5.950	6.0	97	57	48	36
28385			.2362	6.000	6.0	66	28	19	36
	25435		.2362	6.000	6.0	82	44	35	36
		27054	.2362	6.000	6.0	97	57	48	36
28395			.2402	6.100	8.0	79	34	25	36
	25437		.2402	6.100	8.0	91	53	44	36
28405			.2441	6.200	8.0	79	34	25	36
	25440		.2441	6.200	8.0	91	53	44	36
28415			.2480	6.300	8.0	79	34	25	36
	25443		.2480	6.300	8.0	91	53	44	36
28425			.2500	1/4"	6.350	8.0	79	34	36
	25445		.2500	1/4"	6.350	8.0	91	53	36
		27056	.2500	1/4"	6.350	8.0	106	66	36
28435			.2520	6.400	8.0	79	34	24	36
	25450		.2520	6.400	8.0	91	53	43	36
		27058	.2520	6.400	8.0	106	66	56	36
28445			.2559	6.500	8.0	79	34	24	36
	25455		.2559	6.500	8.0	91	53	43	36
		27061	.2559	6.500	8.0	106	66	56	36
28446			.2571	6.530	8.0	79	34	24	36
	25457		.2571	6.530	8.0	91	53	43	36
		27062	.2571	6.530	8.0	106	66	56	36
28455			.2598	6.600	8.0	79	34	24	36
	25460		.2598	6.600	8.0	91	53	43	36
		27064	.2598	6.600	8.0	106	66	56	36
	25463		.2638	6.700	8.0	91	53	43	36
		27066	.2638	6.700	8.0	106	66	56	36
28463			.2656	17/64"	6.746	8.0	79	34	36
	25464		.2656	17/64"	6.746	8.0	91	53	36
		27068	.2656	17/64"	6.746	8.0	106	66	36
28465			.2657	6.750	8.0	79	34	24	36
	25465		.2657	6.750	8.0	91	53	43	36
28475			.2677	6.800	8.0	79	34	24	36
	25475		.2677	6.800	8.0	91	53	43	36
		27071	.2677	6.800	8.0	106	66	56	36
28485			.2717	6.900	8.0	79	34	24	36
	25485		.2717	6.900	8.0	91	53	43	36
		27072	.2717	6.900	8.0	116	76	66	36
28495			.2756	7.000	8.0	79	34	24	36
	25495		.2756	7.000	8.0	91	53	43	36
		27074	.2756	7.000	8.0	116	76	66	36
28498			.2770	J	7.035	8.0	79	41	36
	25498		.2770	J	7.035	8.0	91	53	36
		27076	.2770	J	7.035	8.0	116	76	36
28505			.2795	7.100	8.0	79	41	30	36
	25505		.2795	7.100	8.0	91	53	42	36
28508			.2812	9/32"	7.142	8.0	79	41	36
	25512		.2812	9/32"	7.142	8.0	91	53	36
		27079	.2812	9/32"	7.142	8.0	116	76	36

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>l5</i> Max Drill Depth	<i>l4</i> Shank Length
			Decimal	Metric					
28515			.2815	7.150	8.0	79	41	30	36
	25515		.2815	7.150	8.0	91	53	42	36
		27082	.2815	7.150	8.0	116	76	65	36
28525			.2835	7.200	8.0	79	41	30	36
	25525		.2835	7.200	8.0	91	53	42	36
28535			.2874	7.300	8.0	79	41	30	36
	25530		.2874	7.300	8.0	91	53	42	36
28545			.2913	7.400	8.0	79	41	30	36
	25535		.2913	7.400	8.0	91	53	42	36
28555			.2953	7.500	8.0	79	41	30	36
	25545		.2953	7.500	8.0	91	53	42	36
		27086	.2953	7.500	8.0	116	76	65	36
28565			.2972	7.550	8.0	79	41	30	36
	25555		.2972	7.550	8.0	91	53	42	36
		27088	.2972	7.550	8.0	116	76	65	36
28575			.2992	7.600	8.0	79	41	30	36
	25565		.2992	7.600	8.0	91	53	42	36
28578			.3020	N 7.670	8.0	79	41	29	36
	25570		.3020	N 7.670	8.0	91	53	41	36
		27092	.3020	N 7.670	8.0	116	76	64	36
28585			.3031	7.700	8.0	79	41	29	36
	25575		.3031	7.700	8.0	91	53	41	36
28595			.3071	7.800	8.0	79	41	29	36
	25585		.3071	7.800	8.0	91	53	41	36
		27096	.3071	7.800	8.0	116	76	64	36
28602			.3125	5/16" 7.937	8.0	79	41	29	36
	25593		.3125	5/16" 7.937	8.0	91	53	41	36
		27101	.3125	5/16" 7.937	8.0	116	76	64	36
28605			.3130	7.950	8.0	79	41	29	36
	25595		.3130	7.950	8.0	91	53	41	36
		27102	.3130	7.950	8.0	116	76	64	36
28615			.3150	8.000	8.0	79	41	29	36
	25605		.3150	8.000	8.0	91	53	41	36
		27104	.3150	8.000	8.0	116	76	64	36
28625			.3189	8.100	10.0	89	47	35	40
	25610		.3189	8.100	10.0	103	61	49	40
28635			.3228	8.200	10.0	89	47	35	40
	25615		.3228	8.200	10.0	103	61	49	40
28638			.3230	P 8.204	10.0	89	47	35	40
	25618		.3230	P 8.204	10.0	103	61	49	40
		27108	.3230	P 8.204	10.0	131	87	75	40
28645			.3268	8.300	10.0	89	47	35	40
	25625		.3268	8.300	10.0	103	61	49	40
28648			.3281	21/64" 8.333	10.0	89	47	35	40
	25628		.3281	21/64" 8.333	10.0	103	61	49	40
		27112	.3281	21/64" 8.333	10.0	131	87	75	40
28655			.3287	8.350	10.0	89	47	34	40
	25635		.3287	8.350	10.0	103	61	48	40
		27114	.3287	8.350	10.0	131	87	74	40
28665			.3307	8.400	10.0	89	47	34	40
	25640		.3307	8.400	10.0	103	61	48	40
28675			.3346	8.500	10.0	89	47	34	40
	25645		.3346	8.500	10.0	103	61	48	40
		27118	.3346	8.500	10.0	131	87	74	40
28685			.3386	8.600	10.0	89	47	34	40
	25655		.3386	8.600	10.0	103	61	48	40
		27121	.3386	8.600	10.0	131	87	74	40

continued →

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

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

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>l5</i> Max Drill Depth	<i>l4</i> Shank Length
			Decimal	Metric					
28688			.3390	R	8.610	10.0	89	47	40
	25658		.3390	R	8.610	10.0	103	61	48
		27122	.3390	R	8.610	10.0	131	87	74
28695			.3425		8.700	10.0	89	47	34
	25665		.3425		8.700	10.0	103	61	48
		27124	.3425		8.700	10.0	131	87	74
28698			.3438	11/32"	8.732	10.0	89	47	34
	25670		.3438	11/32"	8.732	10.0	103	61	48
		27126	.3438	11/32"	8.732	10.0	131	87	74
28725			.3445		8.750	10.0	89	47	34
	25675		.3445		8.750	10.0	103	61	48
		27128	.3445		8.750	10.0	131	87	74
28735			.3465		8.800	10.0	89	47	34
	25685		.3465		8.800	10.0	103	61	48
		27130	.3465		8.800	10.0	131	87	74
28745			.3504		8.900	10.0	89	47	34
	25695		.3504		8.900	10.0	103	61	48
28755			.3543		9.000	10.0	89	47	34
	25705		.3543		9.000	10.0	103	61	48
		27134	.3543		9.000	10.0	131	87	74
28765			.3583		9.100	10.0	89	47	33
	25715		.3583		9.100	10.0	103	61	47
28768			.3594	23/64"	9.128	10.0	89	47	33
	25720		.3594	23/64"	9.128	10.0	103	61	47
		27138	.3594	23/64"	9.128	10.0	139	95	84
	25725		.3602		9.150	10.0	103	61	47
		27140	.3602		9.150	10.0	139	95	81
28815			.3622		9.200	10.0	89	47	33
	25735		.3622		9.200	10.0	103	61	47
28825			.3661		9.300	10.0	89	47	33
	25745		.3661		9.300	10.0	103	61	47
28845			.3701		9.400	10.0	89	47	33
	25750		.3701		9.400	10.0	103	61	47
28855			.3740		9.500	10.0	89	47	33
	25755		.3740		9.500	10.0	103	61	47
		27146	.3740		9.500	10.0	139	95	81
28858			.3750	3/8"	9.525	10.0	89	47	33
	25760		.3750	3/8"	9.525	10.0	103	61	47
		27148	.3750	3/8"	9.525	10.0	139	95	81
28875			.3760		9.550	10.0	89	47	33
	25765		.3760		9.550	10.0	103	61	47
		27150	.3760		9.550	10.0	139	95	81
28878			.3780		9.600	10.0	89	47	33
	25767		.3780		9.600	10.0	103	61	47
		27152	.3780		9.600	10.0	139	95	81
28882			.3819		9.700	10.0	89	47	32
	25770		.3819		9.700	10.0	103	61	46
28885			.3858		9.800	10.0	89	47	32
	25775		.3858		9.800	10.0	103	61	46
28895			.3898		9.900	10.0	89	47	32
	25785		.3898		9.900	10.0	103	61	46
		27160	.3898		9.900	10.0	139	95	80
28898			.3906	25/64"	9.920	10.0	89	47	32
	25787		.3906	25/64"	9.920	10.0	103	61	46
		27162	.3906	25/64"	9.920	10.0	139	95	80

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>l5</i> Max Drill Depth	<i>l4</i> Shank Length
			Decimal	Metric					
28905			.3937	10.000	10.0	89	47	32	40
	25795		.3937	10.000	10.0	103	61	46	40
		27164	.3937	10.000	10.0	139	95	80	40
28925			.3976	10.100	12.0	102	55	40	45
	25800		.3976	10.100	12.0	118	71	56	45
28935			.4016	10.200	12.0	102	55	40	45
	25805		.4016	10.200	12.0	118	71	56	45
28945			.4055	10.300	12.0	102	55	40	45
	25815		.4055	10.300	12.0	118	71	56	45
		27170	.4055	10.300	12.0	155	106	91	45
28948			.4062 13/32"	10.317	12.0	102	55	40	45
	25817		.4062 13/32"	10.317	12.0	118	71	56	45
		27172	.4062 13/32"	10.317	12.0	155	106	91	45
28953			.4130 Z	10.490	12.0	102	55	39	45
	25823		.4130 Z	10.490	12.0	118	71	55	45
		27178	.4130 Z	10.490	12.0	155	106	90	45
28955			.4134	10.500	12.0	102	55	39	45
	25825		.4134	10.500	12.0	118	71	55	45
		27180	.4134	10.500	12.0	155	106	90	45
28965			.4173	10.600	12.0	102	55	39	45
	25830		.4173	10.600	12.0	118	71	55	45
		27182	.4173	10.600	12.0	155	106	90	45
28975			.4213	10.700	12.0	102	55	39	45
	25835		.4213	10.700	12.0	118	71	55	45
		27184	.4213	10.700	12.0	155	106	90	45
28978			.4219 27/64"	10.716	12.0	102	55	39	45
	25838		.4219 27/64"	10.716	12.0	118	71	55	45
		27186	.4219 27/64"	10.716	12.0	155	106	90	45
28985			.4252	10.800	12.0	102	55	39	45
	25845		.4252	10.800	12.0	118	71	55	45
28995			.4331	11.000	12.0	102	55	39	45
	25855		.4331	11.000	12.0	118	71	55	45
		27190	.4331	11.000	12.0	163	114	98	45
29005			.4370	11.100	12.0	102	55	38	45
	25865		.4370	11.100	12.0	118	71	54	45
29008			.4375 7/16"	11.112	12.0	102	55	38	45
	25868		.4375 7/16"	11.112	12.0	118	71	54	45
		27194	.4375 7/16"	11.112	12.0	163	114	97	45
29015			.4409	11.200	12.0	102	55	38	45
	25875		.4409	11.200	12.0	118	71	54	45
29025			.4488	11.400	12.0	102	55	38	45
	25880		.4488	11.400	12.0	118	71	54	45
29035			.4528	11.500	12.0	102	55	38	45
	25885		.4528	11.500	12.0	118	71	54	45
29038			.4531 29/64"	11.508	12.0	102	55	38	45
	25888		.4531 29/64"	11.508	12.0	118	71	54	45
		27200	.4531 29/64"	11.508	12.0	163	114	97	45
29045			.4606	11.700	12.0	102	55	37	45
	25895		.4606	11.700	12.0	118	71	53	45
29055			.4685	11.900	12.0	102	55	37	45
29058			.4688 15/32"	11.907	12.0	102	55	37	45
	25910		.4688 15/32"	11.907	12.0	118	71	53	45
		27208	.4688 15/32"	11.907	12.0	163	114	96	45

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>l5</i> Max Drill Depth	<i>l4</i> Shank Length	
			Decimal	Metric						
29065			.4724	12.000	12.0	102	55	37	45	
	25915		.4724	12.000	12.0	118	71	53	45	
		27210	.4724	12.000	12.0	163	114	96	45	
29075			.4764	12.100	14.0	107	60	42	45	
	25925		.4764	12.100	14.0	124	77	59	45	
29085			.4803	12.200	14.0	107	60	42	45	
	25930		.4803	12.200	14.0	124	77	59	45	
29095			.4842	12.300	14.0	107	60	42	45	
	25935		.4842	12.300	14.0	124	77	59	45	
29098			.4844	31/64"	12.303	14.0	107	60	42	45
	25937		.4844	31/64"	12.303	14.0	124	77	59	45
		27214	.4844	31/64"	12.303	14.0	182	133	115	45
29115			.4921	12.500	14.0	107	60	41	45	
	25945		.4921	12.500	14.0	124	77	58	45	
		27218	.4921	12.500	14.0	182	133	114	45	
29125			.4961	12.600	14.0	107	60	41	45	
	25950		.4961	12.600	14.0	124	77	58	45	
29135			.5000	1/2"	12.700	14.0	107	60	41	45
	25955		.5000	1/2"	12.700	14.0	124	77	58	45
		27220	.5000	1/2"	12.700	14.0	182	133	114	45
29145			.5039	12.800	14.0	107	60	41	45	
	25960		.5039	12.800	14.0	124	77	58	45	
29148			.5051	12.830	14.0	107	60	41	45	
	25961		.5051	12.830	14.0	124	77	58	45	
		27224	.5051	12.830	14.0	182	133	114	45	
29155			.5079	12.900	14.0	107	60	41	45	
		27226	.5079	12.900	14.0	182	133	114	45	
29161			.5098	12.950	14.0	107	60	41	45	
		27228	.5098	12.950	14.0	182	133	114	45	
29165			.5118	13.000	14.0	107	60	41	45	
	25965		.5118	13.000	14.0	124	77	58	45	
		27230	.5118	13.000	14.0	182	133	114	45	
29175			.5157	13.100	14.0	107	60	40	45	
	25975		.5157	13.100	14.0	124	77	57	45	
29181			.5236	13.300	14.0	107	60	40	45	
29184			.5312	17/32"	13.492	14.0	107	40	45	
	25983		.5312	17/32"	13.492	14.0	124	77	57	45
		27238	.5312	17/32"	13.492	14.0	182	133	113	45
29185			.5315	13.500	14.0	107	60	40	45	
	25985		.5315	13.500	14.0	124	77	57	45	
		27240	.5315	13.500	14.0	182	133	113	45	
29195			.5394	13.700	14.0	107	60	39	45	
	25995		.5394	13.700	14.0	124	77	56	45	
29205			.5433	13.800	14.0	107	60	39	45	
	26005		.5433	13.800	14.0	124	77	56	45	
29215			.5512	14.000	14.0	107	60	39	45	
	26015		.5512	14.000	14.0	124	77	56	45	
		27250	.5512	14.000	14.0	182	133	112	45	
29225			.5551	14.100	16.0	115	65	44	48	
	26025		.5551	14.100	16.0	133	83	62	48	
29235			.5591	14.200	16.0	115	65	44	48	
	26027		.5591	14.200	16.0	133	83	62	48	
29245			.5610	14.250	16.0	115	65	44	48	

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>l5</i> Max Drill Depth	<i>l4</i> Shank Length
			Decimal	Metric					
29250			.5625	9/16"	14.287	16.0	115	65	44
	26042		.5625	9/16"	14.287	16.0	133	83	62
		27254	.5625	9/16"	14.287	16.0	204	152	131
29255			.5630		14.300	16.0	115	65	44
	26045		.5630		14.300	16.0	133	83	62
29265			.5709		14.500	16.0	115	65	43
	26055		.5709		14.500	16.0	133	83	61
		27258	.5709		14.500	16.0	204	152	130
29275			.5787		14.700	16.0	115	65	43
	26065		.5787		14.700	16.0	133	83	61
29285			.5827		14.800	16.0	115	65	43
29305			.5906		15.000	16.0	115	65	43
	26075		.5906		15.000	16.0	133	83	61
		27264	.5906		15.000	16.0	204	152	130
29308			.5938	19/32"	15.082	16.0	115	65	42
	26083		.5938	19/32"	15.082	16.0	133	83	60
29315			.5945		15.100	16.0	115	65	42
	26085		.5945		15.100	16.0	133	83	60
		27268	.5945		15.100	16.0	204	152	129
29325			.6102		15.500	16.0	115	65	42
	26095		.6102		15.500	16.0	133	83	60
	26105		.6181		15.700	16.0	133	83	59
29345			.6220		15.800	16.0	115	65	41
	26107		.6220		15.800	16.0	133	83	59
		27276	.6220		15.800	16.0	204	152	128
29348			.6250	5/8"	15.875	16.0	115	65	41
	26108		.6250	5/8"	15.875	16.0	133	83	59
		27278	.6250	5/8"	15.875	16.0	204	152	128
	26115		.6299		16.000	16.0	133	83	59
		27282	.6299		16.000	16.0	204	152	128
29363			.6331		16.080	18.0	123	73	49
	26118		.6331		16.080	18.0	143	93	69
29365			.6339		16.100	18.0	123	73	49
	26119		.6339		16.100	18.0	143	93	69
	26123		.6378		16.200	18.0	143	93	69
29375			.6398		16.250	18.0	123	73	49
	26125		.6398		16.250	18.0	143	93	69
29385			.6496		16.500	18.0	123	73	48
	26135		.6496		16.500	18.0	143	93	68
29395			.6555		16.650	18.0	123	73	48
	26145		.6555		16.650	18.0	143	93	68
29405			.6693		17.000	18.0	123	73	48
	26155		.6693		17.000	18.0	143	93	68
29415			.6713		17.050	18.0	123	73	47
	26165		.6713		17.050	18.0	143	93	67
29425			.6870		17.450	18.0	123	73	47
	26175		.6870		17.450	18.0	143	93	67
29435			.6890		17.500	18.0	123	73	47
	26185		.6890		17.500	18.0	143	93	67
29445			.7027		17.850	18.0	123	73	46
	26195		.7027		17.850	18.0	143	93	66
29455			.7087		18.000	18.0	123	73	46
	26205		.7087		18.000	18.0	143	93	66
	26215		.7185		18.250	20.0	153	101	74
	26225		.7283		18.500	20.0	153	101	73

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>l5</i> Max Drill Depth	<i>l4</i> Shank Length
			Decimal	Metric					
	26235		.7342	18.650	20.0	153	101	73	50
	26245		.7480	19.000	20.0	153	101	73	50
29505			.7500	3/4"	19.050	20.0	131	79	50
	26255		.7500	3/4"	19.050	20.0	153	101	72
29545			.7579	19.250	20.0	131	79	50	50
29551			.7598	19.300	20.0	131	79	50	50
29565			.7677	19.500	20.0	131	79	50	50
	26281		.7795	19.800	20.0	153	101	71	50
29595			.7815	19.850	20.0	131	79	49	50
29605			.7874	20.000	20.0	131	79	49	50



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)



TECH
PAGES
340-341

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

BALIQ® ALTINOS Coating (AlTiN-based)

High performance - high penetration solid submicron grain carbide drill

Coolant through capabilities for high pressure coolant systems

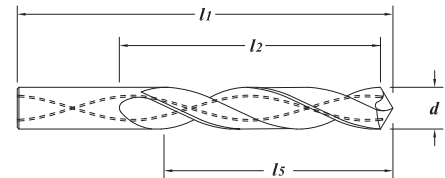
Extended tool life and greater surface finish through faster SFM rates

Up to 70% faster than standard carbide drills

30° helix for better chip evacuation

Honed cutting edge

Live tooling recommended on lathe processes



3xD (1580KH) EDP#	5xD (1280KH) EDP#	7xD (1880KH) EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
			Decimal	Metric			
22010			.1181	3.000	46	16	10
	25366		.1181	3.000	50	19	16
		26366	.1181	3.000	65	28	22
22015			.1200	#31 3.048	1-13/16"	5/8"	.382"
	25371		.1200	#31 3.048	2"	3/4"	.622"
		26371	.1200	#31 3.048	2-1/2"	1-1/8"	.862"
22020			.1250	1/8" 3.175	1-15/16"	11/16"	.398"
	25376		.1250	1/8" 3.175	2"	3/4"	.648"
		26376	.1250	1/8" 3.175	2-1/2"	1-1/8"	.898"
22025			.1285	#30 3.264	1-15/16"	11/16"	.409"
	25381		.1285	#30 3.264	2-1/4"	3/4"	.666"
		26381	.1285	#30 3.264	2-1/2"	1-1/8"	.923"
22030			.1360	#29 3.454	2-1/16"	3/4"	.433"
	25386		.1360	#29 3.454	2-1/4"	7/8"	.705"
		26386	.1360	#29 3.454	3"	1-1/4"	.977"
22035			.1378	3.500	52	19	11
	25391		.1378	3.500	57	22	18
		26391	.1378	3.500	75	32	25
22040			.1405	#28 3.569	2-1/16"	3/4"	.447"
	25396		.1405	#28 3.569	2-1/4"	7/8"	.728"
		26396	.1405	#28 3.569	3"	1-1/4"	1.009"
22045			.1406	9/64" 3.571	2-1/16"	3/4"	.447"
	25401		.1406	9/64" 3.571	2-1/4"	7/8"	.729"
		26401	.1406	9/64" 3.571	3"	1-1/4"	1.010"
22050			.1440	#27 3.658	2-1/16"	3/4"	.458"
	25406		.1440	#27 3.658	2-1/4"	7/8"	.746"
		26406	.1440	#27 3.658	3"	1-3/8"	1.034"
22055			.1470	#26 3.734	2-3/16"	13/16"	.468"
	25411		.1470	#26 3.734	2-1/4"	7/8"	.762"
		26411	.1470	#26 3.734	3"	1-3/8"	1.056"
22060			.1495	#25 3.797	2-3/16"	13/16"	.476"
	25416		.1495	#25 3.797	2-1/4"	15/16"	.775"
		26416	.1495	#25 3.797	3"	1-3/8"	1.074"
22065			.1520	#24 3.861	2-3/16"	13/16"	.484"
	25421		.1520	#24 3.861	2-1/4"	15/16"	.788"
		26421	.1520	#24 3.861	3"	1-1/2"	1.092"
22070			.1540	#23 3.912	2-3/16"	13/16"	.490"
	25426		.1540	#23 3.912	2-1/4"	15/16"	.798"
		26426	.1540	#23 3.912	3"	1-1/2"	1.106"

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	l_5 Max Drill Depth
			Decimal				
22075			.1562	5/32"	3.967	2-3/16"	.497"
	25431		.1562	5/32"	3.967	2-1/2"	.809"
		26431	.1562	5/32"	3.967	3"	1.122"
22080			.1570	#22	3.988	2-3/16"	.500"
	25436		.1570	#22	3.988	2-1/2"	.814"
		26436	.1570	#22	3.988	3"	1.128"
22085			.1575		4.000	56	21
	25441		.1575		4.000	65	24
		26441	.1575		4.000	75	38
22090			.1590	#21	4.039	2-3/16"	.506"
	25446		.1590	#21	4.039	2-1/2"	.824"
		26446	.1590	#21	4.039	3"	1.142"
22095			.1610	#20	4.089	2-3/16"	.512"
	25451		.1610	#20	4.089	2-1/2"	.834"
		26451	.1610	#20	4.089	3"	1.156"
22100			.1660	#19	4.216	2-9/32"	.528"
	25456		.1660	#19	4.216	2-1/2"	.860"
		26456	.1660	#19	4.216	3"	1.192"
22105			.1695	#18	4.305	2-9/32"	.539"
	25461		.1695	#18	4.305	2-1/2"	.878"
		26461	.1695	#18	4.305	3-1/2"	1.217"
22110			.1719	11/64"	4.366	2-9/32"	.547"
	25466		.1719	11/64"	4.366	2-1/2"	.891"
		26466	.1719	11/64"	4.366	3-1/2"	1.235"
22115			.1730	#17	4.394	2-9/32"	.551"
	25471		.1730	#17	4.394	2-1/2"	.897"
		26471	.1730	#17	4.394	3-1/2"	1.243"
22120			.1770	#16	4.496	2-9/32"	.563"
	25476		.1770	#16	4.496	2-1/2"	.913"
		26476	.1770	#16	4.496	3-1/2"	1.271"
22125			.1772		4.500	58	24
	25481		.1772		4.500	65	25
		26481	.1772		4.500	88	45
22130			.1800	#15	4.572	2-9/32"	.573"
	25486		.1800	#15	4.572	2-3/4"	.917"
		26486	.1800	#15	4.572	3-1/2"	1.293"
22135			.1820	#14	4.623	2-9/32"	.579"
	25491		.1820	#14	4.623	2-3/4"	.933"
		26491	.1820	#14	4.623	3-1/2"	1.307"
22140			.1850	#13	4.699	2-9/32"	.589"
	25496		.1850	#13	4.699	2-3/4"	.959"
		26496	.1850	#13	4.699	3-1/2"	1.329"
22145			.1875	3/16"	4.763	2-13/32"	.597"
	25501		.1875	3/16"	4.763	2-3/4"	.972"
		26501	.1875	3/16"	4.763	4"	2"
22150			.1890	#12	4.801	2-13/32"	.601"
	25506		.1890	#12	4.801	2-3/4"	.979"
		26506	.1890	#12	4.801	4"	2"
22155			.1910	#11	4.851	2-13/32"	.608"
	25511		.1910	#11	4.851	2-3/4"	.990"
		26511	.1910	#11	4.851	4"	2"
22160			.1935	#10	4.915	2-13/32"	.616"
	25516		.1935	#10	4.915	2-3/4"	1.003"
		26516	.1935	#10	4.915	4"	2"

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	l_5 Max Drill Depth
			Decimal	Metric			
22165			.1960	#9	4.978	2-13/32"	.624"
	25521		.1960	#9	4.978	3"	1.016"
		26521	.1960	#9	4.978	4"	1.408"
22170			.1969		5.000	61	16
	25526		.1969		5.000	75	26
		26526	.1969		5.000	100	36
22175			.1990	#8	5.055	2-13/32"	.633"
	25531		.1990	#8	5.055	3"	1.031"
		26531	.1990	#8	5.055	4"	1.429"
22180			.2010	#7	5.105	2-13/32"	.640"
	25536		.2010	#7	5.105	3"	1.042"
		26536	.2010	#7	5.105	4"	1.444"
22185			.2031	13/64"	5.159	2-13/32"	.646"
	25541		.2031	13/64"	5.159	3"	1.053"
		26541	.2031	13/64"	5.159	4"	1.459"
22190			.2040	#6	5.182	2-13/32"	.649"
	25546		.2040	#6	5.182	3"	1.057"
		26546	.2040	#6	5.182	4"	1.465"
22195			.2055	#5	5.220	2-13/32"	.654"
	25551		.2055	#5	5.220	3"	1.065"
		26551	.2055	#5	5.220	4"	1.476"
22200			.2090	#4	5.309	2-13/32"	.665"
	25556		.2090	#4	5.309	3"	1.083"
		26556	.2090	#4	5.309	4"	1.501"
22205			.2130	#3	5.410	2-5/8"	.678"
	25561		.2130	#3	5.410	3"	1.104"
		26561	.2130	#3	5.410	4"	1.530"
22210			.2165		5.500	67	18
	25566		.2165		5.500	75	29
		26566	.2165		5.500	100	40
22215			.2188	7/32"	5.558	2-5/8"	.696"
	25571		.2188	7/32"	5.558	3"	1.134"
		26571	.2188	7/32"	5.558	4"	1.571"
22220			.2210	#2	5.613	2-5/8"	.703"
	25576		.2210	#2	5.613	3"	1.145"
		26576	.2210	#2	5.613	4"	1.587"
22225			.2280	#1	5.791	2-5/8"	.726"
	25581		.2280	#1	5.791	3"	1.182"
		26581	.2280	#1	5.791	4-1/8"	1.638"
22230			.2340	A	5.944	2-5/8"	.745"
	25586		.2340	A	5.944	3-1/4"	1.213"
		26586	.2340	A	5.944	4-1/8"	1.681"
22235			.2344	15/64"	5.954	2-5/8"	.746"
	25591		.2344	15/64"	5.954	3-1/4"	1.215"
		26591	.2344	15/64"	5.954	4-1/8"	1.684"
22240			.2362		6.000	67	19
	25596		.2362		6.000	80	31
		26596	.2362		6.000	105	43
22245			.2380	B	6.045	2-3/4"	.757"
	25601		.2380	B	6.045	3-1/4"	1.233"
		26601	.2380	B	6.045	4-1/8"	1.709"
22250			.2420	C	6.147	2-3/4"	.770"
	25606		.2420	C	6.147	3-1/4"	1.254"
		26606	.2420	C	6.147	4-1/4"	1.738"

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	l_5 Max Drill Depth
			Decimal		Metric		
22255			.2460	D	6.248	2-3/4"	1-7/32"
	25611		.2460	D	6.248	3-1/4"	1-5/8"
		26611	.2460	D	6.248	4-1/4"	2-1/4"
22260			.2500	1/4" / E	6.350	2-3/4"	1-7/32"
	25616		.2500	1/4" / E	6.350	3-1/4"	1-5/8"
		26616	.2500	1/4" / E	6.350	4-1/4"	2-1/4"
22265			.2559		6.500	70	31
	25621		.2559		6.500	80	41
		26621	.2559		6.500	105	58
22270			.2570	F	6.528	2-3/4"	1-7/32"
	25626		.2570	F	6.528	3-1/4"	1-11/16"
		26626	.2570	F	6.528	4-3/8"	2-3/8"
22275			.2610	G	6.629	2-3/4"	1-7/32"
	25631		.2610	G	6.629	3-1/2"	1-11/16"
		26631	.2610	G	6.629	4-3/8"	2-3/8"
22280			.2656	17/64"	6.746	2-15/16"	1-11/32"
	25636		.2656	17/64"	6.746	3-1/2"	1-11/16"
		26636	.2656	17/64"	6.746	4-3/8"	2-3/8"
22285			.2660	H	6.756	2-15/16"	1-11/32"
	25641		.2660	H	6.756	3-1/2"	1-11/16"
		26641	.2660	H	6.756	4-3/8"	2-3/8"
22290			.2720	I	6.909	2-15/16"	1-11/32"
	25646		.2720	I	6.909	3-1/2"	1-11/16"
		26646	.2720	I	6.909	4-3/8"	2-3/8"
22295			.2756		7.000	75	34
	25651		.2756		7.000	88	43
		26651	.2756		7.000	110	61
22300			.2770	J	7.036	2-15/16"	1-11/32"
	25656		.2770	J	7.036	3-1/2"	1-11/16"
		26656	.2770	J	7.036	4-3/8"	2-3/8"
22305			.2810	K	7.137	2-15/16"	1-11/32"
	25661		.2810	K	7.137	3-1/2"	1-3/4"
		26661	.2810	K	7.137	4-7/16"	2-7/16"
22310			.2812	9/32"	7.142	2-15/16"	1-11/32"
	25666		.2812	9/32"	7.142	3-1/2"	1-3/4"
		26666	.2812	9/32"	7.142	4-7/16"	2-7/16"
22315			.2900	L	7.366	2-15/16"	1-11/32"
	25671		.2900	L	7.366	3-1/2"	1-3/4"
		26671	.2900	L	7.366	4-7/16"	2-7/16"
22320			.2950	M	7.493	2-15/16"	1-11/32"
	25676		.2950	M	7.493	3-3/4"	1-3/4"
		26676	.2950	M	7.493	4-7/16"	2-7/16"
22325			.2953		7.500	75	34
	25681		.2953		7.500	95	44
		26681	.2953		7.500	115	66
22330			.2969	19/64"	7.541	3-3/32"	1-15/32"
	25686		.2969	19/64"	7.541	3-3/4"	1-7/8"
		26686	.2969	19/64"	7.541	4-9/16"	2-9/16"
22335			.3020	N	7.671	3-3/32"	1-15/32"
	25691		.3020	N	7.671	3-3/4"	1-7/8"
		26691	.3020	N	7.671	4-9/16"	2-9/16"
22340			.3125	5/16"	7.938	3-3/32"	1-15/32"
	25696		.3125	5/16"	7.938	3-3/4"	1-7/8"
		26696	.3125	5/16"	7.938	4-11/16"	2-9/16"

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)



TECH
PAGES
340-341

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

BALIQ® ALTINOS Coating (AlTiN-based)

High performance - high penetration solid submicron grain carbide drill



HIGH PERFORMANCE
DRILLS

3xD (1580KH) EDP#	5xD (1280KH) EDP#	7xD (1880KH) EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
			Decimal	Metric			
22345			.3150	8.000	79	37	25
	25701		.3150	8.000	95	48	41
		26701	.3150	8.000	120	69	57
22350			.3160	O 8.026	3-3/32"	1-15/32"	1.006"
	25706		.3160	O 8.026	3-3/4"	1-7/8"	1.638"
		26706	.3160	O 8.026	4-11/16"	2-11/16"	2.270"
22355			.3230	P 8.204	3-3/32"	1-15/32"	1.028"
	25711		.3230	P 8.204	3-3/4"	2-3/32"	1.674"
		26711	.3230	P 8.204	4-11/16"	2-11/16"	2.320"
22360			.3281	21/64" 8.334	3-3/32"	1-15/32"	1.044"
	25716		.3281	21/64" 8.334	4"	2-3/32"	1.700"
		26716	.3281	21/64" 8.334	4-11/16"	2-11/16"	2.356"
22365			.3320	Q 8.433	3-3/32"	1-15/32"	1.056"
	25721		.3320	Q 8.433	4"	2-3/32"	1.720"
		26721	.3320	Q 8.433	4-15/16"	2-15/16"	2.384"
22370			.3346	8.500	79	37	27
	25726		.3346	8.500	100	53	44
		26726	.3346	8.500	125	75	61
22375			.3390	R 8.611	3-5/16"	1-9/16"	1.079"
	25731		.3390	R 8.611	4"	2-3/32"	1.757"
		26731	.3390	R 8.611	4-15/16"	2-15/16"	2.435"
22380			.3438	11/32" 8.733	3-5/16"	1-9/16"	1.094"
	25736		.3438	11/32" 8.733	4"	2-3/16"	1.782"
		26736	.3438	11/32" 8.733	4-15/16"	2-15/16"	2.470"
22385			.3480	S 8.839	3-5/16"	1-9/16"	1.107"
	25741		.3480	S 8.839	4"	2-3/16"	1.803"
		26741	.3480	S 8.839	5"	3"	2.499"
22390			.3543	9.000	84	40	29
	25746		.3543	9.000	100	56	47
		26746	.3543	9.000	125	77	65
22395			.3580	T 9.093	3-5/16"	1-9/16"	1.139"
	25751		.3580	T 9.093	4-1/4"	2-9/32"	1.855"
		26751	.3580	T 9.093	5"	3"	2.571"
22400			.3594	23/64" 9.129	3-5/16"	1-9/16"	1.144"
	25756		.3594	23/64" 9.129	4-1/4"	2-9/32"	1.862"
		26756	.3594	23/64" 9.129	5"	3"	2.581"
22405			.3680	U 9.347	3-5/16"	1-9/16"	1.171"
	25761		.3680	U 9.347	4-1/4"	2-9/32"	1.907"
		26761	.3680	U 9.347	5"	3"	2.643"
22410			.3740	9.500	84	40	30
	25766		.3740	9.500	105	58	49
		26766	.3740	9.500	130	80	68
22415			.3750	3/8" 9.525	3-1/2"	1-11/16"	1.193"
	25771		.3750	3/8" 9.525	4-1/4"	2-3/8"	1.943"
		26771	.3750	3/8" 9.525	5-1/8"	3-1/8"	2.693"

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	l_5 Max Drill Depth
			Decimal		Metric		
22420			.3770	V	9.576	3-1/2"	1-11/16"
	25776		.3770	V	9.576	4-1/4"	1.954"
		26776	.3770	V	9.576	5-1/8"	2.708"
22425			.3860	W	9.804	3-1/2"	1-11/16"
	25781		.3860	W	9.804	4-1/2"	2.000"
		26781	.3860	W	9.804	5-1/8"	2.772"
22430			.3906	25/64"	9.921	3-1/2"	1-11/16"
	25786		.3906	25/64"	9.921	4-1/2"	2.024"
		26786	.3906	25/64"	9.921	5-1/4"	2.805"
22435			.3937		10.000	89	43
	25791		.3937		10.000	115	60
		26791	.3937		10.000	135	83
22440			.3970	X	10.084	3-1/2"	1-11/16"
	25796		.3970	X	10.084	4-1/2"	2-1/2"
		26796	.3970	X	10.084	5-1/4"	2.851"
22445			.4040	Y	10.262	3-1/2"	1-11/16"
	25801		.4040	Y	10.262	4-1/2"	2-9/16"
		26801	.4040	Y	10.262	5-3/8"	2.902"
22450			.4062	13/32"	10.317	3-1/2"	1-11/16"
	25806		.4062	13/32"	10.317	4-1/2"	2-9/16"
		26806	.4062	13/32"	10.317	5-3/8"	2.917"
22455			.4130	Z	10.490	3-1/2"	1-11/16"
	25811		.4130	Z	10.490	4-1/2"	2-5/8"
		26811	.4130	Z	10.490	5-3/8"	2.966"
22460			.4134		10.500	89	43
	25816		.4134		10.500	115	67
		26816	.4134		10.500	135	86
22465			.4219	27/64"	10.716	3-3/4"	1-13/16"
	25821		.4219	27/64"	10.716	4-1/2"	2-11/16"
		26821	.4219	27/64"	10.716	5-7/16"	3-7/16"
22470			.4331		11.000	95	46
	25826		.4331		11.000	115	68
		26826	.4331		11.000	135	88
22475			.4375	7/16"	11.113	3-3/4"	1-13/16"
	25831		.4375	7/16"	11.113	4-3/4"	2-13/16"
		26831	.4375	7/16"	11.113	5-7/16"	3-7/16"
22480			.4528		11.500	95	46
	25836		.4528		11.500	120	71
		26836	.4528		11.500	140	91
22485			.4531	29/64"	11.509	3-3/4"	1-13/16"
	25841		.4531	29/64"	11.509	4-3/4"	2-7/8"
		26841	.4531	29/64"	11.509	5-9/16"	3-13/16"
22490			.4688	15/32"	11.908	4"	1-15/16"
	25846		.4688	15/32"	11.908	4-3/4"	2-7/8"
		26846	.4688	15/32"	11.908	5-9/16"	3-13/16"
22495			.4724		12.000	102	49
	25851		.4724		12.000	120	73
		26851	.4724		12.000	140	98
22500			.4844	31/64"	12.304	4"	1-15/16"
	25856		.4844	31/64"	12.304	5-5/16"	3"
		26856	.4844	31/64"	12.304	5-9/16"	3-13/16"
22505			.4921		12.500	102	49
	25861		.4921		12.500	135	76
		26861	.4921		12.500	150	102

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	l_5 Max Drill Depth
			Decimal				
22510			.5000	1/2"	12.700	4"	1.591"
	25866		.5000	1/2"	12.700	5-3/8"	2.591"
		26866	.5000	1/2"	12.700	6"	3.591"
22515			.5118		13.000	107	41
	25871		.5118		13.000	135	67
		26871	.5118		13.000	150	93
22520			.5156	33/64"	13.096	4-7/32"	1.641"
	25876		.5156	33/64"	13.096	5-3/8"	2.672"
		26876	.5156	33/64"	13.096	6"	3.703"
22525			.5312	17/32"	13.492	4-7/32"	1.690"
	25881		.5312	17/32"	13.492	5-11/16"	2.753"
		26881	.5312	17/32"	13.492	6-1/8"	3.815"
22530			.5315		13.500	110	43
	25886		.5315		13.500	145	70
		26886	.5315		13.500	155	97
22535			.5469	35/64"	13.891	4-5/16"	1.740"
	25891		.5469	35/64"	13.891	5-13/16"	2.834"
		26891	.5469	35/64"	13.891	6-1/8"	3.928"
22540			.5512		14.000	110	45
	25896		.5512		14.000	145	73
		26896	.5512		14.000	155	101
22545			.5625	9/16"	14.288	4-9/16"	1.790"
	25901		.5625	9/16"	14.288	5-15/16"	2.915"
		26901	.5625	9/16"	14.288	6-1/4"	4.040"
22550			.5709		14.500	116	46
	25906		.5709		14.500	150	75
		26906	.5709		14.500	160	104
22555			.5781	37/64"	14.684	4-15/16"	1.840"
	25911		.5781	37/64"	14.684	6"	2.996"
		26911	.5781	37/64"	14.684	6-1/4"	4.152"
22560			.5906		15.000	125	48
	25916		.5906		15.000	150	78
		26916	.5906		15.000	160	108
22565			.5938	19/32"	15.083	4-15/16"	1.890"
	25921		.5938	19/32"	15.083	6"	3.077"
		26921	.5938	19/32"	15.083	6-3/8"	4.265"
22570			.6094	39/64"	15.479	5-1/16"	1.939"
	25926		.6094	39/64"	15.479	6-3/16"	3.158"
		26926	.6094	39/64"	15.479	6-7/16"	4.377"
22575			.6102		15.500	129	49
	25931		.6102		15.500	160	80
		26931	.6102		15.500	165	111
22580			.6250	5/8"	15.875	5-1/4"	1.989"
	25936		.6250	5/8"	15.875	6-5/16"	3.239"
		26936	.6250	5/8"	15.875	6-9/16"	4.489"
22585			.6299		16.000	133	51
	25941		.6299		16.000	160	83
		26941	.6299		16.000	165	115

Series 1600

.0787" - .3750"
(2.000mm - 9.525mm)TECH
PAGES
328-331

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)

N/C Spotting

Solid submicron grain carbide drill

For spotting to stabilize long drills

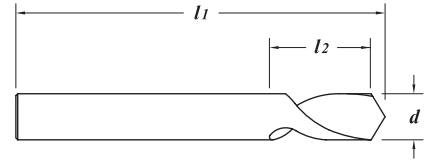
Can be used for chamfering

Rough, angled or spherical surfaces

No O.D. clearance

For locating on true position

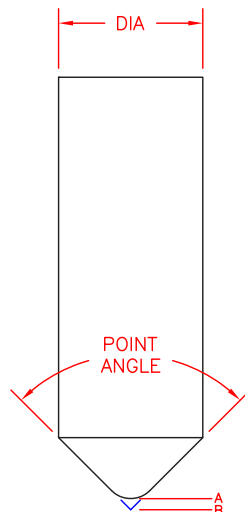
Live tooling recommended on lathe processes



82° EDP#	90° EDP#	120° EDP#	142° EDP#	$d^{\dagger}$ Diameter		l_1 Overall Length	l_2 Flute Length
				Decimal	Metric		
91650	91500	91572	91240	.0787	2.000	50	10
91652	91505	91575	91245	.0938	3/32"	2"	3/8"
-	91507	-	-	.1181	3.000	38	6
-	91510	91580	91250	.1181	3.000	50	10
-	91512	-	-	.1181	3.000	75	10
-	91514	-	-	.1250	1/8"	1-1/2"	1/4"
91656	91000	91100	91260	.1250	1/8"	2"	3/8"
-	91002	-	-	.1250	1/8"	3"	3/8"
91658	91520	91590	91270	.1575	4.000	50	12
-	91522	-	-	.1875	3/16"	2"	3/8"
-	91524	-	-	.1875	3/16"	2-1/2"	1/2"
91660	91010	91110	91280	.1875	3/16"	3"	3/4"
-	91012	-	-	.1875	3/16"	4"	3/4"
-	91014	-	-	.1969	5.000	50	10
-	91530	91600	91290	.1969	5.000	65	15
-	91532	-	-	.1969	5.000	75	15
-	91534	-	-	.2362	6.000	50	12
91664	91540	91610	91300	.2362	6.000	65	20
-	91542	-	-	.2362	6.000	75	20
-	91544	-	-	.2362	6.000	100	20
-	91546	-	-	.2500	1/4"	2"	1/2"
-	91547	-	-	.2500	1/4"	2-1/2"	5/8"
91666	91020	91120	91310	.2500	1/4"	3"	3/4"
-	91021	-	-	.2500	1/4"	4"	3/4"
-	91022	-	-	.2500	1/4"	6"	3/4"
-	91023	-	-	.3125	5/16"	2"	1/2"
-	91024	-	-	.3125	5/16"	2-1/2"	5/8"
91668	91025	91125	91315	.3125	5/16"	3"	1"
-	91026	-	-	.3125	5/16"	4"	1"
-	91548	-	-	.3150	8.000	50	12
-	91549	-	-	.3150	8.000	65	16
91670	91550	91620	91320	.3150	8.000	75	25
-	91551	-	-	.3150	8.000	100	25
-	91028	-	-	.3750	3/8"	2"	1/2"
-	91029	-	-	.3750	3/8"	2-1/2"	5/8"
91672	91030	91130	91330	.3750	3/8"	3"	1"
-	91031	-	-	.3750	3/8"	4"	1"
-	91032	-	-	.3750	3/8"	6"	1"

82° EDP#	90° EDP#	120° EDP#	142° EDP#	$d^{\dagger}$ Diameter		l_1 Overall Length	l_2 Flute Length	
				Decimal	Metric			
-	91558	-	-	.3937	10.000	65	16	
-	91559	-	-	.3937	10.000	70	20	
-	91560	91630	91340	.3937	10.000	88	25	
-	91561	-	-	.3937	10.000	100	25	
-	91564	-	-	.4375	7/16"	11.113	2-3/4"	3/4"
91676	91565	91635	91345	.4375	7/16"	11.113	4"	1"
-	91568	-	-	.4724	12.000	65	16	
-	91569	-	-	.4724	12.000	75	20	
-	91570	91640	91350	.4724	12.000	100	30	
-	91038	-	-	.5000	1/2"	12.700	2-1/2"	5/8"
-	91039	-	-	.5000	1/2"	12.700	3"	3/4"
91680	91040	91140	91360	.5000	1/2"	12.700	4"	1"
-	91041	-	-	.5000	1/2"	12.700	6"	1"
-	91050	91170	91370	.5512	14.000	100	30	
91684	91060	91180	-	.5625	9/16"	14.287	4"	1"
-	91067	-	-	.6250	5/8"	15.875	3"	3/4"
-	91068	-	-	.6250	5/8"	15.875	3-1/2"	1"
-	91069	-	-	.6250	5/8"	15.875	4"	1"
91686	91070	91190	91390	.6250	5/8"	15.875	5"	1"
-	91077	-	-	.6299	16.000	75	20	
-	91078	-	-	.6299	16.000	88	25	
-	91079	-	-	.6299	16.000	100	25	
91688	91080	91200	91400	.6299	16.000	125	30	
91690	91090	91210	-	.7087	18.000	125	30	
-	91148	-	-	.7500	3/4"	19.050	3"	3/4"
-	91149	-	-	.7500	3/4"	19.050	4"	1"
91692	91150	91220	91420	.7500	3/4"	19.050	5"	1"
-	91159	-	-	.7874	20.000	100	25	
-	91160	91230	91430	.7874	20.000	125	30	
-	91161	-	-	.7874	20.000	150	30	

DIAMETER	DRILL POINT ANGLE				
	82°	90°	120°	142°	
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


**TECH
PAGES
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TOLERANCES

d_1	$+0.003" - .000" (+.0762 - .0000\text{mm})$
d_2	$h6$
l_1	$+0.125" - .125" (+3.175 - 3.175\text{mm})$
l_2	$+0.008" - .008" (+.203 - .203\text{mm})$

Combined Drill and Countersink

Solid submicron grain carbide drill

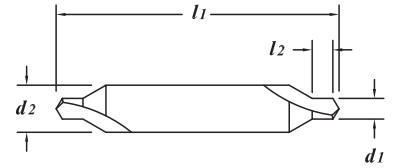
For center drilling applications

$60^\circ \pm 0^\circ 30'$ 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 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Drill Length
		Decimal	Diameter Metric			
58030	1	.0469	3/64"	1.191	1-1/2"	.0469
58040	2	.0781	5/64"	1.984	2"	.0781
58050	3	.1094	7/64"	2.779	2"	.1094
58060	4	.1250	1/8"	3.175	2-1/8"	.1250
58070	5	.1875	3/16"	4.763	2-3/4"	.1875
58080	6	.2188	7/32"	5.558	3"	.2188



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)


Series 1500

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

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

Hard Metal

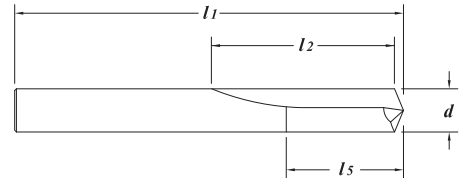
Solid submicron grain carbide drill

Straight flute design provides excellent rigidity

Materials 40 Rc and higher

Live tooling recommended on lathe processes

Durana Coating - page 63



EDP#	$d^{\dagger}$		l_1	l_2	l_5	
	Decimal	Diameter Metric				
59165	.0625	1/16"	1.588	1-3/4"	5/8"	.200"
59180	.0700	#50	1.778	1-3/4"	3/4"	.224"
59185	.0730	#49	1.854	1-3/4"	3/4"	.234"
59190	.0760	#48	1.930	1-3/4"	3/4"	.244"
59195	.0781	5/64"	1.984	1-3/4"	3/4"	.250"
59200	.0785	#47	1.994	1-3/4"	7/8"	.252"
39000	.0787		2.000	50	22	6
59210	.0810	#46	2.057	2"	7/8"	.260"
59215	.0820	#45	2.083	2"	7/8"	.263"
59220	.0860	#44	2.184	2"	7/8"	.276"
59225	.0890	#43	2.261	2"	7/8"	.285"
59230	.0935	#42	2.375	2"	7/8"	.300"
59235	.0938	3/32"	2.383	2"	7/8"	.301"
59240	.0960	#41	2.438	2"	7/8"	.308"
59245	.0980	#40	2.489	2"	7/8"	.314"
39050	.0984		2.500	50	22	8
59255	.0995	#39	2.527	2"	7/8"	.319"
59260	.1015	#38	2.578	2"	7/8"	.326"
59265	.1040	#37	2.642	2"	7/8"	.334"
59270	.1065	#36	2.705	2"	7/8"	.342"
59275	.1094	7/64"	2.779	2"	1"	.351"
59280	.1100	#35	2.794	2"	1"	.353"
59290	.1130	#33	2.870	2"	1"	.362"
59295	.1160	#32	2.946	2"	1"	.372"
39100	.1181		3.000	50	25	10
59305	.1200	#31	3.048	2"	1"	.385"
59310	.1250	1/8"	3.175	2"	1"	.401"
59315	.1285	#30	3.264	2"	1"	.412"
59320	.1360	#29	3.454	2"	1"	.436"
39150	.1378		3.500	50	25	11
59330	.1405	#28	3.569	2"	1"	.451"
59335	.1406	9/64"	3.571	2"	1"	.451"
59340	.1440	#27	3.658	2"	1"	.462"
59345	.1470	#26	3.734	2"	1"	.471"
59350	.1495	#25	3.797	2"	1"	.479"
59355	.1520	#24	3.861	2"	1"	.487"
59360	.1540	#23	3.912	2"	1"	.494"
59365	.1562	5/32"	3.967	2-1/2"	1-1/8"	.501"
59370	.1570	#22	3.988	2-1/2"	1-1/8"	.504"
39200	.1575		4.000	63	28	13
59380	.1590	#21	4.039	2-1/2"	1-1/8"	.510"
59385	.1610	#20	4.089	2-1/2"	1-1/8"	.516"
59390	.1660	#19	4.216	2-1/2"	1-1/8"	.532"

continued →

Series 1500 (continued)

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

EDP#	$d^{\dagger}$ Diameter			l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
	Decimal		Metric			
59395	.1695	#18	4.305	2-1/2"	1-3/16"	.544"
59400	.1719	11/64"	4.366	2-1/2"	1-3/16"	.551"
59405	.1730	#17	4.394	2-1/2"	1-3/16"	.555"
59410	.1770	#16	4.496	2-1/2"	1-3/16"	.568"
39250	.1772		4.500	63	28	14
59420	.1800	#15	4.572	2-1/2"	1-3/16"	.577"
59425	.1820	#14	4.623	2-1/2"	1-3/16"	.584"
59430	.1850	#13	4.700	2-1/2"	1-3/16"	.593"
59435	.1875	3/16"	4.763	2-1/2"	1-3/16"	.601"
59440	.1890	#12	4.801	2-1/2"	1-3/16"	.606"
59445	.1910	#11	4.851	2-1/2"	1-3/16"	.613"
59450	.1935	#10	4.915	2-1/2"	1-1/4"	.621"
59455	.1960	#9	4.978	2-1/2"	1-1/4"	.629"
39300	.1969		5.000	63	32	16
59465	.1990	#8	5.055	2-1/2"	1-1/4"	.638"
59470	.2010	#7	5.105	2-1/2"	1-1/4"	.645"
59475	.2031	13/64"	5.159	2-1/2"	1-1/4"	.651"
59485	.2055	#5	5.220	2-1/2"	1-1/4"	.659"
59490	.2090	#4	5.309	2-1/2"	1-1/4"	.670"
59495	.2130	#3	5.410	2-1/2"	1-1/4"	.683"
39350	.2165		5.500	63	32	18
59505	.2188	7/32"	5.558	2-1/2"	1-1/2"	.702"
59510	.2210	#2	5.613	2-1/2"	1-1/2"	.709"
59515	.2280	#1	5.791	2-1/2"	1-1/2"	.731"
59525	.2344	15/64"	5.954	2-1/2"	1-1/2"	.752"
39400	.2362		6.000	63	38	19
59550	.2500	1/4"	6.350	2-1/2"	1-1/2"	.802"
59570	.2656	17/64"	6.746	2-1/2"	1-1/2"	.852"
39500	.2756		7.000	63	38	22
59600	.2812	9/32"	7.142	2-1/2"	1-1/2"	.902"
39520	.2953		7.500	63	41	24
59620	.2969	19/64"	7.541	2-1/2"	1-5/8"	.952"
59630	.3125	5/16"	7.938	2-1/2"	1-5/8"	1.002"
39540	.3150		8.000	63	41	26
59650	.3281	21/64"	8.334	3"	1-5/8"	1.052"
39560	.3346		8.500	76	41	27
59670	.3438	11/32"	8.733	3"	1-5/8"	1.103"
39580	.3543		9.000	76	41	29
59690	.3594	23/64"	9.129	3"	1-3/4"	1.153"
59705	.3750	3/8"	9.525	3"	1-3/4"	1.203"
59720	.3906	25/64"	9.921	3"	1-3/4"	1.253"
39620	.3937		10.000	76	44	32
59740	.4062	13/32"	10.317	3"	1-3/4"	1.303"
59755	.4219	27/64"	10.716	3"	1-3/4"	1.353"
39660	.4331		11.000	76	44	35
59765	.4375	7/16"	11.113	3"	1-3/4"	1.403"
59775	.4531	29/64"	11.509	3"	1-3/4"	1.453"
59780	.4688	15/32"	11.908	3"	1-3/4"	1.503"
39700	.4724		12.000	76	44	38
59790	.4844	31/64"	12.304	3"	1-3/4"	1.554"
39720	.4921		12.500	76	44	40
59800	.5000	1/2"	12.700	3"	1-3/4"	1.604"

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)


Series 1500H

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

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

Hard Metal
BALINIT® Durana Coating

Solid submicron grain carbide drill

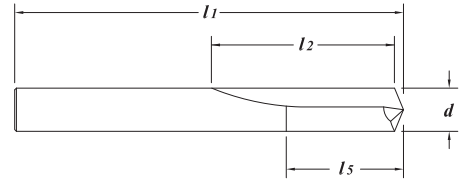
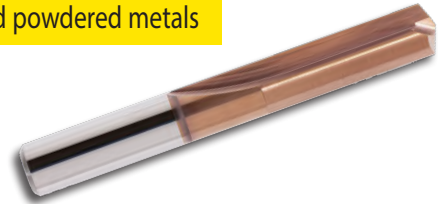
Straight flute design provides excellent rigidity

Materials 40 Rc and higher

Excellent heat resistance and lubricity

Live tooling recommended on lathe processes

Bright Finish - page 61



EDP#	d †		l_1	l_2	l_5	
	Decimal	Diameter Metric				
59166	.0625	1/16"	1.588	1-3/4"	5/8"	.200"
59181	.0700	#50	1.778	1-3/4"	3/4"	.224"
59186	.0730	#49	1.854	1-3/4"	3/4"	.234"
59191	.0760	#48	1.930	1-3/4"	3/4"	.244"
59196	.0781	5/64"	1.984	1-3/4"	3/4"	.250"
59201	.0785	#47	1.994	1-3/4"	7/8"	.252"
39001	.0787		2.000	50	22	6
59211	.0810	#46	2.057	2"	7/8"	.260"
59216	.0820	#45	2.083	2"	7/8"	.263"
59221	.0860	#44	2.184	2"	7/8"	.276"
59226	.0890	#43	2.261	2"	7/8"	.285"
59231	.0935	#42	2.375	2"	7/8"	.300"
59236	.0938	3/32"	2.383	2"	7/8"	.301"
59241	.0960	#41	2.438	2"	7/8"	.308"
59246	.0980	#40	2.489	2"	7/8"	.314"
39051	.0984		2.500	50	22	8
59256	.0995	#39	2.527	2"	7/8"	.319"
59261	.1015	#38	2.578	2"	7/8"	.326"
59266	.1040	#37	2.642	2"	7/8"	.334"
59271	.1065	#36	2.705	2"	7/8"	.342"
59276	.1094	7/64"	2.779	2"	1"	.351"
59281	.1100	#35	2.794	2"	1"	.353"
59286	.1110	#34	2.819	2"	1"	.356"
59291	.1130	#33	2.870	2"	1"	.362"
59296	.1160	#32	2.946	2"	1"	.372"
39101	.1181		3.000	50	25	10
59306	.1200	#31	3.048	2"	1"	.385"
59311	.1250	1/8"	3.175	2"	1"	.401"
59316	.1285	#30	3.264	2"	1"	.412"
59321	.1360	#29	3.454	2"	1"	.436"
39151	.1378		3.500	50	25	11
59331	.1405	#28	3.569	2"	1"	.451"
59336	.1406	9/64"	3.571	2"	1"	.451"
59341	.1440	#27	3.658	2"	1"	.462"
59346	.1470	#26	3.734	2"	1"	.471"
59351	.1495	#25	3.797	2"	1"	.479"
59356	.1520	#24	3.861	2"	1"	.487"
59361	.1540	#23	3.912	2"	1"	.494"
59366	.1562	5/32"	3.967	2-1/2"	1-1/8"	.501"
59371	.1570	#22	3.988	2-1/2"	1-1/8"	.504"
39201	.1575		4.000	63	28	13
59381	.1590	#21	4.039	2-1/2"	1-1/8"	.510"
59386	.1610	#20	4.089	2-1/2"	1-1/8"	.516"
59391	.1660	#19	4.216	2-1/2"	1-1/8"	.532"

continued →

Series 1500H (continued)

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

EDP#	$d^{\dagger}$ Diameter			l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
	Decimal		Metric			
59396	.1695	#18	4.305	2-1/2"	1-3/16"	.544"
59401	.1719	11/64"	4.366	2-1/2"	1-3/16"	.551"
59406	.1730	#17	4.394	2-1/2"	1-3/16"	.555"
59411	.1770	#16	4.496	2-1/2"	1-3/16"	.568"
39251	.1772		4.500	63	28	14
59421	.1800	#15	4.572	2-1/2"	1-3/16"	.577"
59426	.1820	#14	4.623	2-1/2"	1-3/16"	.584"
59431	.1850	#13	4.700	2-1/2"	1-3/16"	.593"
59436	.1875	3/16"	4.763	2-1/2"	1-3/16"	.601"
59441	.1890	#12	4.801	2-1/2"	1-3/16"	.606"
59446	.1910	#11	4.851	2-1/2"	1-3/16"	.613"
59451	.1935	#10	4.915	2-1/2"	1-1/4"	.621"
59456	.1960	#9	4.978	2-1/2"	1-1/4"	.629"
39301	.1969		5.000	63	32	16
59466	.1990	#8	5.055	2-1/2"	1-1/4"	.638"
59471	.2010	#7	5.105	2-1/2"	1-1/4"	.645"
59476	.2031	13/64"	5.159	2-1/2"	1-1/4"	.651"
59481	.2040	#6	5.182	2-1/2"	1-1/4"	.654"
59486	.2055	#5	5.220	2-1/2"	1-1/4"	.659"
59491	.2090	#4	5.309	2-1/2"	1-1/4"	.670"
59496	.2130	#3	5.410	2-1/2"	1-1/4"	.683"
39351	.2165		5.500	63	32	18
59506	.2188	7/32"	5.558	2-1/2"	1-1/2"	.702"
59511	.2210	#2	5.613	2-1/2"	1-1/2"	.709"
59516	.2280	#1	5.791	2-1/2"	1-1/2"	.731"
59526	.2344	15/64"	5.954	2-1/2"	1-1/2"	.752"
39401	.2362		6.000	63	38	19
59551	.2500	1/4"	6.350	2-1/2"	1-1/2"	.802"
39451	.2559		6.500	63	38	21
59571	.2656	17/64"	6.746	2-1/2"	1-1/2"	.852"
39501	.2756		7.000	63	38	22
59601	.2812	9/32"	7.142	2-1/2"	1-1/2"	.902"
39521	.2953		7.500	63	41	24
59621	.2969	19/64"	7.541	2-1/2"	1-5/8"	.952"
59631	.3125	5/16"	7.938	2-1/2"	1-5/8"	1.002"
39541	.3150		8.000	63	41	26
59651	.3281	21/64"	8.334	3"	1-5/8"	1.052"
39561	.3346		8.500	76	41	27
59671	.3438	11/32"	8.733	3"	1-5/8"	1.103"
39581	.3543		9.000	76	41	29
59691	.3594	23/64"	9.129	3"	1-3/4"	1.153"
39601	.3740		9.500	76	41	30
59706	.3750	3/8"	9.525	3"	1-3/4"	1.203"
59721	.3906	25/64"	9.921	3"	1-3/4"	1.253"
39621	.3937		10.000	76	44	32
59741	.4062	13/32"	10.317	3"	1-3/4"	1.303"
59756	.4219	27/64"	10.716	3"	1-3/4"	1.353"
39661	.4331		11.000	76	44	35
59766	.4375	7/16"	11.113	3"	1-3/4"	1.403"
39681	.4528		11.500	76	44	37
59776	.4531	29/64"	11.509	3"	1-3/4"	1.453"
59781	.4688	15/32"	11.908	3"	1-3/4"	1.503"
39701	.4724		12.000	76	44	38
59791	.4844	31/64"	12.304	3"	1-3/4"	1.554"
39721	.4921		12.500	76	44	40
59801	.5000	1/2"	12.700	3"	1-3/4"	1.604"

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)


Series 1510

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

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

Slow Helix

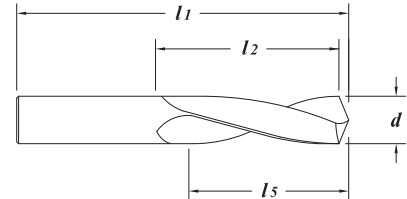
Solid submicron grain carbide drill

Heavy web for extra rigidity and added strength

Thinned point

Live tooling recommended on lathe processes

Durana Coating - page 68



EDP#	d †			l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
	Decimal	Diameter	Metric			
19070	.0625	1/16"	1.588	1-3/4"	5/8"	.200"
19075	.0635	#52	1.613	1-3/4"	11/16"	.204"
19080	.0670	#51	1.702	1-3/4"	11/16"	.215"
19085	.0700	#50	1.778	1-3/4"	11/16"	.224"
19090	.0730	#49	1.854	1-3/4"	11/16"	.234"
19095	.0760	#48	1.930	1-3/4"	11/16"	.244"
19100	.0781	5/64"	1.984	1-3/4"	11/16"	.250"
19105	.0785	#47	1.994	1-3/4"	3/4"	.252"
19115	.0787		2.000	45	19	6
19120	.0810	#46	2.057	1-3/4"	3/4"	.260"
19125	.0820	#45	2.083	1-3/4"	3/4"	.263"
19130	.0860	#44	2.184	1-3/4"	3/4"	.276"
19135	.0890	#43	2.261	1-3/4"	3/4"	.285"
19140	.0935	#42	2.375	1-3/4"	3/4"	.300"
19145	.0938	3/32"	2.383	1-3/4"	3/4"	.301"
19150	.0960	#41	2.438	1-13/16"	13/16"	.308"
19155	.0980	#40	2.489	1-13/16"	13/16"	.314"
19160	.0984		2.500	46	21	8
19165	.0995	#39	2.527	1-13/16"	13/16"	.319"
19170	.1015	#38	2.578	1-13/16"	13/16"	.326"
19175	.1040	#37	2.642	1-13/16"	13/16"	.334"
19180	.1065	#36	2.705	1-13/16"	13/16"	.342"
19185	.1094	7/64"	2.779	1-13/16"	13/16"	.351"
19190	.1100	#35	2.794	1-7/8"	7/8"	.353"
19195	.1110	#34	2.819	1-7/8"	7/8"	.356"
19200	.1130	#33	2.870	1-7/8"	7/8"	.362"
19205	.1160	#32	2.946	1-7/8"	7/8"	.372"
19210	.1181		3.000	48	22	10
19215	.1200	#31	3.048	1-7/8"	7/8"	.385"
19220	.1250	1/8"	3.175	1-7/8"	7/8"	.401"
19225	.1285	#30	3.264	1-15/16"	15/16"	.412"
19230	.1360	#29	3.454	1-15/16"	15/16"	.436"
19235	.1378		3.500	49	24	11
19240	.1405	#28	3.569	1-15/16"	15/16"	.451"
19245	.1406	9/64"	3.571	1-15/16"	15/16"	.451"
19250	.1440	#27	3.658	2-1/16"	1"	.462"
19255	.1470	#26	3.734	2-1/16"	1"	.471"
19260	.1495	#25	3.797	2-1/16"	1"	.479"
19265	.1520	#24	3.861	2-1/16"	1"	.487"
19270	.1540	#23	3.912	2-1/16"	1"	.494"
19275	.1562	5/32"	3.967	2-1/16"	1"	.501"
19280	.1570	#22	3.988	2-1/8"	1-1/16"	.504"
19285	.1575		4.000	54	27	13

continued →

Series 1510 (continued)

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

EDP#	$d^{\dagger}$ Diameter		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
	Decimal	Metric			
19290	.1590	#21	4.039	2-1/8"	1-1/16"
19295	.1610	#20	4.089	2-1/8"	1-1/16"
19300	.1660	#19	4.216	2-1/8"	1-1/16"
19305	.1695	#18	4.305	2-1/8"	1-1/16"
19310	.1719	11/64"	4.366	2-1/8"	1-1/16"
19315	.1730	#17	4.394	2-3/16"	1-1/8"
19320	.1770	#16	4.496	2-3/16"	1-1/8"
19325	.1772		4.500	56	29
19330	.1800	#15	4.572	2-3/16"	1-1/8"
19335	.1820	#14	4.623	2-3/16"	1-1/8"
19340	.1850	#13	4.700	2-3/16"	1-1/8"
19345	.1875	3/16"	4.763	2-3/16"	1-1/8"
19350	.1890	#12	4.801	2-1/4"	1-3/16"
19355	.1910	#11	4.851	2-1/4"	1-3/16"
19360	.1935	#10	4.915	2-1/4"	1-3/16"
19365	.1960	#9	4.978	2-1/4"	1-3/16"
19370	.1969		5.000	57	30
19375	.1990	#8	5.055	2-1/4"	1-3/16"
19380	.2010	#7	5.105	2-1/4"	1-3/16"
19385	.2031	13/64"	5.159	2-1/4"	1-3/16"
19390	.2040	#6	5.182	2-3/8"	1-1/4"
19395	.2055	#5	5.220	2-3/8"	1-1/4"
19400	.2090	#4	5.309	2-3/8"	1-1/4"
19405	.2130	#3	5.410	2-3/8"	1-1/4"
19410	.2165		5.500	60	32
19415	.2188	7/32"	5.558	2-3/8"	1-1/4"
19420	.2210	#2	5.613	2-7/16"	1-5/16"
19425	.2280	#1	5.791	2-7/16"	1-5/16"
19430	.2340	A	5.944	2-7/16"	1-5/16"
19435	.2344	15/64"	5.954	2-7/16"	1-5/16"
19440	.2362		6.000	64	35
19445	.2380	B	6.045	2-1/2"	1-3/8"
19450	.2420	C	6.147	2-1/2"	1-3/8"
19455	.2460	D	6.248	2-1/2"	1-3/8"
19460	.2500	1/4" / E	6.350	2-1/2"	1-3/8"
19465	.2559		6.500	67	37
19470	.2570	F	6.528	2-5/8"	1-7/16"
19475	.2610	G	6.629	2-5/8"	1-7/16"
19480	.2656	17/64"	6.746	2-5/8"	1-7/16"
19485	.2660	H	6.756	2-11/16"	1-1/2"
19490	.2720	I	6.909	2-11/16"	1-1/2"
19495	.2756		7.000	68	38
19500	.2770	J	7.036	2-11/16"	1-1/2"
19505	.2810	K	7.137	2-11/16"	1-1/2"
19510	.2812	9/32"	7.142	2-11/16"	1-1/2"
19515	.2900	L	7.366	2-3/4"	1-9/16"
19520	.2950	M	7.493	2-3/4"	1-9/16"
19525	.2953		7.500	70	40
19530	.2969	19/64"	7.541	2-3/4"	1-9/16"
19535	.3020	N	7.671	2-15/16"	1-5/8"
19540	.3125	5/16"	7.938	2-15/16"	1-5/8"
19545	.3150		8.000	75	43
19550	.3160	O	8.026	2-15/16"	1-11/16"
19555	.3230	P	8.204	2-15/16"	1-11/16"
19560	.3281	21/64"	8.334	2-15/16"	1-11/16"
19565	.3320	Q	8.433	3"	1-11/16"
19570	.3346		8.500	76	43

EDP#	$d^{\dagger}$ Diameter			l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
	Decimal		Metric			
19575	.3390	R	8.611	3"	1-11/16"	1.087"
19580	.3438	11/32"	8.733	3"	1-11/16"	1.103"
19585	.3480	S	8.839	3-1/16"	1-3/4"	1.116"
19590	.3543		9.000	78	44	29
19595	.3580	T	9.093	3-1/16"	1-3/4"	1.148"
19600	.3594	23/64"	9.129	3-1/16"	1-3/4"	1.153"
19605	.3680	U	9.347	3-1/8"	1-13/16"	1.180"
19615	.3750	3/8"	9.525	3-1/8"	1-13/16"	1.203"
19620	.3770	V	9.576	3-1/4"	1-7/8"	1.209"
19625	.3860	W	9.804	3-1/4"	1-7/8"	1.238"
19630	.3906	25/64"	9.921	3-1/4"	1-7/8"	1.253"
19635	.3937		10.000	84	49	32
19640	.3970	X	10.084	3-5/16"	1-15/16"	1.273"
19645	.4040	Y	10.262	3-5/16"	1-15/16"	1.296"
19650	.4062	13/32"	10.317	3-5/16"	1-15/16"	1.303"
19655	.4130	Z	10.490	3-3/8"	2"	1.325"
19660	.4134		10.500	86	51	34
19665	.4219	27/64"	10.716	3-3/8"	2"	1.353"
19670	.4331		11.000	87	52	35
19675	.4375	7/16"	11.113	3-7/16"	2-1/16"	1.403"
19685	.4531	29/64"	11.509	3-9/16"	2-1/8"	1.453"
19690	.4688	15/32"	11.908	3-5/8"	2-1/8"	1.503"
19695	.4724		12.000	94	56	38
19700	.4844	31/64"	12.304	3-11/16"	2-3/16"	1.554"
19705	.4921		12.500	95	56	40
19710	.5000	1/2"	12.700	3-3/4"	2-1/4"	1.604"
19720	.5156	33/64"	13.096	4-1/4"	2-3/8"	1.654"
19725	.5312	17/32"	13.492	4-1/4"	2-3/8"	1.704"
19735	.5469	35/64"	13.891	4-1/4"	2-3/8"	1.754"
19740	.5512		14.000	107	60	45
19745	.5625	9/16"	14.287	4-1/2"	2-1/2"	1.804"
19755	.5781	37/64"	14.683	4-1/2"	2-1/2"	1.854"
19765	.5938	19/32"	15.082	4-1/2"	2-1/2"	1.904"
19770	.6094	39/64"	15.478	4-1/2"	2-1/2"	1.954"
19780	.6250	5/8"	15.875	4-1/2"	2-1/2"	2.004"
19785	.6299		16.000	115	65	51

Series 1510H

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

TOLERANCES

d	+.0000" - .0005" (+.0000 - .0127mm)	
l ₁	≤ 1/8"	+.125" - .062" (+3.175 - 1.588mm)
	> 1/8"	+.125" - .125" (+3.175 - 3.175mm)
l ₂	≤ 1/8"	+.125" - .062" (+3.175 - 1.588mm)
	> 1/8"	+.125" - .125" (+3.175 - 3.175mm)

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

Slow Helix

BALINIT® Durana Coating

Solid submicron grain carbide drill

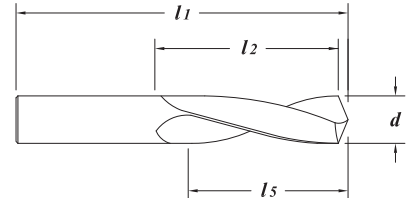
Excellent heat resistance and lubricity

Heavy web for extra rigidity and added strength

Thinned point

Live tooling recommended on lathe processes

Bright Finish - page 65



EDP#	d † Diameter		l ₁ Overall Length	l ₂ Flute Length	l ₅ Max Drill Depth
	Decimal	Metric			
19071	.0625	1/16"	1-3/4"	5/8"	.200"
19076	.0635	#52	1-3/4"	11/16"	.204"
19081	.0670	#51	1-3/4"	11/16"	.215"
19086	.0700	#50	1-3/4"	11/16"	.224"
19091	.0730	#49	1-3/4"	11/16"	.234"
19096	.0760	#48	1-3/4"	11/16"	.244"
19101	.0781	5/64"	1-3/4"	11/16"	.250"
19106	.0785	#47	1-3/4"	3/4"	.252"
19116	.0787		45	19	6
19121	.0810	#46	1-3/4"	3/4"	.260"
19126	.0820	#45	1-3/4"	3/4"	.263"
19128	.0827		45	19	7
19131	.0860	#44	1-3/4"	3/4"	.276"
19136	.0890	#43	1-3/4"	3/4"	.285"
19138	.0906		45	19	7
19141	.0935	#42	1-3/4"	3/4"	.300"
19146	.0938	3/32"	1-3/4"	3/4"	.301"
19148	.0945		46	21	8
19151	.0960	#41	1-13/16"	13/16"	.308"
19156	.0980	#40	1-13/16"	13/16"	.314"
19161	.0984		46	21	8
19166	.0995	#39	1-13/16"	13/16"	.319"
19171	.1015	#38	1-13/16"	13/16"	.326"
19176	.1040	#37	1-13/16"	13/16"	.334"
19181	.1065	#36	1-13/16"	13/16"	.342"
19186	.1094	7/64"	1-13/16"	13/16"	.351"
19191	.1100	#35	1-7/8"	7/8"	.353"
19196	.1110	#34	1-7/8"	7/8"	.356"
19201	.1130	#33	1-7/8"	7/8"	.362"
19206	.1160	#32	1-7/8"	7/8"	.372"
19211	.1181		48	22	10
19216	.1200	#31	1-7/8"	7/8"	.385"
19218	.1220		48	22	10
19221	.1250	1/8"	1-7/8"	7/8"	.401"
19226	.1285	#30	1-15/16"	15/16"	.412"
19231	.1360	#29	1-15/16"	15/16"	.436"
19236	.1378		49	24	11
19241	.1405	#28	1-15/16"	15/16"	.451"
19246	.1406	9/64"	1-15/16"	15/16"	.451"
19251	.1440	#27	2-1/16"	1"	.462"
19256	.1470	#26	2-1/16"	1"	.471"
19261	.1495	#25	2-1/16"	1"	.479"
19266	.1520	#24	2-1/16"	1"	.487"
19271	.1540	#23	2-1/16"	1"	.494"
19276	.1562	5/32"	2-1/16"	1"	.501"
19281	.1570	#22	2-1/8"	1-1/16"	.504"
19286	.1575	4.000	54	27	13

EDP#	$d^{\dagger}$		l_1	l_2	l_5	
	Decimal	Diameter				
19291	.1590	#21	4.039	2-1/8"	1-1/16"	.510"
19296	.1610	#20	4.089	2-1/8"	1-1/16"	.516"
19301	.1660	#19	4.216	2-1/8"	1-1/16"	.532"
19306	.1695	#18	4.305	2-1/8"	1-1/16"	.544"
19311	.1719	11/64"	4.366	2-1/8"	1-1/16"	.551"
19316	.1730	#17	4.394	2-3/16"	1-1/8"	.555"
19321	.1770	#16	4.496	2-3/16"	1-1/8"	.568"
19326	.1772		4.500	56	29	14
19331	.1800	#15	4.572	2-3/16"	1-1/8"	.577"
19336	.1820	#14	4.623	2-3/16"	1-1/8"	.584"
19341	.1850	#13	4.700	2-3/16"	1-1/8"	.593"
19346	.1875	3/16"	4.763	2-3/16"	1-1/8"	.601"
19351	.1890	#12	4.801	2-1/4"	1-3/16"	.606"
19356	.1910	#11	4.851	2-1/4"	1-3/16"	.613"
19361	.1935	#10	4.915	2-1/4"	1-3/16"	.621"
19366	.1960	#9	4.978	2-1/4"	1-3/16"	.629"
19371	.1969		5.000	57	30	16
19376	.1990	#8	5.055	2-1/4"	1-3/16"	.638"
19381	.2010	#7	5.105	2-1/4"	1-3/16"	.645"
19386	.2031	13/64"	5.159	2-1/4"	1-3/16"	.651"
19391	.2040	#6	5.182	2-3/8"	1-1/4"	.654"
19396	.2055	#5	5.220	2-3/8"	1-1/4"	.659"
19401	.2090	#4	5.309	2-3/8"	1-1/4"	.670"
19406	.2130	#3	5.410	2-3/8"	1-1/4"	.683"
19411	.2165		5.500	60	32	18
19416	.2188	7/32"	5.558	2-3/8"	1-1/4"	.702"
19421	.2210	#2	5.613	2-7/16"	1-5/16"	.709"
19426	.2280	#1	5.791	2-7/16"	1-5/16"	.731"
19431	.2340	A	5.944	2-7/16"	1-5/16"	.750"
19436	.2344	15/64"	5.954	2-7/16"	1-5/16"	.752"
19441	.2362		6.000	64	35	19
19446	.2380	B	6.045	2-1/2"	1-3/8"	.763"
19451	.2420	C	6.147	2-1/2"	1-3/8"	.776"
19456	.2460	D	6.248	2-1/2"	1-3/8"	.789"
19461	.2500	1/4" / E	6.350	2-1/2"	1-3/8"	.802"
19466	.2559		6.500	67	37	21
19471	.2570	F	6.528	2-5/8"	1-7/16"	.824"
19476	.2610	G	6.629	2-5/8"	1-7/16"	.837"
19481	.2656	17/64"	6.746	2-5/8"	1-7/16"	.852"
19486	.2660	H	6.756	2-11/16"	1-1/2"	.853"
19491	.2720	I	6.909	2-11/16"	1-1/2"	.872"
19496	.2756		7.000	68	38	22
19501	.2770	J	7.036	2-11/16"	1-1/2"	.888"
19506	.2810	K	7.137	2-11/16"	1-1/2"	.901"
19511	.2812	9/32"	7.142	2-11/16"	1-1/2"	.902"
19516	.2900	L	7.366	2-3/4"	1-9/16"	.930"
19521	.2950	M	7.493	2-3/4"	1-9/16"	.946"
19526	.2953		7.500	70	40	24
19531	.2969	19/64"	7.541	2-3/4"	1-9/16"	.952"
19536	.3020	N	7.671	2-15/16"	1-5/8"	.989"
19541	.3125	5/16"	7.938	2-15/16"	1-5/8"	1.002"
19546	.3150		8.000	75	43	26
19551	.3160	O	8.026	2-15/16"	1-11/16"	1.013"
19556	.3230	P	8.204	2-15/16"	1-11/16"	1.036"
19561	.3281	21/64"	8.334	2-15/16"	1-11/16"	1.052"
19566	.3320	Q	8.433	3"	1-11/16"	1.065"
19571	.3346		8.500	76	43	27

continued →

Series 1510H (continued)

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

EDP#	$d^{\dagger}$ Diameter			l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
	Decimal		Metric			
19576	.3390	R	8.611	3"	1-11/16"	1.087"
19581	.3438	11/32"	8.733	3"	1-11/16"	1.103"
19586	.3480	S	8.839	3-1/16"	1-3/4"	1.116"
19591	.3543		9.000	78	44	29
19596	.3580	T	9.093	3-1/16"	1-3/4"	1.148"
19601	.3594	23/64"	9.129	3-1/16"	1-3/4"	1.153"
19606	.3680	U	9.347	3-1/8"	1-13/16"	1.180"
19611	.3740		9.500	79	46	30
19616	.3750	3/8"	9.525	3-1/8"	1-13/16"	1.203"
19621	.3770	V	9.576	3-1/4"	1-7/8"	1.209"
19626	.3860	W	9.804	3-1/4"	1-7/8"	1.238"
19631	.3906	25/64"	9.921	3-1/4"	1-7/8"	1.253"
19636	.3937		10.000	84	49	32
19641	.3970	X	10.084	3-5/16"	1-15/16"	1.273"
19646	.4040	Y	10.262	3-5/16"	1-15/16"	1.296"
19651	.4062	13/32"	10.317	3-5/16"	1-15/16"	1.303"
19656	.4130	Z	10.490	3-3/8"	2"	1.325"
19661	.4134		10.500	86	51	34
19666	.4219	27/64"	10.716	3-3/8"	2"	1.353"
19671	.4331		11.000	87	52	35
19676	.4375	7/16"	11.113	3-7/16"	2-1/16"	1.403"
19681	.4528		11.500	91	54	37
19686	.4531	29/64"	11.509	3-9/16"	2-1/8"	1.453"
19691	.4688	15/32"	11.908	3-5/8"	2-1/8"	1.503"
19696	.4724		12.000	94	56	38
19701	.4844	31/64"	12.304	3-11/16"	2-3/16"	1.554"
19706	.4921		12.500	95	56	40
19711	.5000	1/2"	12.700	3-3/4"	2-1/4"	1.604"
19716	.5118		13.000	107	60	42
19721	.5156	33/64"	13.096	4-1/4"	2-3/8"	1.654"
19726	.5312	17/32"	13.492	4-1/4"	2-3/8"	1.704"
19731	.5315		13.500	107	60	43
19736	.5469	35/64"	13.891	4-1/4"	2-3/8"	1.754"
19741	.5512		14.000	107	60	45
19746	.5625	9/16"	14.287	4-1/2"	2-1/2"	1.804"
19751	.5709		14.500	115	65	47
19756	.5781	37/64"	14.683	4-1/2"	2-1/2"	1.854"
19761	.5906		15.000	115	65	48
19766	.5938	19/32"	15.082	4-1/2"	2-1/2"	1.904"
19771	.6094	39/64"	15.478	4-1/2"	2-1/2"	1.954"
19776	.6102		15.500	115	65	50
19781	.6250	5/8"	15.875	4-1/2"	2-1/2"	2.004"
19786	.6299		16.000	115	65	51

TOLERANCES

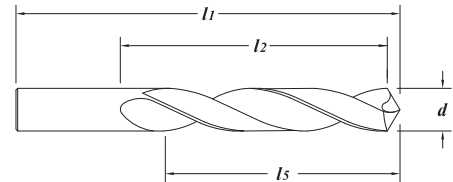
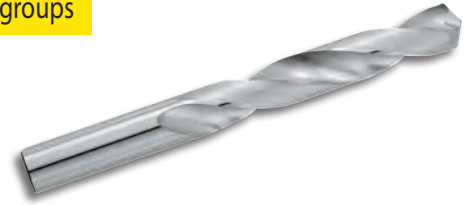
d	+.0000" -.0005" (+.0000 -.0127mm)	
l_1	$\leq 1/8"$	+.125" -.062" (+3.175 -1.588mm)
	$> 1/8"$	+.125" -.125" (+3.175 -3.175mm)
l_2	$\leq 1/8"$	+.125" -.062" (+3.175 -1.588mm)
	$> 1/8"$	+.125" -.125" (+3.175 -3.175mm)


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
 Durana Coating - page 77



3xD (1520) EDP#	5xD (1205) EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
Decimal			Metric			
77165		.0625	1/16"	1.588	1-3/4"	5/8"
	89165	.0625	1/16"	1.588	1-3/4"	3/4"
77170		.0635	#52	1.613	1-3/4"	11/16"
	89170	.0635	#52	1.613	1-3/4"	3/4"
77175		.0670	#51	1.702	1-3/4"	11/16"
	89175	.0670	#51	1.702	1-3/4"	3/4"
77180		.0700	#50	1.778	1-3/4"	11/16"
	89180	.0700	#50	1.778	1-3/4"	7/8"
77185		.0730	#49	1.854	1-3/4"	11/16"
	89185	.0730	#49	1.854	1-3/4"	7/8"
77190		.0760	#48	1.930	1-3/4"	11/16"
	89190	.0760	#48	1.930	1-3/4"	7/8"
77195		.0781	5/64"	1.984	1-3/4"	11/16"
	89195	.0781	5/64"	1.984	1-3/4"	7/8"
77200		.0785	#47	1.994	1-3/4"	3/4"
	89200	.0785	#47	1.994	1-3/4"	7/8"
77205		.0787		2.000	44	19
	89205	.0787		2.000	44	22
77210		.0810	#46	2.057	1-3/4"	3/4"
	89210	.0810	#46	2.057	1-3/4"	7/8"
77215		.0820	#45	2.083	1-3/4"	3/4"
	89215	.0820	#45	2.083	1-3/4"	7/8"
77220		.0860	#44	2.184	1-3/4"	3/4"
	89220	.0860	#44	2.184	2"	1"
77225		.0890	#43	2.261	1-3/4"	3/4"
	89225	.0890	#43	2.261	2"	1"
77230		.0935	#42	2.375	1-3/4"	3/4"
	89230	.0935	#42	2.375	2"	1"
77235		.0938	3/32"	2.383	1-3/4"	3/4"
	89235	.0938	3/32"	2.383	2"	1"
77240		.0960	#41	2.438	1-13/16"	13/16"
	89240	.0960	#41	2.438	2"	1"
77245		.0980	#40	2.489	1-13/16"	13/16"
	89245	.0980	#40	2.489	2"	1"
77250		.0984		2.500	46	21
	89250	.0984		2.500	57	32
77255		.0995	#39	2.527	1-13/16"	13/16"
	89255	.0995	#39	2.527	2-1/4"	1-1/4"
77260		.1015	#38	2.578	1-13/16"	13/16"
	89260	.1015	#38	2.578	2-1/4"	1-1/4"

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	l_5 Max Drill Depth
		Decimal	Metric			
77265		.1040	#37	2.642	1-13/16"	13/16"
	89265	.1040	#37	2.642	2-1/4"	1-1/4"
77270		.1065	#36	2.705	1-13/16"	13/16"
	89270	.1065	#36	2.705	2-1/4"	1-1/4"
77275		.1094	7/64"	2.779	1-13/16"	13/16"
	89275	.1094	7/64"	2.779	2-1/4"	1-1/4"
77280		.1100	#35	2.794	1-7/8"	7/8"
	89280	.1100	#35	2.794	2-1/4"	1-1/4"
77285		.1110	#34	2.819	1-7/8"	7/8"
	89285	.1110	#34	2.819	2-1/4"	1-1/4"
77290		.1130	#33	2.870	1-7/8"	7/8"
	89290	.1130	#33	2.870	2-1/4"	1-1/4"
77295		.1160	#32	2.946	1-7/8"	7/8"
	89295	.1160	#32	2.946	2-1/4"	1-1/4"
77300		.1181		3.000	48	22
	89300	.1181		3.000	57	32
77305		.1200	#31	3.048	1-7/8"	7/8"
	89305	.1200	#31	3.048	2-1/4"	1-1/4"
77310		.1250	1/8"	3.175	1-7/8"	7/8"
	89310	.1250	1/8"	3.175	2-1/4"	1-1/4"
77315		.1285	#30	3.264	1-15/16"	15/16"
	89315	.1285	#30	3.264	2-1/4"	1-1/4"
77320		.1360	#29	3.454	1-15/16"	15/16"
	89320	.1360	#29	3.454	2-1/2"	1-3/8"
77325		.1378		3.500	49	24
	89325	.1378		3.500	63	35
77330		.1405	#28	3.569	1-15/16"	15/16"
	89330	.1405	#28	3.569	2-1/2"	1-3/8"
77335		.1406	9/64"	3.571	1-15/16"	15/16"
	89335	.1406	9/64"	3.571	2-1/2"	1-3/8"
77340		.1440	#27	3.658	2-1/16"	1"
	89340	.1440	#27	3.658	2-1/2"	1-3/8"
77345		.1470	#26	3.734	2-1/16"	1"
	89345	.1470	#26	3.734	2-1/2"	1-3/8"
77350		.1495	#25	3.797	2-1/16"	1"
	89350	.1495	#25	3.797	2-1/2"	1-3/8"
77355		.1520	#24	3.861	2-1/16"	1"
	89355	.1520	#24	3.861	2-1/2"	1-3/8"
77360		.1540	#23	3.912	2-1/16"	1"
	89360	.1540	#23	3.912	2-1/2"	1-3/8"
77365		.1562	5/32"	3.967	2-1/16"	1"
	89365	.1562	5/32"	3.967	2-1/2"	1-3/8"
77370		.1570	#22	3.988	2-1/8"	1-1/16"
	89370	.1570	#22	3.988	2-1/2"	1-3/8"
77375		.1575		4.000	54	27
	89375	.1575		4.000	63	35
77380		.1590	#21	4.039	2-1/8"	1-1/16"
	89380	.1590	#21	4.039	2-1/2"	1-3/8"
77385		.1610	#20	4.089	2-1/8"	1-1/16"
	89385	.1610	#20	4.089	2-1/2"	1-3/8"
77390		.1660	#19	4.216	2-1/8"	1-1/16"
	89390	.1660	#19	4.216	2-3/4"	1-5/8"
77395		.1695	#18	4.305	2-1/8"	1-1/16"
	89395	.1695	#18	4.305	2-3/4"	1-5/8"
77400		.1719	11/64"	4.366	2-1/8"	1-1/16"
	89400	.1719	11/64"	4.366	2-3/4"	1-5/8"

3xD (1520) EDP#	5xD (1205) EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth	
		Decimal		Metric			
77405		.1730	#17	4.394	2-3/16"	1-1/8"	.555"
	89405	.1730	#17	4.394	2-3/4"	1-5/8"	.901"
77410		.1770	#16	4.496	2-3/16"	1-1/8"	.568"
	89410	.1770	#16	4.496	2-3/4"	1-5/8"	.922"
77415		.1772		4.500	56	29	14
	89415	.1772		4.500	70	41	23
77420		.1800	#15	4.572	2-3/16"	1-1/8"	.577"
	89420	.1800	#15	4.572	2-3/4"	1-5/8"	.937"
77425		.1820	#14	4.623	2-3/16"	1-1/8"	.584"
	89425	.1820	#14	4.623	2-3/4"	1-5/8"	.948"
77430		.1850	#13	4.700	2-3/16"	1-1/8"	.593"
	89430	.1850	#13	4.700	2-3/4"	1-5/8"	.963"
77435		.1875	3/16"	4.763	2-3/16"	1-1/8"	.601"
	89435	.1875	3/16"	4.763	2-3/4"	1-5/8"	.976"
77440		.1890	#12	4.801	2-1/4"	1-3/16"	.606"
	89440	.1890	#12	4.801	2-3/4"	1-5/8"	.984"
77445		.1910	#11	4.851	2-1/4"	1-3/16"	.613"
	89445	.1910	#11	4.851	2-3/4"	1-5/8"	.995"
77450		.1935	#10	4.915	2-1/4"	1-3/16"	.621"
	89450	.1935	#10	4.915	2-3/4"	1-5/8"	1.008"
77455		.1960	#9	4.978	2-1/4"	1-3/16"	.629"
	89455	.1960	#9	4.978	3"	1-3/4"	1.021"
77460		.1969		5.000	57	30	16
	89460	.1969		5.000	76	44	26
77465		.1990	#8	5.055	2-1/4"	1-3/16"	.638"
	89465	.1990	#8	5.055	3"	1-3/4"	1.036"
77470		.2010	#7	5.105	2-1/4"	1-3/16"	.645"
	89470	.2010	#7	5.105	3"	1-3/4"	1.047"
77475		.2031	13/64"	5.159	2-1/4"	1-3/16"	.651"
	89475	.2031	13/64"	5.159	3"	1-3/4"	1.058"
77480		.2040	#6	5.182	2-3/8"	1-1/4"	.654"
	89480	.2040	#6	5.182	3"	1-3/4"	1.062"
77485		.2055	#5	5.220	2-3/8"	1-1/4"	.659"
	89485	.2055	#5	5.220	3"	1-3/4"	1.070"
77490		.2090	#4	5.309	2-3/8"	1-1/4"	.670"
	89490	.2090	#4	5.309	3"	1-3/4"	1.088"
77495		.2130	#3	5.410	2-3/8"	1-1/4"	.683"
	89495	.2130	#3	5.410	3"	1-3/4"	1.109"
77500		.2165		5.500	60	32	18
	89500	.2165		5.500	76	44	29
77505		.2188	7/32"	5.558	2-3/8"	1-1/4"	.702"
	89505	.2188	7/32"	5.558	3"	1-3/4"	1.139"
77510		.2210	#2	5.613	2-7/16"	1-5/16"	.709"
	89510	.2210	#2	5.613	3"	1-3/4"	1.151"
77515		.2280	#1	5.791	2-7/16"	1-5/16"	.731"
	89515	.2280	#1	5.791	3"	1-3/4"	1.187"
77520		.2340	A	5.944	2-7/16"	1-5/16"	.750"
	89520	.2340	A	5.944	3-1/4"	2"	1.218"
77525		.2344	15/64"	5.954	2-7/16"	1-5/16"	.752"
	89525	.2344	15/64"	5.954	3-1/4"	2"	1.221"
77530		.2362		6.000	64	35	19
	89530	.2362		6.000	82	50	31
77535		.2380	B	6.045	2-1/2"	1-3/8"	.763"
	89535	.2380	B	6.045	3-1/4"	2"	1.239"
77540		.2420	C	6.147	2-1/2"	1-3/8"	.776"
	89540	.2420	C	6.147	3-1/4"	2"	1.260"

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	l_5 Max Drill Depth
		Decimal		Metric			
77545		.2460	D	6.248	2-1/2"	1-3/8"	.789"
	89545	.2460	D	6.248	3-1/4"	2"	1.281"
77550		.2500	1/4" / E	6.350	2-1/2"	1-3/8"	.802"
	89550	.2500	1/4" / E	6.350	3-1/4"	2"	1.302"
77555		.2559		6.500	67	37	21
	89555	.2559		6.500	82	50	34
77560		.2570	F	6.528	2-5/8"	1-7/16"	.824"
	89560	.2570	F	6.528	3-1/4"	2"	1.338"
77565		.2610	G	6.629	2-5/8"	1-7/16"	.837"
	89565	.2610	G	6.629	3-1/2"	2-1/8"	1.359"
77570		.2656	17/64"	6.746	2-5/8"	1-7/16"	.852"
	89570	.2656	17/64"	6.746	3-1/2"	2-1/8"	1.383"
77575		.2660	H	6.756	2-11/16"	1-1/2"	.853"
	89575	.2660	H	6.756	3-1/2"	2-1/8"	1.385"
77580		.2720	I	6.909	2-11/16"	1-1/2"	.872"
	89580	.2720	I	6.909	3-1/2"	2-1/8"	1.416"
77585		.2756		7.000	68	38	22
	89585	.2756		7.000	88	54	36
77590		.2770	J	7.036	2-11/16"	1-1/2"	.888"
	89590	.2770	J	7.036	3-1/2"	2-1/8"	1.442"
77595		.2810	K	7.137	2-11/16"	1-1/2"	.901"
	89595	.2810	K	7.137	3-1/2"	2-1/8"	1.463"
77600		.2812	9/32"	7.142	2-11/16"	1-1/2"	.902"
	89600	.2812	9/32"	7.142	3-1/2"	2-1/8"	1.464"
77605		.2900	L	7.366	2-3/4"	1-9/16"	.930"
	89605	.2900	L	7.366	3-1/2"	2-1/8"	1.510"
77610		.2950	M	7.493	2-3/4"	1-9/16"	.946"
	89610	.2950	M	7.493	3-3/4"	2-3/8"	1.536"
77615		.2953		7.500	70	40	24
	89615	.2953		7.500	95	60	39
77620		.2969	19/64"	7.541	2-3/4"	1-9/16"	.952"
	89620	.2969	19/64"	7.541	3-3/4"	2-3/8"	1.546"
77625		.3020	N	7.671	2-15/16"	1-5/8"	.969"
	89625	.3020	N	7.671	3-3/4"	2-3/8"	1.573"
77630		.3125	5/16"	7.938	2-15/16"	1-5/8"	1.002"
	89630	.3125	5/16"	7.938	3-3/4"	2-3/8"	1.627"
77635		.3150		8.000	75	43	26
	89635	.3150		8.000	95	60	42
77640		.3160	O	8.026	2-15/16"	1-11/16"	1.013"
	89640	.3160	O	8.026	3-3/4"	2-3/8"	1.645"
77645		.3230	P	8.204	2-15/16"	1-11/16"	1.036"
	89645	.3230	P	8.204	3-3/4"	2-3/8"	1.682"
77650		.3281	21/64"	8.334	2-15/16"	1-11/16"	1.052"
	89650	.3281	21/64"	8.334	4"	2-1/2"	1.708"
77655		.3320	Q	8.433	3"	1-11/16"	1.065"
	89655	.3320	Q	8.433	4"	2-1/2"	1.729"
77660		.3346		8.500	76	43	27
	89660	.3346		8.500	101	63	44
77665		.3390	R	8.611	3"	1-11/16"	1.087"
	89665	.3390	R	8.611	4"	2-1/2"	1.765"
77670		.3438	11/32"	8.733	3"	1-11/16"	1.103"
	89670	.3438	11/32"	8.733	4"	2-1/2"	1.790"
77675		.3480	S	8.839	3-1/16"	1-3/4"	1.116"
	89675	.3480	S	8.839	4"	2-1/2"	1.812"
77680		.3543		9.000	78	44	29
	89680	.3543		9.000	101	63	47

3xD (1520) EDP#	5xD (1205) EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
		Decimal	Metric			
77685	89685	.3580	T	9.093	3-1/16"	1-3/4"
		.3580	T	9.093	4-1/4"	1.864"
77690	89690	.3594	23/64"	9.129	3-1/16"	1.153"
		.3594	23/64"	9.129	4-1/4"	1.871"
77695	89695	.3680	U	9.347	3-1/8"	1-13/16"
		.3680	U	9.347	4-1/4"	1.916"
77700	89700	.3740		9.500	79	46
		.3740		9.500	107	70
77705	89705	.3750	3/8"	9.525	3-1/8"	1-13/16"
		.3750	3/8"	9.525	4-1/4"	1.953"
77710	89710	.3770	V	9.576	3-1/4"	1-7/8"
		.3770	V	9.576	4-1/4"	1.963"
77715	89715	.3860	W	9.804	3-1/4"	1-7/8"
		.3860	W	9.804	4-1/2"	2-7/8"
77720	89720	.3906	25/64"	9.921	3-1/4"	1-7/8"
		.3906	25/64"	9.921	4-1/2"	2-7/8"
77725	89725	.3937		10.000	84	49
		.3937		10.000	114	73
77730	89730	.3970	X	10.084	3-5/16"	1-15/16"
		.3970	X	10.084	4-1/2"	2-7/8"
77735	89735	.4040	Y	10.262	4-1/2"	2-7/8"
		.4062	13/32"	10.317	3-5/16"	1-15/16"
77740	89740	.4062	13/32"	10.317	4-1/2"	2-7/8"
		.4130	Z	10.490	3-3/8"	2"
77745	89745	.4130	Z	10.490	4-1/2"	2-7/8"
		.4134		10.500	86	51
77750	89750	.4134		10.500	114	73
		.4219	27/64"	10.716	3-3/8"	2"
77755	89755	.4219	27/64"	10.716	4-1/2"	2-7/8"
		.4331		11.000	87	52
77760	89760	.4331		11.000	114	73
		.4375	7/16"	11.113	3-7/16"	2-1/16"
77765	89765	.4375	7/16"	11.113	4-1/2"	2-7/8"
		.4528		11.500	91	54
77770	89770	.4528		11.500	120	76
		.4531	29/64"	11.509	3-9/16"	2-1/8"
77775	89775	.4531	29/64"	11.509	4-3/4"	3"
		.4688	15/32"	11.908	3-5/8"	2-1/8"
77780	89780	.4688	15/32"	11.908	4-3/4"	3"
		.4724		12.000	94	56
77785	89785	.4724		12.000	120	76
		.4844	31/64"	12.304	3-11/16"	2-3/16"
77790	89790	.4844	31/64"	12.304	4-3/4"	3"
		.4921		12.500	95	56
77795	89795	.4921		12.500	120	76
		.5000	1/2"	12.700	3-3/4"	2-1/4"
77800	89800	.5000	1/2"	12.700	4-3/4"	3"
		.5118		13.000	107	60
77805	89805	.5118		13.000	127	83
		.5156	33/64"	13.096	4-1/4"	2-3/8"
77810	89810	.5156	33/64"	13.096	5"	3-1/4"
		.5312	17/32"	13.492	4-1/4"	2-3/8"
77815	89815	.5312	17/32"	13.492	5"	3-1/4"
		.5315		13.500	107	60
77820	89820	.5315		13.500	127	83
		.5315		13.500		70

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	l_5 Max Drill Depth
		Decimal	Metric			
77825	89825	.5469	35/64"	13.891	4-1/4"	1.754"
		.5469	35/64"	13.891	5"	2.848"
77830	89830	.5512		14.000	107	60
		.5512		14.000	127	83
77835	89835	.5625	9/16"	14.287	4-1/2"	2-1/2"
		.5625	9/16"	14.287	5"	3-1/4"
77840	89840	.5709		14.500	115	65
		.5709		14.500	127	83
	89845	.5781	37/64"	14.683	5-1/4"	3-1/2"
77850	89850	.5906		15.000	115	65
		.5906		15.000	133	89
77855	89855	.5938	19/32"	15.082	4-1/2"	2-1/2"
		.5938	19/32"	15.082	5-1/4"	3-1/2"
77860	89860	.6094	39/64"	15.478	4-1/2"	2-1/2"
		.6094	39/64"	15.478	5-1/4"	3-1/2"
	89865	.6102		15.500	133	89
77870	89870	.6250	5/8"	15.875	4-1/2"	2-1/2"
		.6250	5/8"	15.875	5-1/4"	3-1/2"
	89875	.6299		16.000	133	89

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)


Series 1520H, 1205H

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

General purpose for all material groups

BALINIT® Durana Coating

Solid submicron grain carbide drill

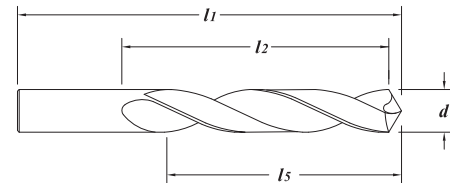
Excellent heat resistance and lubricity

No spotting required in most applications

4-flute self-centering point

Live tooling recommended on lathe processes

Bright Finish - page 71



3xD (1520H) EDP#	5xD (1205H) EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
		Decimal	Metric			
77166		.0625	1/16"	1.588	1-3/4"	.200"
	89166	.0625	1/16"	1.588	1-3/4"	.325"
77171		.0635	#52	1.613	1-3/4"	.204"
	89171	.0635	#52	1.613	1-3/4"	.331"
77176		.0670	#51	1.702	1-3/4"	.215"
	89176	.0670	#51	1.702	1-3/4"	.349"
77181		.0700	#50	1.778	1-3/4"	.224"
	89181	.0700	#50	1.778	1-3/4"	.364"
77186		.0730	#49	1.854	1-3/4"	.234"
	89186	.0730	#49	1.854	1-3/4"	.380"
77191		.0760	#48	1.930	1-3/4"	.244"
	89191	.0760	#48	1.930	1-3/4"	.396"
77196		.0781	5/64"	1.984	1-3/4"	.250"
	89196	.0781	5/64"	1.984	1-3/4"	.407"
77201		.0785	#47	1.994	1-3/4"	.252"
	89201	.0785	#47	1.994	1-3/4"	.409"
77206		.0787		2.000	44	6
	89206	.0787		2.000	44	10
77211		.0810	#46	2.057	1-3/4"	.260"
	89211	.0810	#46	2.057	1-3/4"	.422"
77216		.0820	#45	2.083	1-3/4"	.263"
	89216	.0820	#45	2.083	1-3/4"	.427"
77221		.0860	#44	2.184	1-3/4"	.276"
	89221	.0860	#44	2.184	2"	.448"
77226		.0890	#43	2.261	1-3/4"	.285"
	89226	.0890	#43	2.261	2"	.463"
77231		.0935	#42	2.375	1-3/4"	.300"
	89231	.0935	#42	2.375	2"	.487"
77236		.0938	3/32"	2.383	1-3/4"	.301"
	89236	.0938	3/32"	2.383	2"	.488"
77241		.0960	#41	2.438	1-13/16"	.308"
	89241	.0960	#41	2.438	2"	.500"
77246		.0980	#40	2.489	1-13/16"	.314"
	89246	.0980	#40	2.489	2"	.510"
77251		.0984		2.500	46	8
	89251	.0984		2.500	57	13
77256		.0995	#39	2.527	1-13/16"	.319"
	89256	.0995	#39	2.527	2-1/4"	.518"
77261		.1015	#38	2.578	1-13/16"	.326"
	89261	.1015	#38	2.578	2-1/4"	.529"

GENERAL PURPOSE
DRILLS

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	l_5 Max Drill Depth
		Decimal		Metric			
77266		.1040	#37	2.642	1-13/16"	13/16"	.334"
	89266	.1040	#37	2.642	2-1/4"	1-1/4"	.542"
77271		.1065	#36	2.705	1-13/16"	13/16"	.342"
	89271	.1065	#36	2.705	2-1/4"	1-1/4"	.555"
77276		.1094	7/64"	2.779	1-13/16"	13/16"	.351"
	89276	.1094	7/64"	2.779	2-1/4"	1-1/4"	.570"
77281		.1100	#35	2.794	1-7/8"	7/8"	.353"
	89281	.1100	#35	2.794	2-1/4"	1-1/4"	.573"
77286		.1110	#34	2.819	1-7/8"	7/8"	.356"
	89286	.1110	#34	2.819	2-1/4"	1-1/4"	.578"
77291		.1130	#33	2.870	1-7/8"	7/8"	.362"
	89291	.1130	#33	2.870	2-1/4"	1-1/4"	.588"
77296		.1160	#32	2.946	1-7/8"	7/8"	.372"
	89296	.1160	#32	2.946	2-1/4"	1-1/4"	.604"
77301		.1181		3.000	48	22	10
	89301	.1181		3.000	57	32	16
77306		.1200	#31	3.048	1-7/8"	7/8"	.385"
	89306	.1200	#31	3.048	2-1/4"	1-1/4"	.625"
77311		.1250	1/8"	3.175	1-7/8"	7/8"	.401"
	89311	.1250	1/8"	3.175	2-1/4"	1-1/4"	.651"
77316		.1285	#30	3.264	1-15/16"	15/16"	.412"
	89316	.1285	#30	3.264	2-1/4"	1-1/4"	.669"
77321		.1360	#29	3.454	1-15/16"	15/16"	.436"
	89321	.1360	#29	3.454	2-1/2"	1-3/8"	.708"
77326		.1378		3.500	49	24	11
	89326	.1378		3.500	63	35	18
77331		.1405	#28	3.569	1-15/16"	15/16"	.451"
	89331	.1405	#28	3.569	2-1/2"	1-3/8"	.732"
77336		.1406	9/64"	3.571	1-15/16"	15/16"	.451"
	89336	.1406	9/64"	3.571	2-1/2"	1-3/8"	.732"
77341		.1440	#27	3.658	2-1/16"	1"	.462"
	89341	.1440	#27	3.658	2-1/2"	1-3/8"	.750"
77346		.1470	#26	3.734	2-1/16"	1"	.471"
	89346	.1470	#26	3.734	2-1/2"	1-3/8"	.765"
77351		.1495	#25	3.797	2-1/16"	1"	.479"
	89351	.1495	#25	3.797	2-1/2"	1-3/8"	.778"
77356		.1520	#24	3.861	2-1/16"	1"	.487"
	89356	.1520	#24	3.861	2-1/2"	1-3/8"	.791"
77361		.1540	#23	3.912	2-1/16"	1"	.494"
	89361	.1540	#23	3.912	2-1/2"	1-3/8"	.802"
77366		.1562	5/32"	3.967	2-1/16"	1"	.501"
	89366	.1562	5/32"	3.967	2-1/2"	1-3/8"	.813"
77371		.1570	#22	3.988	2-1/8"	1-1/16"	.504"
	89371	.1570	#22	3.988	2-1/2"	1-3/8"	.818"
77376		.1575		4.000	54	27	13
	89376	.1575		4.000	63	35	21
77381		.1590	#21	4.039	2-1/8"	1-1/16"	.510"
	89381	.1590	#21	4.039	2-1/2"	1-3/8"	.828"
77386		.1610	#20	4.089	2-1/8"	1-1/16"	.516"
	89386	.1610	#20	4.089	2-1/2"	1-3/8"	.838"
77391		.1660	#19	4.216	2-1/8"	1-1/16"	.532"
	89391	.1660	#19	4.216	2-3/4"	1-5/8"	.864"
77396		.1695	#18	4.305	2-1/8"	1-1/16"	.544"
	89396	.1695	#18	4.305	2-3/4"	1-5/8"	.883"
77401		.1719	11/64"	4.366	2-1/8"	1-1/16"	.551"
	89401	.1719	11/64"	4.366	2-3/4"	1-5/8"	.895"

3xD (1520H) EDP#	5xD (1205H) EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth	
		Decimal	Metric				
77406		.1730	#17	4.394	2-3/16"	1-1/8"	.555"
	89406	.1730	#17	4.394	2-3/4"	1-5/8"	.901"
77411		.1770	#16	4.496	2-3/16"	1-1/8"	.568"
	89411	.1770	#16	4.496	2-3/4"	1-5/8"	.922"
77416		.1772		4.500	56	29	14
	89416	.1772		4.500	70	41	23
77421		.1800	#15	4.572	2-3/16"	1-1/8"	.577"
	89421	.1800	#15	4.572	2-3/4"	1-5/8"	.937"
77426		.1820	#14	4.623	2-3/16"	1-1/8"	.584"
	89426	.1820	#14	4.623	2-3/4"	1-5/8"	.948"
77431		.1850	#13	4.700	2-3/16"	1-1/8"	.593"
	89431	.1850	#13	4.700	2-3/4"	1-5/8"	.963"
77436		.1875	3/16"	4.763	2-3/16"	1-1/8"	.601"
	89436	.1875	3/16"	4.763	2-3/4"	1-5/8"	.976"
77441		.1890	#12	4.801	2-1/4"	1-3/16"	.606"
	89441	.1890	#12	4.801	2-3/4"	1-5/8"	.984"
77446		.1910	#11	4.851	2-1/4"	1-3/16"	.613"
	89446	.1910	#11	4.851	2-3/4"	1-5/8"	.995"
77451		.1935	#10	4.915	2-1/4"	1-3/16"	.621"
	89451	.1935	#10	4.915	2-3/4"	1-5/8"	1.008"
77456		.1960	#9	4.978	2-1/4"	1-3/16"	.629"
	89456	.1960	#9	4.978	3"	1-3/4"	1.021"
77461		.1969		5.000	57	30	16
	89461	.1969		5.000	76	44	26
77466		.1990	#8	5.055	2-1/4"	1-3/16"	.638"
	89466	.1990	#8	5.055	3"	1-3/4"	1.036"
77471		.2010	#7	5.105	2-1/4"	1-3/16"	.645"
	89471	.2010	#7	5.105	3"	1-3/4"	1.047"
77476		.2031	13/64"	5.159	2-1/4"	1-3/16"	.651"
	89476	.2031	13/64"	5.159	3"	1-3/4"	1.058"
77481		.2040	#6	5.182	2-3/8"	1-1/4"	.654"
	89481	.2040	#6	5.182	3"	1-3/4"	1.062"
77486		.2055	#5	5.220	2-3/8"	1-1/4"	.659"
	89486	.2055	#5	5.220	3"	1-3/4"	1.070"
77491		.2090	#4	5.309	2-3/8"	1-1/4"	.670"
	89491	.2090	#4	5.309	3"	1-3/4"	1.088"
77496		.2130	#3	5.410	2-3/8"	1-1/4"	.683"
	89496	.2130	#3	5.410	3"	1-3/4"	1.109"
77501		.2165		5.500	60	32	18
	89501	.2165		5.500	76	44	29
77506		.2188	7/32"	5.558	2-3/8"	1-1/4"	.702"
	89506	.2188	7/32"	5.558	3"	1-3/4"	1.139"
77511		.2210	#2	5.613	2-7/16"	1-5/16"	.709"
	89511	.2210	#2	5.613	3"	1-3/4"	1.151"
77516		.2280	#1	5.791	2-7/16"	1-5/16"	.731"
	89516	.2280	#1	5.791	3"	1-3/4"	1.187"
77521		.2340	A	5.944	2-7/16"	1-5/16"	.750"
	89521	.2340	A	5.944	3-1/4"	2"	1.218"
77526		.2344	15/64"	5.954	2-7/16"	1-5/16"	.752"
	89526	.2344	15/64"	5.954	3-1/4"	2"	1.221"
77531		.2362		6.000	64	35	19
	89531	.2362		6.000	82	50	31
77536		.2380	B	6.045	2-1/2"	1-3/8"	.763"
	89536	.2380	B	6.045	3-1/4"	2"	1.239"
77541		.2420	C	6.147	2-1/2"	1-3/8"	.776"
	89541	.2420	C	6.147	3-1/4"	2"	1.260"

continued →

Series 1520H, 1205H (continued)

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

3xD (1520H) EDP#	5xD (1205H) EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
		Decimal	Metric			
77546		.2460	D	6.248	2-1/2"	.789"
	89546	.2460	D	6.248	3-1/4"	1.281"
77551		.2500	1/4" / E	6.350	2-1/2"	.802"
	89551	.2500	1/4" / E	6.350	3-1/4"	1.302"
77556		.2559		6.500	67	21
	89556	.2559		6.500	82	34
77561		.2570	F	6.528	2-5/8"	.824"
	89561	.2570	F	6.528	3-1/4"	1.338"
77566		.2610	G	6.629	2-5/8"	.837"
	89566	.2610	G	6.629	3-1/2"	1.359"
77571		.2656	17/64"	6.746	2-5/8"	.852"
	89571	.2656	17/64"	6.746	3-1/2"	1.383"
77576		.2660	H	6.756	2-11/16"	.853"
	89576	.2660	H	6.756	3-1/2"	1.385"
77581		.2720	I	6.909	2-11/16"	.872"
	89581	.2720	I	6.909	3-1/2"	1.416"
77586		.2756		7.000	68	22
	89586	.2756		7.000	88	36
77591		.2770	J	7.036	2-11/16"	.888"
	89591	.2770	J	7.036	3-1/2"	1.442"
77596		.2810	K	7.137	2-11/16"	.901"
	89596	.2810	K	7.137	3-1/2"	1.463"
77601		.2812	9/32"	7.142	2-11/16"	.902"
	89601	.2812	9/32"	7.142	3-1/2"	1.464"
77606		.2900	L	7.366	2-3/4"	.930"
	89606	.2900	L	7.366	3-1/2"	1.510"
77611		.2950	M	7.493	2-3/4"	.946"
	89611	.2950	M	7.493	3-3/4"	1.536"
77616		.2953		7.500	70	24
	89616	.2953		7.500	95	39
77621		.2969	19/64"	7.541	2-3/4"	.952"
	89621	.2969	19/64"	7.541	3-3/4"	1.546"
77626		.3020	N	7.671	2-15/16"	.969"
	89626	.3020	N	7.671	3-3/4"	1.573"
77631		.3125	5/16"	7.938	2-15/16"	1.002"
	89631	.3125	5/16"	7.938	3-3/4"	1.627"
77636		.3150		8.000	75	26
	89636	.3150		8.000	95	42
77641		.3160	O	8.026	2-15/16"	1.013"
	89641	.3160	O	8.026	3-3/4"	1.645"
77646		.3230	P	8.204	2-15/16"	1.036"
	89646	.3230	P	8.204	3-3/4"	1.682"
77651		.3281	21/64"	8.334	2-15/16"	1.052"
	89651	.3281	21/64"	8.334	4"	1.708"
77656		.3320	Q	8.433	3"	1-11/16"
	89656	.3320	Q	8.433	4"	1.729"
77661		.3346		8.500	76	27
	89661	.3346		8.500	101	44
77666		.3390	R	8.611	3"	1-11/16"
	89666	.3390	R	8.611	4"	1.765"
77671		.3438	11/32"	8.733	3"	1-11/16"
	89671	.3438	11/32"	8.733	4"	1.790"
77676		.3480	S	8.839	3-1/16"	1.116"
	89676	.3480	S	8.839	4"	1.812"
77681		.3543		9.000	78	29
	89681	.3543		9.000	101	47

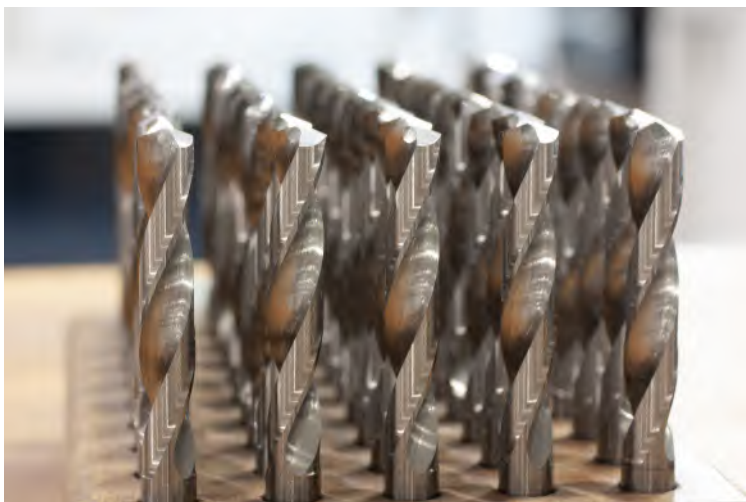
3xD (1520H) EDP#	5xD (1205H) EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
		Decimal	Metric			
77686		.3580	T	9.093	3-1/16"	1-3/4"
	89686	.3580	T	9.093	4-1/4"	2-3/4"
77691		.3594	23/64"	9.129	3-1/16"	1-3/4"
	89691	.3594	23/64"	9.129	4-1/4"	2-3/4"
77696		.3680	U	9.347	3-1/8"	1-13/16"
	89696	.3680	U	9.347	4-1/4"	2-3/4"
77701		.3740		9.500	79	46
	89701	.3740		9.500	107	70
77706		.3750	3/8"	9.525	3-1/8"	1-13/16"
	89706	.3750	3/8"	9.525	4-1/4"	2-3/4"
77711		.3770	V	9.576	3-1/4"	1-7/8"
	89711	.3770	V	9.576	4-1/4"	2-3/4"
77716		.3860	W	9.804	3-1/4"	1-7/8"
	89716	.3860	W	9.804	4-1/2"	2-7/8"
77721		.3906	25/64"	9.921	3-1/4"	1-7/8"
	89721	.3906	25/64"	9.921	4-1/2"	2-7/8"
77726		.3937		10.000	84	49
	89726	.3937		10.000	114	73
77731		.3970	X	10.084	3-5/16"	1-15/16"
	89731	.3970	X	10.084	4-1/2"	2-7/8"
77736		.4040	Y	10.262	3-5/16"	1-15/16"
	89736	.4040	Y	10.262	4-1/2"	2-7/8"
77741		.4062	13/32"	10.317	3-5/16"	1-15/16"
	89741	.4062	13/32"	10.317	4-1/2"	2-7/8"
77746		.4130	Z	10.490	3-3/8"	2"
	89746	.4130	Z	10.490	4-1/2"	2-7/8"
77751		.4134		10.500	86	51
	89751	.4134		10.500	114	73
77756		.4219	27/64"	10.716	3-3/8"	2"
	89756	.4219	27/64"	10.716	4-1/2"	2-7/8"
77761		.4331		11.000	87	52
	89761	.4331		11.000	114	73
77766		.4375	7/16"	11.113	3-7/16"	2-1/16"
	89766	.4375	7/16"	11.113	4-1/2"	2-7/8"
77771		.4528		11.500	91	54
	89771	.4528		11.500	120	76
77776		.4531	29/64"	11.509	3-9/16"	2-1/8"
	89776	.4531	29/64"	11.509	4-3/4"	3"
77781		.4688	15/32"	11.908	3-5/8"	2-1/8"
	89781	.4688	15/32"	11.908	4-3/4"	3"
77786		.4724		12.000	94	56
	89786	.4724		12.000	120	76
77791		.4844	31/64"	12.304	3-11/16"	2-3/16"
	89791	.4844	31/64"	12.304	4-3/4"	3"
77796		.4921		12.500	95	56
	89796	.4921		12.500	120	76
77801		.5000	1/2"	12.700	3-3/4"	2-1/4"
	89801	.5000	1/2"	12.700	4-3/4"	3"
77806		.5118		13.000	107	60
	89806	.5118		13.000	127	83
77811		.5156	33/64"	13.096	4-1/4"	2-3/8"
	89811	.5156	33/64"	13.096	5"	3-1/4"
77816		.5312	17/32"	13.492	4-1/4"	2-3/8"
	89816	.5312	17/32"	13.492	5"	3-1/4"
77821		.5315		13.500	107	60
	89821	.5315		13.500	127	83

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	l_5 Max Drill Depth
		Decimal	Metric			
77826	89826	.5469	35/64"	13.891	4-1/4"	1.754"
		.5469	35/64"	13.891	5"	2.848"
77831	89831	.5512		14.000	107	60
		.5512		14.000	127	83
77836	89836	.5625	9/16"	14.287	4-1/2"	2-1/2"
		.5625	9/16"	14.287	5"	3-1/4"
77841	89841	.5709		14.500	115	65
		.5709		14.500	127	83
77846	89846	.5781	37/64"	14.683	4-1/2"	2-1/2"
		.5781	37/64"	14.683	5-1/4"	3-1/2"
77851	89851	.5906		15.000	115	65
		.5906		15.000	133	89
77856	89856	.5938	19/32"	15.082	4-1/2"	2-1/2"
		.5938	19/32"	15.082	5-1/4"	3-1/2"
77861	89861	.6094	39/64"	15.478	4-1/2"	2-1/2"
		.6094	39/64"	15.478	5-1/4"	3-1/2"
77866	89866	.6102		15.500	115	65
		.6102		15.500	133	89
77871	89871	.6250	5/8"	15.875	4-1/2"	2-1/2"
		.6250	5/8"	15.875	5-1/4"	3-1/2"
77876	89876	.6299		16.000	115	65
		.6299		16.000	133	89



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)


Series 1120H, 1100H

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

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

BALINIT® Durana 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

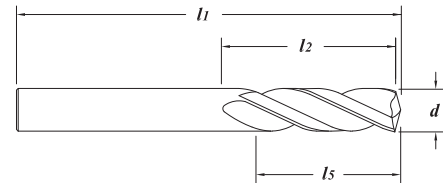
Stub length reduces deflection and vibration

Tighter tolerance holes

Improved roundness and straightness

Live tooling recommended on lathe processes

Series 1100 Bright Finish - page [92](#)



3xD (1120H) EDP#	5xD (1100H) EDP#	d †		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
		Decimal	Diameter Metric			
78276		.1094	7/64"	2.779	1-13/16"	.343"
	90276	.1094	7/64"	2.779	2-1/4"	.562"
78281		.1100	#35	2.794	1-7/8"	.345"
	90281	.1100	#35	2.794	2-1/4"	.565"
78286		.1110	#34	2.819	1-7/8"	.348"
78291		.1130	#33	2.870	1-7/8"	.354"
	90291	.1130	#33	2.870	2-1/4"	.580"
78296		.1160	#32	2.946	1-7/8"	.364"
	90296	.1160	#32	2.946	2-1/4"	.596"
78301		.1181		3.000	48	9
	90301	.1181		3.000	57	15
78306		.1200	#31	3.048	1-7/8"	.376"
	90306	.1200	#31	3.048	2-1/4"	.616"
78311		.1250	1/8"	3.175	1-7/8"	.392"
	90311	.1250	1/8"	3.175	2-1/4"	.642"
78316		.1285	#30	3.264	1-15/16"	.403"
	90316	.1285	#30	3.264	2-1/4"	.660"
78321		.1360	#29	3.454	1-15/16"	.426"
	90321	.1360	#29	3.454	2-1/2"	.698"
78326		.1378		3.500	49	11
	90326	.1378		3.500	63	18
78331		.1405	#28	3.569	1-15/16"	.440"
	90331	.1405	#28	3.569	2-1/2"	.721"
78336		.1406	9/64"	3.571	1-15/16"	.441"
	90336	.1406	9/64"	3.571	2-1/2"	.722"
78341		.1440	#27	3.658	2-1/16"	.451"
	90341	.1440	#27	3.658	2-1/2"	.739"
78346		.1470	#26	3.734	2-1/16"	.461"
	90346	.1470	#26	3.734	2-1/2"	.755"
78351		.1495	#25	3.797	2-1/16"	.469"
	90351	.1495	#25	3.797	2-1/2"	.768"
78356		.1520	#24	3.861	2-1/16"	.476"
	90356	.1520	#24	3.861	2-1/2"	.780"
78361		.1540	#23	3.912	2-1/16"	.483"
	90361	.1540	#23	3.912	2-1/2"	.791"
78366		.1562	5/32"	3.967	2-1/16"	.490"
	90366	.1562	5/32"	3.967	2-1/2"	.802"
78371		.1570	#22	3.988	2-1/8"	.492"
	90371	.1570	#22	3.988	2-1/2"	.806"
78376		.1575		4.000	54	13
	90376	.1575		4.000	63	21

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	l_5 Max Drill Depth
		Decimal		Metric			
78381		.1590	#21	4.039	2-1/8"	1-1/16"	.498"
	90381	.1590	#21	4.039	2-1/2"	1-3/8"	.816"
78386		.1610	#20	4.089	2-1/8"	1-1/16"	.505"
	90386	.1610	#20	4.089	2-1/2"	1-3/8"	.827"
78391		.1660	#19	4.216	2-1/8"	1-1/16"	.520"
	90391	.1660	#19	4.216	2-3/4"	1-5/8"	.852"
78396		.1695	#18	4.305	2-1/8"	1-1/16"	.531"
	90396	.1695	#18	4.305	2-3/4"	1-5/8"	.870"
78401		.1719	11/64"	4.366	2-1/8"	1-1/16"	.539"
	90401	.1719	11/64"	4.366	2-3/4"	1-5/8"	.883"
78406		.1730	#17	4.394	2-3/16"	1-1/8"	.542"
	90406	.1730	#17	4.394	2-3/4"	1-5/8"	.888"
78411		.1770	#16	4.496	2-3/16"	1-1/8"	.555"
	90411	.1770	#16	4.496	2-3/4"	1-5/8"	.909"
	90416	.1772		4.500	70	41	23
78421		.1800	#15	4.572	2-3/16"	1-1/8"	.564"
	90421	.1800	#15	4.572	2-3/4"	1-5/8"	.924"
78426		.1820	#14	4.623	2-3/16"	1-1/8"	.570"
	90426	.1820	#14	4.623	2-3/4"	1-5/8"	.934"
78431		.1850	#13	4.700	2-3/16"	1-1/8"	.580"
	90431	.1850	#13	4.700	2-3/4"	1-5/8"	.950"
78436		.1875	3/16"	4.763	2-3/16"	1-1/8"	.588"
	90436	.1875	3/16"	4.763	2-3/4"	1-5/8"	.963"
78441		.1890	#12	4.801	2-1/4"	1-3/16"	.592"
	90441	.1890	#12	4.801	2-3/4"	1-5/8"	.970"
78446		.1910	#11	4.851	2-1/4"	1-3/16"	.599"
	90446	.1910	#11	4.851	2-3/4"	1-5/8"	.981"
78451		.1935	#10	4.915	2-1/4"	1-3/16"	.606"
	90451	.1935	#10	4.915	2-3/4"	1-5/8"	.993"
78456		.1960	#9	4.978	2-1/4"	1-3/16"	.614"
	90456	.1960	#9	4.978	3"	1-3/4"	1.006"
78461		.1969		5.000	57	30	16
	90461	.1969		5.000	76	44	26
78466		.1990	#8	5.055	2-1/4"	1-3/16"	.624"
	90466	.1990	#8	5.055	3"	1-3/4"	1.022"
78471		.2010	#7	5.105	2-1/4"	1-3/16"	.630"
	90471	.2010	#7	5.105	3"	1-3/4"	1.032"
78476		.2031	13/64"	5.159	2-1/4"	1-3/16"	.637"
	90476	.2031	13/64"	5.159	3"	1-3/4"	1.043"
	90481	.2040	#6	5.182	3"	1-3/4"	1.047"
78486		.2055	#5	5.220	2-3/8"	1-1/4"	.644"
	90486	.2055	#5	5.220	3"	1-3/4"	1.055"
78491		.2090	#4	5.309	2-3/8"	1-1/4"	.655"
	90491	.2090	#4	5.309	3"	1-3/4"	1.073"
78496		.2130	#3	5.410	2-3/8"	1-1/4"	.668"
	90496	.2130	#3	5.410	3"	1-3/4"	1.094"
78501		.2165		5.500	60	32	17
	90501	.2165		5.500	76	44	28
78506		.2188	7/32"	5.558	2-3/8"	1-1/4"	.686"
	90506	.2188	7/32"	5.558	3"	1-3/4"	1.123"
78511		.2210	#2	5.613	2-7/16"	1-5/16"	.693"
	90511	.2210	#2	5.613	3"	1-3/4"	1.135"
78516		.2280	#1	5.791	2-7/16"	1-5/16"	.715"
	90516	.2280	#1	5.791	3"	1-3/4"	1.171"
78521		.2340	A	5.944	2-7/16"	1-5/16"	.733"
	90521	.2340	A	5.944	3-1/4"	2"	1.201"
78526		.2344	15/64"	5.954	2-7/16"	1-5/16"	.735"
	90526	.2344	15/64"	5.954	3-1/4"	2"	1.203"
78531		.2362		6.000	64	35	19
	90531	.2362		6.000	82	50	31

3xD (1120H) EDP#	5xD (1100H) EDP#	d^+ Diameter			l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
		Decimal		Metric			
78536		.2380	B	6.045	2-1/2"	1-3/8"	.746"
	90536	.2380	B	6.045	3-1/4"	2"	1.222"
78541		.2420	C	6.147	2-1/2"	1-3/8"	.758"
	90541	.2420	C	6.147	3-1/4"	2"	1.242"
78546		.2460	D	6.248	2-1/2"	1-3/8"	.771"
	90546	.2460	D	6.248	3-1/4"	2"	1.263"
78551		.2500	1/4" / E	6.350	2-1/2"	1-3/8"	.783"
	90551	.2500	1/4" / E	6.350	3-1/4"	2"	1.283"
78556		.2559		6.500	67	37	21
	90556	.2559		6.500	82	50	33
78561		.2570	F	6.528	2-5/8"	1-7/16"	.805"
	90561	.2570	F	6.528	3-1/4"	2"	1.319"
78566		.2610	G	6.629	2-5/8"	1-7/16"	.818"
	90566	.2610	G	6.629	3-1/2"	2-1/8"	1.340"
78571		.2656	17/64"	6.746	2-5/8"	1-7/16"	.832"
	90571	.2656	17/64"	6.746	3-1/2"	2-1/8"	1.364"
78576		.2660	H	6.756	2-11/16"	1-1/2"	.834"
	90576	.2660	H	6.756	3-1/2"	2-1/8"	1.366"
78581		.2720	I	6.909	2-11/16"	1-1/2"	.852"
	90581	.2720	I	6.909	3-1/2"	2-1/8"	1.396"
78586		.2756		7.000	68	38	22
	90586	.2756		7.000	88	54	36
	90591	.2770	J	7.036	3-1/2"	2-1/8"	1.422"
78596		.2810	K	7.137	2-11/16"	1-1/2"	.881"
	90596	.2810	K	7.137	3-1/2"	2-1/8"	1.443"
78601		.2812	9/32"	7.142	2-11/16"	1-1/2"	.881"
	90601	.2812	9/32"	7.142	3-1/2"	2-1/8"	1.444"
78606		.2900	L	7.366	2-3/4"	1-9/16"	.909"
	90606	.2900	L	7.366	3-1/2"	2-1/8"	1.489"
	90611	.2950	M	7.493	3-3/4"	2-3/8"	1.515"
78616		.2953		7.500	70	40	23
78621		.2969	19/64"	7.541	2-3/4"	1-9/16"	.930"
	90621	.2969	19/64"	7.541	3-3/4"	2-3/8"	1.524"
78626		.3020	N	7.671	2-15/16"	1-5/8"	.946"
	90626	.3020	N	7.671	3-3/4"	2-3/8"	1.550"
78631		.3125	5/16"	7.938	2-15/16"	1-5/8"	.979"
	90631	.3125	5/16"	7.938	3-3/4"	2-3/8"	1.604"
78636		.3150		8.000	75	43	25
	90636	.3150		8.000	95	60	41
78641		.3160	O	8.026	2-15/16"	1-11/16"	.990"
	90641	.3160	O	8.026	3-3/4"	2-3/8"	1.622"
78646		.3230	P	8.204	2-15/16"	1-11/16"	1.012"
	90646	.3230	P	8.204	3-3/4"	2-3/8"	1.658"
78651		.3281	21/64"	8.334	2-15/16"	1-11/16"	1.028"
	90651	.3281	21/64"	8.334	4"	2-1/2"	1.684"
78656		.3320	Q	8.433	3"	1-11/16"	1.040"
	90656	.3320	Q	8.433	4"	2-1/2"	1.704"
78661		.3346		8.500	76	43	27
	90661	.3346		8.500	101	63	44
78666		.3390	R	8.611	3"	1-11/16"	1.062"
	90666	.3390	R	8.611	4"	2-1/2"	1.740"
78671		.3438	11/32"	8.733	3"	1-11/16"	1.077"
	90671	.3438	11/32"	8.733	4"	2-1/2"	1.765"
78676		.3480	S	8.839	3-1/16"	1-3/4"	1.091"
	90676	.3480	S	8.839	4"	2-1/2"	1.787"
78681		.3543		9.000	78	44	28
	90681	.3543		9.000	101	63	46

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	l_5 Max Drill Depth	
		Decimal		Metric			
78686		.3580	T	9.093	3-1/16"	1-3/4"	1.122"
78691		.3594	23/64"	9.129	3-1/16"	1-3/4"	1.126"
	90691	.3594	23/64"	9.129	4-1/4"	2-3/4"	1.845"
78696		.3680	U	9.347	3-1/8"	1-13/16"	1.153"
	90696	.3680	U	9.347	4-1/4"	2-3/4"	1.889"
78701		.3740		9.500	79	46	30
	90701	.3740		9.500	107	70	49
78706		.3750	3/8"	9.525	3-1/8"	1-13/16"	1.175"
	90706	.3750	3/8"	9.525	4-1/4"	2-3/4"	1.925"
78711		.3770	V	9.576	3-1/4"	1-7/8"	1.182"
	90711	.3770	V	9.576	4-1/4"	2-3/4"	1.936"
78716		.3860	W	9.804	3-1/4"	1-7/8"	1.210"
	90716	.3860	W	9.804	4-1/2"	2-7/8"	1.982"
78721		.3906	25/64"	9.921	3-1/4"	1-7/8"	1.224"
	90721	.3906	25/64"	9.921	4-1/2"	2-7/8"	2.005"
78726		.3937		10.000	84	49	31
	90726	.3937		10.000	114	73	51
78736		.4040	Y	10.262	3-5/16"	1-15/16"	1.266"
	90736	.4040	Y	10.262	4-1/2"	2-7/8"	2.074"
78741		.4062	13/32"	10.317	3-5/16"	1-15/16"	1.273"
	90741	.4062	13/32"	10.317	4-1/2"	2-7/8"	2.085"
78746		.4130	Z	10.490	3-3/8"	2"	1.294"
	90746	.4130	Z	10.490	4-1/2"	2-7/8"	2.120"
78751		.4134		10.500	86	51	33
	90751	.4134		10.500	114	73	54
78756		.4219	27/64"	10.716	3-3/8"	2"	1.322"
	90756	.4219	27/64"	10.716	4-1/2"	2-7/8"	2.166"
78761		.4331		11.000	87	52	34
	90761	.4331		11.000	114	73	56
78766		.4375	7/16"	11.113	3-7/16"	2-1/16"	1.371"
	90766	.4375	7/16"	11.113	4-1/2"	2-7/8"	2.246"
	90771	.4528		11.500	120	76	59
78776		.4531	29/64"	11.509	3-9/16"	2-1/8"	1.420"
	90776	.4531	29/64"	11.509	4-3/4"	3"	2.326"
78781		.4688	15/32"	11.908	3-5/8"	2-1/8"	1.469"
	90781	.4688	15/32"	11.908	4-3/4"	3"	2.407"
78786		.4724		12.000	94	56	38
	90786	.4724		12.000	120	76	62
78791		.4844	31/64"	12.304	3-11/16"	2-3/16"	1.518"
	90791	.4844	31/64"	12.304	4-3/4"	3"	2.487"
78796		.4921		12.500	95	56	39
	90796	.4921		12.500	120	76	64
78801		.5000	1/2"	12.700	3-3/4"	2-1/4"	1.567"
	90801	.5000	1/2"	12.700	4-3/4"	3"	2.567"

TOLERANCES

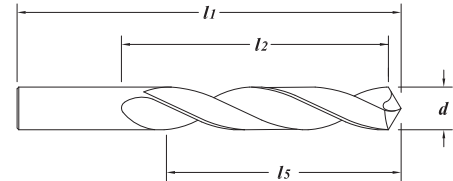
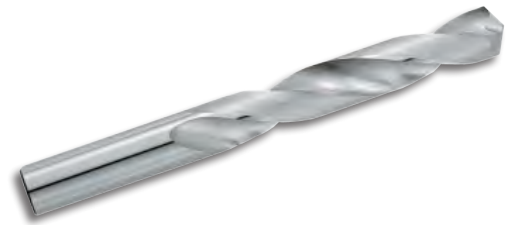
d	+.0000" -.0005" (+.0000 -.0127mm)	
l_1	$\leq 1/8"$	+.125" -.062" (+3.175 -1.588mm)
	$> 1/8"$	+.125" -.125" (+3.175 -3.175mm)
l_2	$\leq 1/8"$	+.125" -.062" (+3.175 -1.588mm)
	$> 1/8"$	+.125" -.125" (+3.175 -3.175mm)


Series 1200

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

GENERAL PURPOSE
DRILLS

Solid submicron grain carbide drill
General purpose jobber style
Cam point ($\leq 1/8"$ diameter - 4-facet point)
Live tooling recommended on lathe processes
Durana Coating - page 90



EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
	Decimal	Metric			
56165	.0625	1/16"	1.588	1-3/4"	.331"
56170	.0635	#52	1.613	1-3/4"	.337"
56175	.0670	#51	1.702	1-3/4"	.355"
56180	.0700	#50	1.778	1-3/4"	.371"
56185	.0730	#49	1.854	1-3/4"	.387"
56190	.0760	#48	1.930	1-3/4"	.403"
56195	.0781	5/64"	1.984	1-3/4"	.414"
56200	.0785	#47	1.994	1-3/4"	.416"
56205	.0787		2.000	44	11
56210	.0810	#46	2.057	1-3/4"	.429"
56215	.0820	#45	2.083	1-3/4"	.435"
56220	.0860	#44	2.184	2"	.456"
56225	.0890	#43	2.261	2"	.472"
56230	.0935	#42	2.375	2"	.496"
56235	.0938	3/32"	2.383	2"	.497"
56240	.0960	#41	2.438	2"	.509"
56245	.0980	#40	2.489	2"	.519"
56250	.0984		2.500	57	32
56255	.0995	#39	2.527	2-1/4"	.527"
56260	.1015	#38	2.578	2-1/4"	.538"
56265	.1040	#37	2.642	2-1/4"	.551"
56270	.1065	#36	2.705	2-1/4"	.564"
56275	.1094	7/64"	2.779	2-1/4"	.580"
56280	.1100	#35	2.794	2-1/4"	.583"
56285	.1110	#34	2.819	2-1/4"	.588"
56290	.1130	#33	2.870	2-1/4"	.599"
56295	.1160	#32	2.946	2-1/4"	.615"
56300	.1181		3.000	57	32
56305	.1200	#31	3.048	2-1/4"	.636"
56310	.1250	1/8"	3.175	2-1/4"	.663"
56315	.1285	#30	3.264	2-1/4"	.681"
56320	.1360	#29	3.454	2-1/2"	.721"
56325	.1378		3.500	63	35
56330	.1405	#28	3.569	2-1/2"	.745"
56335	.1406	9/64"	3.571	2-1/2"	.745"
56340	.1440	#27	3.658	2-1/2"	.763"
56345	.1470	#26	3.734	2-1/2"	.779"
56350	.1495	#25	3.797	2-1/2"	.792"
56355	.1520	#24	3.861	2-1/2"	.806"
56360	.1540	#23	3.912	2-1/2"	.816"
56365	.1562	5/32"	3.967	2-1/2"	.828"
56370	.1570	#22	3.988	2-1/2"	.832"
56375	.1575		4.000	63	35

continued →

Series 1200 (continued)

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

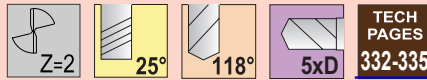
EDP#	$d^{\dagger}$ Diameter		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth	
	Decimal	Metric				
56380	.1590	#21	4.039	2-1/2"	1-3/8"	.843"
56385	.1610	#20	4.089	2-1/2"	1-3/8"	.853"
56390	.1660	#19	4.216	2-3/4"	1-5/8"	.880"
56395	.1695	#18	4.305	2-3/4"	1-5/8"	.898"
56400	.1719	11/64"	4.366	2-3/4"	1-5/8"	.911"
56405	.1730	#17	4.394	2-3/4"	1-5/8"	.917"
56410	.1770	#16	4.496	2-3/4"	1-5/8"	.938"
56415	.1772		4.500	70	41	24
56420	.1800	#15	4.572	2-3/4"	1-5/8"	.954"
56425	.1820	#14	4.623	2-3/4"	1-5/8"	.965"
56430	.1850	#13	4.700	2-3/4"	1-5/8"	.981"
56435	.1875	3/16"	4.763	2-3/4"	1-5/8"	.994"
56440	.1890	#12	4.801	2-3/4"	1-5/8"	1.002"
56445	.1910	#11	4.851	2-3/4"	1-5/8"	1.012"
56450	.1935	#10	4.915	2-3/4"	1-5/8"	1.026"
56455	.1960	#9	4.978	3"	1-3/4"	1.039"
56460	.1969		5.000	76	44	26
56465	.1990	#8	5.055	3"	1-3/4"	1.055"
56470	.2010	#7	5.105	3"	1-3/4"	1.065"
56475	.2031	13/64"	5.159	3"	1-3/4"	1.077"
56480	.2040	#6	5.182	3"	1-3/4"	1.081"
56485	.2055	#5	5.220	3"	1-3/4"	1.089"
56490	.2090	#4	5.309	3"	1-3/4"	1.108"
56495	.2130	#3	5.410	3"	1-3/4"	1.129"
56500	.2165		5.500	76	44	29
56505	.2188	7/32"	5.558	3"	1-3/4"	1.160"
56510	.2210	#2	5.613	3"	1-3/4"	1.171"
56515	.2280	#1	5.791	3"	1-3/4"	1.208"
56520	.2340	A	5.944	3-1/4"	2"	1.240"
56525	.2344	15/64"	5.954	3-1/4"	2"	1.242"
56530	.2362		6.000	82	50	32
56535	.2380	B	6.045	3-1/4"	2"	1.262"
56540	.2420	C	6.147	3-1/4"	2"	1.283"
56545	.2460	D	6.248	3-1/4"	2"	1.304"
56550	.2500	1/4" / E	6.350	3-1/4"	2"	1.325"
56555	.2559		6.500	82	50	34
56560	.2570	F	6.528	3-1/4"	2"	1.362"
56565	.2610	G	6.629	3-1/2"	2-1/8"	1.383"
56570	.2656	17/64"	6.746	3-1/2"	2-1/8"	1.408"
56575	.2660	H	6.756	3-1/2"	2-1/8"	1.410"
56580	.2720	I	6.909	3-1/2"	2-1/8"	1.442"
56585	.2756		7.000	88	54	37
56590	.2770	J	7.036	3-1/2"	2-1/8"	1.468"
56595	.2810	K	7.137	3-1/2"	2-1/8"	1.489"
56600	.2812	9/32"	7.142	3-1/2"	2-1/8"	1.490"
56605	.2900	L	7.366	3-1/2"	2-1/8"	1.537"
56610	.2950	M	7.493	3-3/4"	2-3/8"	1.564"
56615	.2953		7.500	95	60	40
56620	.2969	19/64"	7.541	3-3/4"	2-3/8"	1.574"
56625	.3020	N	7.671	3-3/4"	2-3/8"	1.601"
56630	.3125	5/16"	7.938	3-3/4"	2-3/8"	1.656"
56635	.3150		8.000	95	60	42
56640	.3160	O	8.026	3-3/4"	2-3/8"	1.675"
56645	.3230	P	8.204	3-3/4"	2-3/8"	1.712"
56650	.3281	21/64"	8.334	4"	2-1/2"	1.739"
56655	.3320	Q	8.433	4"	2-1/2"	1.760"
56660	.3346		8.500	101	63	45

EDP#	$d^{\dagger}$ Diameter		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth	
	Decimal	Metric				
56665	.3390	R	8.611	4"	2-1/2"	1.797"
56670	.3438	11/32"	8.733	4"	2-1/2"	1.822"
56675	.3480	S	8.839	4"	2-1/2"	1.845"
56680	.3543		9.000	101	63	48
56685	.3580	T	9.093	4-1/4"	2-3/4"	1.898"
56690	.3594	23/64"	9.129	4-1/4"	2-3/4"	1.905"
56695	.3680	U	9.347	4-1/4"	2-3/4"	1.951"
56700	.3740		9.500	107	70	50
56705	.3750	3/8"	9.525	4-1/4"	2-3/4"	1.988"
56710	.3770	V	9.576	4-1/4"	2-3/4"	1.998"
56715	.3860	W	9.804	4-1/2"	2-7/8"	2.046"
56720	.3906	25/64"	9.921	4-1/2"	2-7/8"	2.070"
56725	.3937		10.000	114	73	53
56730	.3970	X	10.084	4-1/2"	2-7/8"	2.104"
56735	.4040	Y	10.262	4-1/2"	2-7/8"	2.141"
56740	.4062	13/32"	10.317	4-1/2"	2-7/8"	2.153"
56745	.4130	Z	10.490	4-1/2"	2-7/8"	2.189"
56750	.4134		10.500	114	73	56
56755	.4219	27/64"	10.716	4-1/2"	2-7/8"	2.236"
56760	.4331		11.000	114	73	58
56765	.4375	7/16"	11.113	4-1/2"	2-7/8"	2.319"
56770	.4528		11.500	120	76	61
56775	.4531	29/64"	11.509	4-3/4"	3"	2.402"
56780	.4688	15/32"	11.908	4-3/4"	3"	2.485"
56785	.4724		12.000	120	76	64
56790	.4844	31/64"	12.304	4-3/4"	3"	2.568"
56795	.4921		12.500	120	76	2.608"
56800	.5000	1/2"	12.700	4-3/4"	3"	2.650"

*Drill Manufacturing*

Series 1200H

.0625" - .1570"
(1.588mm - 3.988mm)



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)

BALINIT® Durana Coating

Solid submicron grain carbide drill

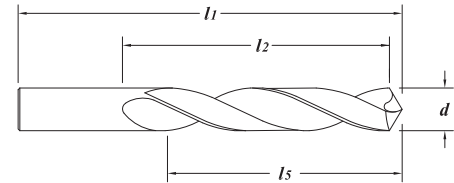
General purpose jobber style

Excellent heat resistance and lubricity

Cam point ($\leq 1/8"$ diameter is with 4-facet point)

Live tooling recommended on lathe processes

Bright Finish - page 87



EDP#	d †			l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
	Decimal	Diameter	Metric			
56166	.0625	1/16"	1.588	1-3/4"	3/4"	.331"
56171	.0635	#52	1.613	1-3/4"	3/4"	.337"
56181	.0700	#50	1.778	1-3/4"	7/8"	.371"
56186	.0730	#49	1.854	1-3/4"	7/8"	.387"
56191	.0760	#48	1.930	1-3/4"	7/8"	.403"
56196	.0781	5/64"	1.984	1-3/4"	7/8"	.414"
56206	.0787		2.000	44	22	11
56216	.0820	#45	2.083	1-3/4"	7/8"	.435"
56221	.0860	#44	2.184	2"	1"	.456"
56226	.0890	#43	2.261	2"	1"	.472"
56231	.0935	#42	2.375	2"	1"	.496"
56236	.0938	3/32"	2.383	2"	1"	.497"
56241	.0960	#41	2.438	2"	1"	.509"
56246	.0980	#40	2.489	2"	1"	.519"
56251	.0984		2.500	57	32	13
56256	.0995	#39	2.527	2-1/4"	1-1/4"	.527"
56261	.1015	#38	2.578	2-1/4"	1-1/4"	.538"
56266	.1040	#37	2.642	2-1/4"	1-1/4"	.551"
56271	.1065	#36	2.705	2-1/4"	1-1/4"	.564"
56276	.1094	7/64"	2.779	2-1/4"	1-1/4"	.580"
56281	.1100	#35	2.794	2-1/4"	1-1/4"	.583"
56286	.1110	#34	2.819	2-1/4"	1-1/4"	.588"
56291	.1130	#33	2.870	2-1/4"	1-1/4"	.599"
56296	.1160	#32	2.946	2-1/4"	1-1/4"	.615"
56301	.1181		3.000	57	32	16
56306	.1200	#31	3.048	2-1/4"	1-1/4"	.636"
56311	.1250	1/8"	3.175	2-1/4"	1-1/4"	.663"
56316	.1285	#30	3.264	2-1/4"	1-1/4"	.681"
56321	.1360	#29	3.454	2-1/2"	1-3/8"	.721"
56331	.1405	#28	3.569	2-1/2"	1-3/8"	.745"
56336	.1406	9/64"	3.571	2-1/2"	1-3/8"	.745"
56341	.1440	#27	3.658	2-1/2"	1-3/8"	.763"
56346	.1470	#26	3.734	2-1/2"	1-3/8"	.779"
56351	.1495	#25	3.797	2-1/2"	1-3/8"	.792"
56356	.1520	#24	3.861	2-1/2"	1-3/8"	.806"
56361	.1540	#23	3.912	2-1/2"	1-3/8"	.816"
56366	.1562	5/32"	3.967	2-1/2"	1-3/8"	.828"
56371	.1570	#22	3.988	2-1/2"	1-3/8"	.832"

EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
	Decimal	Metric			
5638J	.1590	#21	4.039	2-1/2"	1-3/8"
56386	.1610	#20	4.089	2-1/2"	1-3/8"
5639J	.1660	#19	4.216	2-3/4"	1-5/8"
56396	.1695	#18	4.305	2-3/4"	1-5/8"
5640J	.1719	11/64"	4.366	2-3/4"	1-5/8"
5641J	.1770	#16	4.496	2-3/4"	1-5/8"
5642J	.1800	#15	4.572	2-3/4"	1-5/8"
56426	.1820	#14	4.623	2-3/4"	1-5/8"
56436	.1875	3/16"	4.763	2-3/4"	1-5/8"
5644J	.1890	#12	4.801	2-3/4"	1-5/8"
56446	.1910	#11	4.851	2-3/4"	1-5/8"
5645J	.1935	#10	4.915	2-3/4"	1-5/8"
5647J	.2010	#7	5.105	3"	1-3/4"
5648J	.2040	#6	5.182	3"	1-3/4"
56486	.2055	#5	5.220	3"	1-3/4"
5649J	.2090	#4	5.309	3"	1-3/4"
56496	.2130	#3	5.410	3"	1-3/4"
56506	.2188	7/32"	5.558	3"	1-3/4"
56516	.2280	#1	5.791	3"	1-3/4"
56526	.2344	15/64"	5.954	3-1/4"	2"
5654J	.2420	C	6.147	3-1/4"	2"
5655J	.2500	1/4" / E	6.350	3-1/4"	2"
5656J	.2570	F	6.528	3-1/4"	2"
56566	.2610	G	6.629	3-1/2"	2-1/8"
5657J	.2656	17/64"	6.746	3-1/2"	2-1/8"
5660J	.2812	9/32"	7.142	3-1/2"	2-1/8"
56606	.2900	L	7.366	3-1/2"	2-1/8"
56626	.3020	N	7.671	3-3/4"	2-3/8"
5663J	.3125	5/16"	7.938	3-3/4"	2-3/8"
56646	.3230	P	8.204	3-3/4"	2-3/8"
5665J	.3281	21/64"	8.334	4"	2-1/2"
5667J	.3438	11/32"	8.733	4"	2-1/2"
56696	.3680	U	9.347	4-1/4"	2-3/4"
56706	.3750	3/8"	9.525	4-1/4"	2-3/4"
5673J	.3970	X	10.084	4-1/2"	2-7/8"
5674J	.4062	13/32"	10.317	4-1/2"	2-7/8"
56756	.4219	27/64"	10.716	4-1/2"	2-7/8"
56766	.4375	7/16"	11.113	4-1/2"	2-7/8"
5680J	.5000	1/2"	12.700	4-3/4"	3"

Series 1100

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



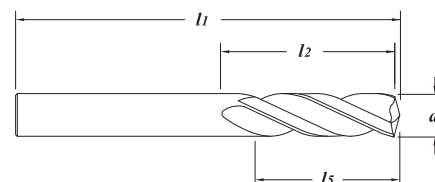
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TOLERANCES

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
Durana Coating - page 83



EDP#	$d^{\dagger}$		l_1	l_2	l_5	
	Decimal	Diameter Metric				
90275	.1094	7/64"	2.779	2-1/4"	1-1/4"	.562"
90280	.1100	#35	2.794	2-1/4"	1-1/4"	.565"
90285	.1110	#34	2.819	2-1/4"	1-1/4"	.570"
90290	.1130	#33	2.870	2-1/4"	1-1/4"	.580"
90295	.1160	#32	2.946	2-1/4"	1-1/4"	.596"
90300	.1181		3.000	57	32	15
90305	.1200	#31	3.048	2-1/4"	1-1/4"	.616"
90310	.1250	1/8"	3.175	2-1/4"	1-1/4"	.642"
90315	.1285	#30	3.264	2-1/4"	1-1/4"	.660"
90320	.1360	#29	3.454	2-1/2"	1-3/8"	.698"
90325	.1378		3.500	63	35	18
90330	.1405	#28	3.569	2-1/2"	1-3/8"	.721"
90335	.1406	9/64"	3.571	2-1/2"	1-3/8"	.722"
90340	.1440	#27	3.658	2-1/2"	1-3/8"	.739"
90345	.1470	#26	3.734	2-1/2"	1-3/8"	.755"
90350	.1495	#25	3.797	2-1/2"	1-3/8"	.768"
90355	.1520	#24	3.861	2-1/2"	1-3/8"	.780"
90365	.1562	5/32"	3.967	2-1/2"	1-3/8"	.802"
90375	.1575		4.000	63	35	21
90380	.1590	#21	4.039	2-1/2"	1-3/8"	.816"
90385	.1610	#20	4.089	2-1/2"	1-3/8"	.827"
90390	.1660	#19	4.216	2-3/4"	1-5/8"	.852"
90395	.1695	#18	4.305	2-3/4"	1-5/8"	.870"
90400	.1719	11/64"	4.366	2-3/4"	1-5/8"	.883"
90420	.1800	#15	4.572	2-3/4"	1-5/8"	.924"
90425	.1820	#14	4.623	2-3/4"	1-5/8"	.934"
90435	.1875	3/16"	4.763	2-3/4"	1-5/8"	.963"
90440	.1890	#12	4.801	2-3/4"	1-5/8"	.970"
90455	.1960	#9	4.978	3"	1-3/4"	1.006"
90460	.1969		5.000	76	44	26
90470	.2010	#7	5.105	3"	1-3/4"	1.032"
90475	.2031	13/64"	5.159	3"	1-3/4"	1.043"
90480	.2040	#6	5.182	3"	1-3/4"	1.047"

EDP#	d † Diameter			l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
	Decimal		Metric			
90485	.2055	#5	5.220	3"	1-3/4"	1.055"
90500	.2165		5.500	76	44	28
90505	.2188	7/32"	5.558	3"	1-3/4"	1.123"
90510	.2210	#2	5.613	3"	1-3/4"	1.135"
90515	.2280	#1	5.791	3"	1-3/4"	1.171"
90525	.2344	15/64"	5.954	3-1/4"	2"	1.203"
90530	.2362		6.000	82	50	31
90550	.2500	1/4" / E	6.350	3-1/4"	2"	1.283"
90555	.2559		6.500	82	50	33
90560	.2570	F	6.528	3-1/4"	2"	1.319"
90565	.2610	G	6.629	3-1/2"	2-1/8"	1.340"
90570	.2656	17/64"	6.746	3-1/2"	2-1/8"	1.364"
90575	.2660	H	6.756	3-1/2"	2-1/8"	1.366"
90580	.2720	I	6.909	3-1/2"	2-1/8"	1.396"
90585	.2756		7.000	88	54	36
90600	.2812	9/32"	7.142	3-1/2"	2-1/8"	1.444"
90605	.2900	L	7.366	3-1/2"	2-1/8"	1.489"
90620	.2969	19/64"	7.541	3-3/4"	2-3/8"	1.524"
90625	.3020	N	7.671	3-3/4"	2-3/8"	1.550"
90630	.3125	5/16"	7.938	3-3/4"	2-3/8"	1.604"
90635	.3150		8.000	95	60	41
90640	.3160	O	8.026	3-3/4"	2-3/8"	1.622"
90650	.3281	21/64"	8.334	4"	2-1/2"	1.684"
90655	.3320	Q	8.433	4"	2-1/2"	1.704"
90660	.3346		8.500	101	63	44
90665	.3390	R	8.611	4"	2-1/2"	1.740"
90670	.3438	11/32"	8.733	4"	2-1/2"	1.765"
90680	.3543		9.000	101	63	46
90690	.3594	23/64"	9.129	4-1/4"	2-3/4"	1.845"
90705	.3750	3/8"	9.525	4-1/4"	2-3/4"	1.925"
90725	.3937		10.000	114	73	51
90745	.4130	Z	10.490	4-1/2"	2-7/8"	2.120"
90755	.4219	27/64"	10.716	4-1/2"	2-7/8"	2.166"
90760	.4331		11.000	114	73	56
90765	.4375	7/16"	11.113	4-1/2"	2-7/8"	2.246"
90775	.4531	29/64"	11.509	4-3/4"	3"	2.326"
90780	.4688	15/32"	11.908	4-3/4"	3"	2.407"
90790	.4844	31/64"	12.304	4-3/4"	3"	2.487"
90800	.5000	1/2"	12.700	4-3/4"	3"	2.567"

Series 1800H

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



TOLERANCES

d	$+0.000" - 0.005" (+0.000 - 0.127\text{mm})$
l_1	$+0.125" - 0.125" (+3.175 - 3.175\text{mm})$
l_2	$+0.125" - 0.125" (+3.175 - 3.175\text{mm})$

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

Parabolic

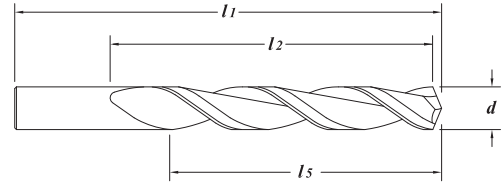
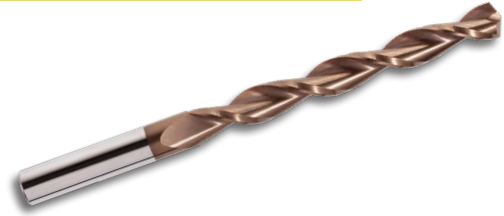
BALINIT® Durana Coating

Solid submicron grain carbide drill

Wide open flutes and high helix remove chips quickly

4-facet point

Live tooling recommended on lathe processes



EDP#	$d^{\dagger}$ Diameter		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth	
	Decimal	Metric				
22436	.1875	3/16"	4.763	3-13/16"	2-5/16"	1.539"
22441	.1890	#12	4.801	3-13/16"	2-5/16"	1.551"
22456	.1960	#9	4.978	3-15/16"	2-7/16"	1.609"
22461	.1969		5.000	100	62	41
22466	.1990	#8	5.055	3-15/16"	2-7/16"	1.633"
22471	.2010	#7	5.105	3-15/16"	2-7/16"	1.650"
22476	.2031	13/64"	5.159	3-15/16"	2-7/16"	1.667"
22486	.2055	#5	5.220	4"	2-1/2"	1.687"
22496	.2130	#3	5.410	4"	2-1/2"	1.748"
22501	.2165		5.500	102	64	45
22506	.2188	7/32"	5.558	4"	2-1/2"	1.796"
22511	.2210	#2	5.613	4"	2-1/2"	1.814"
22516	.2280	#1	5.791	4-1/8"	2-5/8"	1.871"
22531	.2362		6.000	105	67	49
22541	.2420	C	6.147	4-1/4"	2-3/4"	1.986"
22546	.2460	D	6.248	4-1/4"	2-3/4"	2.019"
22551	.2500	1/4" / E	6.350	4-1/4"	2-3/4"	2.052"
22556	.2559		6.500	108	70	53
22561	.2570	F	6.528	4-3/8"	2-7/8"	2.109"
22566	.2610	G	6.629	4-3/8"	2-7/8"	2.142"
22571	.2656	17/64"	6.746	4-3/8"	2-7/8"	2.180"
22576	.2660	H	6.756	4-3/8"	2-7/8"	2.183"
22581	.2720	I	6.909	4-3/8"	2-7/8"	2.232"
22586	.2756		7.000	111	73	57
22596	.2810	K	7.137	4-7/16"	2-15/16"	2.306"
22606	.2900	L	7.366	4-7/16"	2-15/16"	2.380"
22631	.3125	5/16"	7.938	4-11/16"	3-3/16"	2.565"

EDP#	d † Diameter		l_1 Overall Length	l_2 Flute Length	l_5 Max Drill Depth
	Decimal	Metric			
22636	.3150	8.000	119	81	66
22646	.3230	P 8.204	4-11/16"	3-3/16"	2.651"
22656	.3320	Q 8.433	4-15/16"	3-7/16"	2.725"
22661	.3346	8.500	125	87	70
22666	.3390	R 8.611	4-15/16"	3-7/16"	2.782"
22696	.3680	U 9.347	5"	3-1/2"	3.020"
22706	.3750	3/8" 9.525	5-1/8"	3-5/8"	3.078"
22721	.3906	25/64" 9.921	5-1/4"	3-3/4"	3.206"
22726	.3937	10.000	133	95	82
22751	.4134	10.500	137	98	86
22761	.4331	11.000	138	100	90
22766	.4375	7/16" 11.113	5-7/16"	3-15/16"	3.591"
22776	.4531	29/64" 11.509	5-9/16"	4-5/16"	3.719"
22801	.5000	1/2" 12.700	6"	4-1/2"	4.104"
22811	.5156	33/64" 13.096	6"	4-1/2"	4.232"
22831	.5512	14.000	156	117	115



Series 4100

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



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TOLERANCES

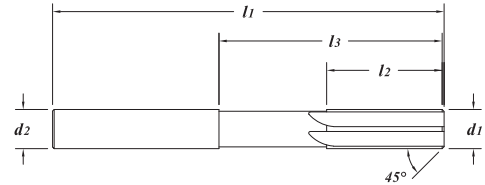
d_1	.0590" - .2509" (1.498 - 6.372mm)	+ .0002" - .0000" (+.0050 - .0000mm)
	.2510" - .5020" (6.375 - 12.750mm)	+ .0003" - .0000" (+.0075 - .0000mm)
d_2	.0590" - .2509" (1.498 - 6.372mm)	+ .0002" - .0000" (+.0050 - .0000mm)
	.2510" - .5020" (6.375 - 12.750mm)	+ .0003" - .0000" (+.0075 - .0000mm)

Solid Carbide Submicron Grain

Straight - RHC Flutes

Standard 45° Lead Chamfer

Neck diameter is .010" ±.002" less than (d_1) fluted diameter



EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Reach Length	Number Flutes
	Decimal	Metric					
95066	.0590	1.499	.0590"	1-1/2"	3/8"	5/8"	4
95069	.0591	1.500	.0591"	1-1/2"	3/8"	5/8"	4
95072	.0595 #53	1.511	.0595"	1-1/2"	3/8"	5/8"	4
95075	.0600	1.524	.0600"	1-1/2"	3/8"	5/8"	4
95078	.0605	1.537	.0605"	1-1/2"	3/8"	5/8"	4
95081	.0610	1.549	.0610"	1-1/2"	3/8"	5/8"	4
95084	.0615	1.562	.0615"	1-1/2"	3/8"	5/8"	4
95087	.0620	1.575	.0620"	1-1/2"	3/8"	5/8"	4
95090	.0625 1/16"	1.588	.0625"	1-1/2"	3/8"	5/8"	4
95093	.0630	1.600	.0630"	1-1/2"	3/8"	5/8"	4
95096	.0635 #52	1.613	.0635"	1-1/2"	3/8"	5/8"	4
95099	.0640	1.626	.0640"	1-1/2"	3/8"	5/8"	4
95102	.0645	1.638	.0645"	1-1/2"	3/8"	5/8"	4
95105	.0650	1.651	.0650"	1-1/2"	3/8"	5/8"	4
95108	.0660	1.676	.0660"	1-3/4"	1/2"	3/4"	4
95111	.0670 #51	1.702	.0670"	1-3/4"	1/2"	3/4"	4
95114	.0680	1.727	.0680"	1-3/4"	1/2"	7/8"	4
95117	.0690	1.753	.0690"	1-3/4"	1/2"	7/8"	4
95120	.0700 #50	1.778	.0700"	1-3/4"	1/2"	7/8"	4
95123	.0710	1.803	.0710"	1-3/4"	1/2"	7/8"	4
95126	.0720	1.829	.0720"	1-3/4"	1/2"	7/8"	4
95129	.0730 #49	1.854	.0730"	1-3/4"	1/2"	7/8"	4
95132	.0740	1.880	.0740"	1-3/4"	1/2"	7/8"	4
95135	.0750	1.905	.0750"	1-3/4"	1/2"	7/8"	4
95138	.0760 #48	1.930	.0760"	1-3/4"	1/2"	7/8"	4
95141	.0770	1.956	.0770"	1-3/4"	1/2"	7/8"	4
95144	.0780	1.981	.0780"	1-3/4"	1/2"	7/8"	4
95147	.0781 5/64"	1.984	.0781"	1-3/4"	1/2"	7/8"	4
95150	.0785 #47	1.994	.0785"	1-3/4"	1/2"	7/8"	4
95153	.0787	2.000	.0787"	1-3/4"	1/2"	7/8"	4
95156	.0790	2.007	.0790"	1-3/4"	1/2"	7/8"	4
95159	.0800	2.032	.0800"	1-3/4"	1/2"	7/8"	4
95162	.0810 #46	2.057	.0810"	2"	1/2"	7/8"	4
95165	.0820 #45	2.083	.0820"	2"	1/2"	7/8"	4

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

continued →

Series 4100 (continued)

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

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Reach Length	Number Flutes	
	Decimal	Metric						
95312	.1200	#31	3.048	.1200"	2-1/4"	5/8"	1-1/8"	4
95315	.1210		3.073	.1210"	2-1/4"	5/8"	1-1/8"	4
95318	.1220		3.099	.1220"	2-1/4"	5/8"	1-1/8"	4
95321	.1230		3.124	.1230"	2-1/4"	5/8"	1-1/8"	4
95324	.1235		3.137	.1235"	2-1/4"	5/8"	1-1/8"	4
95327	.1240		3.150	.1240"	2-1/4"	5/8"	1-1/8"	4
95330	.1245		3.162	.1245"	2-1/4"	5/8"	1-1/8"	4
95333	.1248		3.170	.1248"	2-1/4"	5/8"	1-1/8"	4
95336	.1250	1/8"	3.175	.1250"	2-1/4"	5/8"	1-1/8"	4
95339	.1255		3.188	.1255"	2-1/4"	5/8"	1-1/8"	4
95342	.1260		3.200	.1260"	2-1/4"	5/8"	1-1/8"	4
95345	.1265		3.213	.1265"	2-1/4"	5/8"	1-1/8"	4
95348	.1270		3.226	.1270"	2-1/4"	5/8"	1-1/8"	4
95351	.1275		3.239	.1275"	2-1/4"	5/8"	1-1/8"	4
95354	.1280		3.251	.1280"	2-1/4"	5/8"	1-1/8"	4
95357	.1285	#30	3.264	.1285"	2-1/4"	5/8"	1-1/8"	4
95360	.1290		3.277	.1290"	2-1/4"	5/8"	1-1/8"	4
95363	.1300		3.302	.1300"	2-1/4"	5/8"	1-1/8"	4
95366	.1310		3.327	.1310"	2-1/2"	3/4"	1-1/4"	4
95369	.1320		3.353	.1320"	2-1/2"	3/4"	1-1/4"	4
95372	.1330		3.378	.1330"	2-1/2"	3/4"	1-1/4"	4
95375	.1340		3.404	.1340"	2-1/2"	3/4"	1-1/4"	4
95378	.1350		3.429	.1350"	2-1/2"	3/4"	1-1/4"	4
95381	.1360	#29	3.454	.1360"	2-1/2"	3/4"	1-1/4"	4
95384	.1370		3.480	.1370"	2-1/2"	3/4"	1-1/4"	4
95387	.1378		3.500	.1378"	2-1/2"	3/4"	1-1/4"	4
95390	.1380		3.505	.1380"	2-1/2"	3/4"	1-1/4"	4
95393	.1390		3.531	.1390"	2-1/2"	3/4"	1-1/4"	4
95396	.1400		3.556	.1400"	2-1/2"	3/4"	1-1/4"	4
95399	.1405	#28	3.569	.1405"	2-1/2"	3/4"	1-1/4"	4
95402	.1406	9/64"	3.571	.1406"	2-1/2"	3/4"	1-1/4"	4
95405	.1410		3.581	.1410"	2-1/2"	3/4"	1-1/4"	4
95408	.1420		3.607	.1420"	2-1/2"	3/4"	1-1/4"	4
95411	.1430		3.632	.1430"	2-1/2"	3/4"	1-1/4"	4
95414	.1440	#27	3.658	.1440"	2-1/2"	3/4"	1-1/4"	4
95417	.1450		3.683	.1450"	2-1/2"	3/4"	1-1/4"	4
95420	.1460		3.708	.1460"	2-1/2"	3/4"	1-1/4"	4
95423	.1470	#26	3.734	.1470"	2-1/2"	3/4"	1-1/4"	4
95426	.1480		3.759	.1480"	2-1/2"	3/4"	1-1/4"	4
95429	.1490		3.785	.1490"	2-1/2"	3/4"	1-1/4"	4
95432	.1495	#25	3.797	.1495"	2-1/2"	3/4"	1-1/4"	4
95435	.1500		3.810	.1500"	2-1/2"	3/4"	1-1/4"	4
95438	.1510		3.835	.1510"	2-1/2"	3/4"	1-1/4"	4
95441	.1520	#24	3.861	.1520"	2-1/2"	3/4"	1-1/4"	4
95444	.1530		3.886	.1530"	2-1/2"	3/4"	1-1/4"	4
95447	.1540	#23	3.912	.1540"	2-1/2"	3/4"	1-1/4"	4
95450	.1545		3.924	.1545"	2-1/2"	3/4"	1-1/4"	4
95453	.1550		3.937	.1550"	2-1/2"	3/4"	1-1/4"	4

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

continued →

Series 4100 (continued)

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



TECH
PAGES
322-323

TOLERANCES

d_1	.0590" - .2509" (1.498 - 6.372mm)	+ .0002" - .0000" (+.0050 - .0000mm)
	.2510" - .5020" (6.375 - 12.750mm)	+ .0003" - .0000" (+.0075 - .0000mm)
d_2	.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" $\pm$.002" less than (d_1) fluted diameter

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Reach Length	Number Flutes
	Decimal	Metric					
95597	.1920	4.877	.1920"	2-3/4"	7/8"	1-1/2"	4
95600	.1930	4.902	.1930"	2-3/4"	7/8"	1-1/2"	4
95603	.1935 #10	4.915	.1935"	2-3/4"	7/8"	1-1/2"	4
95606	.1940	4.928	.1940"	2-3/4"	7/8"	1-1/2"	4
95609	.1950	4.953	.1950"	2-3/4"	7/8"	1-1/2"	4
95612	.1960 #9	4.978	.1960"	3"	1"	1-5/8"	4
95615	.1969	5.000	.1969"	3"	1"	1-5/8"	4
95618	.1970	5.004	.1970"	3"	1"	1-5/8"	4
95621	.1980	5.029	.1980"	3"	1"	1-5/8"	4
95624	.1990 #8	5.055	.1990"	3"	1"	1-5/8"	4
95627	.2000	5.080	.2000"	3"	1"	1-5/8"	4
95630	.2010 #7	5.105	.2010"	3"	1"	1-5/8"	4
95633	.2020	5.131	.2020"	3"	1"	1-5/8"	4
95636	.2030	5.156	.2030"	3"	1"	1-5/8"	4
95639	.2031 13/64"	5.159	.2031"	3"	1"	1-5/8"	4
95642	.2040 #6	5.182	.2040"	3"	1"	1-5/8"	4
95645	.2050	5.207	.2050"	3"	1"	1-5/8"	4
95648	.2055 #5	5.220	.2055"	3"	1"	1-5/8"	4
95651	.2060	5.232	.2060"	3"	1"	1-5/8"	4
95654	.2070	5.258	.2070"	3"	1"	1-5/8"	4
95657	.2080	5.283	.2080"	3"	1"	1-5/8"	4
95660	.2090 #4	5.309	.2090"	3"	1"	1-5/8"	4
95663	.2100	5.334	.2100"	3"	1"	1-5/8"	4
95666	.2110	5.359	.2110"	3"	1"	1-5/8"	4
95669	.2120	5.385	.2120"	3"	1"	1-5/8"	4
95672	.2130 #3	5.410	.2130"	3"	1"	1-5/8"	4
95675	.2140	5.436	.2140"	3"	1"	1-5/8"	4
95678	.2150	5.461	.2150"	3"	1"	1-5/8"	4
95681	.2160	5.486	.2160"	3"	1"	1-5/8"	4
95684	.2165	5.500	.2165"	3"	1"	1-5/8"	4
95687	.2170	5.512	.2170"	3"	1"	1-5/8"	4
95690	.2180	5.537	.2180"	3"	1"	1-5/8"	4
95693	.2188 7/32"	5.558	.2188"	3"	1"	1-5/8"	4
95696	.2190	5.563	.2190"	3"	1"	1-5/8"	4
95699	.2200	5.588	.2200"	3"	1"	1-5/8"	4
95702	.2210 #2	5.613	.2210"	3"	1"	1-5/8"	4
95705	.2220	5.639	.2220"	3"	1"	1-5/8"	4
95708	.2230	5.664	.2230"	3"	1"	1-5/8"	4
95711	.2240	5.690	.2240"	3"	1"	1-5/8"	4
95714	.2250	5.715	.2250"	3"	1"	1-5/8"	4

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Reach Length	Number Flutes
	Decimal	Metric					
95717	.2260	5.740	.2260"	3"	1"	1-5/8"	4
95720	.2270	5.766	.2270"	3"	1"	1-5/8"	4
95723	.2280	#1 5.791	.2280"	3"	1"	1-5/8"	4
95726	.2290	5.817	.2290"	3"	1"	1-5/8"	4
95729	.2300	5.842	.2300"	3"	1"	1-5/8"	4
95732	.2310	5.867	.2310"	3"	1"	1-5/8"	4
95735	.2320	5.893	.2320"	3"	1"	1-5/8"	4
95738	.2330	5.918	.2330"	3"	1"	1-5/8"	4
95741	.2340	A 5.944	.2340"	3"	1"	1-5/8"	4
95744	.2344	15/64" 5.954	.2344"	3"	1"	1-5/8"	4
95747	.2350	5.969	.2350"	3"	1"	1-5/8"	4
95750	.2360	5.994	.2360"	3"	1"	1-5/8"	4
95753	.2362	6.000	.2362"	3"	1"	1-5/8"	4
95756	.2370	6.020	.2370"	3"	1"	1-5/8"	4
95759	.2380	B 6.045	.2380"	3"	1"	1-5/8"	4
95762	.2390	6.071	.2390"	3"	1"	1-5/8"	4
95765	.2400	6.096	.2400"	3"	1"	1-5/8"	4
95768	.2410	6.121	.2410"	3"	1"	1-5/8"	4
95771	.2420	C 6.147	.2420"	3"	1"	1-5/8"	4
95774	.2430	6.172	.2430"	3"	1"	1-5/8"	4
95777	.2440	6.198	.2440"	3"	1"	1-5/8"	4
95780	.2450	6.223	.2450"	3"	1"	1-5/8"	4
95783	.2460	D 6.248	.2460"	3"	1"	1-5/8"	4
95786	.2470	6.274	.2470"	3"	1"	1-5/8"	4
95789	.2480	6.299	.2480"	3"	1"	1-5/8"	4
95792	.2485	6.312	.2485"	3"	1"	1-5/8"	4
95795	.2490	6.325	.2490"	3"	1"	1-5/8"	4
95798	.2495	6.337	.2495"	3"	1"	1-5/8"	4
95799	.2498	6.345	.2498"	3"	1"	1-5/8"	4
95801	.2500	1/4" / E 6.350	.2500"	3"	1"	1-5/8"	4
95802	.2502	6.355	.2502"	3"	1"	1-5/8"	4
95804	.2505	6.363	.2505"	3"	1"	1-5/8"	4
95807	.2510	6.375	.2510"	3"	1"	1-5/8"	4
95810	.2515	6.388	.2515"	3"	1"	1-5/8"	4
95813	.2520	6.401	.2520"	3"	1"	1-5/8"	4
95816	.2530	6.426	.2530"	3"	1"	1-5/8"	4
95819	.2540	6.452	.2540"	3"	1"	1-5/8"	4
95822	.2550	6.477	.2550"	3-1/4"	1-1/8"	1-3/4"	6
95825	.2559	6.500	.2559"	3-1/4"	1-1/8"	1-3/4"	6
95828	.2560	6.502	.2560"	3-1/4"	1-1/8"	1-3/4"	6
95831	.2570	F 6.528	.2570"	3-1/4"	1-1/8"	1-3/4"	6
95834	.2580	6.553	.2580"	3-1/4"	1-1/8"	1-3/4"	6
95837	.2590	6.579	.2590"	3-1/4"	1-1/8"	1-3/4"	6
95840	.2600	6.604	.2600"	3-1/4"	1-1/8"	1-3/4"	6
95843	.2610	G 6.629	.2610"	3-1/4"	1-1/8"	1-3/4"	6
95846	.2620	6.655	.2620"	3-1/4"	1-1/8"	1-3/4"	6
95849	.2630	6.680	.2630"	3-1/4"	1-1/8"	1-3/4"	6
95852	.2640	6.706	.2640"	3-1/4"	1-1/8"	1-3/4"	6

continued →

Series 4100 (continued)

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

EDP#	$d1$ †			$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	$l3$ Reach Length	Number Flutes
	Decimal	Diameter	Metric					
95855	.2650		6.731	.2650"	3-1/4"	1-1/8"	1-3/4"	6
95858	.2656	17/64"	6.746	.2656"	3-1/4"	1-1/8"	1-3/4"	6
95861	.2660	H	6.756	.2660"	3-1/4"	1-1/8"	1-3/4"	6
95864	.2670		6.782	.2670"	3-1/4"	1-1/8"	1-3/4"	6
95867	.2680		6.807	.2680"	3-1/4"	1-1/8"	1-3/4"	6
95870	.2690		6.833	.2690"	3-1/4"	1-1/8"	1-3/4"	6
95873	.2700		6.858	.2700"	3-1/4"	1-1/8"	1-3/4"	6
95876	.2710		6.883	.2710"	3-1/4"	1-1/8"	1-3/4"	6
95879	.2720	I	6.909	.2720"	3-1/4"	1-1/8"	1-7/8"	6
95882	.2730		6.934	.2730"	3-1/4"	1-1/8"	1-7/8"	6
95885	.2740		6.960	.2740"	3-1/4"	1-1/8"	1-7/8"	6
95888	.2750		6.985	.2750"	3-1/4"	1-1/8"	1-7/8"	6
95891	.2756		7.000	.2756"	3-1/4"	1-1/8"	1-7/8"	6
95894	.2760		7.010	.2760"	3-1/4"	1-1/8"	1-7/8"	6
95897	.2770	J	7.036	.2770"	3-1/4"	1-1/8"	1-7/8"	6
95900	.2780		7.061	.2780"	3-1/4"	1-1/8"	1-7/8"	6
95903	.2790		7.087	.2790"	3-1/4"	1-1/8"	1-7/8"	6
95906	.2800		7.112	.2800"	3-1/4"	1-1/8"	1-7/8"	6
95909	.2810	K	7.137	.2810"	3-1/4"	1-1/8"	1-7/8"	6
95912	.2812	9/32"	7.142	.2812"	3-1/4"	1-1/8"	1-7/8"	6
95915	.2820		7.163	.2820"	3-1/4"	1-1/8"	1-7/8"	6
95918	.2830		7.188	.2830"	3-1/4"	1-1/8"	1-7/8"	6
95921	.2840		7.214	.2840"	3-1/4"	1-1/8"	1-7/8"	6
95924	.2850		7.239	.2850"	3-1/4"	1-1/8"	1-7/8"	6
95927	.2860		7.264	.2860"	3-1/4"	1-1/8"	1-7/8"	6
95930	.2870		7.290	.2870"	3-1/4"	1-1/8"	1-7/8"	6
95933	.2880		7.315	.2880"	3-1/4"	1-1/8"	1-7/8"	6
95936	.2890		7.341	.2890"	3-1/4"	1-1/8"	1-7/8"	6
95939	.2900	L	7.366	.2900"	3-1/4"	1-1/8"	1-7/8"	6
95942	.2910		7.391	.2910"	3-1/4"	1-1/8"	1-7/8"	6
95945	.2920		7.417	.2920"	3-1/4"	1-1/8"	1-7/8"	6
95948	.2930		7.442	.2930"	3-1/4"	1-1/8"	1-7/8"	6
95951	.2940		7.468	.2940"	3-1/4"	1-1/8"	1-7/8"	6
95954	.2950	M	7.493	.2950"	3-1/4"	1-1/8"	1-7/8"	6
95957	.2953		7.500	.2953"	3-1/4"	1-1/8"	1-7/8"	6
95960	.2960		7.518	.2960"	3-1/4"	1-1/8"	1-7/8"	6
95963	.2969	19/64"	7.541	.2969"	3-1/4"	1-1/8"	1-7/8"	6
95966	.2970		7.544	.2970"	3-1/4"	1-1/8"	1-7/8"	6
95969	.2980		7.569	.2980"	3-1/4"	1-1/8"	1-7/8"	6
95972	.2990		7.595	.2990"	3-1/4"	1-1/8"	1-7/8"	6
95975	.3000		7.620	.3000"	3-1/4"	1-1/8"	1-7/8"	6
95978	.3010		7.645	.3010"	3-1/4"	1-1/8"	1-7/8"	6
95981	.3020	N	7.671	.3020"	3-1/4"	1-1/8"	1-7/8"	6
95984	.3030		7.696	.3030"	3-1/4"	1-1/8"	1-7/8"	6
95987	.3040		7.722	.3040"	3-1/4"	1-1/8"	1-7/8"	6
95990	.3050		7.747	.3050"	3-1/4"	1-1/8"	1-7/8"	6
95993	.3060		7.772	.3060"	3-1/4"	1-1/8"	1-7/8"	6
95996	.3070		7.798	.3070"	3-1/4"	1-1/8"	1-7/8"	6

EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Reach Length	Number Flutes	
	Decimal	Metric						
95999	.3080		7.823	.3080"	3-1/4"	1-1/8"	1-7/8"	6
96002	.3090		7.849	.3090"	3-1/4"	1-1/8"	1-7/8"	6
96005	.3100		7.874	.3100"	3-1/4"	1-1/8"	1-7/8"	6
96006	.3105		7.887	.3105"	3-1/4"	1-1/8"	1-7/8"	6
96008	.3110		7.899	.3110"	3-1/4"	1-1/8"	1-7/8"	6
96011	.3115		7.912	.3115"	3-1/4"	1-1/8"	1-7/8"	6
96014	.3120		7.925	.3120"	3-1/4"	1-1/8"	1-7/8"	6
96015	.3123		7.932	.3123"	3-1/4"	1-1/8"	1-7/8"	6
96017	.3125	5/16"	7.938	.3125"	3-1/4"	1-1/8"	1-7/8"	6
96021	.3130		7.950	.3130"	3-1/4"	1-1/8"	1-7/8"	6
96023	.3135		7.963	.3135"	3-1/4"	1-1/8"	1-7/8"	6
96026	.3140		7.976	.3140"	3-1/4"	1-1/8"	1-7/8"	6
96029	.3150		8.000	.3150"	3-1/4"	1-1/8"	1-7/8"	6
96032	.3160	O	8.026	.3160"	3-1/4"	1-1/8"	1-7/8"	6
96035	.3170		8.052	.3170"	3-1/4"	1-1/8"	1-7/8"	6
96038	.3180		8.077	.3180"	3-1/4"	1-1/8"	1-7/8"	6
96041	.3190		8.103	.3190"	3-1/2"	1-1/4"	2"	6
96044	.3200		8.128	.3200"	3-1/2"	1-1/4"	2"	6
96047	.3210		8.153	.3210"	3-1/2"	1-1/4"	2"	6
96050	.3220		8.179	.3220"	3-1/2"	1-1/4"	2"	6
96053	.3230	P	8.204	.3230"	3-1/2"	1-1/4"	2"	6
96056	.3240		8.230	.3240"	3-1/2"	1-1/4"	2"	6
96059	.3250		8.255	.3250"	3-1/2"	1-1/4"	2"	6
96062	.3260		8.280	.3260"	3-1/2"	1-1/4"	2"	6
96065	.3270		8.306	.3270"	3-1/2"	1-1/4"	2"	6
96068	.3280		8.331	.3280"	3-1/2"	1-1/4"	2"	6
96071	.3281	21/64"	8.334	.3281"	3-1/2"	1-1/4"	2"	6
96074	.3290		8.357	.3290"	3-1/2"	1-1/4"	2"	6
96077	.3300		8.382	.3300"	3-1/2"	1-1/4"	2"	6
96079	.3310		8.407	.3310"	3-1/2"	1-1/4"	2"	6
96083	.3320	Q	8.433	.3320"	3-1/2"	1-1/4"	2"	6
96086	.3330		8.458	.3330"	3-1/2"	1-1/4"	2"	6
96089	.3340		8.484	.3340"	3-1/2"	1-1/4"	2"	6
96092	.3346		8.500	.3346"	3-1/2"	1-1/4"	2"	6
96095	.3350		8.509	.3350"	3-1/2"	1-1/4"	2"	6
96098	.3360		8.534	.3360"	3-1/2"	1-1/4"	2"	6
96101	.3370		8.560	.3370"	3-1/2"	1-1/4"	2"	6
96104	.3380		8.585	.3380"	3-1/2"	1-1/4"	2"	6
96107	.3390	R	8.611	.3390"	3-1/2"	1-1/4"	2"	6
96110	.3400		8.636	.3400"	3-1/2"	1-1/4"	2"	6
96113	.3410		8.661	.3410"	3-1/2"	1-1/4"	2"	6
96116	.3420		8.687	.3420"	3-1/2"	1-1/4"	2"	6
96119	.3430		8.712	.3430"	3-1/2"	1-1/4"	2"	6
96122	.3438	11/32"	8.733	.3438"	3-1/2"	1-1/4"	2"	6
96125	.3440		8.738	.3440"	3-1/2"	1-1/4"	2"	6
96128	.3450		8.763	.3450"	3-1/2"	1-1/4"	2"	6
96131	.3460		8.788	.3460"	3-1/2"	1-1/4"	2"	6
96134	.3470		8.814	.3470"	3-1/2"	1-1/4"	2"	6

continued →

Series 4100 (continued)

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



TECH
PAGES
322-323

TOLERANCES

d_1	.0590" - .2509" (1.498 - 6.372mm)	+ .0002" - .0000" (+.0050 - .0000mm)
	.2510" - .5020" (6.375 - 12.750mm)	+ .0003" - .0000" (+.0075 - .0000mm)
d_2	.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" $\pm$.002" less than (d_1) fluted diameter

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Reach Length	Number Flutes
	Decimal	Metric					
96137	.3480	S	8.839	.3480"	3-1/2"	1-1/4"	6
96141	.3490		8.865	.3490"	3-1/2"	1-1/4"	6
96143	.3500		8.890	.3500"	3-1/2"	1-1/4"	6
96146	.3510		8.915	.3510"	3-1/2"	1-1/4"	6
96149	.3520		8.941	.3520"	3-1/2"	1-1/4"	6
96152	.3530		8.966	.3530"	3-1/2"	1-1/4"	6
96155	.3540		8.992	.3540"	3-1/2"	1-1/4"	6
96158	.3543		9.000	.3543"	3-1/2"	1-1/4"	6
96161	.3550		9.017	.3550"	3-1/2"	1-1/4"	6
96164	.3560		9.042	.3560"	3-1/2"	1-1/4"	6
96167	.3570		9.068	.3570"	3-1/2"	1-1/4"	6
96170	.3580	T	9.093	.3580"	3-1/2"	1-1/4"	6
96173	.3590		9.119	.3590"	3-1/2"	1-1/4"	6
96176	.3594	23/64"	9.129	.3594"	3-1/2"	1-1/4"	6
96179	.3600		9.144	.3600"	3-1/2"	1-1/4"	6
96182	.3610		9.169	.3610"	3-1/2"	1-1/4"	6
96185	.3620		9.195	.3620"	3-1/2"	1-1/4"	6
96191	.3640		9.246	.3640"	3-1/2"	1-1/4"	6
96194	.3650		9.271	.3650"	3-1/2"	1-1/4"	6
96197	.3660		9.296	.3660"	3-1/2"	1-1/4"	6
96199	.3670		9.322	.3670"	3-1/2"	1-1/4"	6
96203	.3680	U	9.347	.3680"	3-1/2"	1-1/4"	6
96206	.3690		9.373	.3690"	3-1/2"	1-1/4"	6
96209	.3700		9.398	.3700"	3-1/2"	1-1/4"	6
96212	.3710		9.423	.3710"	3-1/2"	1-1/4"	6
96215	.3720		9.449	.3720"	3-1/2"	1-1/4"	6
96218	.3730		9.474	.3730"	3-1/2"	1-1/4"	6
96221	.3740		9.500	.3740"	3-1/2"	1-1/4"	6
96224	.3745		9.512	.3745"	3-1/2"	1-1/4"	6
96225	.3748		9.520	.3748"	3-1/2"	1-1/4"	6
96227	.3750	3/8"	9.525	.3750"	3-1/2"	1-1/4"	6
96230	.3755		9.538	.3755"	3-1/2"	1-1/4"	6
96233	.3760		9.550	.3760"	3-1/2"	1-1/4"	6
96236	.3765		9.563	.3765"	3-1/2"	1-1/4"	6
96239	.3770	V	9.576	.3770"	3-1/2"	1-1/4"	6
96242	.3780		9.601	.3780"	3-1/2"	1-1/4"	6
96245	.3790		9.627	.3790"	3-1/2"	1-1/4"	6
96248	.3800		9.652	.3800"	3-1/2"	1-1/4"	6
96251	.3810		9.677	.3810"	3-1/2"	1-1/4"	6

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Reach Length	Number Flutes
	Decimal	Metric					
96254	.3820	9.703	.3820"	3-1/2"	1-1/4"	2"	6
96257	.3830	9.728	.3830"	3-1/2"	1-1/4"	2"	6
96260	.3840	9.754	.3840"	3-1/2"	1-1/4"	2"	6
96263	.3850	9.779	.3850"	3-1/2"	1-1/4"	2"	6
96266	.3860	W 9.804	.3860"	3-1/2"	1-1/4"	2"	6
96269	.3870	9.830	.3870"	3-1/2"	1-1/4"	2"	6
96272	.3880	9.855	.3880"	3-1/2"	1-1/4"	2"	6
96275	.3890	9.881	.3890"	3-1/2"	1-1/4"	2"	6
96278	.3900	9.906	.3900"	3-1/2"	1-1/4"	2"	6
96281	.3906	25/64" 9.921	.3906"	3-1/2"	1-1/4"	2"	6
96284	.3910	9.931	.3910"	3-1/2"	1-1/4"	2"	6
96287	.3920	9.957	.3920"	3-1/2"	1-1/4"	2"	6
96290	.3930	9.982	.3930"	3-1/2"	1-1/4"	2"	6
96293	.3937	10.000	.3937"	3-1/2"	1-1/4"	2"	6
96296	.3940	10.008	.3940"	3-1/2"	1-1/4"	2"	6
96299	.3950	10.033	.3950"	3-1/2"	1-1/4"	2"	6
96302	.3960	10.058	.3960"	3-1/2"	1-1/4"	2"	6
96305	.3970	X 10.084	.3970"	3-1/2"	1-1/4"	2"	6
96308	.3980	10.109	.3980"	3-1/2"	1-1/4"	2"	6
96311	.3990	10.135	.3990"	3-1/2"	1-1/4"	2"	6
96314	.4000	10.160	.4000"	3-1/2"	1-1/4"	2"	6
96317	.4010	10.185	.4010"	3-1/2"	1-1/4"	2"	6
96319	.4020	10.211	.4020"	3-1/2"	1-1/4"	2"	6
96323	.4030	10.236	.4030"	3-1/2"	1-1/4"	2"	6
96326	.4040	Y 10.262	.4040"	3-1/2"	1-1/4"	2"	6
96329	.4050	10.287	.4050"	3-1/2"	1-1/4"	2"	6
96332	.4060	10.312	.4060"	3-1/2"	1-1/4"	2"	6
96335	.4062	13/32" 10.317	.4062"	3-1/2"	1-1/4"	2"	6
96338	.4070	10.338	.4070"	3-1/2"	1-1/4"	2"	6
96341	.4080	10.363	.4080"	3-1/2"	1-1/4"	2"	6
96344	.4090	10.389	.4090"	3-1/2"	1-1/4"	2"	6
96347	.4100	10.414	.4100"	3-1/2"	1-1/4"	2"	6
96350	.4110	10.439	.4110"	3-1/2"	1-1/4"	2"	6
96353	.4120	10.465	.4120"	3-1/2"	1-1/4"	2"	6
96356	.4130	Z 10.490	.4130"	3-1/2"	1-1/4"	2"	6
96359	.4134	10.500	.4134"	3-1/2"	1-1/4"	2"	6
96362	.4140	10.516	.4140"	3-1/2"	1-1/4"	2"	6
96365	.4150	10.541	.4150"	3-1/2"	1-1/4"	2"	6
96366	.4160	10.566	.4160"	4"	1-3/8"	2-1/8"	6
96367	.4170	10.592	.4170"	4"	1-3/8"	2-1/8"	6
96369	.4190	10.643	.4190"	4"	1-3/8"	2-1/8"	6
96374	.4210	10.693	.4210"	4"	1-3/8"	2-1/8"	6
96377	.4219	27/64" 10.716	.4219"	4"	1-3/8"	2-1/8"	6
96380	.4220	10.719	.4220"	4"	1-3/8"	2-1/8"	6
96383	.4230	10.744	.4230"	4"	1-3/8"	2-1/8"	6
96386	.4240	10.770	.4240"	4"	1-3/8"	2-1/8"	6

continued →

Series 4100 (continued)

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

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Reach Length	Number Flutes
	Decimal	Metric					
96389	.4250	10.795	.4250"	4"	1-3/8"	2-1/8"	6
96392	.4260	10.820	.4260"	4"	1-3/8"	2-1/8"	6
96395	.4270	10.846	.4270"	4"	1-3/8"	2-1/8"	6
96398	.4280	10.871	.4280"	4"	1-3/8"	2-1/8"	6
96404	.4300	10.922	.4300"	4"	1-3/8"	2-1/8"	6
96407	.4310	10.947	.4310"	4"	1-3/8"	2-1/8"	6
96410	.4320	10.973	.4320"	4"	1-3/8"	2-1/8"	6
96413	.4330	10.998	.4330"	4"	1-3/8"	2-1/8"	6
96416	.4331	11.000	.4331"	4"	1-3/8"	2-1/8"	6
96419	.4340	11.024	.4340"	4"	1-3/8"	2-1/8"	6
96422	.4350	11.049	.4350"	4"	1-3/8"	2-1/8"	6
96425	.4360	11.074	.4360"	4"	1-3/8"	2-1/8"	6
96428	.4365	11.087	.4365"	4"	1-3/8"	2-1/8"	6
96431	.4370	11.100	.4370"	4"	1-3/8"	2-1/8"	6
96432	.4373	11.107	.4373"	4"	1-3/8"	2-1/8"	6
96434	.4375	7/16"	.4375"	4"	1-3/8"	2-1/8"	6
96437	.4380	11.125	.4380"	4"	1-3/8"	2-1/8"	6
96440	.4385	11.138	.4385"	4"	1-3/8"	2-1/8"	6
96443	.4390	11.151	.4390"	4"	1-3/8"	2-1/8"	6
96446	.4400	11.176	.4400"	4"	1-3/8"	2-1/8"	6
96449	.4410	11.201	.4410"	4"	1-3/8"	2-1/8"	6
96455	.4430	11.252	.4430"	4"	1-3/8"	2-1/8"	6
96458	.4440	11.278	.4440"	4"	1-3/8"	2-1/8"	6
96461	.4450	11.303	.4450"	4"	1-3/8"	2-1/8"	6
96467	.4470	11.354	.4470"	4"	1-3/8"	2-1/8"	6
96470	.4480	11.379	.4480"	4"	1-3/8"	2-1/8"	6
96473	.4490	11.405	.4490"	4"	1-3/8"	2-1/8"	6
96476	.4500	11.430	.4500"	4"	1-3/8"	2-1/8"	6
96479	.4510	11.455	.4510"	4"	1-3/8"	2-1/8"	6
96485	.4528	11.500	.4528"	4"	1-3/8"	2-1/8"	6
96488	.4530	11.506	.4530"	4"	1-3/8"	2-1/8"	6
96491	.4531	29/64"	.4531"	4"	1-3/8"	2-1/8"	6
96494	.4540	11.532	.4540"	4"	1-3/8"	2-1/8"	6
96497	.4550	11.557	.4550"	4"	1-3/8"	2-1/8"	6
96500	.4560	11.582	.4560"	4"	1-3/8"	2-1/8"	6
96503	.4570	11.608	.4570"	4"	1-3/8"	2-1/8"	6
96506	.4580	11.633	.4580"	4"	1-3/8"	2-1/8"	6
96512	.4600	11.684	.4600"	4"	1-3/8"	2-1/8"	6
96515	.4610	11.709	.4610"	4"	1-3/8"	2-1/8"	6
96527	.4650	11.811	.4650"	4"	1-3/8"	2-1/8"	6
96530	.4660	11.836	.4660"	4"	1-3/8"	2-1/8"	6
96533	.4670	11.862	.4670"	4"	1-3/8"	2-1/8"	6
96539	.4688	15/32"	.4688"	4"	1-3/8"	2-1/8"	6
96542	.4690	11.913	.4690"	4"	1-3/8"	2-1/8"	6
96545	.4700	11.938	.4700"	4"	1-1/2"	2-1/4"	6
96548	.4710	11.963	.4710"	4"	1-1/2"	2-1/4"	6
96551	.4720	11.989	.4720"	4"	1-1/2"	2-1/4"	6
96554	.4724	12.000	.4724"	4"	1-1/2"	2-1/4"	6

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	l_3 Reach Length	Number Flutes
	Decimal	Metric					
96557	.4730	12.014	.4730"	4"	1-1/2"	2-1/4"	6
96561	.4740	12.040	.4740"	4"	1-1/2"	2-1/4"	6
96563	.4750	12.065	.4750"	4"	1-1/2"	2-1/4"	6
96566	.4760	12.090	.4760"	4"	1-1/2"	2-1/4"	6
96569	.4770	12.116	.4770"	4"	1-1/2"	2-1/4"	6
96572	.4780	12.141	.4780"	4"	1-1/2"	2-1/4"	6
96578	.4800	12.192	.4800"	4"	1-1/2"	2-1/4"	6
96581	.4810	12.217	.4810"	4"	1-1/2"	2-1/4"	6
96584	.4820	12.243	.4820"	4"	1-1/2"	2-1/4"	6
96590	.4840	12.294	.4840"	4"	1-1/2"	2-1/4"	6
96593	.4844 31/64"	12.304	.4844"	4"	1-1/2"	2-1/4"	6
96596	.4850	12.319	.4850"	4"	1-1/2"	2-1/4"	6
96602	.4870	12.370	.4870"	4"	1-1/2"	2-1/4"	6
96608	.4890	12.421	.4890"	4"	1-1/2"	2-1/4"	6
96617	.4920	12.497	.4920"	4"	1-1/2"	2-1/4"	6
96620	.4921	12.500	.4921"	4"	1-1/2"	2-1/4"	6
96623	.4930	12.522	.4930"	4"	1-1/2"	2-1/4"	6
96629	.4950	12.573	.4950"	4"	1-1/2"	2-1/4"	6
96632	.4960	12.598	.4960"	4"	1-1/2"	2-1/4"	6
96635	.4970	12.624	.4970"	4"	1-1/2"	2-1/4"	6
96638	.4980	12.649	.4980"	4"	1-1/2"	2-1/4"	6
96641	.4990	12.675	.4990"	4"	1-1/2"	2-1/4"	6
96644	.4995	12.687	.4995"	4"	1-1/2"	2-1/4"	6
96645	.4998	12.695	.4998"	4"	1-1/2"	2-1/4"	6
96647	.5000 1/2"	12.700	.5000"	4"	1-1/2"	2-1/4"	6
96650	.5005	12.713	.5005"	4"	1-1/2"	2-1/4"	6
96653	.5010	12.725	.5010"	4"	1-1/2"	2-1/4"	6
96656	.5020	12.751	.5020"	4"	1-1/2"	2-1/4"	6

Series 4100 (Metric)

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



TOLERANCES

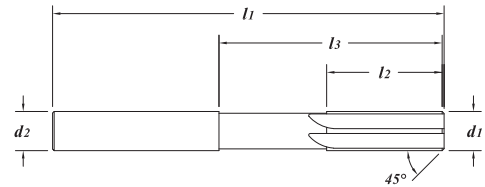
d_1	1.500 - 6.372mm	+0.005mm - .000
	6.375 - 12.750mm	+0.0075mm - .0000
d_2	1.500 - 6.372mm	+0.005mm - .000
	6.375 - 12.750mm	+0.0075mm - .0000

Solid Carbide Submicron Grain

Straight - RHC Flutes

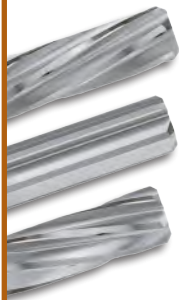
Standard 45° Lead Chamfer

Neck diameter is 0.25mm $\pm$ 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	Number Flutes
	Decimal	Metric					
96659	.07835	1.990	1.990	50	12	32	4
96662	.07874	2.000	2.000	50	12	32	4
96665	.07913	2.010	2.010	50	12	32	4
96668	.07953	2.020	2.020	50	12	32	4
96671	.11772	2.990	2.990	65	16	36	4
96674	.11811	3.000	3.000	65	16	36	4
96677	.11850	3.010	3.010	65	16	36	4
96680	.11890	3.020	3.020	65	16	36	4
96683	.15709	3.990	3.990	75	20	45	4
96686	.15748	4.000	4.000	75	20	45	4
96689	.15787	4.010	4.010	75	20	45	4
96692	.15827	4.020	4.020	75	20	45	4
96695	.15866	4.030	4.030	75	20	45	4
96698	.19646	4.990	4.990	100	25	60	4
96701	.19685	5.000	5.000	100	25	60	4
96704	.19724	5.010	5.010	100	25	60	4
96707	.19764	5.020	5.020	100	25	60	4
96710	.19803	5.030	5.030	100	25	60	4
96713	.23583	5.990	5.990	100	25	60	4
96716	.23622	6.000	6.000	100	25	60	4
96719	.23661	6.010	6.010	100	25	60	4
96722	.23701	6.020	6.020	100	25	60	4
96725	.27559	7.000	7.000	100	25	60	6
96728	.31457	7.990	7.990	120	32	75	6
96731	.31496	8.000	8.000	120	32	75	6
96734	.31535	8.010	8.010	120	32	75	6
96737	.31575	8.020	8.020	120	32	75	6
96740	.31614	8.030	8.030	120	32	75	6
96743	.35433	9.000	9.000	120	32	75	6
96746	.39291	9.980	9.980	130	32	75	6
96749	.39331	9.990	9.990	130	32	75	6
96752	.39370	10.000	10.000	130	32	75	6
96755	.39409	10.010	10.010	130	32	75	6
96758	.39449	10.020	10.020	130	32	75	6
96761	.39488	10.030	10.030	130	32	75	6
96764	.39528	10.040	10.040	130	32	75	6

EDP#	d_1		d_2	l_1	l_2	l_3	Number Flutes
	Decimal	Metric	Shank Diameter	Overall Length	Flute Length	Reach Length	
96767	.47165	11.980	11.980	150	40	100	6
96770	.47205	11.990	11.990	150	40	100	6
96773	.47244	12.000	12.000	150	40	100	6
96776	.47283	12.010	12.010	150	40	100	6
96779	.47323	12.020	12.020	150	40	100	6
96782	.47362	12.030	12.030	150	40	100	6



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

Drill/End Mill

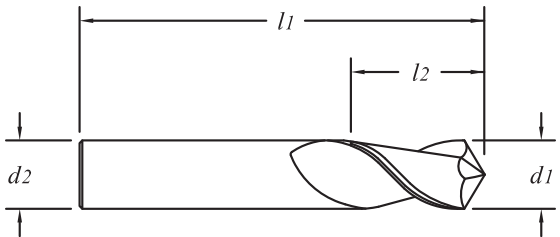
Solid submicron grain carbide

Included angle to a point - center cutting

Tools do not have drill point geometry

Extremely versatile

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



EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
	Decimal	Metric			
57200	.1250	1/8"	3.175	1-1/2"	1/2"
57210	.1875	3/16"	4.763	2"	5/8"
57220	.2500	1/4"	6.350	2-1/2"	3/4"
57230	.3125	5/16"	7.938	2-1/2"	7/8"
57240	.3750	3/8"	9.525	2-1/2"	7/8"
57250	.4375	7/16"	11.113	2-3/4"	1"
57260	.5000	1/2"	12.700	3"	1"
57270	.6250	5/8"	15.875	3-1/2"	1-1/4"
57280	.7500	3/4"	19.050	4"	1-1/2"

MATERIAL HARDNESS (Rc)

70

35

0

TOLERANCES

$d1$	$+0.000" -0.002" (+.000 / -.050\text{mm})$
$d2$	$h6$



TECH
PAGES
324-325

Series 152MA

DRILL MILLS

Drill/End Mill

TiALN Coating

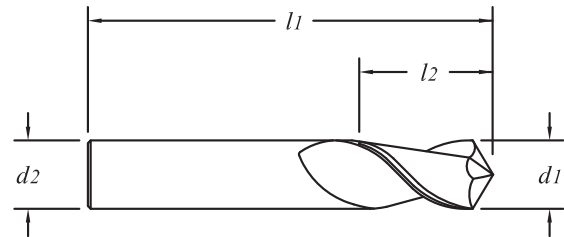
Solid submicron grain carbide

Included angle to a point - center cutting

Tools do not have drill point geometry

Extremely versatile

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



EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length
	Decimal	Metric			
57207	.1250	1/8"	3.175	1/8"	1-1/2"
57217	.1875	3/16"	4.763	3/16"	2"
57227	.2500	1/4"	6.350	1/4"	2-1/2"
57237	.3125	5/16"	7.938	5/16"	2-1/2"
57247	.3750	3/8"	9.525	3/8"	2-1/2"
57257	.4375	7/16"	11.113	7/16"	2-3/4"
57267	.5000	1/2"	12.700	1/2"	3"
57277	.6250	5/8"	15.875	5/8"	3-1/2"
57287	.7500	3/4"	19.050	3/4"	4"

MATERIAL HARDNESS (Rc)

70

35

0



TOLERANCES

$d1$	$+0.000^{\circ} - .002^{\circ}$ (+.000 / -.050mm)
$d2$	$h6$

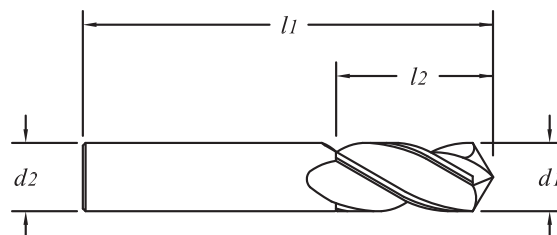
Drill/End Mill

Solid submicron grain carbide

Included angle to a point - center cutting

Tools do not have drill point geometry

Extremely versatile

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

60° EDP#	82° EDP#	90° EDP#	100° EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length
				Decimal	Metric			
-	-	58198	-	.1181	3.000	3.0	38	12
-	57346	58200	-	.1250	1/8"	3.175	1/8"	1/2"
-	-	58202	-	.1575		4.000	50	14
-	57350	58210	57390	.1875	3/16"	4.763	2"	5/8"
-	57352	58212	57392	.1969		5.000	65	16
57314	57354	58214	-	.2362		6.000	65	19
57316	57356	58220	57396	.2500	1/4"	6.350	2-1/2"	3/4"
57318	57358	58230	57398	.3125	5/16"	7.938	2-1/2"	7/8"
57320	-	58232	57400	.3150		8.000	65	22
57322	57362	58240	57402	.3750	3/8"	9.525	2-1/2"	7/8"
57324	-	58242	57404	.3937		10.000	70	25
-	-	58252	57408	.4724		12.000	75	25
57330	57370	58260	57410	.5000	1/2"	12.700	3"	1"
57332	57372	58270	57412	.6250	5/8"	15.875	3-1/2"	1-1/4"
-	-	58272	57414	.6299		16.000	88	32
57336	57376	58280	-	.7500	3/4"	19.050	4"	1-1/2"

MATERIAL HARDNESS (Rc)

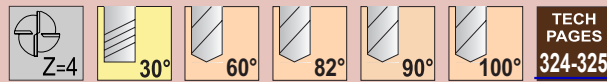
70

35

0

TOLERANCES

$d1$	$+0.000^{\circ} - 0.002^{\circ}$ (+.000 / -.050mm)
$d2$	$h6$

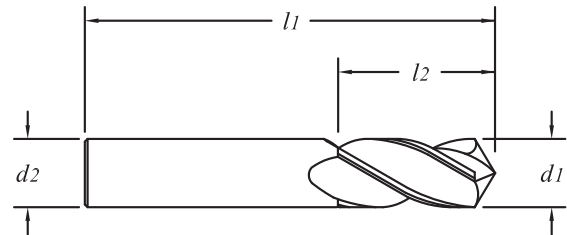
Series 154MA

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


60° EDP#	82° EDP#	90° EDP#	100° EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length
				Decimal	Metric			
-	-	58205	-	.1181	3.000	3.0	38	12
-	58346	58207	-	.1250	1/8"	3.175	1/8"	1/2"
-	58348	58209	58388	.1575	4.000	4.0	50	14
-	58350	58217	58390	.1875	3/16"	4.763	3/16"	5/8"
-	-	58219	-	.1969	5.000	5.0	65	16
58314	58354	58221	58394	.2362	6.000	6.0	65	19
58316	58356	58227	58396	.2500	1/4"	6.350	1/4"	3/4"
58318	58358	58237	58398	.3125	5/16"	7.938	5/16"	7/8"
58320	-	58239	58400	.3150	8.000	8.0	65	22
58322	58362	58247	58402	.3750	3/8"	9.525	3/8"	7/8"
58324	58364	58249	58404	.3937	10.000	10.0	70	25
58326	58366	58257	-	.4375	7/16"	11.113	7/16"	1"
58328	-	58259	58408	.4724	12.000	12.0	75	25
58330	58370	58267	58410	.5000	1/2"	12.700	1/2"	1"
58332	58372	58277	58412	.6250	5/8"	15.875	5/8"	1-1/4"
-	58374	58279	-	.6299	16.000	16.0	88	32
58336	58376	58287	58416	.7500	3/4"	19.050	3/4"	1-1/2"
-	58378	58289	-	.7874	20.000	20.0	100	38

DRILL MILLS

MATERIAL HARDNESS (Rc)

70

35

0

d_1	$+0.000^{\circ} - .002^{\circ}$ (+.000 / -.050mm)
d_2	$h6$



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

Drill/End Mill

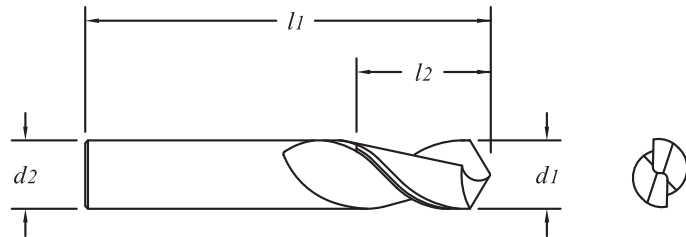
TiALN Coating

Solid submicron grain carbide

Four-facet drill point geometry (NOT to a true point - Reference page 57)

Extremely versatile

Point tolerance $\pm 1^{\circ}$



EDP#	$d_1^{\dagger}$ Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
	Decimal	Metric			
57421	.1181	3.000	3.0	38	12
57423	.1250	1/8"	3.175	1-1/8"	1-1/2"
57425	.1575	4.000	4.0	50	14
57427	.1875	3/16"	4.762	2"	5/8"
57429	.1969	5.000	5.0	65	16
57431	.2362	6.000	6.0	65	19
57433	.2500	1/4"	6.350	2-1/2"	3/4"
57435	.3125	5/16"	7.937	2-1/2"	7/8"
57437	.3150	8.000	8.0	65	22
57439	.3750	3/8"	9.525	2-1/2"	7/8"
57441	.3937	10.000	10.0	70	25
57443	.4375	7/16"	11.112	2-3/4"	1"
57445	.4724	12.000	12.0	75	25
57447	.5000	1/2"	12.700	3"	1"
57449	.6250	5/8"	15.875	3-1/2"	1-1/4"
57451	.6299	16.000	16.0	88	32
57453	.7500	3/4"	19.050	4"	1-1/2"
57455	.7874	20.000	20.0	100	38

70

MATERIAL HARDNESS (Rc)

35

0



Series ARC

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



TOLERANCES

d_1	$+0.000" - .002" (+.000 - .050\text{mm})$
d_2	$h6$
d_3	$+0.000" - .005" (+.000 - .127\text{mm})$

Recommended for aluminum and non-ferrous materials

Aluminum Knuckle Rougher / Ripper

Bright Finish

Solid submicron grain carbide end mill - center cutting

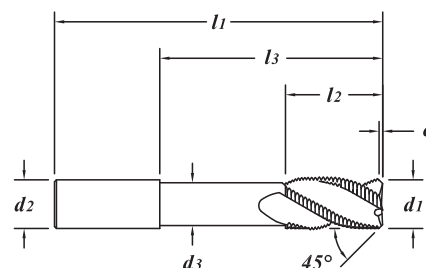
Wave knuckle design to break up chips

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



EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	c Chamfer Length	l_3 Reach Length	d_3 Neck Diameter
	Decimal	Metric						
46219	.1575	4.000	6.0	50	8	0.30	-	-
46222	.1575	4.000	6.0	50	12	0.30	-	-
46225	.1575	4.000	6.0	65	10	0.30	30	3.2
46228	.1575	4.000	6.0	75	15	0.30	40	3.2
46231	.1875	3/16"	4.763	2"	5/16"	.015"	-	-
46234	.1875	3/16"	4.763	2"	9/16"	.015"	-	-
46237	.1875	3/16"	4.763	3"	1"	.015"	-	-
46240	.1875	3/16"	4.763	3"	1/2"	.015"	1-1/2"	.160"
46243	.2362	6.000	6.0	50	12	0.50	-	-
46246	.2362	6.000	6.0	65	19	0.50	-	-
46249	.2362	6.000	6.0	100	20	0.50	60	5.2
46252	.2500	1/4"	6.350	1/4"	2"	3/8"	.020"	-
46255	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"	-
46258	.2500	1/4"	6.350	1/4"	4"	1-1/2"	.020"	-
46261	.2500	1/4"	6.350	1/4"	4"	1"	.020"	2"
46264	.3125	5/16"	7.938	5/16"	2"	7/16"	.020"	-
46267	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.020"	-
46270	.3125	5/16"	7.938	5/16"	4"	1-1/2"	.020"	-
46273	.3125	5/16"	7.938	5/16"	4"	1"	.020"	2"
46276	.3150	8.000	8.0	50	12	0.50	-	-
46279	.3150	8.000	8.0	65	22	0.50	-	-
46282	.3150	8.000	8.0	100	40	0.50	-	-
46285	.3150	8.000	8.0	100	20	0.50	60	7.2
46288	.3150	8.000	8.0	150	40	0.50	100	7.2
46291	.3750	3/8"	9.525	3/8"	2"	1/2"	.025"	-
46294	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.025"	-
46297	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.025"	-
46300	.3750	3/8"	9.525	3/8"	4"	1-5/8"	.025"	-
46303	.3750	3/8"	9.525	3/8"	4"	1"	.025"	2"
46306	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.025"	4"

MATERIAL HARDNESS (Rc)

70

35

0

EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	c Chamfer Length	l_3 Reach Length	d_3 Neck Diameter
	Decimal	Metric						
46309	.3937	10.000	10.0	50	16	0.50	-	-
46312	.3937	10.000	10.0	70	22	0.50	-	-
46315	.3937	10.000	10.0	100	40	0.50	-	-
46318	.3937	10.000	10.0	100	20	0.50	60	9.2
46321	.3937	10.000	10.0	150	40	0.50	100	9.2
46324	.4724	12.000	12.0	65	19	0.80	-	-
46327	.4724	12.000	12.0	75	32	0.80	-	-
46330	.4724	12.000	12.0	100	50	0.80	-	-
46333	.4724	12.000	12.0	100	25	0.80	60	11.2
46336	.4724	12.000	12.0	150	40	0.80	100	11.2
46339	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"	-
46342	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-
46345	.5000	1/2"	12.700	1/2"	4"	2"	.030"	-
46348	.5000	1/2"	12.700	1/2"	4"	1"	.030"	2"
46351	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.030"	4"
46354	.6250	5/8"	15.875	5/8"	3"	3/4"	.035"	-
46357	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.035"	-
46360	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.035"	-
46363	.6250	5/8"	15.875	5/8"	4"	1"	.035"	2"
46366	.6250	5/8"	15.875	5/8"	6"	1-1/2"	.035"	3"
46369	.6250	5/8"	15.875	5/8"	6"	1-1/2"	.035"	4"
46372	.6299	16.000	16.0	75	19	1.00	-	-
46375	.6299	16.000	16.0	88	32	1.00	-	-
46378	.6299	16.000	16.0	100	50	1.00	-	-
46381	.6299	16.000	16.0	100	20	1.00	50	15.2
46384	.6299	16.000	16.0	150	40	1.00	100	15.2
46387	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.040"	-
46390	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.040"	-
46393	.7500	3/4"	19.050	3/4"	4"	7/8"	.040"	2"
46396	.7500	3/4"	19.050	3/4"	6"	1-1/2"	.040"	3"
46399	.7500	3/4"	19.050	3/4"	6"	1-1/2"	.040"	4"
46402	.7874	20.000	20.0	100	22	1.00	-	-
46405	.7874	20.000	20.0	100	40	1.00	-	-
46408	.7874	20.000	20.0	100	30	1.00	50	19.2
46411	.7874	20.000	20.0	150	40	1.00	100	19.2
46414	1.000	1"	25.400	1"	4"	1-1/2"	.040"	-
46417	1.000	1"	25.400	1"	5"	2"	.040"	-
46420	1.000	1"	25.400	1"	6"	2"	.040"	3-1/2"
46423	1.000	1"	25.400	1"	7"	2"	.040"	4-1/2"

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MATERIAL HARDNESS (Rc)

35

0

Series VHM

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



TOLERANCES

d_1	$+0.000" - .002" (+.000 - .050\text{mm})$
d_2	$h6$
d_3	$+0.000" - .005" (+.000 - .127\text{mm})$

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

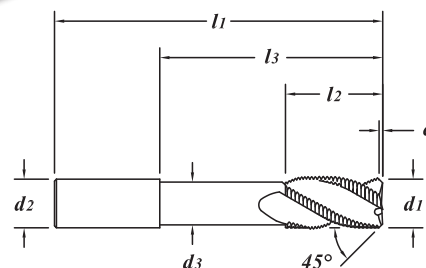
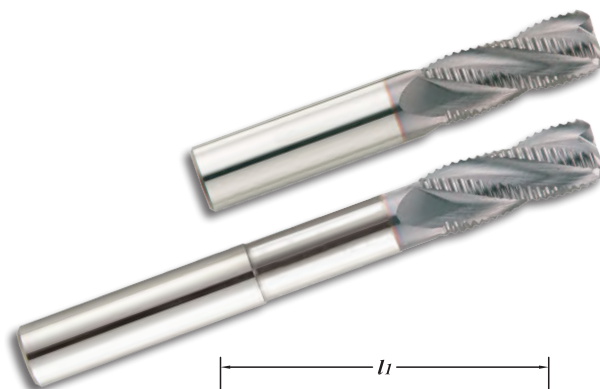
Solid submicron grain carbide end mill - center cutting

State-of-the-art rougher using VRX technology

Reduces tool pressure for more aggressive machining

Recommended for pocket milling

Variable flute geometry



EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	c Chamfer Length	l_3 Reach Length	d_3 Neck Diameter
	Decimal	Metric						
49450	.1575	4.000	6.0	50	8	0.30	-	-
49455	.1575	4.000	6.0	50	12	0.30	-	-
49460	.1575	4.000	6.0	65	10	0.30	30	3.4
49465	.1575	4.000	6.0	75	15	0.30	40	3.4
49470	.1875	3/16"	4.763	3/16"	2"	5/16"	.015"	-
49475	.1875	3/16"	4.763	3/16"	2"	9/16"	.015"	-
49480	.1875	3/16"	4.763	3/16"	3"	1"	.015"	-
49485	.1875	3/16"	4.763	3/16"	3"	1/2"	.015"	1-1/2"
49490	.2362	6.000	6.0	50	12	0.50	-	-
49500	.2362	6.000	6.0	65	19	0.50	-	-
49505	.2362	6.000	6.0	100	15	0.50	40	5.4
49510	.2362	6.000	6.0	100	20	0.50	60	5.4
49520	.2500	1/4"	6.350	1/4"	2"	3/8"	.020"	-
49540	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"	-
49543	.2500	1/4"	6.350	1/4"	4"	1-1/2"	.020"	-
49547	.2500	1/4"	6.350	1/4"	4"	1"	.020"	2"
49550	.2756	7.000	8.0	50	12	0.50	-	-
49555	.2756	7.000	8.0	65	22	0.50	-	-
49570	.2812	9/32"	7.142	5/16"	2"	7/16"	.020"	-
49575	.2812	9/32"	7.142	5/16"	2-1/2"	13/16"	.020"	-
49580	.3125	5/16"	7.938	5/16"	2"	7/16"	.020"	-
49600	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.020"	-
49603	.3125	5/16"	7.938	5/16"	4"	1-1/2"	.020"	-
49605	.3125	5/16"	7.938	5/16"	4"	1"	.020"	2"
49610	.3150	8.000	8.0	50	12	0.50	-	-
49620	.3150	8.000	8.0	65	22	0.50	-	-
49622	.3150	8.000	8.0	100	40	0.50	-	-
49623	.3150	8.000	8.0	100	20	0.50	60	7.4
49624	.3150	8.000	8.0	150	40	0.50	100	7.4
49625	.3438	11/32"	8.733	3/8"	2"	1/2"	.025"	-
49630	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	.025"	-
49635	.3543	9.000	10.0	50	14	0.50	-	-
49637	.3543	9.000	10.0	65	22	0.50	-	-

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MATERIAL HARDNESS (Rc)

0

EDP#	$d1$ †			$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	c Chamfer Length	$l3$ Reach Length	$d3$ Neck Diameter
	Decimal	Diameter	Metric						
49640	.3750	3/8"	9.525	3/8"	2"	1/2"	.025"	-	-
49660	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.025"	-	-
49662	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.025"	-	-
49664	.3750	3/8"	9.525	3/8"	4"	1-5/8"	.025"	-	-
49667	.3750	3/8"	9.525	3/8"	4"	1"	.025"	2"	.355"
49670	.3937		10.000	10.0	50	16	0.50	-	-
49680	.3937		10.000	10.0	70	22	0.50	-	-
49682	.3937		10.000	10.0	100	40	0.50	-	-
49684	.3937		10.000	10.0	100	20	0.50	40	9.4
49686	.3937		10.000	10.0	100	30	0.50	60	9.4
49690	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.025"	-	-
49700	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.025"	-	-
49710	.4724		12.000	12.0	65	19	0.80	-	-
49720	.4724		12.000	12.0	75	32	0.80	-	-
49725	.4724		12.000	12.0	100	50	0.80	-	-
49730	.4724		12.000	12.0	100	25	0.80	60	11.4
49735	.4724		12.000	12.0	150	40	0.80	100	11.4
* 49740	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"	-	-
* 49760	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	-
* 49761	.5000	1/2"	12.700	1/2"	4"	2"	.030"	-	-
* 49762	.5000	1/2"	12.700	1/2"	4"	1"	.030"	2"	.480"
* 49764	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.030"	4"	.480"
* 49765	.5512		14.000	14.0	75	19	0.80	-	-
* 49770	.5512		14.000	14.0	88	32	0.80	-	-
* 49780	.6250	5/8"	15.875	5/8"	3"	3/4"	.035"	-	-
* 49800	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.035"	-	-
* 49820	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.035"	-	-
* 49824	.6250	5/8"	15.875	5/8"	4"	1"	.035"	2"	.605"
* 49826	.6250	5/8"	15.875	5/8"	6"	1-1/2"	.035"	3"	.605"
* 49828	.6250	5/8"	15.875	5/8"	6"	1-1/2"	.035"	4"	.605"
* 49830	.6299		16.000	16.0	75	19	1.00	-	-
* 49840	.6299		16.000	16.0	88	32	1.00	-	-
* 49842	.6299		16.000	16.0	100	50	1.00	-	-
* 49843	.6299		16.000	16.0	100	20	1.00	50	15.4
* 49844	.6299		16.000	16.0	150	40	1.00	100	15.4
* 49850	.7087		18.000	18.0	100	38	1.00	-	-
* 49860	.7500	3/4"	19.050	3/4"	3"	7/8"	.040"	-	-
* 49880	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.040"	-	-
* 49882	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.040"	-	-
* 49886	.7500	3/4"	19.050	3/4"	6"	1-1/2"	.040"	3"	.730"
* 49887	.7500	3/4"	19.050	3/4"	6"	1-1/2"	.040"	4"	.730"
* 49890	.7874		20.000	20.0	75	22	1.00	-	-
* 49900	.7874		20.000	20.0	100	38	1.00	-	-
* 49902	.7874		20.000	20.0	100	30	1.00	50	19.4
* 49904	.7874		20.000	20.0	150	40	1.00	100	19.4
* 49915	.9843		25.000	25.0	100	25	1.00	-	-
* 49920	.9843		25.000	25.0	100	38	1.00	-	-
* 49925	1.000	1"	25.400	1"	4"	1"	.040"	-	-
* 49930	1.000	1"	25.400	1"	4"	1-1/2"	.040"	-	-
* 49940	1.000	1"	25.400	1"	5"	2"	.040"	-	-

* - Tools with weldon flats

70

35

MATERIAL HARDNESS (Rc)

0

S M P K

High Performance End Mills

X3 BALIQ® ALCRONOS Coating (AlCrN)

G3 BALIQ® TISINOS PRO Coating (AlTiSiN)

X3 Target Materials:

Stainless Steel (Inox, Austenitic/Martensitic)

Carbon Tools Steels (Up to 50 HRc)

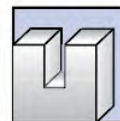
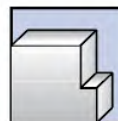
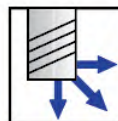
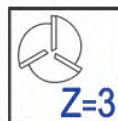
Cast Iron

G3 Target Materials:

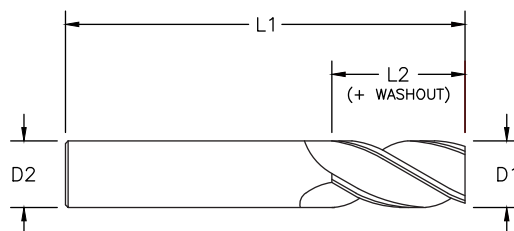
Heat Resistant Super Alloys

PH Stainless Steels (Inox, 13-8, 15-5, 17-4, Martensitic)

Conditioned Tool Steels (50-70 HRc)



CALCULATE IDEAL PARAMETERS
FOR THE X3 AND G3 IN YOUR
APPLICATION WITH THE GARR
TECHNICAL ADVISOR



X3

G3

MATERIAL HARDNESS (Rc)
G3 70
X3 35
0

← View the X3

View the G3 →



TOLERANCES

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

THE NEXT GENERATION

Series X3, G3



.0312" - .0787"
(0.792mm - 2.000mm)

X3 Recommended for Low, Medium, and High Carbon Tool Steels (up to 50 HRC), cast iron, and stainless steel (Inox).

G3 Recommended for tough machining materials such as Heat Resistant Super Alloys,
PH Stainless steels (Inox), and conditioned tool steels. (50-70 HRC)

3 Flute High Performance End Mills

X3 BALIQ® ALCRONOS Coating (AlCrN-based)

G3 BALIQ® TISINOS PRO Coating (AlTiSiN)

Solid submicron grain carbide - center cutting

h6 shank tolerance

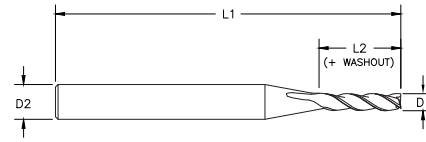
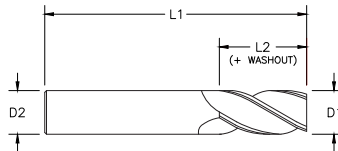
Engineered for High Efficiency Milling

Variable flute grind

Honed edge treatment

Polished fluting

Material and condition specific coatings



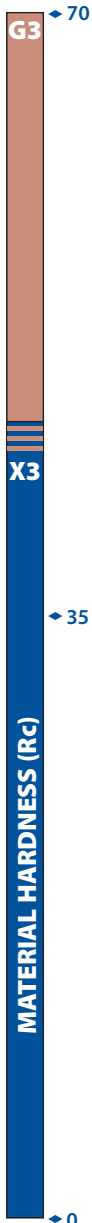
X3 EDP#	G3 EDP#	$d1$ †			$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius
		Decimal	Diameter	Metric				
87100	88100	.0312	1/32"	0.792	1/4"	2"	1/16"	-
87101	88101	.0312	1/32"	0.792	1/4"	2"	3/32"	-
87102	88102	.0312	1/32"	0.792	1/4"	2"	1/8"	-
87103	88103	.0315		0.800	6	50	2.40	-
87104	88104	.0354		0.900	6	50	2.70	-
87105	88105	.0394		1.000	6	50	3	-
87106	88106	.0400	.040"	1.016	1/4"	2"	.120"	-
87107	88107	.0450	.045"	1.143	1/4"	2"	.135"	-
87108	88108	.0469	3/64"	1.191	1/4"	2"	5/32"	-
87109	88109	.0500	.050"	1.270	1/4"	2"	.150"	-
87110	88110	.0550	.055"	1.397	1/4"	2"	.250"	-
87111	88111	.0591		1.500	6	50	3	-
87112	88112	.0591		1.500	6	50	3	0.20
87113	88113	.0591		1.500	6	50	6	-
87114	88114	.0591		1.500	6	50	6	0.20
87115	88115	.0600	.060"	1.524	1/4"	2"	.090"	-
87116	88116	.0600	.060"	1.524	1/4"	2"	.180"	-
87117	88117	.0625	1/16"	1.587	1/4"	2"	1/8"	-
87118	88118	.0625	1/16"	1.587	1/4"	2"	1/8"	.005"
87119	88119	.0625	1/16"	1.587	1/4"	2"	1/8"	.010"
87120	88120	.0625	1/16"	1.587	1/4"	2"	1/4"	-
87121	88121	.0625	1/16"	1.587	1/4"	2"	1/4"	.005"
87122	88122	.0625	1/16"	1.587	1/4"	2"	1/4"	.010"
87123	88123	.0700	.070"	1.778	1/4"	2"	.210"	-
87124	88124	.0781	5/64"	1.983	1/4"	2"	1/4"	-
87125	88125	.0781	5/64"	1.983	1/4"	2"	1/4"	.005"
87126	88126	.0781	5/64"	1.983	1/4"	2"	1/4"	.010"
87127	88127	.0787		2.000	6	50	8	-
87128	88128	.0787		2.000	6	50	8	0.10
87129	88129	.0787		2.000	6	50	8	0.20

continued →

Series X3, G3 (continued)

.0800" - .1562"
(2.032mm - 3.967mm)

X3 EDP#	G3 EDP#	d_1 †			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius
		Decimal	Diameter	Metric				
87130	88130	.0800	.080"	2.032	1/4"	2"	1/4"	-
87131	88131	.0900	.090"	2.286	1/4"	2"	9/32"	-
87132	88132	.0938	3/32"	2.382	1/4"	2"	3/16"	-
87133	88133	.0938	3/32"	2.382	1/4"	2"	3/16"	.005"
87134	88134	.0938	3/32"	2.382	1/4"	2"	3/16"	.010"
87135	88135	.0938	3/32"	2.382	1/4"	2"	3/8"	-
87136	88136	.0938	3/32"	2.382	1/4"	2"	3/8"	.005"
87137	88137	.0938	3/32"	2.382	1/4"	2"	3/8"	.010"
87138	88138	.0984		2.500	6	50	8	-
87139	88139	.0984		2.500	6	50	8	0.10
87140	88140	.0984		2.500	6	50	8	0.20
87141	88141	.1000	.100"	2.540	1/4"	2"	3/16"	-
87142	88142	.1000	.100"	2.540	1/4"	2"	5/16"	-
87143	88143	.1094	7/64"	2.778	1/4"	2"	1/4"	-
87144	88144	.1094	7/64"	2.778	1/4"	2"	1/4"	.005"
87145	88145	.1094	7/64"	2.778	1/4"	2"	1/4"	.010"
87146	88146	.1094	7/64"	2.778	1/4"	2"	3/8"	-
87147	88147	.1094	7/64"	2.778	1/4"	2"	3/8"	.005"
87148	88148	.1094	7/64"	2.778	1/4"	2"	3/8"	.010"
87149	88149	.1181		3.000	6.0	50	6	-
87150	88150	.1181		3.000	6.0	50	6	0.10
87151	88151	.1181		3.000	6.0	50	6	0.20
87152	88152	.1181		3.000	6.0	50	6	0.30
87153	88153	.1181		3.000	6.0	50	6	0.50
87154	88154	.1181		3.000	6.0	50	9	-
87155	88155	.1181		3.000	6.0	50	9	0.20
87156	88156	.1181		3.000	6.0	50	9	0.30
87157	88157	.1181		3.000	6.0	50	9	0.50
87158	88158	.1181		3.000	6.0	65	12	-
87159	88159	.1181		3.000	6.0	65	12	0.10
87160	88160	.1181		3.000	6.0	65	12	0.20
87161	88161	.1181		3.000	6.0	65	12	0.30
87162	88162	.1181		3.000	6.0	65	12	0.50
87163	88163	.1250	1/8"	3.175	1/4"	2"	1/4"	-
87164	88164	.1250	1/8"	3.175	1/4"	2"	1/4"	.010"
87165	88165	.1250	1/8"	3.175	1/4"	2"	1/4"	.015"
87166	88166	.1250	1/8"	3.175	1/4"	2"	1/4"	.020"
87167	88167	.1250	1/8"	3.175	1/4"	2"	3/8"	-
87168	88168	.1250	1/8"	3.175	1/4"	2"	3/8"	.010"
87169	88169	.1250	1/8"	3.175	1/4"	2"	3/8"	.015"
87170	88170	.1250	1/8"	3.175	1/4"	2-1/2"	1/2"	-
87171	88171	.1250	1/8"	3.175	1/4"	2-1/2"	1/2"	.005"
87172	88172	.1250	1/8"	3.175	1/4"	2-1/2"	1/2"	.010"
87173	88173	.1250	1/8"	3.175	1/4"	2-1/2"	1/2"	.015"
87174	88174	.1250	1/8"	3.175	1/4"	2-1/2"	1/2"	.020"
87175	88175	.1562	5/32"	3.967	1/4"	2"	5/16"	-
87176	88176	.1562	5/32"	3.967	1/4"	2"	5/16"	.010"
87177	88177	.1562	5/32"	3.967	1/4"	2"	7/16"	-
87178	88178	.1562	5/32"	3.967	1/4"	2"	7/16"	.010"
87179	88179	.1562	5/32"	3.967	1/4"	2-1/2"	9/16"	-
87180	88180	.1562	5/32"	3.967	1/4"	2-1/2"	9/16"	.010"



X3 EDP#	G3 EDP#	$d1^+$		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius
		Decimal	Diameter Metric				
87181	88181	.1575	4.000	6	50	8	-
87182	88182	.1575	4.000	6	50	8	0.30
87183	88183	.1575	4.000	6	50	8	0.50
87184	88184	.1875	3/16"	1/4"	2"	5/16"	-
87185	88185	.1875	3/16"	1/4"	2"	5/16"	.010"
87186	88186	.1875	3/16"	1/4"	2"	5/16"	.015"
87187	88187	.1875	3/16"	1/4"	2"	7/16"	-
87188	88188	.1875	3/16"	1/4"	2"	7/16"	.010"
87189	88189	.1875	3/16"	1/4"	2"	7/16"	.015"
87190	88190	.1875	3/16"	1/4"	2-1/2"	9/16"	-
87191	88191	.1875	3/16"	1/4"	2-1/2"	9/16"	.010"
87192	88192	.1875	3/16"	1/4"	2-1/2"	9/16"	.015"
87193	88193	.1969	5.000	6	50	10	-
87194	88194	.1969	5.000	6	50	10	0.30
87195	88195	.1969	5.000	6	50	10	0.50
87196	88196	.1969	5.000	6	65	15	-
87197	88197	.1969	5.000	6	65	15	0.30
87198	88198	.1969	5.000	6	65	15	0.50
87199	88199	.2188	7/32"	1/4"	2"	3/8"	-
87200	88200	.2188	7/32"	1/4"	2"	3/8"	.015"
87201	88201	.2188	7/32"	1/4"	2-1/2"	3/4"	-
87202	88202	.2188	7/32"	1/4"	2-1/2"	3/4"	.015"
87203	88203	.2362	6.000	6	50	13	-
87204	88204	.2362	6.000	6	50	13	0.30
87205	88205	.2362	6.000	6	50	13	0.50
87206	88206	.2362	6.000	6	65	19	-
87207	88207	.2362	6.000	6	65	19	0.30
87208	88208	.2362	6.000	6	65	19	0.50
87209	88209	.2362	6.000	6	75	26	-
87210	88210	.2362	6.000	6	75	26	0.30
87211	88211	.2362	6.000	6	75	26	0.50
87212	88212	.2500	1/4"	1/4"	2-1/2"	1/2"	-
87213	88213	.2500	1/4"	1/4"	2-1/2"	1/2"	.010"
87214	88214	.2500	1/4"	1/4"	2-1/2"	1/2"	.015"
87215	88215	.2500	1/4"	1/4"	2-1/2"	1/2"	.020"
87216	88216	.2500	1/4"	1/4"	2-1/2"	1/2"	.030"
87217	88217	.2500	1/4"	1/4"	2-1/2"	5/8"	-
87218	88218	.2500	1/4"	1/4"	2-1/2"	5/8"	.010"
87219	88219	.2500	1/4"	1/4"	2-1/2"	5/8"	.015"
87220	88220	.2500	1/4"	1/4"	2-1/2"	5/8"	.020"
87221	88221	.2500	1/4"	1/4"	2-1/2"	5/8"	.030"
87222	88222	.2500	1/4"	1/4"	2-1/2"	3/4"	-
87223	88223	.2500	1/4"	1/4"	2-1/2"	3/4"	.010"
87224	88224	.2500	1/4"	1/4"	2-1/2"	3/4"	.015"
87225	88225	.2500	1/4"	1/4"	2-1/2"	3/4"	.020"
87226	88226	.2500	1/4"	1/4"	2-1/2"	3/4"	.030"
87227	88227	.2500	1/4"	1/4"	2-1/2"	3/4"	.060"
87228	88228	.2500	1/4"	1/4"	3"	1"	-
87229	88229	.2500	1/4"	1/4"	3"	1"	.015"
87230	88230	.2500	1/4"	1/4"	3"	1"	.030"

70

G3

X3

35

MATERIAL HARDNESS (Rc)

0

S M P K

High Performance End Mills

X5 BALIQ® ALCRONOS Coating (AlCrN)

G5 BALIQ® TISINOS PRO Coating (AlTiSiN)

X5 Target Materials:

Stainless Steel (Inox, Austenitic/Martensitic)

Carbon Tools Steels (Up to 50 HRC)

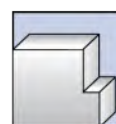
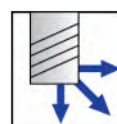
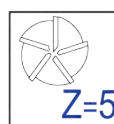
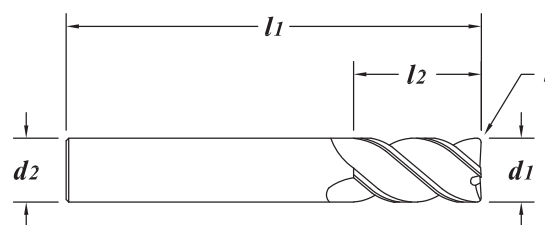
Cast Iron

G5 Target Materials:

Heat Resistant Super Alloys

PH Stainless Steels (Inox, 13-8, 15-5, 17-4, Martensitic)

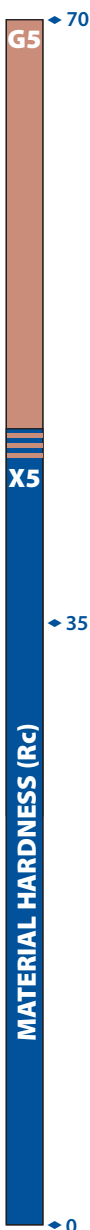
Conditioned Tool Steels (50-70 HRC)

CALCULATE IDEAL PARAMETERS
FOR THE X5 AND G5 IN YOUR
APPLICATION WITH THE GARR
TECHNICAL ADVISOR

X5

G5

MATERIAL HARDNESS (HRC)



← View the X5

View the G5 →



TOLERANCES

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

THE NEXT GENERATION

Series X5, G5



TECH
PAGES
302-303

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

X5 Recommended for Low, Medium, and High Carbon Tool Steels (up to 50 HRC), cast iron, and stainless steel (Inox).

G5 Recommended for tough machining materials such as Heat Resistant Super Alloys,
PH Stainless steels (Inox), and conditioned tool steels. (50-70 HRC)

5 Flute High Performance End Mills

X5 BALIQ® ALCRONOS Coating (AlCrN-based)

G5 BALIQ® TISINOS PRO Coating (AlTiSiN)

Solid submicron grain carbide - center cutting

h6 shank tolerance

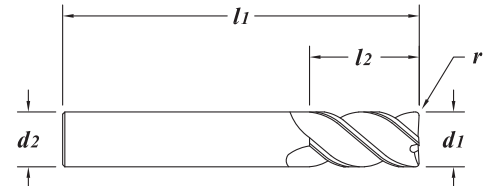
Engineered for High Efficiency Milling

Variable flute grind

Honed edge treatment

Polished fluting

Material and condition specific coatings



X5 EDP#	G5 EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	
		Decimal	Metric					
31400	34700	.1562	5/32"	3.967	1/4"	2"	5/16"	-
31401	34701	.1562	5/32"	3.967	1/4"	2"	5/16"	.010"
31402	34702	.1562	5/32"	3.967	1/4"	2"	7/16"	-
31403	34703	.1562	5/32"	3.967	1/4"	2"	7/16"	.010"
31404	34704	.1562	5/32"	3.967	1/4"	2-1/2"	9/16"	-
31405	34705	.1562	5/32"	3.967	1/4"	2-1/2"	9/16"	.010"
31406	34706	.1575		4.000	6.0	50	8	-
31407	34707	.1575		4.000	6.0	50	8	0.30
31408	34708	.1575		4.000	6.0	50	8	0.50
31409	34709	.1575		4.000	6.0	50	16	-
31410	34710	.1575		4.000	6.0	50	16	0.30
31411	34711	.1575		4.000	6.0	50	16	0.50
31412	34712	.1875	3/16"	4.763	1/4"	2"	5/16"	-
31413	34713	.1875	3/16"	4.763	1/4"	2"	5/16"	.010"
31414	34714	.1875	3/16"	4.763	1/4"	2"	5/16"	.015"
31415	34715	.1875	3/16"	4.763	1/4"	2"	7/16"	-
31416	34716	.1875	3/16"	4.763	1/4"	2"	7/16"	.010"
31417	34717	.1875	3/16"	4.763	1/4"	2"	7/16"	.015"
31418	34718	.1875	3/16"	4.763	1/4"	2-1/2"	9/16"	-
31419	34719	.1875	3/16"	4.763	1/4"	2-1/2"	9/16"	.010"
31420	34720	.1875	3/16"	4.763	1/4"	2-1/2"	9/16"	.015"
31421	34721	.1969		5.000	6.0	50	10	-
31422	34722	.1969		5.000	6.0	50	10	0.30
31423	34723	.1969		5.000	6.0	50	10	0.50
31424	34724	.1969		5.000	6.0	65	15	-
31425	34725	.1969		5.000	6.0	65	15	0.30
31426	34726	.1969		5.000	6.0	65	15	0.50
31427	34727	.2188	7/32"	5.558	1/4"	2"	3/8"	-
31428	34728	.2188	7/32"	5.558	1/4"	2"	3/8"	.015"
31429	34729	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	-
31430	34730	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	.015"

continued →



Series X5, G5 (continued)

.2362" - .3750"
(6.000mm - 9.525mm)

X5 EDP#	G5 EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius
		Decimal	Metric				
31431	34731	.2362	6.000	6	50	13	-
31432	34732	.2362	6.000	6	50	13	0.30
31433	34733	.2362	6.000	6	50	13	0.50
31434	34734	.2362	6.000	6	65	19	-
31435	34735	.2362	6.000	6	65	19	0.30
31436	34736	.2362	6.000	6	65	19	0.50
31437	34737	.2362	6.000	6	75	26	-
31438	34738	.2362	6.000	6	75	26	0.30
31439	34739	.2362	6.000	6	75	26	0.50
31440	34740	.2500	1/4"	6.350	1/4"	2-1/2"	1/2"
31441	34741	.2500	1/4"	6.350	1/4"	2-1/2"	1/2"
31442	34742	.2500	1/4"	6.350	1/4"	2-1/2"	1/2"
31443	34743	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"
31444	34744	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"
31445	34745	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"
31446	34746	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"
31447	34747	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"
31448	34748	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"
31449	34749	.2500	1/4"	6.350	1/4"	3"	1"
31450	34750	.2500	1/4"	6.350	1/4"	3"	1"
31451	34751	.2500	1/4"	6.350	1/4"	3"	1"
31452	34752	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"
31453	34753	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"
31454	34754	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"
31455	34755	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"
31456	34756	.3150		8.000	8	65	22
31457	34757	.3150		8.000	8	65	22
31458	34758	.3150		8.000	8	65	22
31459	34759	.3150		8.000	8	75	32
31460	34760	.3150		8.000	8	75	32
31461	34761	.3150		8.000	8	75	32
31462	34762	.3750	3/8"	9.525	3/8"	2"	1/2"
31463	34763	.3750	3/8"	9.525	3/8"	2"	1/2"
31464	34764	.3750	3/8"	9.525	3/8"	2"	1/2"
31465	34765	.3750	3/8"	9.525	3/8"	2"	1/2"
31466	34766	.3750	3/8"	9.525	3/8"	2"	5/8"
31467	34767	.3750	3/8"	9.525	3/8"	2"	5/8"
31468	34768	.3750	3/8"	9.525	3/8"	2"	5/8"
31469	34769	.3750	3/8"	9.525	3/8"	2"	5/8"
31595	34886	.3750	3/8"	9.525	3/8"	2-1/2"	5/8"
31470	34770	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"
31471	34771	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"
31472	34772	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"
31473	34773	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"
31588	34879	.3750	3/8"	9.525	3/8"	2-1/2"	1"
31589	34880	.3750	3/8"	9.525	3/8"	2-1/2"	1"
31590	34881	.3750	3/8"	9.525	3/8"	2-1/2"	1"
31591	34882	.3750	3/8"	9.525	3/8"	2-1/2"	1"
31592	34883	.3750	3/8"	9.525	3/8"	2-1/2"	1"
31593	34884	.3750	3/8"	9.525	3/8"	2-1/2"	1"
31474	34774	.3750	3/8"	9.525	3/8"	3"	1"
31475	34775	.3750	3/8"	9.525	3/8"	3"	1"
31476	34776	.3750	3/8"	9.525	3/8"	3"	1"
31477	34777	.3750	3/8"	9.525	3/8"	3"	1"
31594	34885	.3750	3/8"	9.525	3/8"	3"	1"
31478	34778	.3750	3/8"	9.525	3/8"	3"	1-1/4"
31479	34779	.3750	3/8"	9.525	3/8"	3"	1-1/4"

G5 70

X5

MATERIAL HARDNESS (Rc)

35

0

X5 EDP#	G5 EDP#	$d1^+$ Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius
		Decimal	Metric				
31480	34780	.3937	10.000	10	70	26	-
31481	34781	.3937	10.000	10	70	26	0.50
31482	34782	.3937	10.000	10	70	26	1.00
31483	34783	.3937	10.000	10	75	32	-
31484	34784	.3937	10.000	10	75	32	0.50
31485	34785	.3937	10.000	10	75	32	1.00
31486	34786	.4724	12.000	12	65	19	-
31487	34787	.4724	12.000	12	65	19	0.30
31488	34788	.4724	12.000	12	65	19	0.50
31489	34789	.4724	12.000	12	65	19	1.00
31490	34790	.4724	12.000	12	75	26	-
31491	34791	.4724	12.000	12	75	26	0.30
31492	34792	.4724	12.000	12	75	26	0.50
31493	34793	.4724	12.000	12	75	26	1.00
31494	34794	.4724	12.000	12	75	32	-
31495	34795	.4724	12.000	12	75	32	0.30
31496	34796	.4724	12.000	12	75	32	0.50
31497	34797	.4724	12.000	12	75	32	1.00
31498	34798	.4724	12.000	12	100	42	-
31499	34799	.4724	12.000	12	100	42	0.30
31500	34800	.4724	12.000	12	100	42	0.50
31501	34801	.4724	12.000	12	100	42	1.00
31502	34802	.4724	12.000	12	100	50	-
31503	34803	.4724	12.000	12	100	50	0.30
31504	34804	.4724	12.000	12	100	50	0.50
31505	34805	.4724	12.000	12	100	50	1.00
31506	34806	.5000	12.700	1/2"	2-1/2"	5/8"	-
31507	34807	.5000	12.700	1/2"	2-1/2"	5/8"	.010"
31508	34808	.5000	12.700	1/2"	2-1/2"	5/8"	.015"
31509	34809	.5000	12.700	1/2"	2-1/2"	5/8"	.020"
31511	34810	.5000	12.700	1/2"	2-1/2"	5/8"	.030"
31596	34887	.5000	12.700	1/2"	2-1/2"	5/8"	.125"
31512	34811	.5000	12.700	1/2"	3"	1"	-
31513	34812	.5000	12.700	1/2"	3"	1"	.015"
31514	34813	.5000	12.700	1/2"	3"	1"	.030"
31515	34814	.5000	12.700	1/2"	3"	1"	.060"
31516	34815	.5000	12.700	1/2"	3"	1-1/4"	-
31517	34816	.5000	12.700	1/2"	3"	1-1/4"	.010"
31518	34817	.5000	12.700	1/2"	3"	1-1/4"	.015"
31519	34818	.5000	12.700	1/2"	3"	1-1/4"	.020"
31521	34819	.5000	12.700	1/2"	3"	1-1/4"	.030"
31522	34820	.5000	12.700	1/2"	3"	1-1/4"	.060"
31523	34821	.5000	12.700	1/2"	3"	1-1/4"	.125"
31524	34822	.5000	12.700	1/2"	4"	1-5/8"	-
31525	34823	.5000	12.700	1/2"	4"	1-5/8"	.015"
31526	34824	.5000	12.700	1/2"	4"	1-5/8"	.020"
31527	34825	.5000	12.700	1/2"	4"	1-5/8"	.030"
31528	34826	.5000	12.700	1/2"	4"	2-1/8"	-
31529	34827	.5000	12.700	1/2"	4"	2-1/8"	.015"
31530	34828	.5000	12.700	1/2"	4"	2-1/8"	.030"
31531	34829	.6250	15.875	5/8"	3"	1"	-
31532	34830	.6250	15.875	5/8"	3"	1"	.015"
31533	34831	.6250	15.875	5/8"	3"	1"	.030"
31534	34832	.6250	15.875	5/8"	3-1/2"	1-1/2"	-
31535	34833	.6250	15.875	5/8"	3-1/2"	1-1/2"	.015"
31536	34834	.6250	15.875	5/8"	3-1/2"	1-1/2"	.030"
31537	34835	.6250	15.875	5/8"	3-1/2"	1-1/2"	.060"

70 G5

X5

35

MATERIAL HARDNESS (Rc)

0

continued

Series X5, G5 (continued)

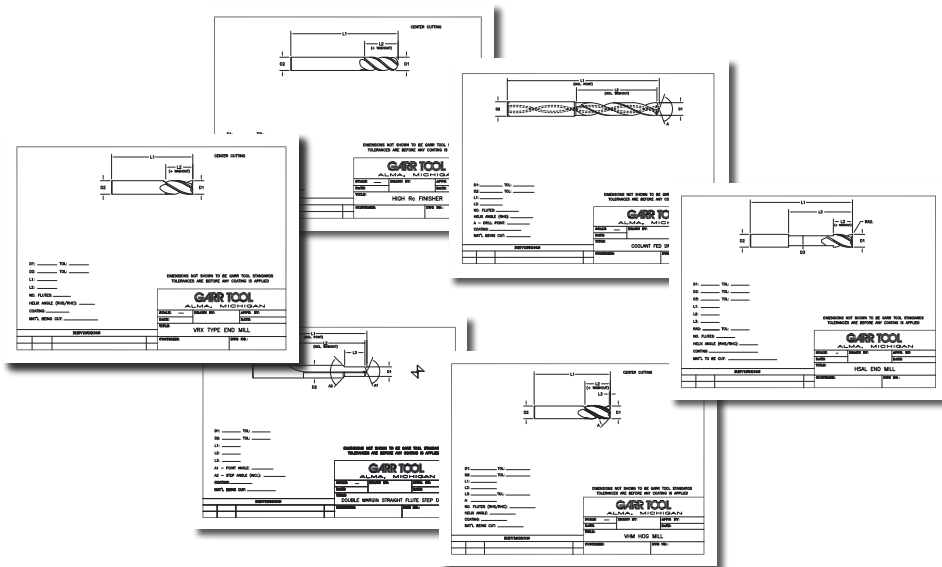
.6250" - 1.000"
(15.875mm - 25.400mm)

X5 EDP#	G5 EDP#	d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius
		Decimal		Metric				
31538	34836	.6250	5/8"	15.875	5/8"	4"	1-3/4"	-
31539	34837	.6250	5/8"	15.875	5/8"	4"	1-3/4"	.015"
31541	34838	.6250	5/8"	15.875	5/8"	4"	1-3/4"	.030"
31542	34839	.6250	5/8"	15.875	5/8"	4"	2-1/8"	-
31543	34840	.6250	5/8"	15.875	5/8"	4"	2-1/8"	.015"
31544	34841	.6250	5/8"	15.875	5/8"	4"	2-1/8"	.030"
31545	34842	.6299		16.000	16	88	32	-
31546	34843	.6299		16.000	16	88	32	0.50
31548	34844	.6299		16.000	16	88	32	1.00
31549	34845	.6299		16.000	16	100	40	-
31550	34846	.6299		16.000	16	100	40	0.50
31551	34847	.6299		16.000	16	100	40	1.00
31552	34848	.6299		16.000	16	100	50	-
31553	34849	.6299		16.000	16	100	50	0.50
31554	34850	.6299		16.000	16	100	50	1.00
31555	34851	.7500	3/4"	19.050	3/4"	4"	1-5/8"	-
31556	34852	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.015"
31558	34853	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.030"
31559	34854	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.060"
31561	34855	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.090"
31562	34856	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.125"
31563	34857	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.190"
31564	34858	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.250"
31565	34859	.7500	3/4"	19.050	3/4"	5"	2-1/4"	-
31566	34860	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.030"
31567	34861	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.060"
31568	34862	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.125"
31569	34863	.7500	3/4"	19.050	3/4"	6"	3-1/4"	-
31571	34864	.7500	3/4"	19.050	3/4"	6"	3-1/4"	.030"
31572	34865	.7500	3/4"	19.050	3/4"	6"	3-1/4"	.060"
31573	34866	.7500	3/4"	19.050	3/4"	6"	3-1/4"	.125"
31574	34867	.7874		20.000	20	100	38	-
31575	34868	.7874		20.000	20	100	38	0.50
31576	34869	.7874		20.000	20	100	38	1.00
31578	34870	.7874		20.000	20	100	50	-
31579	34871	.7874		20.000	20	100	50	0.50
31581	34872	.7874		20.000	20	100	50	1.00
31582	34873	1.000	1"	25.400	1"	4"	1-1/2"	-
31583	34874	1.000	1"	25.400	1"	4"	1-1/2"	.030"
31584	34875	1.000	1"	25.400	1"	4"	1-1/2"	.060"
31585	34876	1.000	1"	25.400	1"	4"	1-1/2"	.125"
31586	34877	1.000	1"	25.400	1"	5"	2-1/2"	-
31587	34878	1.000	1"	25.400	1"	5"	2-1/2"	.030"

QUICKLY CALCULATE IDEAL PARAMETERS FOR THE X5 OR G5
IN YOUR APPLICATION WITH OUR ONLINE CALCULATOR.

NO REGISTRATION REQUIRED.

CHECK OUT THE
GARR TECHNICAL ADVISOR



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from our website to aid in the quoting of custom tooling.

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NEW
SERIES

Series X7, G7

SERIES HIGHLIGHT

HIGH PERFORMANCE
END MILLS

S M P K

High Performance End Mills

X7 BALIQ® ALCRONOS Coating (AlCrN)

G7 BALIQ® TISINOS PRO Coating (AlTiSiN)

X7 Target Materials:

Stainless Steel (Inox, Austenitic/Martensitic)

Carbon Tools Steels (Up to 50 HRC)

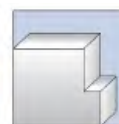
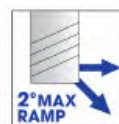
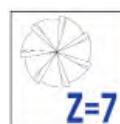
Cast Iron

G7 Target Materials:

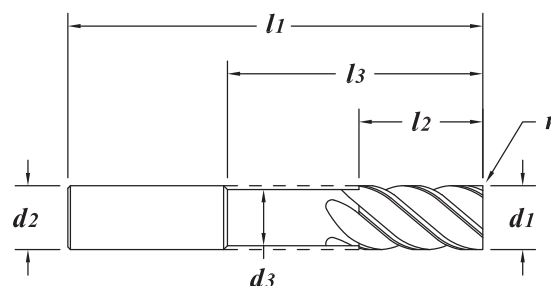
Heat Resistant Super Alloys

PH Stainless Steels (Inox, 13-8, 15-5, 17-4, Martensitic)

Conditioned Tool Steels (50-70 HRC)



CALCULATE IDEAL PARAMETERS
FOR THE X7 AND G7 IN YOUR
APPLICATION WITH THE GARR
TECHNICAL ADVISOR



MATERIAL HARDNESS (Rc)

G7 70

X7 35

0

X7

G7



← View the X7

View the G7 →



TOLERANCES

$d1$	$+0.000" -0.002" (+.000mm -.050mm)$
$d2$	$h6$
r	$+0.001" -.001" (+.025 -.025mm)$

THE NEXT GENERATION

Series X7, G7



.3150" - .4724"
(8.000mm - 12.000mm)

X7 Recommended for Low, Medium, and High Carbon Tool Steels (up to 50 HRC), cast iron, and stainless steel (Inox).

G7 Recommended for tough machining materials such as Heat Resistant Super Alloys,
PH Stainless steels (Inox), and conditioned tool steels. (50-70 HRC)

7 Flute High Performance End Mills

X7 BALIQ® ALCRONOS Coating (AlCrN-based)

G7 BALIQ® TISINOS PRO Coating (AlTiSiN)

Solid submicron grain carbide - non-center cutting

h6 shank tolerance

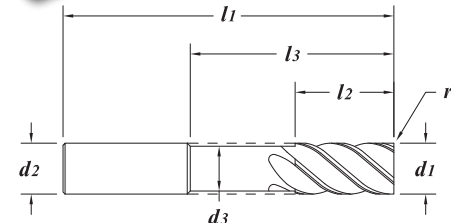
Engineered for High Efficiency Milling

Variable flute grind

Honed edge treatment

Polished fluting

Material and condition specific coatings



X7 EDP#	G7 EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	$l3$ Reach Length	$d3$ Neck Diameter	
		Decimal	Metric							
64100	64500	.3150"		8.000	8	65	22	-	-	-
64102	64501	.3150"		8.000	8	65	22	0.50	-	-
64104	64502	.3150"		8.000	8	65	22	1.00	-	-
64105	64503	.3150"		8.000	8	75	27	1.60	-	-
64106	64504	.3150"		8.000	8	75	32	-	-	-
64108	64505	.3150"		8.000	8	75	32	0.50	-	-
64110	64506	.3150"		8.000	8	75	32	1.00	-	-
64267	64507	.3750"	3/8"	9.525	3/8"	2"	5/8"	-	-	-
64268	64508	.3750"	3/8"	9.525	3/8"	2"	5/8"	.010"	-	-
64269	64509	.3750"	3/8"	9.525	3/8"	2"	5/8"	.015"	-	-
64270	64510	.3750"	3/8"	9.525	3/8"	2"	5/8"	.020"	-	-
64271	64511	.3750"	3/8"	9.525	3/8"	2"	5/8"	.030"	-	-
64112	64512	.3750"	3/8"	9.525	3/8"	2-1/2"	1"	-	-	-
64114	64513	.3750"	3/8"	9.525	3/8"	2-1/2"	1"	.020"	-	-
64116	64514	.3750"	3/8"	9.525	3/8"	2-1/2"	1"	.030"	-	-
64217	64645	.3750"	3/8"	9.525	3/8"	3"	1"	-	-	-
64219	64646	.3750"	3/8"	9.525	3/8"	3"	1"	.015"	-	-
64117	64515	.3750"	3/8"	9.525	3/8"	3"	1"	.025"	-	-
64221	64647	.3750"	3/8"	9.525	3/8"	3"	1"	.030"	-	-
64225	64648	.3750"	3/8"	9.525	3/8"	3"	1"	.060"	-	-
64118	64516	.3750"	3/8"	9.525	3/8"	3"	1-1/2"	-	-	-
64120	64517	.3750"	3/8"	9.525	3/8"	3"	1-1/2"	.020"	-	-
64122	64518	.3750"	3/8"	9.525	3/8"	3"	1-1/2"	.030"	-	-
64123	64519	.3750"	3/8"	9.525	3/8"	3"	1-1/2"	.060"	-	-
64246	64520	.3750"	3/8"	9.525	3/8"	4"	7/8"	.015"	1-7/8"	.355"
64124	64521	.3937"		10.000	10	70	25	-	-	-
64126	64522	.3937"		10.000	10	70	25	0.50	-	-
64128	64523	.3937"		10.000	10	70	25	1.00	-	-
64130	64524	.4724"		12.000	12	75	26	-	-	-
64132	64525	.4724"		12.000	12	75	26	0.50	-	-
64134	64526	.4724"		12.000	12	75	26	1.00	-	-
64136	64527	.4724"		12.000	12	75	32	-	-	-
64138	64528	.4724"		12.000	12	75	32	0.50	-	-
64140	64529	.4724"		12.000	12	75	32	1.00	-	-
64141	64530	.4724"		12.000	12	100	42	1.00	-	-
64142	64531	.4724"		12.000	12	100	50	-	-	-
64144	64532	.4724"		12.000	12	100	50	0.50	-	-
64146	64533	.4724"		12.000	12	100	50	1.00	-	-

continued →

Series X7, G7 (continued)

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

X7 EDP#	G7 EDP#	$d1$ † Diameter			$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	$l3$ Reach Length	$d3$ Neck Diameter
		Decimal		Metric						
64218	64534	.5000"	1/2"	12.700	1/2"	2-1/2"	5/8"	-	-	-
64220	64535	.5000"	1/2"	12.700	1/2"	2-1/2"	5/8"	.015"	-	-
64222	64536	.5000"	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"	-	-
64223	64537	.5000"	1/2"	12.700	1/2"	2-1/2"	5/8"	.060"	-	-
64224	64538	.5000"	1/2"	12.700	1/2"	3"	1"	-	-	-
64226	64539	.5000"	1/2"	12.700	1/2"	3"	1"	.015"	-	-
64228	64540	.5000"	1/2"	12.700	1/2"	3"	1"	.030"	-	-
64148	64541	.5000"	1/2"	12.700	1/2"	3"	1-1/4"	-	-	-
64150	64542	.5000"	1/2"	12.700	1/2"	3"	1-1/4"	.015"	-	-
64152	64543	.5000"	1/2"	12.700	1/2"	3"	1-1/4"	.020"	-	-
64154	64544	.5000"	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	-
64156	64545	.5000"	1/2"	12.700	1/2"	3"	1-1/4"	.060"	-	-
64157	64546	.5000"	1/2"	12.700	1/2"	3"	1-1/4"	.125"	-	-
64158	64547	.5000"	1/2"	12.700	1/2"	3-1/2"	1-1/2"	-	-	-
64160	64548	.5000"	1/2"	12.700	1/2"	3-1/2"	1-1/2"	.030"	-	-
64161	64549	.5000"	1/2"	12.700	1/2"	4"	5/8"	.015"	2-1/8"	.475"
64242	64550	.5000"	1/2"	12.700	1/2"	4"	1-5/8"	-	-	-
64244	64551	.5000"	1/2"	12.700	1/2"	4"	1-5/8"	.015"	-	-
64162	64552	.5000"	1/2"	12.700	1/2"	4"	2"	-	-	-
64163	64553	.5000"	1/2"	12.700	1/2"	4"	2"	.015"	-	-
64164	64554	.5000"	1/2"	12.700	1/2"	4"	2"	.030"	-	-
64165	64555	.5000"	1/2"	12.700	1/2"	4"	2"	.125"	-	-
64248	64556	.5512"	14	14.000	14	88	32	0.50	-	-
64273	64557	.6250"	5/8"	15.875	5/8"	3"	1"	-	-	-
64274	64558	.6250"	5/8"	15.875	5/8"	3"	1"	.015"	-	-
64275	64559	.6250"	5/8"	15.875	5/8"	3"	1"	.030"	-	-
64166	64560	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/4"	-	-	-
64276	64561	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"	-	-
64320	64639	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.020"	-	-
64168	64562	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	-	-
64170	64563	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	-	-
64171	64564	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.120"	-	-
64277	64565	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/2"	-	-	-
64278	64566	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/2"	.015"	-	-
64279	64567	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/2"	.030"	-	-
64280	64568	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/2"	.060"	-	-
64281	64569	.6250"	5/8"	15.875	5/8"	3-1/2"	1-5/8"	-	-	-
64282	64570	.6250"	5/8"	15.875	5/8"	3-1/2"	1-5/8"	.015"	-	-
64283	64571	.6250"	5/8"	15.875	5/8"	3-1/2"	1-5/8"	.030"	-	-
64284	64572	.6250"	5/8"	15.875	5/8"	3-1/2"	1-5/8"	.060"	-	-
64172	64573	.6250"	5/8"	15.875	5/8"	4"	1-3/4"	-	-	-
64285	64574	.6250"	5/8"	15.875	5/8"	4"	1-3/4"	.015"	-	-
64174	64575	.6250"	5/8"	15.875	5/8"	4"	1-3/4"	.030"	-	-
64176	64576	.6250"	5/8"	15.875	5/8"	4"	1-3/4"	.060"	-	-
64321	64640	.6250"	5/8"	15.875	5/8"	4"	1-3/4"	.090"	-	-
64177	64577	.6250"	5/8"	15.875	5/8"	4"	1-3/4"	.120"	-	-
64286	64578	.6250"	5/8"	15.875	5/8"	4"	2"	-	-	-
64287	64579	.6250"	5/8"	15.875	5/8"	4"	2"	.015"	-	-
64288	64580	.6250"	5/8"	15.875	5/8"	4"	2"	.030"	-	-
64289	64581	.6250"	5/8"	15.875	5/8"	4"	2"	.060"	-	-
64250	64582	.6250"	5/8"	15.875	5/8"	4"	2"	.120"	-	-
64323	64641	.6250"	5/8"	15.875	5/8"	4"	2-1/8"	.125"	-	-
64324	64642	.6250"	5/8"	15.875	5/8"	5"	2-1/2"	-	-	-
64325	64643	.6250"	5/8"	15.875	5/8"	5"	2-1/2"	.125"	-	-

G7 70

X7

MATERIAL HARDNESS (Rc)

35

0

X7 EDP#	G7 EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	$l3$ Reach Length	$d3$ Neck Diameter
		Decimal	Metric						
64178	64583	.6299"	16.000	16	88	32	-	-	-
64180	64584	.6299"	16.000	16	88	32	0.50	-	-
64182	64585	.6299"	16.000	16	88	32	1.00	-	-
64230	64586	.6299"	16.000	16	88	32	2.00	-	-
64290	64587	.6299"	16.000	16	100	40	-	-	-
64291	64588	.6299"	16.000	16	100	40	0.50	-	-
64231	64589	.6299"	16.000	16	100	40	1.00	-	-
64232	64590	.6299"	16.000	16	100	40	1.50	-	-
64292	64591	.6299"	16.000	16	100	50	-	-	-
64293	64592	.6299"	16.000	16	100	50	0.50	-	-
64294	64593	.6299"	16.000	16	100	50	1.00	-	-
64234	64594	.6299"	16.000	16	125	65	0.50	-	-
64236	64595	.6299"	16.000	16	125	65	3.00	-	-
64252	64596	.7500"	3/4"	19.050	3/4"	3"	1"	-	-
64254	64597	.7500"	3/4"	19.050	3/4"	3"	1"	.030"	-
64184	64598	.7500"	3/4"	19.050	3/4"	4"	1-1/2"	-	-
64186	64599	.7500"	3/4"	19.050	3/4"	4"	1-1/2"	.030"	-
64188	64600	.7500"	3/4"	19.050	3/4"	4"	1-1/2"	.060"	-
64190	64601	.7500"	3/4"	19.050	3/4"	4"	1-1/2"	.120"	-
64295	64602	.7500"	3/4"	19.050	3/4"	4"	1-5/8"	-	-
64296	64603	.7500"	3/4"	19.050	3/4"	4"	1-5/8"	.015"	-
64297	64604	.7500"	3/4"	19.050	3/4"	4"	1-5/8"	.030"	-
64298	64605	.7500"	3/4"	19.050	3/4"	4"	1-5/8"	.060"	-
64299	64606	.7500"	3/4"	19.050	3/4"	4"	1-5/8"	.090"	-
64301	64607	.7500"	3/4"	19.050	3/4"	4"	1-5/8"	.125"	-
64303	64608	.7500"	3/4"	19.050	3/4"	4"	1-5/8"	.190"	-
64305	64609	.7500"	3/4"	19.050	3/4"	4"	1-5/8"	.250"	-
64256	64610	.7500"	3/4"	19.050	3/4"	4"	1-3/4"	-	-
64258	64611	.7500"	3/4"	19.050	3/4"	4"	1-3/4"	.030"	-
64260	64612	.7500"	3/4"	19.050	3/4"	5"	1"	.030"	3"
64192	64613	.7500"	3/4"	19.050	3/4"	5"	2-1/4"	-	-
64194	64614	.7500"	3/4"	19.050	3/4"	5"	2-1/4"	.030"	-
64238	64615	.7500"	3/4"	19.050	3/4"	5"	2-1/4"	.060"	-
64262	64616	.7500"	3/4"	19.050	3/4"	5"	2-1/4"	.120"	-
64307	64617	.7500"	3/4"	19.050	3/4"	5"	2-1/4"	.125"	-
64264	64618	.7500"	3/4"	19.050	3/4"	5"	2-1/2"	.060"	-
64266	64619	.7500"	3/4"	19.050	3/4"	6"	1-1/8"	.120"	3-5/8"
64196	64620	.7500"	3/4"	19.050	3/4"	6"	3-1/4"	-	-
64198	64621	.7500"	3/4"	19.050	3/4"	6"	3-1/4"	.030"	-
64309	64622	.7500"	3/4"	19.050	3/4"	6"	3-1/4"	.060"	-
64311	64623	.7500"	3/4"	19.050	3/4"	6"	3-1/4"	.125"	-
64200	64624	.7874"	20.000	20	100	38	-	-	-
64202	64625	.7874"	20.000	20	100	38	0.50	-	-
64204	64626	.7874"	20.000	20	100	38	1.00	-	-
64313	64627	.7874"	20.000	20	100	50	-	-	-
64315	64628	.7874"	20.000	20	100	50	0.50	-	-
64317	64629	.7874"	20.000	20	100	50	1.00	-	-
64206	64630	1.000"	1"	25.400	1"	4"	1-1/2"	-	-
64208	64631	1.000"	1"	25.400	1"	4"	1-1/2"	.030"	-
64319	64632	1.000"	1"	25.400	1"	4"	1-1/2"	.060"	-
64240	64633	1.000"	1"	25.400	1"	4"	1-1/2"	.125"	-
64210	64634	1.000"	1"	25.400	1"	5"	2"	-	-
64212	64635	1.000"	1"	25.400	1"	5"	2-1/2"	-	-
64213	64636	1.000"	1"	25.400	1"	5"	2-1/2"	.030"	-
64214	64637	1.000"	1"	25.400	1"	6"	3-1/4"	-	-
64216	64638	1.000"	1"	25.400	1"	6"	3-1/4"	.030"	-

70

G7

X7

35

MATERIAL HARDNESS (Rc)

0

S M P K

High Performance End Mills

X7C BALIQ® ALCRONOS Coating (AlCrN)

G7C BALIQ® TISINOS PRO Coating (AlTiSiN)

X7C Target Materials:

Stainless Steel (Inox, Austenitic/Martensitic)

Carbon Tools Steels (Up to 50 HRC)

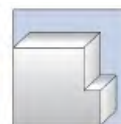
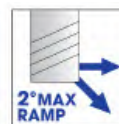
Cast Iron

G7C Target Materials:

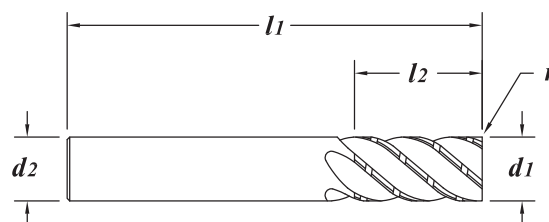
Heat Resistant Super Alloys

PH Stainless Steels (Inox, 13-8, 15-5, 17-4, Martensitic)

Conditioned Tool Steels (50-70 HRC)



CALCULATE IDEAL PARAMETERS
FOR THE X7C AND G7C IN YOUR
APPLICATION WITH THE GARR
TECHNICAL ADVISOR



X7C

G7C

View the X7C

View the G7C

TOLERANCES

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

THE NEXT GENERATION

Series X7C, G7C



.3750" - .4724"
(9.525mm - 12.000mm)

X7C Recommended for Low, Medium, and High Carbon Tool Steels (up to 50 HRC), cast iron, and stainless steel (Inox).

G7C Recommended for tough machining materials such as Heat Resistant Super Alloys,
PH Stainless steels (Inox), and conditioned tool steels. (50-70 HRC)

7 Flute High Performance End Mills

X7C BALIQ® ALCRONOS Coating (AlCrN-based)

G7C BALIQ® TISINOS PRO Coating (AlTiSiN)

Solid submicron grain carbide - non-center cutting

Chip splitters

h6 shank tolerance

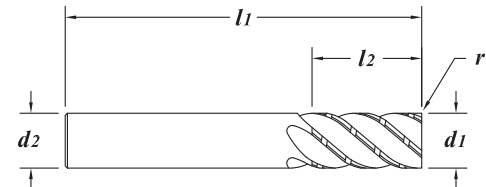
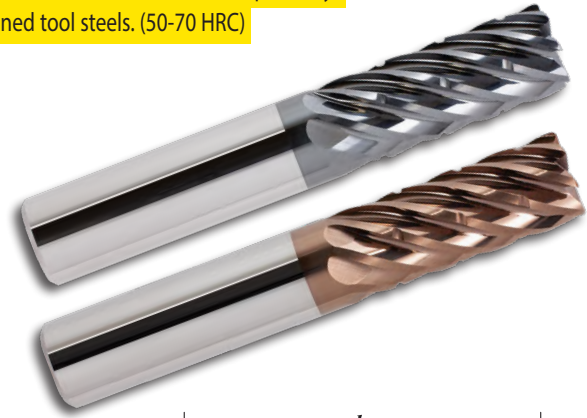
Engineered for High Efficiency Milling

Variable flute grind

Honed edge treatment

Polished fluting

Material and condition specific coatings



X7C EDP#	G7C EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	$l3$ Reach Length	$d3$ Neck Diameter
Decimal	Metric								
64300	64700	.3750"	3/8"	9.525	3/8"	2-1/2"	1"	-	-
64302	64701	.3750"	3/8"	9.525	3/8"	2-1/2"	1"	.020"	-
64304	64702	.3750"	3/8"	9.525	3/8"	2-1/2"	1"	.030"	-
64900	64703	.3750"	3/8"	9.525	3/8"	3"	1-1/2"	-	-
64901	64704	.3750"	3/8"	9.525	3/8"	3"	1-1/2"	.020"	-
64902	64705	.3750"	3/8"	9.525	3/8"	3"	1-1/2"	.030"	-
64903	64706	.3750"	3/8"	9.525	3/8"	3"	1-1/2"	.060"	-
64904	64707	.3750"	3/8"	9.525	3/8"	4"	7/8"	.015"	1-7/8"
64905	64708	.3937"		10.000	10	70	25	-	-
64906	64709	.3937"		10.000	10	70	25	0.50	-
64907	64710	.3937"		10.000	10	70	25	1.00	-
64908	64711	.4724"		12.000	12	75	26	-	-
64909	64712	.4724"		12.000	12	75	26	0.50	-
64910	64713	.4724"		12.000	12	75	26	1.00	-
64911	64714	.4724"		12.000	12	75	32	-	-
64912	64715	.4724"		12.000	12	75	32	0.50	-
64913	64716	.4724"		12.000	12	75	32	1.00	-
64914	64717	.4724"		12.000	12	100	42	1.00	-
64915	64718	.4724"		12.000	12	100	50	-	-
64310	64719	.4724"		12.000	12	100	50	0.50	-
64916	64720	.4724"		12.000	12	100	50	1.00	-

HIGH PERFORMANCE
END MILLS

70 → **G7**

X7

35 →

MATERIAL HARDNESS (Rc)

0 →

continued →

Series **X7C, G7C** (continued).5000" - .6250"
(12.700mm - 15.875mm)

X7C EDP#	G7C EDP#	$d1^{\dagger}$ Diameter			$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius
		Decimal		Metric				
64917	64721	.5000"	1/2"	12.700	1/2"	2-1/2"	5/8"	-
64918	64722	.5000"	1/2"	12.700	1/2"	2-1/2"	5/8"	.015"
64316	64723	.5000"	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"
64318	64724	.5000"	1/2"	12.700	1/2"	2-1/2"	5/8"	.060"
64919	64725	.5000"	1/2"	12.700	1/2"	3"	1"	-
64920	64726	.5000"	1/2"	12.700	1/2"	3"	1"	.015"
64322	64727	.5000"	1/2"	12.700	1/2"	3"	1"	.030"
64921	64728	.5000"	1/2"	12.700	1/2"	3"	1-1/4"	-
64922	64729	.5000"	1/2"	12.700	1/2"	3"	1-1/4"	.015"
64923	64730	.5000"	1/2"	12.700	1/2"	3"	1-1/4"	.020"
64330	64731	.5000"	1/2"	12.700	1/2"	3"	1-1/4"	.030"
64332	64732	.5000"	1/2"	12.700	1/2"	3"	1-1/4"	.060"
64924	64733	.5000"	1/2"	12.700	1/2"	3"	1-1/4"	.125"
64338	64734	.5000"	1/2"	12.700	1/2"	3-1/2"	1-1/2"	-
64342	64735	.5000"	1/2"	12.700	1/2"	3-1/2"	1-1/2"	.030"
64925	64736	.5000"	1/2"	12.700	1/2"	3-1/2"	1-1/2"	.060"
64926	64737	.5000"	1/2"	12.700	1/2"	4"	1-5/8"	-
64927	64738	.5000"	1/2"	12.700	1/2"	4"	1-5/8"	.015"
64928	64739	.5000"	1/2"	12.700	1/2"	4"	1-5/8"	.030"
64929	64740	.5000"	1/2"	12.700	1/2"	4"	1-5/8"	.060"
64346	64741	.5000"	1/2"	12.700	1/2"	4"	2"	-
64930	64742	.5000"	1/2"	12.700	1/2"	4"	2"	.015"
64348	64743	.5000"	1/2"	12.700	1/2"	4"	2"	.030"
64931	64744	.5000"	1/2"	12.700	1/2"	4"	2"	.060"
64352	64745	.5000"	1/2"	12.700	1/2"	4"	2"	.125"
64932	64746	.5512"		14.000	14	88	32	0.50
64933	64747	.6250"	5/8"	15.875	5/8"	3"	1"	-
64934	64748	.6250"	5/8"	15.875	5/8"	3"	1"	.015"
64935	64749	.6250"	5/8"	15.875	5/8"	3"	1"	.030"
64936	64750	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/4"	-
64937	64751	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"
65006	64829	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.020"
64938	64752	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"
64939	64753	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"
64940	64754	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.120"
64941	64755	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/2"	-
64942	64756	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/2"	.015"
64943	64757	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/2"	.030"
64944	64758	.6250"	5/8"	15.875	5/8"	3-1/2"	1-1/2"	.060"
64945	64759	.6250"	5/8"	15.875	5/8"	3-1/2"	1-5/8"	-
64946	64760	.6250"	5/8"	15.875	5/8"	3-1/2"	1-5/8"	.015"
64947	64761	.6250"	5/8"	15.875	5/8"	3-1/2"	1-5/8"	.030"
64948	64762	.6250"	5/8"	15.875	5/8"	3-1/2"	1-5/8"	.060"
64360	64763	.6250"	5/8"	15.875	5/8"	4"	1-3/4"	-
64949	64764	.6250"	5/8"	15.875	5/8"	4"	1-3/4"	.015"
64364	64765	.6250"	5/8"	15.875	5/8"	4"	1-3/4"	.030"
64950	64766	.6250"	5/8"	15.875	5/8"	4"	1-3/4"	.060"
64951	64767	.6250"	5/8"	15.875	5/8"	4"	1-3/4"	.090"
64952	64768	.6250"	5/8"	15.875	5/8"	4"	1-3/4"	.120"
64953	64769	.6250"	5/8"	15.875	5/8"	4"	2"	-
64954	64770	.6250"	5/8"	15.875	5/8"	4"	2"	.015"
64955	64771	.6250"	5/8"	15.875	5/8"	4"	2"	.030"
64956	64772	.6250"	5/8"	15.875	5/8"	4"	2"	.060"
64957	64773	.6250"	5/8"	15.875	5/8"	4"	2"	.120"
65007	64830	.6250"	5/8"	15.875	5/8"	4"	2-1/8"	.125"
65008	64831	.6250"	5/8"	15.875	5/8"	5"	2-1/2"	-
65009	64832	.6250"	5/8"	15.875	5/8"	5"	2-1/2"	.125"

G7

70

X7

35

MATERIAL HARDNESS (Rc)

0

X7C EDP#	G7C EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius
		Decimal	Metric				
64958	64774	.6299"	16.000	16	88	32	-
64959	64775	.6299"	16.000	16	88	32	0.50
64960	64776	.6299"	16.000	16	88	32	1.00
64961	64777	.6299"	16.000	16	88	32	2.00
64962	64778	.6299"	16.000	16	100	40	-
64963	64779	.6299"	16.000	16	100	40	0.50
64368	64780	.6299"	16.000	16	100	40	0.75
64369	64781	.6299"	16.000	16	100	40	1.00
64964	64782	.6299"	16.000	16	100	40	1.50
64965	64783	.6299"	16.000	16	100	50	-
64966	64784	.6299"	16.000	16	100	50	0.50
64372	64785	.6299"	16.000	16	100	50	1.00
64967	64786	.6299"	16.000	16	125	65	0.50
64968	64787	.6299"	16.000	16	125	65	3.00
64969	64788	.7500" 3/4"	19.050	3/4"	3"	1"	-
64970	64789	.7500" 3/4"	19.050	3/4"	3"	1"	.030"
64971	64790	.7500" 3/4"	19.050	3/4"	4"	1-1/2"	-
64380	64791	.7500" 3/4"	19.050	3/4"	4"	1-1/2"	.030"
64972	64792	.7500" 3/4"	19.050	3/4"	4"	1-1/2"	.060"
64973	64793	.7500" 3/4"	19.050	3/4"	4"	1-1/2"	.120"
64974	64794	.7500" 3/4"	19.050	3/4"	4"	1-5/8"	-
64975	64795	.7500" 3/4"	19.050	3/4"	4"	1-5/8"	.015"
64976	64796	.7500" 3/4"	19.050	3/4"	4"	1-5/8"	.030"
64977	64797	.7500" 3/4"	19.050	3/4"	4"	1-5/8"	.060"
64978	64798	.7500" 3/4"	19.050	3/4"	4"	1-5/8"	.090"
64979	64799	.7500" 3/4"	19.050	3/4"	4"	1-5/8"	.125"
64980	64800	.7500" 3/4"	19.050	3/4"	4"	1-5/8"	.190"
64981	64801	.7500" 3/4"	19.050	3/4"	4"	1-5/8"	.250"
64982	64802	.7500" 3/4"	19.050	3/4"	4"	1-3/4"	-
64983	64803	.7500" 3/4"	19.050	3/4"	4"	1-3/4"	.030"
64984	64804	.7500" 3/4"	19.050	3/4"	5"	2-1/4"	-
64985	64805	.7500" 3/4"	19.050	3/4"	5"	2-1/4"	.030"
64986	64806	.7500" 3/4"	19.050	3/4"	5"	2-1/4"	.060"
64987	64807	.7500" 3/4"	19.050	3/4"	5"	2-1/4"	.120"
64988	64808	.7500" 3/4"	19.050	3/4"	5"	2-1/4"	.125"
64989	64809	.7500" 3/4"	19.050	3/4"	5"	2-1/2"	.060"
64990	64810	.7500" 3/4"	19.050	3/4"	6"	3-1/4"	-
64386	64811	.7500" 3/4"	19.050	3/4"	6"	3-1/4"	.030"
64991	64812	.7500" 3/4"	19.050	3/4"	6"	3-1/4"	.060"
64992	64813	.7500" 3/4"	19.050	3/4"	6"	3-1/4"	.125"
64993	64814	.7874"	20.000	20	100	38	-
64389	64815	.7874"	20.000	20	100	38	0.50
64994	64816	.7874"	20.000	20	100	38	1.00
64995	64817	.7874"	20.000	20	100	50	-
64996	64818	.7874"	20.000	20	100	50	0.50
64997	64819	.7874"	20.000	20	100	50	1.00
64998	64820	1.000" 1"	25.400	1"	4"	1-1/2"	-
64999	64821	1.000" 1"	25.400	1"	4"	1-1/2"	.030"
65000	64822	1.000" 1"	25.400	1"	4"	1-1/2"	.060"
65001	64823	1.000" 1"	25.400	1"	4"	1-1/2"	.125"
65002	64824	1.000" 1"	25.400	1"	5"	2"	-
65003	64825	1.000" 1"	25.400	1"	5"	2-1/2"	-
64400	64826	1.000" 1"	25.400	1"	5"	2-1/2"	.030"
65004	64827	1.000" 1"	25.400	1"	6"	3-1/4"	-
65005	64828	1.000" 1"	25.400	1"	6"	3-1/4"	.030"

70

G7

X7

35

MATERIAL HARDNESS (Rc)

0

S M P K

High Performance End Mills

X9 BALIQ® ALCRONOS Coating (AlCrN)

G9 BALIQ® TISINOS PRO Coating (AlTiSiN)

X9 Target Materials:

Stainless Steel (Inox, Austenitic/Martensitic)

Carbon Tools Steels (Up to 50 HRC)

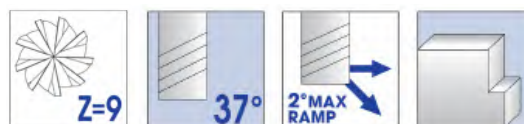
Cast Iron

G9 Target Materials:

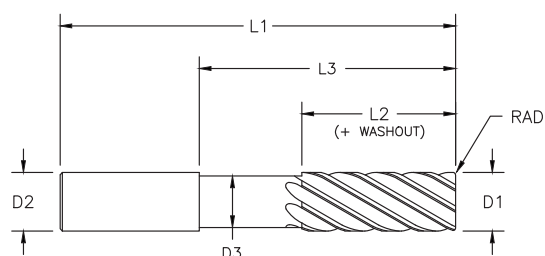
Heat Resistant Super Alloys

PH Stainless Steels (Inox, 13-8, 15-5, 17-4, Martensitic)

Conditioned Tool Steels (50-70 HRC)



CALCULATE IDEAL PARAMETERS
FOR THE X9 AND G9 IN YOUR
APPLICATION WITH THE GARR
TECHNICAL ADVISOR



X9

G9

MATERIAL HARDNESS (HRC)

G9

X9



← View the X9

View the G9 →



TOLERANCES

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

THE NEXT GENERATION

Series X9, G9



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

X9 Recommended for Low, Medium, and High Carbon Tool Steels (up to 50 HRC), cast iron, and stainless steel (Inox).

G9 Recommended for tough machining materials such as Heat Resistant Super Alloys,
PH Stainless steels (Inox), and conditioned tool steels. (50-70 HRC)

9 Flute High Performance End Mills

X9 BALIQ® ALCRONOS Coating (AlCrN-based)

G9 BALIQ® TISINOS PRO Coating (AlTiSiN)

Solid submicron grain carbide - non-center cutting

h6 shank tolerance

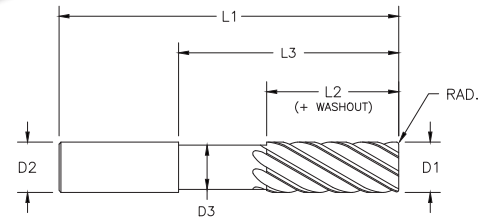
Engineered for High Efficiency Milling

Variable flute grind

Honed edge treatment

Polished fluting

Material and condition specific coatings



X9 EDP#	G9 EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	d_3 Neck Diameter	l_3 Reach Length
		Decimal	Diameter Metric						
31100	31101	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.015"	-
31102	31103	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-
31104	31105	.6250	5/8"	15.875	5/8"	3"	3/4"	.030"	-
31106	31107	.6250	5/8"	15.875	5/8"	3-1/2"	3/4"	.060"	-
31108	31109	.6250	5/8"	15.875	5/8"	3-1/2"	3/4"	.090"	-
31110	31111	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"	-
31112	31113	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	-
31114	31115	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	-
31116	31117	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.090"	-
31118	31119	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/2"	.020"	-
31122	31121	.6250	5/8"	15.875	5/8"	3-1/2"	1-5/8"	.020"	-
31124	31123	.6250	5/8"	15.875	5/8"	4"	1-7/8"	.030"	-
31126	31125	.6250	5/8"	15.875	5/8"	5"	1-1/4"	.015"	.595"
31128	31129	.6250	5/8"	15.875	5/8"	5"	1-1/4"	.030"	.595"
31130	31131	.6250	5/8"	15.875	5/8"	5"	1-1/4"	.015"	.595"
31132	31133	.6250	5/8"	15.875	5/8"	5"	1-1/4"	.030"	.595"
31134	31135	.6299		16.000	16	100	42	1.00	-
31136	31137	.6299		16.000	16	120	65	0.50	-
31138	31139	.6299		16.000	16	120	40	0.50	15.2
31140	31141	.7500	3/4"	19.050	3/4"	3"	1"	.030"	-
31142	31143	.7500	3/4"	19.050	3/4"	3"	1"	.060"	-
31144	31145	.7500	3/4"	19.050	3/4"	3"	1"	.120"	-
31146	31147	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"	-
31148	31149	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	-
31152	31151	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	-
31154	31153	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.120"	-
31156	31155	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.030"	-
31158	31159	.7500	3/4"	19.050	3/4"	6"	1-1/2"	.015"	.720"
31162	31161	.7500	3/4"	19.050	3/4"	6"	1-1/2"	.030"	.720"
31164	31163	.7500	3/4"	19.050	3/4"	6"	1-1/2"	.015"	.720"
31166	31165	.7500	3/4"	19.050	3/4"	6"	1-1/2"	.030"	.720"

HIGH PERFORMANCE
END MILLS

70

G9

X9

35

MATERIAL HARDNESS (Rc)

0

S M P K

High Performance End Mills

X9C BALIQ® ALCRONOS Coating (AlCrN)

G9C BALIQ® TISINOS PRO Coating (AlTiSiN)

X9C Target Materials:

Stainless Steel (Inox, Austenitic/Martensitic)

Carbon Tools Steels (Up to 50 HRC)

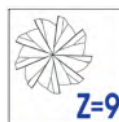
Cast Iron

G9C Target Materials:

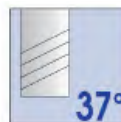
Heat Resistant Super Alloys

PH Stainless Steels (Inox, 13-8, 15-5, 17-4, Martensitic)

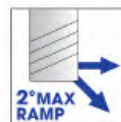
Conditioned Tool Steels (50-70 HRC)



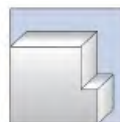
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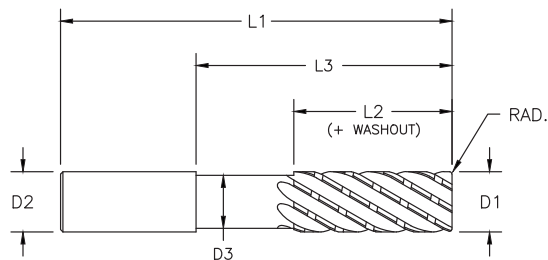
37°



2° MAX
RAMP



CALCULATE IDEAL PARAMETERS
FOR THE X9C AND G9C IN YOUR
APPLICATION WITH THE GARR
TECHNICAL ADVISOR



X9C

G9C



← View the X9C

View the G9C →



TOLERANCES

d_1	$+0.000" - .002" (+.000\text{mm} - .050\text{mm})$
d_2	$h6$
r	$+0.001" - .001" (+.025 - .025\text{mm})$

THE NEXT GENERATION

Series X9C, G9C



TECH
PAGES
306-307

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

X9C Recommended for Low, Medium, and High Carbon Tool Steels (up to 50 HRC), cast iron, and stainless steel (Inox).

G9C Recommended for tough machining materials such as Heat Resistant Super Alloys,
PH Stainless steels (Inox), and conditioned tool steels. (50-70 HRC)

9 Flute High Performance End Mills

X9C BALIQ® ALCRONOS Coating (AlCrN-based)

G9C BALIQ® TISINOS PRO Coating (AlTiSiN)

Solid submicron grain carbide - non-center cutting

Chip splitters

h6 shank tolerance

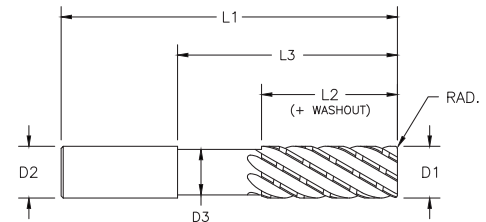
Engineered for High Efficiency Milling

Variable flute grind

Honed edge treatment

Polished fluting

Material and condition specific coatings



X9C EDP#	G9C EDP#	d_1 †			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	d_3 Neck Diameter	l_3 Reach Length
		Decimal	Diameter	Metric						
31168	31167	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.015"	-	-
31172	31169	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	-
31174	31171	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"	-	-
31176	31173	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	-	-
31178	31175	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	-	-
31182	31177	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.090"	-	-
31184	31179	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/2"	.020"	-	-
31186	31181	.6250	5/8"	15.875	5/8"	3-1/2"	1-5/8"	.020"	-	-
31188	31183	.6250	5/8"	15.875	5/8"	4"	1-7/8"	.030"	-	-
31190	31185	.6299		16.000	16	100	42	1.00	-	-
31192	31187	.6299		16.000	16	120	65	0.50	-	-
31194	31189	.6299		16.000	16	120	40	0.50	15.2	65
31196	31191	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"	-	-
31198	31193	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	-	-
31200	31195	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	-	-
31202	31197	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.120"	-	-
31204	31199	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.030"	-	-

HIGH PERFORMANCE
END MILLS

70
G9
X9
35
MATERIAL HARDNESS (Rc)
0

N

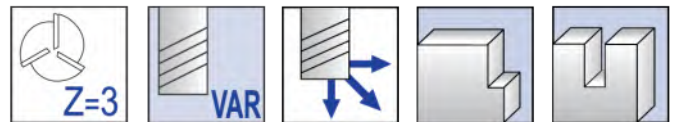
Bright Finish

Target Materials:
Aluminum

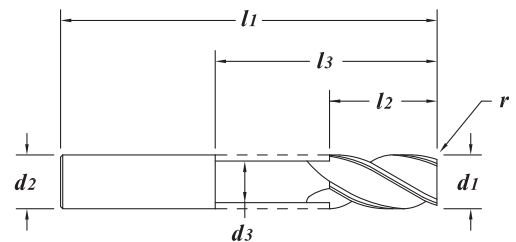
MATERIAL HARDNESS (Rc)
70
35
0



A3



**CALCULATE IDEAL PARAMETERS
FOR THE A3 IN YOUR
APPLICATION WITH THE GARR
TECHNICAL ADVISOR**



View the A3

TOLERANCES

d_1	+.000" -.001" (+.000 -.025mm)
d_2	h6
r	+.001" -.001" (+.025 -.025mm)
ball	+.0000" -.0005" (+.0000 -.0127mm)

HIGH EFFICIENCY MILLING

Series A3 (continued)



.1562" - .2500"
(3.967mm - 6.350mm)

Recommended for aluminum

Variable Helix End Mill

Bright Finish

Solid submicron grain carbide end mill - center cutting

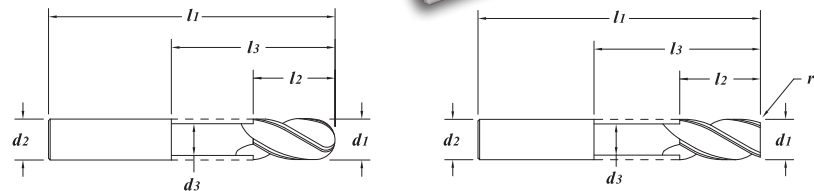
Engineered for High Efficiency Milling of Aluminum

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



EDP#	d_1 †			d_2	l_1	l_2	r	l_3	d_3	
	Decimal	Diameter	Metric	Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter	
NEW	06996	.1562	5/32"	3.967	3/16"	2"	1/2"	-	-	-
NEW	06997	.1562	5/32"	3.967	3/16"	2"	1/2"	.010"	-	-
NEW	06998	.1562	5/32"	3.967	3/16"	2"	1/2"	.020"	-	-
NEW	06999	.1562	5/32"	3.967	3/16"	2"	1/2"	.030"	-	-
	07000	.1575		4.000	6.0	50	12	-	16	3.80
	07001	.1575		4.000	6.0	50	12	0.20	16	3.80
	07002	.1575		4.000	6.0	50	12	0.50	16	3.80
	07003	.1575		4.000	6.0	50	12	1.00	16	3.80
	07004	.1875	3/16"	4.763	3/16"	2"	1/2"	-	5/8"	.179"
	07005	.1875	3/16"	4.763	3/16"	2"	1/2"	.015"	5/8"	.179"
	07006	.1875	3/16"	4.763	3/16"	2"	1/2"	.030"	5/8"	.179"
	07007	.1875	3/16"	4.763	3/16"	2"	1/2"	.060"	5/8"	.179"
	07008	.1875	3/16"	4.763	3/16"	2"	1/2"	BALL	5/8"	.179"
NEW	07231	.1875	3/16"	4.763	3/16"	2-1/2"	3/4"	-	-	-
	07009	.1969		5.000	6.0	65	16	-	26	4.70
	07010	.1969		5.000	6.0	65	16	0.20	26	4.70
	07011	.1969		5.000	6.0	65	16	0.50	26	4.70
	07012	.1969		5.000	6.0	65	16	1.00	26	4.70
	07013	.2362		6.000	6.0	65	19	-	26	5.70
	07014	.2362		6.000	6.0	65	19	0.20	26	5.70
	07015	.2362		6.000	6.0	65	19	0.50	26	5.70
	07016	.2362		6.000	6.0	65	19	1.00	26	5.70
	07017	.2362		6.000	6.0	65	19	1.50	26	5.70
	07018	.2362		6.000	6.0	65	19	2.00	26	5.70
	07019	.2362		6.000	6.0	65	19	BALL	26	5.70
NEW	07228	.2500	1/4"	6.350	1/4"	2"	3/8"	-	-	-
NEW	07229	.2500	1/4"	6.350	1/4"	2"	1/2"	-	-	-
	07020	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	-	-	-
	07021	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	-	-
	07022	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	-	-
	07023	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.060"	-	-
	07024	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.090"	-	-
	07025	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	BALL	-	-
	07026	.2500	1/4"	6.350	1/4"	3"	1"	-	-	-
	07027	.2500	1/4"	6.350	1/4"	3"	1"	.030"	-	-
	07028	.2500	1/4"	6.350	1/4"	3"	1"	.060"	-	-

HIGH PERFORMANCE
END MILLS

MATERIAL HARDNESS (Rc)

70

35

0

Series A3 (continued)

.2500" - .4724"
(6.350mm - 12.000mm)

EDP#	$d1$ †			$d2$	$l1$	$l2$	r	$l3$	$d3$
	Decimal	Diameter	Metric	Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter
07029	.2500	1/4"	6.350	1/4"	3"	3/8"	-	1-1/8"	.235"
07030	.2500	1/4"	6.350	1/4"	3"	3/8"	.015"	1-1/8"	.235"
07031	.2500	1/4"	6.350	1/4"	3"	3/8"	.030"	1-1/8"	.235"
07032	.2500	1/4"	6.350	1/4"	3"	3/8"	.060"	1-1/8"	.235"
07033	.3150		8.000	8.0	65	19	-	26	7.40
07034	.3150		8.000	8.0	65	19	0.20	26	7.40
07035	.3150		8.000	8.0	65	19	0.50	26	7.40
07036	.3150		8.000	8.0	65	19	1.00	26	7.40
07037	.3150		8.000	8.0	65	19	1.50	26	7.40
07041	.3750	3/8"	9.525	3/8"	2-1/2"	1"	-	-	-
07042	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.010"	-	-
07043	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.015"	-	-
07044	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.020"	-	-
07045	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.030"	-	-
07046	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.060"	-	-
07047	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.090"	-	-
07048	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.120"	-	-
07049	.3750	3/8"	9.525	3/8"	2-1/2"	1"	BALL	-	-
07050	.3750	3/8"	9.525	3/8"	3"	1-1/4"	-	-	-
07051	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.015"	-	-
07052	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.030"	-	-
07053	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.060"	-	-
07054	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.120"	-	-
07055	.3750	3/8"	9.525	3/8"	3"	1/2"	-	1-1/8"	.355"
07056	.3750	3/8"	9.525	3/8"	3"	1/2"	.015"	1-1/8"	.355"
07057	.3750	3/8"	9.525	3/8"	3"	1/2"	.030"	1-1/8"	.355"
07058	.3750	3/8"	9.525	3/8"	3"	1/2"	.060"	1-1/8"	.355"
07059	.3750	3/8"	9.525	3/8"	3"	1/2"	.090"	1-1/8"	.355"
07060	.3750	3/8"	9.525	3/8"	3"	1/2"	.120"	1-1/8"	.355"
07061	.3750	3/8"	9.525	3/8"	4"	1/2"	-	2-1/8"	.355"
07062	.3750	3/8"	9.525	3/8"	4"	1/2"	.015"	2-1/8"	.355"
07063	.3750	3/8"	9.525	3/8"	4"	1/2"	.020"	2-1/8"	.355"
07064	.3750	3/8"	9.525	3/8"	4"	1/2"	.030"	2-1/8"	.355"
07065	.3750	3/8"	9.525	3/8"	4"	1/2"	.060"	2-1/8"	.355"
07066	.3750	3/8"	9.525	3/8"	4"	1/2"	.090"	2-1/8"	.355"
07067	.3750	3/8"	9.525	3/8"	4"	1/2"	.120"	2-1/8"	.355"
07068	.3937		10.000	10.0	70	22	-	30	9.40
07069	.3937		10.000	10.0	70	22	0.20	30	9.40
07070	.3937		10.000	10.0	70	22	0.50	30	9.40
07071	.3937		10.000	10.0	70	22	1.00	30	9.40
07072	.3937		10.000	10.0	70	22	1.50	30	9.40
07073	.3937		10.000	10.0	70	22	2.00	30	9.40
07074	.3937		10.000	10.0	70	22	3.00	30	9.40
07075	.3937		10.000	10.0	70	22	BALL	30	9.40
07076	.3937		10.000	10.0	100	40	-	-	-
07077	.3937		10.000	10.0	100	22	-	55	9.40
07078	.4724		12.000	12.0	88	26	-	38	11.40
07079	.4724		12.000	12.0	88	26	0.20	38	11.40
07212	.4724		12.000	12.0	88	26	0.50	38	11.40
07081	.4724		12.000	12.0	88	26	1.00	38	11.40
07082	.4724		12.000	12.0	88	26	1.50	38	11.40

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
	Decimal	Metric						
07083	.4724	12.000	12.0	88	26	2.00	38	11.40
07084	.4724	12.000	12.0	88	26	3.00	38	11.40
07085	.4724	12.000	12.0	88	26	4.00	38	11.40
07086	.4724	12.000	12.0	88	26	BALL	38	11.40
07213	.4724	12.000	12.0	88	36	-	-	-
07088	.4724	12.000	12.0	88	36	0.20	-	-
07089	.4724	12.000	12.0	88	36	0.50	-	-
07090	.4724	12.000	12.0	88	36	1.00	-	-
07091	.4724	12.000	12.0	88	36	1.50	-	-
07092	.4724	12.000	12.0	88	36	2.00	-	-
07093	.4724	12.000	12.0	88	36	3.00	-	-
07094	.4724	12.000	12.0	88	36	4.00	-	-
07095	.4724	12.000	12.0	88	36	BALL	-	-
07215	.5000 1/2"	12.700	1/2"	3"	1"	-	-	-
07216	.5000 1/2"	12.700	1/2"	3"	1"	.030"	-	-
07217	.5000 1/2"	12.700	1/2"	3"	1"	BALL	-	-
07096	.5000 1/2"	12.700	1/2"	3"	1-1/4"	-	-	-
07097	.5000 1/2"	12.700	1/2"	3"	1-1/4"	.010"	-	-
07098	.5000 1/2"	12.700	1/2"	3"	1-1/4"	.015"	-	-
07099	.5000 1/2"	12.700	1/2"	3"	1-1/4"	.020"	-	-
07100	.5000 1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	-
07101	.5000 1/2"	12.700	1/2"	3"	1-1/4"	.060"	-	-
07102	.5000 1/2"	12.700	1/2"	3"	1-1/4"	.090"	-	-
07103	.5000 1/2"	12.700	1/2"	3"	1-1/4"	.120"	-	-
07218	.5000 1/2"	12.700	1/2"	3"	1-1/4"	.125"	-	-
07104	.5000 1/2"	12.700	1/2"	3"	1-1/4"	.190"	-	-
07105	.5000 1/2"	12.700	1/2"	3"	1-1/4"	BALL	-	-
07219	.5000 1/2"	12.700	1/2"	3"	1/2"	.030"	1-1/2"	.470"
07220	.5000 1/2"	12.700	1/2"	3"	1/2"	.090"	1-1/2"	.470"
NEW 07230	.5000 1/2"	12.700	1/2"	3-1/2"	1-1/2"	-	-	-
07221	.5000 1/2"	12.700	1/2"	4"	1-5/8"	-	-	-
07222	.5000 1/2"	12.700	1/2"	4"	1-5/8"	.030"	-	-
07223	.5000 1/2"	12.700	1/2"	4"	1-5/8"	BALL	-	-
07106	.5000 1/2"	12.700	1/2"	4"	2-1/16"	-	-	-
07107	.5000 1/2"	12.700	1/2"	4"	2-1/16"	.015"	-	-
07108	.5000 1/2"	12.700	1/2"	4"	2-1/16"	.030"	-	-
07109	.5000 1/2"	12.700	1/2"	4"	2-1/16"	.060"	-	-
07110	.5000 1/2"	12.700	1/2"	4"	2-1/16"	.120"	-	-
07224	.5000 1/2"	12.700	1/2"	4"	1/2"	.090"	2"	.470"
07225	.5000 1/2"	12.700	1/2"	4"	1/2"	.190"	2"	.470"
07111	.5000 1/2"	12.700	1/2"	4"	5/8"	-	2-1/4"	.475"
07112	.5000 1/2"	12.700	1/2"	4"	5/8"	.015"	2-1/4"	.475"
07113	.5000 1/2"	12.700	1/2"	4"	5/8"	.030"	2-1/4"	.475"
07114	.5000 1/2"	12.700	1/2"	4"	5/8"	.060"	2-1/4"	.475"
07115	.5000 1/2"	12.700	1/2"	4"	5/8"	BALL	2-1/4"	.475"
07116	.6250 5/8"	15.875	5/8"	4"	1-5/8"	-	-	-
07214	.6250 5/8"	15.875	5/8"	4"	1-5/8"	.030"	-	-
07118	.6250 5/8"	15.875	5/8"	4"	1-5/8"	.060"	-	-
07119	.6250 5/8"	15.875	5/8"	4"	1-5/8"	.090"	-	-
07120	.6250 5/8"	15.875	5/8"	4"	1-5/8"	.120"	-	-
07121	.6250 5/8"	15.875	5/8"	4"	3/4"	-	2-3/8"	.590"
07122	.6250 5/8"	15.875	5/8"	4"	3/4"	.030"	2-3/8"	.590"
07123	.6250 5/8"	15.875	5/8"	4"	3/4"	.060"	2-3/8"	.590"
07124	.6250 5/8"	15.875	5/8"	4"	3/4"	.120"	2-3/8"	.590"
07125	.6250 5/8"	15.875	5/8"	4"	3/4"	.190"	2-3/8"	.590"

continued →

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Series A3 (continued)

.6299" - .7500"
(16.000mm - 19.050mm)

EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	$l3$ Reach Length	$d3$ Neck Diameter
	Decimal	Metric						
07126	.6299	16.000	16.0	100	24	-	50	15.40
07127	.6299	16.000	16.0	100	24	0.50	50	15.40
07128	.6299	16.000	16.0	100	24	1.00	50	15.40
07129	.6299	16.000	16.0	100	24	1.50	50	15.40
07130	.6299	16.000	16.0	100	24	3.00	50	15.40
07131	.6299	16.000	16.0	100	24	6.00	50	15.40
07132	.6299	16.000	16.0	100	32	-	50	15.40
07133	.6299	16.000	16.0	100	32	0.50	50	15.40
07134	.6299	16.000	16.0	100	32	1.00	50	15.40
07135	.6299	16.000	16.0	100	32	1.50	50	15.40
07136	.6299	16.000	16.0	100	32	3.00	50	15.40
07137	.6299	16.000	16.0	100	32	6.00	50	15.40
07138	.7500	3/4"	19.050	3/4"	4"	1-3/4"	-	-
07139	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.015"	-
07140	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.030"	-
07141	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.060"	-
07142	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.078"	-
07143	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.094"	-
07144	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.120"	-
07145	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.156"	-
07146	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.190"	-
07147	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.250"	-
07148	.7500	3/4"	19.050	3/4"	4"	1-3/4"	BALL	-
07149	.7500	3/4"	19.050	3/4"	4"	1"	-	2"
07150	.7500	3/4"	19.050	3/4"	4"	1"	.030"	2"
07151	.7500	3/4"	19.050	3/4"	4"	1"	.060"	2"
07152	.7500	3/4"	19.050	3/4"	4"	1"	.090"	2"
07153	.7500	3/4"	19.050	3/4"	4"	1"	.120"	2"
07154	.7500	3/4"	19.050	3/4"	4"	1"	.125"	2"
07155	.7500	3/4"	19.050	3/4"	4"	1"	.160"	2"
07156	.7500	3/4"	19.050	3/4"	4"	1"	.190"	2"
07157	.7500	3/4"	19.050	3/4"	5"	2-1/4"	-	-
07158	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.030"	-
07159	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.060"	-
07160	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.120"	-
07161	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.125"	-
07162	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.190"	-
07163	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.250"	-
07226	.7500	3/4"	19.050	3/4"	6"	3-1/4"	-	-
07164	.7500	3/4"	19.050	3/4"	6"	1"	-	3-3/8"
07165	.7500	3/4"	19.050	3/4"	6"	1"	.030"	3-3/8"
07166	.7500	3/4"	19.050	3/4"	6"	1"	.060"	3-3/8"
07167	.7500	3/4"	19.050	3/4"	6"	1"	.090"	3-3/8"
07168	.7500	3/4"	19.050	3/4"	6"	1"	.125"	3-3/8"
07169	.7500	3/4"	19.050	3/4"	6"	1"	.250"	3-3/8"
07170	.7500	3/4"	19.050	3/4"	6"	1"	BALL	3-3/8"

MATERIAL HARDNESS (Rc)

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EDP#	$d1^{\dagger}$ Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Cnr Radius	$l3$ Reach Length	$d3$ Neck Diameter	
	Decimal	Metric							
07171	.7874	20.000	20.0	100	30	-	50	19.4	
07172	.7874	20.000	20.0	100	30	0.50	50	19.4	
07173	.7874	20.000	20.0	100	30	1.00	50	19.4	
07174	.7874	20.000	20.0	100	30	1.50	50	19.4	
07175	.7874	20.000	20.0	100	30	3.00	50	19.4	
07177	.7874	20.000	20.0	100	30	5.00	50	19.4	
07178	.7874	20.000	20.0	100	30	6.00	50	19.4	
07179	.7874	20.000	20.0	100	30	8.00	50	19.4	
07180	.7874	20.000	20.0	150	30	-	100	19.40	
07181	.7874	20.000	20.0	150	30	0.50	100	19.40	
07182	.7874	20.000	20.0	150	30	1.00	100	19.40	
07183	.7874	20.000	20.0	150	30	1.50	100	19.40	
07184	.7874	20.000	20.0	150	30	3.00	100	19.40	
07185	.7874	20.000	20.0	150	30	4.00	100	19.40	
07186	.7874	20.000	20.0	150	30	5.00	100	19.40	
07187	.7874	20.000	20.0	150	30	6.00	100	19.40	
07188	.7874	20.000	20.0	150	30	8.00	100	19.40	
07189	1.000	1"	25.400	1"	4"	1-1/4"	-	2"	.950"
07190	1.000	1"	25.400	1"	4"	1-1/4"	.060"	2"	.950"
07191	1.000	1"	25.400	1"	4-1/2"	1-1/4"	-	2-1/2"	.950"
07192	1.000	1"	25.400	1"	4-1/2"	1-1/4"	.030"	2-1/2"	.950"
07193	1.000	1"	25.400	1"	4-1/2"	1-1/4"	.060"	2-1/2"	.950"
07194	1.000	1"	25.400	1"	4-1/2"	1-1/4"	.120"	2-1/2"	.950"
07196	1.000	1"	25.400	1"	5"	1"	-	2-5/8"	.950"
07197	1.000	1"	25.400	1"	5"	1"	.030"	2-5/8"	.950"
07198	1.000	1"	25.400	1"	5"	1"	.060"	2-5/8"	.950"
07199	1.000	1"	25.400	1"	5"	1"	.125"	2-5/8"	.950"
07200	1.000	1"	25.400	1"	5"	1"	.250"	2-5/8"	.950"
07201	1.000	1"	25.400	1"	5"	1"	BALL	2-5/8"	.950"
07202	1.000	1"	25.400	1"	5"	2-1/4"	-	-	-
07203	1.000	1"	25.400	1"	5"	2-1/4"	.030"	-	-
07204	1.000	1"	25.400	1"	5"	2-1/4"	.060"	-	-
07205	1.000	1"	25.400	1"	5"	2-1/4"	.120"	-	-
07206	1.000	1"	25.400	1"	5"	2-1/4"	.250"	-	-
07207	1.000	1"	25.400	1"	6"	3-1/4"	-	-	-
07208	1.000	1"	25.400	1"	6"	3-1/4"	.030"	-	-
07209	1.000	1"	25.400	1"	6"	3-1/4"	.060"	-	-
07210	1.000	1"	25.400	1"	6"	3-1/4"	.120"	-	-
07211	1.000	1"	25.400	1"	6"	3-1/4"	.250"	-	-

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MATERIAL HARDNESS (Rc)

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HSAL End Mills
BALINIT® MAYURA Coating

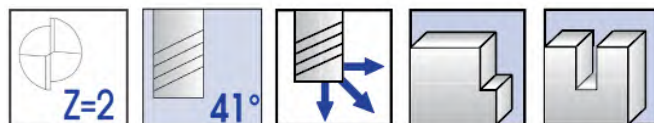
Target Materials:
Aluminum

MATERIAL HARDNESS (Rc)

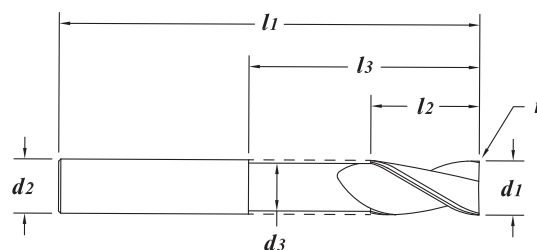
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CALCULATE IDEAL PARAMETERS
FOR THE 142M, 142R AND 142B
IN YOUR APPLICATION WITH
GARR TECHNICAL ADVISOR



← View the 142

TOLERANCES

d_1	+.000" - .001" (+.000 - .025mm)
d_2	h6
r	+.001" - .001" (+.025 - .025mm)
ball	+.0000" - .0005" (+.0000 - .0127mm)

HIGH EFFICIENCY MILLING

Series 142M, 142R, 142B

TECH
PAGES
295.1575" - .2756"
(4.000mm - 7.000mm)

Recommended for aluminum

HSAL End Mill - Square End, Corner Radius and Ball End

BALINIT® MAYURA 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.)

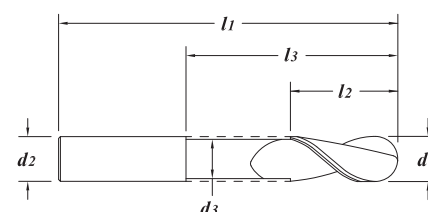
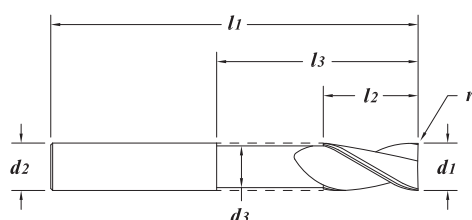
For high speed machining of aluminum

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#	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
	Decimal	Metric						
41222	.1575	4.000	6	50	12	-	-	-
39222	.1575	4.000	6	50	12	0.30	-	-
42522	.1575	4.000	6	50	12	BALL	-	-
41232	.1575	4.000	6	65	6	-	20	3.7
39232	.1575	4.000	6	65	6	0.50	20	3.7
39242	.1575	4.000	6	65	6	1.00	20	3.7
41282	.1875	3/16"	4.763	3/16"	2"	9/16"	-	-
39282	.1875	3/16"	4.763	3/16"	2"	9/16"	.010"	-
42582	.1875	3/16"	4.763	3/16"	2"	9/16"	BALL	-
41342	.1969	5.000	6	65	16	-	-	-
39342	.1969	5.000	6	65	16	0.30	-	-
42642	.1969	5.000	6	65	16	BALL	-	-
41352	.1969	5.000	6	75	8	-	20	4.7
39352	.1969	5.000	6	75	8	0.50	20	4.7
39362	.1969	5.000	6	75	8	1.00	20	4.7
41402	.2362	6.000	6	65	19	-	-	-
39402	.2362	6.000	6	65	19	0.30	-	-
42702	.2362	6.000	6	65	19	BALL	-	-
41412	.2362	6.000	6	75	10	-	25	5.7
39412	.2362	6.000	6	75	10	0.50	25	5.7
39422	.2362	6.000	6	75	10	1.00	25	5.7
39432	.2362	6.000	6	75	10	1.50	25	5.7
39442	.2362	6.000	6	75	10	2.00	25	5.7
41462	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	-	-
39462	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	-
42762	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	BALL	-
42764	.2500	1/4"	6.350	1/4"	4"	3/8"	BALL	1-1/8"
41542	.2756	7.000	8	65	19	-	-	-
42842	.2756	7.000	8	65	19	BALL	-	-

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MATERIAL HARDNESS (Rc)

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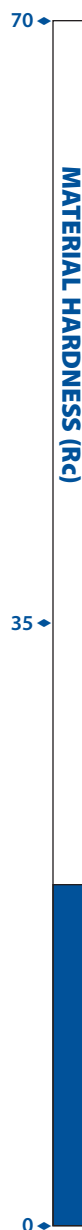
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Series 142M, 142R, 142B

.3125" - .7500"
(7.938mm - 19.050mm)

EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	$l3$ Reach Length	$d3$ Neck Diameter
	Decimal	Metric						
41602	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	-	-
39602	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	.015"	-
42902	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	BALL	-
41662	.3150		8.000	8	65	19	-	-
39662	.3150		8.000	8	65	19	0.50	-
42962	.3150		8.000	8	65	19	BALL	-
41672	.3150		8.000	8	75	12	-	25
39672	.3150		8.000	8	75	12	0.50	25
39682	.3150		8.000	8	75	12	1.00	25
39692	.3150		8.000	8	75	12	2.00	25
39702	.3150		8.000	8	75	12	3.00	25
41722	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	-	-
39722	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	-
43022	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	BALL	-
43023	.3750	3/8"	9.525	3/8"	4"	1/2"	BALL	1-1/8"
41802	.3937		10.000	10	70	24	-	-
39802	.3937		10.000	10	70	24	0.50	-
43102	.3937		10.000	10	70	24	BALL	-
41812	.3937		10.000	10	75	12	-	30
41822	.3937		10.000	10	100	12	-	35
39812	.3937		10.000	10	100	12	1.00	35
39822	.3937		10.000	10	100	12	1.50	35
39832	.3937		10.000	10	100	12	2.00	35
39842	.3937		10.000	10	100	12	3.00	35
41882	.4724		12.000	12	75	32	-	-
39882	.4724		12.000	12	75	32	0.50	-
43182	.4724		12.000	12	75	32	BALL	-
41892	.4724		12.000	12	75	16	-	30
41902	.4724		12.000	12	100	16	-	35
41912	.4724		12.000	12	100	16	-	40
39892	.4724		12.000	12	100	16	0.50	40
39902	.4724		12.000	12	100	16	1.00	40
39912	.4724		12.000	12	100	16	1.50	40
39922	.4724		12.000	12	100	16	2.00	40
39932	.4724		12.000	12	100	16	3.00	40
41942	.5000	1/2"	12.700	1/2"	3"	1-1/4"	-	-
39942	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-
43242	.5000	1/2"	12.700	1/2"	3"	1-1/4"	BALL	-
43243	.5000	1/2"	12.700	1/2"	4"	5/8"	BALL	2-1/4"
42022	.6250	5/8"	15.875	5/8"	4"	1-5/8"	-	-
40022	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.030"	-
43322	.6250	5/8"	15.875	5/8"	4"	1-5/8"	BALL	-
42072	.6299		16.000	16	75	16	-	30
42082	.6299		16.000	16	100	40	-	-
40082	.6299		16.000	16	100	40	1.00	-
43382	.6299		16.000	16	100	40	BALL	-
42092	.6299		16.000	16	100	20	-	40
42102	.6299		16.000	16	125	20	-	60
40092	.6299		16.000	16	125	20	1.00	60
40102	.6299		16.000	16	125	20	2.00	60
42142	.7500	3/4"	19.050	3/4"	4"	1-5/8"	-	-
40142	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.030"	-
43442	.7500	3/4"	19.050	3/4"	4"	1-5/8"	BALL	-
43444	.7500	3/4"	19.050	3/4"	5"	1"	BALL	3-1/16"

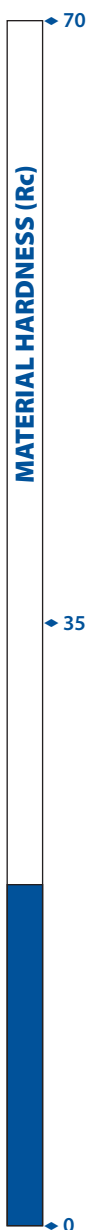
EDP#	$d1^{\dagger}$		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	$l3$ Reach Length	$d3$ Neck Diameter
	Decimal	Metric						
40182	.7874	20.000	20	100	40	1.00	-	-
42212	.7874	20.000	20	100	32	-	-	-
43482	.7874	20.000	20	100	32	BALL	-	-
42222	.7874	20.000	20	100	20	-	40	19
42232	.7874	20.000	20	125	20	-	60	19
40192	.7874	20.000	20	150	20	1.00	65	19
40202	.7874	20.000	20	150	20	2.00	65	19
40212	.7874	20.000	20	150	20	3.00	65	19
43542	.9843	25.000	25	100	38	BALL	-	-
42302	1.000	1"	1"	4"	1-5/8"	-	-	-
43602	1.000	1"	1"	4"	1-5/8"	BALL	-	-



N

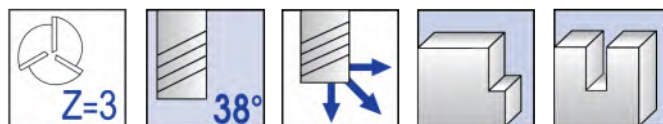
HSAL End Mills
BALINIT® MAYURA Coating

Target Materials:
Aluminum

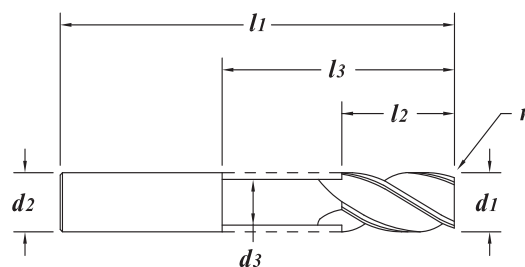


143M

143R



CALCULATE IDEAL PARAMETERS
FOR THE 143M AND 143R IN YOUR
APPLICATION WITH THE GARR
TECHNICAL ADVISOR



← View the 143M

View the 143R →

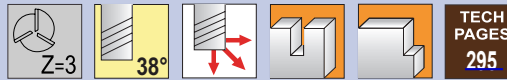


TOLERANCES

d_1	$+0.000" -0.001" (+.000 -0.025mm)$
d_2	$h6$
r	$+0.001" -0.001" (+.025 -0.025mm)$

HIGH EFFICIENCY MILLING

Series 143M, 143R



.1181" - .1875"
(3.000mm - 4.763mm)

Recommended for aluminum

HSAL End Mill - Square End and Corner Radius

BALINIT® MAYURA 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.)

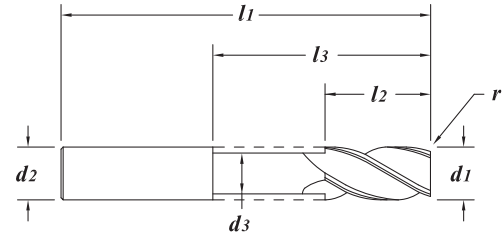
For high speed machining of aluminum

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#	d_1 †		d_2	l_1	l_2	r	l_3	d_3
	Decimal	Diameter Metric						
41173	.1181	3.000	3	38	6	-	-	-
39113	.1181	3.000	3	38	6	0.20	-	-
39123	.1181	3.000	3	38	6	0.50	-	-
41183	.1181	3.000	3	38	12	-	-	-
39133	.1181	3.000	3	38	12	0.20	-	-
39143	.1181	3.000	3	38	12	0.50	-	-
41193	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	-	-
39153	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.010"	-
39163	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.020"	-
41203	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	-	-
39173	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.010"	-
39183	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.020"	-
41213	.1575	4.000	6	50	8	-	-	-
39193	.1575	4.000	6	50	8	0.20	-	-
39203	.1575	4.000	6	50	8	0.50	-	-
41223	.1575	4.000	6	50	12	-	-	-
39213	.1575	4.000	6	50	12	0.20	-	-
39223	.1575	4.000	6	50	12	0.30	-	-
39225	.1575	4.000	6	50	12	0.50	-	-
41243	.1575	4.000	6	65	6	-	20	3.7
39243	.1575	4.000	6	65	6	0.30	20	3.7
39253	.1575	4.000	6	65	6	0.50	20	3.7
39263	.1575	4.000	6	65	6	1.00	20	3.7
41273	.1875	3/16"	4.763	3/16"	2"	5/16"	-	-
39265	.1875	3/16"	4.763	3/16"	2"	5/16"	.010"	-
39275	.1875	3/16"	4.763	3/16"	2"	5/16"	.020"	-
39280	.1875	3/16"	4.763	3/16"	2"	5/16"	.030"	-
41283	.1875	3/16"	4.763	3/16"	2"	9/16"	-	-
39283	.1875	3/16"	4.763	3/16"	2"	9/16"	.010"	-
39285	.1875	3/16"	4.763	3/16"	2"	9/16"	.020"	-
39293	.1875	3/16"	4.763	3/16"	2"	9/16"	.030"	-
41303	.1875	3/16"	4.763	3/16"	3"	7/32"	-	3/4"
39303	.1875	3/16"	4.763	3/16"	3"	7/32"	.010"	3/4"
39313	.1875	3/16"	4.763	3/16"	3"	7/32"	.030"	3/4"
41313	.1875	3/16"	4.763	3/16"	3"	1"	-	-

HIGH PERFORMANCE
END MILLS

MATERIAL HARDNESS (Rc)

70

35

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continued →

Series 143M, 143R (continued)

.1969" - .3125"
(5.000mm - 7.938mm)

EDP#	$d1$ †		$d2$	$l1$	$l2$	r	$l3$	$d3$
	Decimal	Diameter Metric						
41343	.1969	5.000	6	65	16	-	-	-
39343	.1969	5.000	6	65	16	0.30	-	-
41363	.1969	5.000	6	75	8	-	20	4.7
39363	.1969	5.000	6	75	8	0.30	20	4.7
39373	.1969	5.000	6	75	8	0.50	20	4.7
39383	.1969	5.000	6	75	8	1.00	20	4.7
41403	.2362	6.000	6	65	19	-	-	-
39403	.2362	6.000	6	65	19	0.30	-	-
41423	.2362	6.000	6	75	10	-	25	5.7
39423	.2362	6.000	6	75	10	0.30	25	5.7
39433	.2362	6.000	6	75	10	0.50	25	5.7
39436	.2362	6.000	6	75	10	1.00	25	5.7
39439	.2362	6.000	6	75	10	1.50	25	5.7
39443	.2362	6.000	6	75	10	2.00	25	5.7
39735	.2500	1/4"	6.350	1/4"	2"	3/8"	-	-
39737	.2500	1/4"	6.350	1/4"	2"	1/2"	-	-
39314	.2500	1/4"	6.350	1/4"	2"	1/2"	.010"	-
39316	.2500	1/4"	6.350	1/4"	2"	1/2"	.015"	-
39318	.2500	1/4"	6.350	1/4"	2"	1/2"	.020"	-
41453	.2500	1/4"	6.350	1/4"	2-1/2"	3/8"	-	-
41463	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	-	-
39453	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"	-
39463	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	-
39320	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"	-
39473	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	-
41473	.2500	1/4"	6.350	1/4"	3"	1"	-	-
39483	.2500	1/4"	6.350	1/4"	3"	1-1/8"	.030"	-
41475	.2500	1/4"	6.350	1/4"	3"	1-1/4"	-	-
41493	.2500	1/4"	6.350	1/4"	4"	3/8"	-	1-1/8"
39493	.2500	1/4"	6.350	1/4"	4"	3/8"	.015"	1-1/8"
40403	.2500	1/4"	6.350	1/4"	4"	3/8"	.030"	1-1/8"
41503	.2500	1/4"	6.350	1/4"	4"	3/8"	-	2-1/8"
39503	.2500	1/4"	6.350	1/4"	4"	3/8"	.015"	2-1/8"
41511	.2500	1/4"	6.350	1/4"	4"	1-1/2"	-	-
41513	.2500	1/4"	6.350	1/4"	4"	1-5/8"	-	-
41543	.2756	7.000	8	65	19	-	-	-
39543	.2756	7.000	8	65	19	0.30	-	-
41563	.2756	7.000	8	75	12	-	25	6.4
39563	.2756	7.000	8	75	12	0.30	25	6.4
39322	.3125	5/16"	7.938	5/16"	2"	1/2"	.010"	-
39324	.3125	5/16"	7.938	5/16"	2"	1/2"	.020"	-
41593	.3125	5/16"	7.938	5/16"	2-1/2"	7/16"	-	-
41603	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	-	-
39593	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	.010"	-
39603	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	.015"	-
39326	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	.020"	-
39613	.3125	5/16"	7.938	5/16"	2-1/2"	3/4"	.030"	-
41605	.3125	5/16"	7.938	5/16"	3"	1"	-	-
41623	.3125	5/16"	7.938	5/16"	4"	7/16"	-	1-1/8"
39623	.3125	5/16"	7.938	5/16"	4"	7/16"	.015"	1-1/8"
39633	.3125	5/16"	7.938	5/16"	4"	7/16"	.030"	1-1/8"

EDP#	$d1^{\dagger}$ Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	$l3$ Reach Length	$d3$ Neck Diameter
	Decimal	Metric						
39739	.3150	8.000	8	50	12	-	-	-
39328	.3150	8.000	8	50	12	0.50	-	-
41663	.3150	8.000	8	65	19	-	-	-
39663	.3150	8.000	8	65	19	0.50	-	-
41683	.3150	8.000	8	75	12	-	25	7.4
39683	.3150	8.000	8	75	12	0.50	25	7.4
39688	.3150	8.000	8	75	12	1.00	25	7.4
39693	.3150	8.000	8	75	12	2.00	25	7.4
39698	.3150	8.000	8	75	12	3.00	25	7.4
41685	.3150	8.000	8	75	26	-	-	-
41687	.3150	8.000	8	75	30	-	-	-
41693	.3150	8.000	8	100	12	-	55	7.4
39741	.3750	3/8"	9.525	3/8"	2"	1/2"	-	-
39330	.3750	3/8"	9.525	3/8"	2"	1/2"	.010"	-
39332	.3750	3/8"	9.525	3/8"	2"	1/2"	.020"	-
41713	.3750	3/8"	9.525	3/8"	2-1/2"	1/2"	-	-
39743	.3750	3/8"	9.525	3/8"	2-1/2"	3/4"	-	-
41723	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	-	-
39703	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.010"	-
39713	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.015"	-
39334	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.020"	-
39723	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	-
39733	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.060"	-
39734	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.120"	-
41733	.3750	3/8"	9.525	3/8"	3"	1"	-	-
41735	.3750	3/8"	9.525	3/8"	3"	1-1/4"	-	-
39738	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.030"	-
41737	.3750	3/8"	9.525	3/8"	3-1/2"	1-1/2"	-	-
39761	.3750	3/8"	9.525	3/8"	4"	1/2"	.030"	1-5/8"
41763	.3750	3/8"	9.525	3/8"	4"	1/2"	-	2-1/8"
39763	.3750	3/8"	9.525	3/8"	4"	1/2"	.030"	2-1/8"
39773	.3750	3/8"	9.525	3/8"	4"	1/2"	.060"	2-1/8"
41773	.3750	3/8"	9.525	3/8"	4"	1-5/8"	-	-
42363	.3750	3/8"	9.525	3/8"	4"	2"	-	-
41783	.3750	3/8"	9.525	3/8"	6"	1/2"	-	4"
39783	.3750	3/8"	9.525	3/8"	6"	1/2"	.030"	4"
39745	.3937	10.000	10	50	14	-	-	-
39336	.3937	10.000	10	50	14	0.50	-	-
41803	.3937	10.000	10	70	24	-	-	-
39803	.3937	10.000	10	70	24	0.50	-	-
41805	.3937	10.000	10	75	30	-	-	-
41843	.3937	10.000	10	100	12	-	35	9.4
39843	.3937	10.000	10	100	12	0.50	35	9.4
39848	.3937	10.000	10	100	12	1.00	35	9.4
39853	.3937	10.000	10	100	12	1.50	35	9.4
39863	.3937	10.000	10	100	12	2.00	35	9.4
39873	.3937	10.000	10	100	12	3.00	35	9.4
41853	.3937	10.000	10	100	12	-	55	9.4
41863	.3937	10.000	10	150	12	-	110	9.4

70

MATERIAL HARDNESS (Rc)

35

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continued →

Series 143M, 143R (continued)

.4724" - .5000"
(12.000mm - 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
	Decimal	Metric						
39747	.4724	12.000	12	65	16	-	-	-
39344	.4724	12.000	12	65	16	0.50	-	-
39749	.4724	12.000	12	75	26	-	-	-
41883	.4724	12.000	12	75	32	-	-	-
39883	.4724	12.000	12	75	32	0.50	-	-
39346	.4724	12.000	12	75	32	0.75	-	-
39348	.4724	12.000	12	75	32	1.00	-	-
41893	.4724	12.000	12	100	50	-	-	-
41903	.4724	12.000	12	100	16	-	40	11.4
39903	.4724	12.000	12	100	16	0.50	40	11.4
39907	.4724	12.000	12	100	16	1.00	40	11.4
39911	.4724	12.000	12	100	16	1.50	40	11.4
39915	.4724	12.000	12	100	16	2.00	40	11.4
39919	.4724	12.000	12	100	16	3.00	40	11.4
41913	.4724	12.000	12	100	16	-	55	11.4
41923	.4724	12.000	12	150	16	-	110	11.4
39751	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	-	-
39353	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.010"	-
39355	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.020"	-
39753	.5000	1/2"	12.700	1/2"	2-1/2"	3/4"	-	-
41933	.5000	1/2"	12.700	1/2"	3"	5/8"	-	-
39755	.5000	1/2"	12.700	1/2"	3"	1"	-	-
41943	.5000	1/2"	12.700	1/2"	3"	1-1/4"	-	-
39923	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.010"	-
39933	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.015"	-
39356	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.020"	-
39943	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-
39953	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"	-
39963	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.120"	-
39965	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.125"	-
39967	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.190"	-
41945	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	-	-
41963	.5000	1/2"	12.700	1/2"	4"	1-5/8"	-	-
39972	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.015"	-
39975	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.030"	-
39977	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.090"	-
41965	.5000	1/2"	12.700	1/2"	4"	1-3/4"	-	-
41973	.5000	1/2"	12.700	1/2"	4"	2"	-	-
39973	.5000	1/2"	12.700	1/2"	4"	2"	.010"	-
40413	.5000	1/2"	12.700	1/2"	4"	2"	.030"	-
40423	.5000	1/2"	12.700	1/2"	4"	2"	.060"	-
41983	.5000	1/2"	12.700	1/2"	4"	5/8"	-	2-1/8"
40433	.5000	1/2"	12.700	1/2"	4"	5/8"	.010"	2-1/8"
39983	.5000	1/2"	12.700	1/2"	4"	5/8"	.030"	2-1/8"
40443	.5000	1/2"	12.700	1/2"	4"	5/8"	.060"	2-1/8"
40453	.5000	1/2"	12.700	1/2"	4"	5/8"	.120"	2-1/8"
41985	.5000	1/2"	12.700	1/2"	4"	5/8"	-	2-1/4"
41993	.5000	1/2"	12.700	1/2"	6"	5/8"	-	4-1/8"
39993	.5000	1/2"	12.700	1/2"	6"	5/8"	.030"	4-1/8"
42003	.5000	1/2"	12.700	1/2"	6"	3-1/8"	-	-

MATERIAL HARDNESS (Rc)

70

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EDP#	d_1 †		Metric	d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	l_3 Reach Length	d_3 Neck Diameter
	Decimal	Diameter							
39757	.6250	5/8"	15.875	5/8"	3"	3/4"	-	-	-
39366	.6250	5/8"	15.875	5/8"	3"	3/4"	.010"	-	-
39368	.6250	5/8"	15.875	5/8"	3"	3/4"	.020"	-	-
42013	.6250	5/8"	15.875	5/8"	3-1/2"	3/4"	-	-	-
39759	.6250	5/8"	15.875	5/8"	3-1/2"	1"	-	-	-
42016	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	-	-	-
39369	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"	-	-
39370	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.020"	-	-
42021	.6250	5/8"	15.875	5/8"	4"	1-1/2"	-	-	-
42023	.6250	5/8"	15.875	5/8"	4"	1-5/8"	-	-	-
40463	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.015"	-	-
39372	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.020"	-	-
40023	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.030"	-	-
40473	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.060"	-	-
40483	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.120"	-	-
40485	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.190"	-	-
42025	.6250	5/8"	15.875	5/8"	4"	1-3/4"	-	-	-
42373	.6250	5/8"	15.875	5/8"	4"	2-1/8"	-	-	-
42033	.6250	5/8"	15.875	5/8"	6"	3/4"	-	2-3/8"	.590"
40033	.6250	5/8"	15.875	5/8"	6"	3/4"	.030"	2-3/8"	.590"
42043	.6250	5/8"	15.875	5/8"	6"	3/4"	-	4-3/8"	.590"
40043	.6250	5/8"	15.875	5/8"	6"	3/4"	.030"	4-3/8"	.590"
42053	.6250	5/8"	15.875	5/8"	6"	3-1/4"	-	-	-
42083	.6299		16.000	16	100	40	-	-	-
40083	.6299		16.000	16	100	40	1.00	-	-
42103	.6299		16.000	16	100	20	-	40	15.4
40103	.6299		16.000	16	100	20	1.00	40	15.4
42113	.6299		16.000	16	125	20	-	60	15.4
40113	.6299		16.000	16	125	20	2.00	60	15.4
40118	.6299		16.000	16	125	20	3.00	60	15.4
40123	.6299		16.000	16	125	20	4.00	60	15.4
42123	.6299		16.000	16	150	20	-	110	15.4

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MATERIAL HARDNESS (Rc)

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continued →

Series 143M, 143R (continued)

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

EDP#	$d1$ †			$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	$l3$ Reach Length	$d3$ Neck Diameter
	Decimal	Diameter	Metric						
42133	.7500	3/4"	19.050	3/4"	4"	1"	-	-	-
42136	.7500	3/4"	19.050	3/4"	4"	1-1/4"	-	-	-
39374	.7500	3/4"	19.050	3/4"	4"	1-1/4"	.020"	-	-
42141	.7500	3/4"	19.050	3/4"	4"	1-1/2"	-	-	-
42143	.7500	3/4"	19.050	3/4"	4"	1-5/8"	-	-	-
40133	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.015"	-	-
39376	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.020"	-	-
40143	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.030"	-	-
40153	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.060"	-	-
40493	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.120"	-	-
40495	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.190"	-	-
40497	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.250"	-	-
42145	.7500	3/4"	19.050	3/4"	4"	1-3/4"	-	-	-
42153	.7500	3/4"	19.050	3/4"	5"	2-1/4"	-	-	-
42155	.7500	3/4"	19.050	3/4"	5"	2-1/2"	-	-	-
42163	.7500	3/4"	19.050	3/4"	6"	1"	-	2-1/2"	.715"
40503	.7500	3/4"	19.050	3/4"	6"	1"	.015"	2-1/2"	.715"
40163	.7500	3/4"	19.050	3/4"	6"	1"	.030"	2-1/2"	.715"
40513	.7500	3/4"	19.050	3/4"	6"	1"	.060"	2-1/2"	.715"
40523	.7500	3/4"	19.050	3/4"	6"	1"	.120"	2-1/2"	.715"
40171	.7500	3/4"	19.050	3/4"	6"	1"	.015"	4"	.715"
42173	.7500	3/4"	19.050	3/4"	6"	1"	-	4-3/8"	.715"
40173	.7500	3/4"	19.050	3/4"	6"	1"	.030"	4-3/8"	.715"
42193	.7500	3/4"	19.050	3/4"	6"	3-1/4"	-	-	-
40175	.7500	3/4"	19.050	3/4"	6"	3-1/4"	.125"	-	-
42195	.7500	3/4"	19.050	3/4"	6-1/2"	4"	-	-	-
40177	.7500	3/4"	19.050	3/4"	6-1/2"	4"	.125"	-	-
42203	.7874		20.000	20	100	25	-	-	-
42213	.7874		20.000	20	100	32	-	-	-
40183	.7874		20.000	20	100	32	1.00	-	-
42223	.7874		20.000	20	100	20	-	40	19
40223	.7874		20.000	20	100	20	1.00	40	19
42226	.7874		20.000	20	125	20	-	60	19
40225	.7874		20.000	20	150	20	1.00	65	19
40226	.7874		20.000	20	150	20	2.00	65	19
40229	.7874		20.000	20	150	20	3.00	65	19
40231	.7874		20.000	20	150	20	4.00	65	19
42233	.7874		20.000	20	150	20	-	85	19
42236	.7874		20.000	20	150	20	-	110	19
42243	.9843		25.000	25	100	38	-	-	-
40243	.9843		25.000	25	100	38	1.00	-	-
42283	.9843		25.000	25	100	25	-	50	24
42286	.9843		25.000	25	125	25	-	65	24
42291	.9843		25.000	25	150	25	-	90	24
42293	1.000	1"	25.400	1"	4"	1"	-	-	-
42303	1.000	1"	25.400	1"	4"	1-5/8"	-	-	-
40293	1.000	1"	25.400	1"	4"	1-5/8"	.030"	-	-
40303	1.000	1"	25.400	1"	4"	1-5/8"	.060"	-	-
40313	1.000	1"	25.400	1"	4"	1-5/8"	.120"	-	-
42313	1.000	1"	25.400	1"	5"	2"	-	-	-
42343	1.000	1"	25.400	1"	6"	1-1/4"	-	3-3/8"	.960"
40343	1.000	1"	25.400	1"	6"	1-1/4"	.030"	3-3/8"	.960"
40353	1.000	1"	25.400	1"	6"	1-1/4"	.060"	3-3/8"	.960"
40363	1.000	1"	25.400	1"	6"	1-1/4"	.120"	3-3/8"	.960"
40366	1.000	1"	25.400	1"	6"	1-1/4"	.030"	4"	.960"
42353	1.000	1"	25.400	1"	6"	3-1/4"	-	-	-

MATERIAL HARDNESS (Rc)

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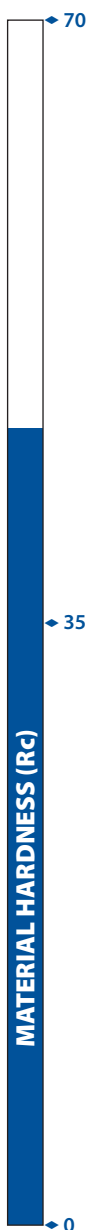
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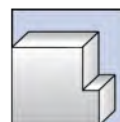
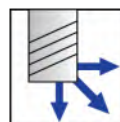
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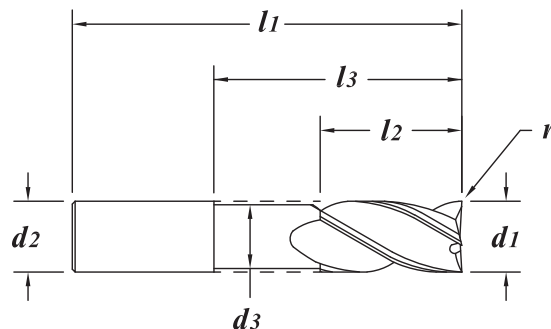
V4S

V4R

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CALCULATE IDEAL PARAMETERS
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TOLERANCES

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



Series V4S, V4R, V4B

.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

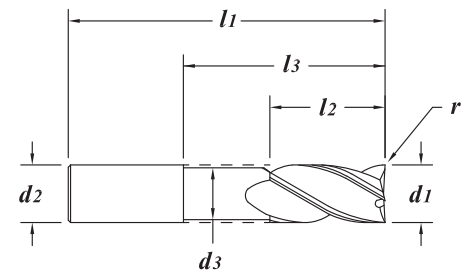
Variable rake aids in chip formation

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



EDP#		d_1 †			d_2	l_1	l_2	r	l_3	d_3
(plain)	(weldon)	Decimal	Diameter	Metric	Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter
50171	-	.1562	5/32"	3.967	1/4"	2"	1/2"	-	-	-
50172	-	.1562	5/32"	3.967	1/4"	2"	1/2"	.010"	-	-
50173	-	.1562	5/32"	3.967	1/4"	2"	1/2"	.015"	-	-
50174	-	.1562	5/32"	3.967	1/4"	2"	1/2"	.020"	-	-
50175	-	.1562	5/32"	3.967	1/4"	2"	1/2"	.030"	-	-
50176	-	.1562	5/32"	3.967	1/4"	2"	1/2"	BALL	-	-
50177	-	.1575		4.000	6.0	50	12	-	-	-
50178	-	.1575		4.000	6.0	50	12	0.20	-	-
50179	-	.1575		4.000	6.0	50	12	0.30	-	-
50180	-	.1575		4.000	6.0	50	12	0.50	-	-
50181	-	.1575		4.000	6.0	50	12	BALL	-	-
50182	-	.1875	3/16"	4.763	1/4"	2"	1/2"	-	-	-
50183	-	.1875	3/16"	4.763	1/4"	2"	1/2"	.010"	-	-
50184	-	.1875	3/16"	4.763	1/4"	2"	1/2"	.015"	-	-
50185	-	.1875	3/16"	4.763	1/4"	2"	1/2"	.020"	-	-
50186	-	.1875	3/16"	4.763	1/4"	2"	1/2"	.030"	-	-
50187	-	.1875	3/16"	4.763	1/4"	2"	1/2"	BALL	-	-
50188	-	.1969		5.000	6.0	65	20	-	-	-
50189	-	.1969		5.000	6.0	65	20	0.20	-	-
50190	-	.1969		5.000	6.0	65	20	0.30	-	-
50191	-	.1969		5.000	6.0	65	20	0.50	-	-
50192	-	.1969		5.000	6.0	65	20	BALL	-	-
50193	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	-	-	-
50194	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	.010"	-	-
50195	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	.015"	-	-
50196	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	.020"	-	-
50197	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	.030"	-	-
50198	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	BALL	-	-

continued →

Series V4S, V4R, V4B (continued)

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

EDP#		$d1$ †		$d2$	$l1$	$l2$	r	$l3$	$d3$
		Decimal	Diameter						
(plain)	(weldon)			Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter
50236	-	.2362	6.000	6.0	65	12	-	-	-
50199	-	.2362	6.000	6.0	65	12	0.30	-	-
50200	-	.2362	6.000	6.0	65	12	0.50	-	-
50201	-	.2362	6.000	6.0	65	12	0.75	-	-
50202	-	.2362	6.000	6.0	65	12	1.00	-	-
50203	-	.2362	6.000	6.0	65	12	1.50	-	-
50252	-	.2362	6.000	6.0	65	12	BALL	-	-
50237	-	.2362	6.000	6.0	65	19	-	-	-
50204	-	.2362	6.000	6.0	65	19	0.30	-	-
50205	-	.2362	6.000	6.0	65	19	0.50	-	-
50206	-	.2362	6.000	6.0	65	19	1.00	-	-
50253	-	.2362	6.000	6.0	65	19	BALL	-	-
50540	-	.2500	1/4"	6.350	1/4"	2"	3/8"	-	-
50489	-	.2500	1/4"	6.350	1/4"	2"	3/8"	.010"	-
50490	-	.2500	1/4"	6.350	1/4"	2"	3/8"	.015"	-
50491	-	.2500	1/4"	6.350	1/4"	2"	3/8"	.020"	-
50708	-	.2500	1/4"	6.350	1/4"	2"	3/8"	.030"	-
50709	-	.2500	1/4"	6.350	1/4"	2"	3/8"	.040"	-
50710	-	.2500	1/4"	6.350	1/4"	2"	3/8"	.060"	-
50711	-	.2500	1/4"	6.350	1/4"	2"	3/8"	.090"	-
50560	-	.2500	1/4"	6.350	1/4"	2"	3/8"	BALL	-
50645	-	.2500	1/4"	6.350	1/4"	2"	1/2"	-	-
50614	-	.2500	1/4"	6.350	1/4"	2"	1/2"	.010"	-
50616	-	.2500	1/4"	6.350	1/4"	2"	1/2"	.015"	-
50618	-	.2500	1/4"	6.350	1/4"	2"	1/2"	.020"	-
50712	-	.2500	1/4"	6.350	1/4"	2"	1/2"	.030"	-
50713	-	.2500	1/4"	6.350	1/4"	2"	1/2"	.040"	-
50714	-	.2500	1/4"	6.350	1/4"	2"	1/2"	.060"	-
50715	-	.2500	1/4"	6.350	1/4"	2"	1/2"	.090"	-
50238	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	-	-
50207	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"	-
50208	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	-
50620	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"	-
50209	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	-
50716	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.040"	-
50210	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.060"	-
50717	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.090"	-
50254	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	BALL	-
50653	-	.2500	1/4"	6.350	1/4"	3"	1-1/8"	-	-
50493	-	.2500	1/4"	6.350	1/4"	3"	1-1/8"	.030"	-
50677	-	.2500	1/4"	6.350	1/4"	3"	1-1/8"	BALL	-

EDP# (plain) (weldon)		d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	l_3 Reach Length	d_3 Neck Diameter
		Decimal	Metric						
50654	-	.2500	1/4"	6.350	1/4"	4"	1-1/2"	-	-
50681	-	.2500	1/4"	6.350	1/4"	4"	1-1/2"	BALL	-
50655	-	.2500	1/4"	6.350	1/4"	4"	1-3/4"	-	-
50718	-	.2500	1/4"	6.350	1/4"	4"	1-3/4"	.020"	-
50682	-	.2500	1/4"	6.350	1/4"	4"	1-3/4"	BALL	-
50656	-	.2500	1/4"	6.350	1/4"	4"	2"	-	-
50683	-	.2500	1/4"	6.350	1/4"	4"	2"	BALL	-
50651	-	.2500	1/4"	6.350	1/4"	3"	3/8"	-	1-1/8"
50678	-	.2500	1/4"	6.350	1/4"	3"	3/8"	BALL	1-1/8"
50600	-	.2500	1/4"	6.350	1/4"	4"	3/8"	-	1-1/8"
50211	-	.2500	1/4"	6.350	1/4"	4"	3/8"	.015"	1-1/4"
50474	-	.2500	1/4"	6.350	1/4"	4"	3/8"	BALL	1-1/8"
50679	-	.2500	1/4"	6.350	1/4"	4"	3/8"	BALL	1-1/2"
50652	-	.2500	1/4"	6.350	1/4"	4"	3/8"	-	2"
50680	-	.2500	1/4"	6.350	1/4"	4"	3/8"	BALL	2"
50719	-	.2500	1/4"	6.350	1/4"	6"	3/8"	.010"	4"
50684	-	.2500	1/4"	6.350	1/4"	6"	3/8"	BALL	4"
50720	-	.3125	5/16"	7.937	5/16"	2"	3/8"	.030"	-
50541	-	.3125	5/16"	7.937	5/16"	2"	7/16"	-	-
50622	-	.3125	5/16"	7.937	5/16"	2"	7/16"	.010"	-
50624	-	.3125	5/16"	7.937	5/16"	2"	7/16"	.015"	-
50492	-	.3125	5/16"	7.937	5/16"	2"	7/16"	.020"	-
50721	-	.3125	5/16"	7.937	5/16"	2"	7/16"	.125"	-
50561	-	.3125	5/16"	7.937	5/16"	2"	7/16"	BALL	-
50239	-	.3125	5/16"	7.937	5/16"	2-1/2"	13/16"	-	-
50626	-	.3125	5/16"	7.937	5/16"	2-1/2"	13/16"	.010"	-
50628	-	.3125	5/16"	7.937	5/16"	2-1/2"	13/16"	.015"	-
50212	-	.3125	5/16"	7.937	5/16"	2-1/2"	13/16"	.020"	-
50213	-	.3125	5/16"	7.937	5/16"	2-1/2"	13/16"	.030"	-
50722	-	.3125	5/16"	7.937	5/16"	2-1/2"	13/16"	.060"	-
50723	-	.3125	5/16"	7.937	5/16"	2-1/2"	13/16"	.125"	-
50255	-	.3125	5/16"	7.937	5/16"	2-1/2"	13/16"	BALL	-
50657	-	.3125	5/16"	7.937	5/16"	3"	1-1/4"	-	-
50724	-	.3125	5/16"	7.937	5/16"	3"	1-1/4"	.015"	-
50725	-	.3125	5/16"	7.937	5/16"	3"	1-1/4"	.030"	-
50726	-	.3125	5/16"	7.937	5/16"	3"	1-1/4"	.060"	-
50685	-	.3125	5/16"	7.937	5/16"	3"	1-1/4"	BALL	-
50658	-	.3125	5/16"	7.937	5/16"	3"	7/16"	-	1-1/2"
50686	-	.3125	5/16"	7.937	5/16"	3"	7/16"	BALL	1-1/2"
50602	-	.3150		8.000	8.0	50	12	-	-
50630	-	.3150		8.000	8.0	50	12	0.50	-
50240	-	.3150		8.000	8.0	65	22	-	-
50214	-	.3150		8.000	8.0	65	22	0.50	-
50356	-	.3150		8.000	8.0	65	22	0.75	-
50215	-	.3150		8.000	8.0	65	22	1.00	-
50727	-	.3150		8.000	8.0	65	22	1.20	-
50357	-	.3150		8.000	8.0	65	22	1.50	-
50358	-	.3150		8.000	8.0	65	22	2.00	-
50728	-	.3150		8.000	8.0	65	22	3.00	-
50256	-	.3150		8.000	8.0	65	22	BALL	-

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continued →

Series V4S, V4R, V4B (continued)

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

EDP#		$d1$ †		$d2$	$l1$	$l2$	r	$l3$	$d3$
		Decimal	Diameter						
(plain)	(weldon)			Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter
50659	-	.3150		8.000	8.0	75	32	-	-
50687	-	.3150		8.000	8.0	75	32	BALL	-
50660	-	.3150		8.000	8.0	100	12	-	7.50
50688	-	.3150		8.000	8.0	100	12	BALL	7.50
50542	-	.3750	3/8"	9.525	3/8"	2"	1/2"	-	-
50632	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.010"	-
50729	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.015"	-
50494	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.020"	-
50634	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.030"	-
50730	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.060"	-
50732	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.090"	-
50733	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.120"	-
50734	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.125"	-
50562	-	.3750	3/8"	9.525	3/8"	2"	1/2"	BALL	-
50241	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	-	-
50216	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.010"	-
50735	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.015"	-
50217	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.020"	-
50218	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.030"	-
50736	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.040"	-
50219	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.060"	-
50636	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.090"	-
50737	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.120"	-
50738	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.125"	-
50257	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	BALL	-
50661	-	.3750	3/8"	9.525	3/8"	3"	1-1/4"	-	-
50739	-	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.015"	-
50637	-	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.030"	-
50740	-	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.060"	-
50689	-	.3750	3/8"	9.525	3/8"	3"	1-1/4"	BALL	-
50662	-	.3750	3/8"	9.525	3/8"	4"	1-1/2"	-	-
50741	-	.3750	3/8"	9.525	3/8"	4"	1-1/2"	.015"	-
50742	-	.3750	3/8"	9.525	3/8"	4"	1-1/2"	.030"	-
50743	-	.3750	3/8"	9.525	3/8"	4"	1-1/2"	.060"	-
50744	-	.3750	3/8"	9.525	3/8"	4"	1-1/2"	.120"	-
50690	-	.3750	3/8"	9.525	3/8"	4"	1-1/2"	BALL	-
50745	-	.3750	3/8"	9.525	3/8"	6"	2-1/2"	.060	-
50604	-	.3750	3/8"	9.525	3/8"	4"	1/2"	-	1-1/8" .355"
50220	-	.3750	3/8"	9.525	3/8"	4"	1/2"	.020"	1-7/8" .350"
50476	-	.3750	3/8"	9.525	3/8"	4"	1/2"	BALL	1-1/8" .355"
50606	-	.3937		10.000	10.0	50	14	-	-
50638	-	.3937		10.000	10.0	50	14	0.50	-
50242	-	.3937		10.000	10.0	70	22	-	-
50746	-	.3937		10.000	10.0	70	22	0.25	-
50221	-	.3937		10.000	10.0	70	22	0.50	-
50359	-	.3937		10.000	10.0	70	22	0.75	-
50360	-	.3937		10.000	10.0	70	22	1.00	-
50361	-	.3937		10.000	10.0	70	22	1.50	-
50362	-	.3937		10.000	10.0	70	22	2.00	-
50747	-	.3937		10.000	10.0	70	22	3.00	-
50258	-	.3937		10.000	10.0	70	22	BALL	-
50608	-	.3937		10.000	10.0	70	26	-	-
50748	-	.3937		10.000	10.0	70	26	1.50	-
50663	-	.3937		10.000	10.0	70	30	-	-
50691	-	.3937		10.000	10.0	70	30	BALL	-

EDP#		d_1 †		d_2	l_1	l_2	r	l_3	d_3
(plain)	(weldon)	Decimal	Diameter	Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter
50749	-	.3937	10.000	10.0	70	22	0.50	30	9.40
50750	-	.3937	10.000	10.0	100	12	0.30	50	9.40
50692	-	.3937	10.000	10.0	100	14	BALL	50	9.40
50450	50449	.4724	12.000	12.0	75	26	-	-	-
50363	50369	.4724	12.000	12.0	75	26	0.30	-	-
50364	50370	.4724	12.000	12.0	75	26	0.50	-	-
50365	50366	.4724	12.000	12.0	75	26	0.75	-	-
50367	50371	.4724	12.000	12.0	75	26	1.00	-	-
50372	50373	.4724	12.000	12.0	75	26	1.50	-	-
50374	50375	.4724	12.000	12.0	75	26	2.00	-	-
50470	-	.4724	12.000	12.0	75	26	BALL	-	-
50243	50283	.4724	12.000	12.0	75	32	-	-	-
50222	50270	.4724	12.000	12.0	75	32	0.50	-	-
50223	50271	.4724	12.000	12.0	75	32	1.00	-	-
50259	50291	.4724	12.000	12.0	75	32	BALL	-	-
50664	-	.4724	12.000	12.0	88	36	-	-	-
50751	-	.4724	12.000	12.0	88	36	0.30	-	-
50752	-	.4724	12.000	12.0	88	36	0.50	-	-
50753	-	.4724	12.000	12.0	88	36	1.00	-	-
50754	-	.4724	12.000	12.0	88	36	1.50	-	-
50755	-	.4724	12.000	12.0	88	36	3.00	-	-
50693	-	.4724	12.000	12.0	88	36	BALL	-	-
50564	-	.4724	12.000	12.0	100	42	-	-	-
50566	-	.4724	12.000	12.0	100	42	0.30	-	-
50568	-	.4724	12.000	12.0	100	42	0.50	-	-
50570	-	.4724	12.000	12.0	100	42	1.00	-	-
50572	-	.4724	12.000	12.0	100	42	2.00	-	-
50574	-	.4724	12.000	12.0	100	42	3.00	-	-
50576	-	.4724	12.000	12.0	100	42	BALL	-	-
50665	-	.4724	12.000	12.0	100	48	-	-	-
50756	-	.4724	12.000	12.0	100	48	0.30	-	-
50757	-	.4724	12.000	12.0	100	48	0.50	-	-
50758	-	.4724	12.000	12.0	100	48	1.00	-	-
50759	-	.4724	12.000	12.0	100	48	1.50	-	-
50760	-	.4724	12.000	12.0	100	48	3.00	-	-
50761	-	.4724	12.000	12.0	100	48	4.00	-	-
50694	-	.4724	12.000	12.0	100	48	BALL	-	-
50695	-	.4724	12.000	12.0	100	14	BALL	50	11.40
50543	-	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	-	-
50640	-	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.010"	-
50762	-	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.015"	-
50496	50497	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.020"	-
50642	-	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"	-
50763	-	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.060"	-
50764	-	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.090"	-
50765	-	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.120"	-
50644	-	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.125"	-
50766	-	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.156"	-
50767	-	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.190"	-
50563	-	.5000	1/2"	12.700	1/2"	2-1/2"	BALL	-	-

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MATERIAL HARDNESS (Rc)

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
(plain)	(weldon)	Decimal		Metric						
50452	50453	.5000	1/2"	12.700	1/2"	3"	1"	-	-	-
50379	50380	.5000	1/2"	12.700	1/2"	3"	1"	.010"	-	-
50768	-	.5000	1/2"	12.700	1/2"	3"	1"	.015"	-	-
50381	50382	.5000	1/2"	12.700	1/2"	3"	1"	.020"	-	-
50383	50384	.5000	1/2"	12.700	1/2"	3"	1"	.030"	-	-
50385	50386	.5000	1/2"	12.700	1/2"	3"	1"	.060"	-	-
50769	-	.5000	1/2"	12.700	1/2"	3"	1"	.090"	-	-
50770	-	.5000	1/2"	12.700	1/2"	3"	1"	.120"	-	-
50771	-	.5000	1/2"	12.700	1/2"	3"	1"	.125"	-	-
50772	-	.5000	1/2"	12.700	1/2"	3"	1"	.190"	-	-
50472	50473	.5000	1/2"	12.700	1/2"	3"	1"	BALL	-	-
50244	50284	.5000	1/2"	12.700	1/2"	3"	1-1/4"	-	-	-
50224	50272	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.010"	-	-
50773	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.015"	-	-
50225	50273	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.020"	-	-
50226	50274	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	-
50227	50275	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"	-	-
50774	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.090"	-	-
50775	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.120"	-	-
50776	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.125"	-	-
50777	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.156"	-	-
50778	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.190"	-	-
50260	50292	.5000	1/2"	12.700	1/2"	3"	1-1/4"	BALL	-	-
50666	-	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	-	-	-
50779	-	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	.010"	-	-
50780	-	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	.015"	-	-
50781	-	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	.020"	-	-
50782	-	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	.030"	-	-
50783	-	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	.060"	-	-
50784	-	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	.090"	-	-
50785	-	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	.120"	-	-
50696	-	.5000	1/2"	12.700	1/2"	3-1/2"	1-1/2"	BALL	-	-
50578	50579	.5000	1/2"	12.700	1/2"	4"	1-5/8"	-	-	-
50580	50581	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.010"	-	-
50582	50583	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.020"	-	-
50584	50585	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.030"	-	-
50586	50587	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.040"	-	-
50588	50589	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.060"	-	-
50590	50591	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.120"	-	-
50592	50593	.5000	1/2"	12.700	1/2"	4"	1-5/8"	BALL	-	-
50646	-	.5000	1/2"	12.700	1/2"	4"	1-3/4"	-	-	-
50647	-	.5000	1/2"	12.700	1/2"	4"	2"	-	-	-
50245	50285	.5000	1/2"	12.700	1/2"	4"	2-1/8"	-	-	-
50786	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.010"	-	-
50787	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.015"	-	-
50788	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.020"	-	-
50789	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.030"	-	-
50790	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.060"	-	-
50791	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.090"	-	-
50792	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.120"	-	-
50793	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.125"	-	-
50794	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.190"	-	-
50261	50293	.5000	1/2"	12.700	1/2"	4"	2-1/8"	BALL	-	-

EDP# (plain) (weldon)		d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	l_3 Reach Length	d_3 Neck Diameter
		Decimal	Metric						
50668	-	.5000	1/2"	12.700	1/2"	6"	3"	-	-
50795	-	.5000	1/2"	12.700	1/2"	6"	3"	.020"	-
50796	-	.5000	1/2"	12.700	1/2"	6"	3"	.030"	-
50797	-	.5000	1/2"	12.700	1/2"	6"	3"	.060"	-
50798	-	.5000	1/2"	12.700	1/2"	6"	3"	.120"	-
50799	-	.5000	1/2"	12.700	1/2"	6"	3"	.190"	-
50699	-	.5000	1/2"	12.700	1/2"	6"	3"	BALL	-
50610	-	.5000	1/2"	12.700	1/2"	4"	5/8"	-	2-1/4" .475"
50228	50276	.5000	1/2"	12.700	1/2"	4"	5/8"	.020"	2-1/4" .470"
50900	-	.5000	1/2"	12.700	1/2"	4"	5/8"	.030"	2-1/4" .470"
50901	-	.5000	1/2"	12.700	1/2"	4"	5/8"	.060"	2-1/4" .470"
50902	-	.5000	1/2"	12.700	1/2"	4"	5/8"	.120"	2-1/4" .470"
50478	-	.5000	1/2"	12.700	1/2"	4"	5/8"	BALL	2-1/4" .475"
50667	-	.5000	1/2"	12.700	1/2"	6"	5/8"	-	3-1/8" .475"
50235	-	.5000	1/2"	12.700	1/2"	6"	5/8"	-	4-1/8" .475"
50594	-	.5000	1/2"	12.700	1/2"	6"	5/8"	.020"	4-1/8" .470"
50596	-	.5000	1/2"	12.700	1/2"	6"	5/8"	.030"	4-1/8" .470"
50697	-	.5000	1/2"	12.700	1/2"	6"	5/8"	BALL	3-1/8" .475"
50598	-	.5000	1/2"	12.700	1/2"	6"	5/8"	BALL	4-1/8" .475"
50698	-	.5000	1/2"	12.700	1/2"	6"	1"	BALL	4-1/2" .475"
50545	50546	.6250	5/8"	15.875	5/8"	3"	3/4"	-	-
50903	-	.6250	5/8"	15.875	5/8"	3"	3/4"	.010"	-
50904	-	.6250	5/8"	15.875	5/8"	3"	3/4"	.015"	-
50498	50499	.6250	5/8"	15.875	5/8"	3"	3/4"	.020"	-
50500	50501	.6250	5/8"	15.875	5/8"	3"	3/4"	.030"	-
50502	50503	.6250	5/8"	15.875	5/8"	3"	3/4"	.060"	-
50905	-	.6250	5/8"	15.875	5/8"	3"	3/4"	.090"	-
50906	-	.6250	5/8"	15.875	5/8"	3"	3/4"	.120"	-
50907	-	.6250	5/8"	15.875	5/8"	3"	3/4"	.125"	-
50908	-	.6250	5/8"	15.875	5/8"	3"	3/4"	.156"	-
50909	-	.6250	5/8"	15.875	5/8"	3"	3/4"	.190"	-
50910	-	.6250	5/8"	15.875	5/8"	3"	3/4"	.250"	-
50246	50286	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	-	-
50911	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.010"	-
50912	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"	-
50229	50277	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.020"	-
50534	50535	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	-
50536	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.040"	-
50538	50539	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	-
50913	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.090"	-
50230	50278	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.120"	-
50914	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.125"	-
50915	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.156"	-
50916	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.190"	-
50917	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.250"	-
50262	50294	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	BALL	-

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continued →

Series V4S, V4R, V4B (continued)

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

EDP# (plain) (weldon)	d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	l_3 Reach Length	d_3 Neck Diameter
	Decimal		Metric						
50669	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	-	-
50918	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.010"	-
50919	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.015"	-
50920	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.020"	-
50921	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.030"	-
50922	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.060"	-
50923	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.090"	-
50924	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.120"	-
50925	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.125"	-
50926	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.156"	-
50927	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.190"	-
50928	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.250"	-
50700	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	BALL	-
50612	-	.6250	5/8"	15.875	5/8"	4"	1-5/8"	-	-
50670	-	.6250	5/8"	15.875	5/8"	4"	1-3/4"	-	-
50701	-	.6250	5/8"	15.875	5/8"	4"	1-3/4"	BALL	-
50547	-	.6299		16.000	16.0	75	19	-	-
50504	-	.6299		16.000	16.0	75	19	0.50	-
50506	-	.6299		16.000	16.0	75	19	1.00	-
50508	-	.6299		16.000	16.0	75	19	3.00	-
50929	-	.6299		16.000	16.0	75	19	4.00	-
50930	-	.6299		16.000	16.0	75	19	5.00	-
50931	-	.6299		16.000	16.0	75	19	6.00	-
50247	50287	.6299		16.000	16.0	88	32	-	-
50231	50279	.6299		16.000	16.0	88	32	0.50	-
50409	50410	.6299		16.000	16.0	88	32	0.75	-
50411	50412	.6299		16.000	16.0	88	32	1.00	-
50413	50414	.6299		16.000	16.0	88	32	1.50	-
50415	50416	.6299		16.000	16.0	88	32	2.00	-
50932	-	.6299		16.000	16.0	88	32	2.50	-
50417	50418	.6299		16.000	16.0	88	32	3.00	-
50933	-	.6299		16.000	16.0	88	32	4.00	-
50934	-	.6299		16.000	16.0	88	32	5.00	-
50935	-	.6299		16.000	16.0	88	32	6.00	-
50263	50295	.6299		16.000	16.0	88	32	BALL	-
50671	-	.6299		16.000	16.0	100	48	-	-
50936	-	.6299		16.000	16.0	100	48	0.50	-
50937	-	.6299		16.000	16.0	100	48	1.00	-
50938	-	.6299		16.000	16.0	100	48	1.50	-
50939	-	.6299		16.000	16.0	100	48	2.00	-
50940	-	.6299		16.000	16.0	100	48	3.00	-
50941	-	.6299		16.000	16.0	100	48	4.00	-
50942	-	.6299		16.000	16.0	100	48	5.00	-
50943	-	.6299		16.000	16.0	100	48	6.00	-
50702	-	.6299		16.000	16.0	100	48	BALL	-

EDP#		d_1 †			d_2	l_1	l_2	r	l_3	d_3
(plain)	(weldon)	Decimal	Diameter	Metric	Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter
50548	-	.7500	3/4"	19.050	3/4"	3"	7/8"	-	-	-
50944	-	.7500	3/4"	19.050	3/4"	3"	7/8"	.010"	-	-
50945	-	.7500	3/4"	19.050	3/4"	3"	7/8"	.015"	-	-
50946	-	.7500	3/4"	19.050	3/4"	3"	7/8"	.020"	-	-
50556	-	.7500	3/4"	19.050	3/4"	3"	7/8"	.030"	-	-
50947	-	.7500	3/4"	19.050	3/4"	3"	7/8"	.060"	-	-
50948	-	.7500	3/4"	19.050	3/4"	3"	7/8"	.120"	-	-
50549	50550	.7500	3/4"	19.050	3/4"	4"	1"	-	-	-
50949	-	.7500	3/4"	19.050	3/4"	4"	1"	.010"	-	-
50950	-	.7500	3/4"	19.050	3/4"	4"	1"	.015"	-	-
50510	50511	.7500	3/4"	19.050	3/4"	4"	1"	.020"	-	-
50512	50513	.7500	3/4"	19.050	3/4"	4"	1"	.030"	-	-
50514	50515	.7500	3/4"	19.050	3/4"	4"	1"	.060"	-	-
50951	-	.7500	3/4"	19.050	3/4"	4"	1"	.090"	-	-
50952	-	.7500	3/4"	19.050	3/4"	4"	1"	.120"	-	-
50954	-	.7500	3/4"	19.050	3/4"	4"	1"	.250"	-	-
50955	-	.7500	3/4"	19.050	3/4"	4"	1"	.3125"	-	-
50248	50288	.7500	3/4"	19.050	3/4"	4"	1-1/2"	-	-	-
50956	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.010"	-	-
50957	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"	-	-
50516	50517	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.020"	-	-
50232	50280	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	-	-
50518	50519	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	-	-
50958	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.090"	-	-
50520	50521	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.120"	-	-
50959	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.125"	-	-
50960	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.156"	-	-
50961	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.190"	-	-
50962	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.250"	-	-
50963	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.3125"	-	-
50264	50296	.7500	3/4"	19.050	3/4"	4"	1-1/2"	BALL	-	-
50551	50552	.7500	3/4"	19.050	3/4"	4"	1-3/4"	-	-	-
50964	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.010"	-	-
50965	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.015"	-	-
50522	50523	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.020"	-	-
50524	50525	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.030"	-	-
50526	50527	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.060"	-	-
50966	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.090"	-	-
50967	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.120"	-	-
50968	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.125"	-	-
50969	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.156"	-	-
50970	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.190"	-	-
50971	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.250"	-	-
50972	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.3125"	-	-

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MATERIAL HARDNESS (Rc)

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continued →

Series V4S, V4R, V4B (continued)

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

EDP#		d_1 †			d_2	l_1	l_2	r	l_3	d_3
(plain)	(weldon)	Decimal	Diameter	Metric	Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter
50553	50554	.7500	3/4"	19.050	3/4"	5"	2-1/8"	-	-	-
50973	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.010"	-	-
50974	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.015"	-	-
50975	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.020"	-	-
50976	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.030"	-	-
50977	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.060"	-	-
50979	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.120"	-	-
50980	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.125"	-	-
50981	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.156"	-	-
50982	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.190"	-	-
50983	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.250"	-	-
50984	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.3125"	-	-
50672	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	-	-	-
50985	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.010"	-	-
50986	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.015"	-	-
50987	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.020"	-	-
50988	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.030"	-	-
50989	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.060"	-	-
50990	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.090"	-	-
50991	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.120"	-	-
50992	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.125"	-	-
50993	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.156"	-	-
50994	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.190"	-	-
50995	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.250"	-	-
50996	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.3125"	-	-
50703	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	BALL	-	-
50555	-	.7874		20.000	20.0	100	25	-	-	-
50249	50289	.7874		20.000	20.0	100	38	-	-	-
50997	-	.7874		20.000	20.0	100	38	0.50	-	-
50528	-	.7874		20.000	20.0	100	38	1.00	-	-
50530	-	.7874		20.000	20.0	100	38	2.00	-	-
50998	-	.7874		20.000	20.0	100	38	2.50	-	-
50532	-	.7874		20.000	20.0	100	38	3.00	-	-
50999	-	.7874		20.000	20.0	100	38	4.00	-	-
50121	-	.7874		20.000	20.0	100	38	5.00	-	-
50122	-	.7874		20.000	20.0	100	38	6.00	-	-
50123	-	.7874		20.000	20.0	100	38	8.00	-	-
50265	50297	.7874		20.000	20.0	100	38	BALL	-	-
50673	-	.7874		20.000	20.0	100	48	-	-	-
50124	-	.7874		20.000	20.0	100	48	0.50	-	-
50125	-	.7874		20.000	20.0	100	48	1.00	-	-
50126	-	.7874		20.000	20.0	100	48	1.50	-	-
50127	-	.7874		20.000	20.0	100	48	2.00	-	-
50128	-	.7874		20.000	20.0	100	48	2.50	-	-
50129	-	.7874		20.000	20.0	100	48	3.00	-	-
50131	-	.7874		20.000	20.0	100	48	4.00	-	-
50132	-	.7874		20.000	20.0	100	48	5.00	-	-
50133	-	.7874		20.000	20.0	100	48	6.00	-	-
50134	-	.7874		20.000	20.0	100	48	8.00	-	-

EDP#		$d1$ †			$d2$	$l1$	$l2$	r	$l3$	$d3$
(plain)	(weldon)	Decimal	Diameter	Metric	Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter
50674	-	.7874		20.000	20.0	150	60	-	-	-
50135	-	.7874		20.000	20.0	150	60	0.50	-	-
50136	-	.7874		20.000	20.0	150	60	1.00	-	-
50137	-	.7874		20.000	20.0	150	60	3.00	-	-
50138	-	.7874		20.000	20.0	150	60	6.00	-	-
50705	-	.7874		20.000	20.0	150	60	BALL	-	-
50250	50290	1.000	1"	25.400	1"	4"	1-1/2"	-	-	-
50139	-	1.000	1"	25.400	1"	4"	1-1/2"	.020"		
50233	50281	1.000	1"	25.400	1"	4"	1-1/2"	.030"	-	-
50141	-	1.000	1"	25.400	1"	4"	1-1/2"	.060"	-	-
50142	-	1.000	1"	25.400	1"	4"	1-1/2"	.090"	-	-
50143	-	1.000	1"	25.400	1"	4"	1-1/2"	.120"	-	-
50557	-	1.000	1"	25.400	1"	4"	1-1/2"	.125"	-	-
50144	-	1.000	1"	25.400	1"	4"	1-1/2"	.156"	-	-
50145	-	1.000	1"	25.400	1"	4"	1-1/2"	.190"	-	-
50146	-	1.000	1"	25.400	1"	4"	1-1/2"	.250"	-	-
50147	-	1.000	1"	25.400	1"	4"	1-1/2"	.3125"	-	-
50148	-	1.000	1"	25.400	1"	4"	1-1/2"	.375"	-	-
50266	50298	1.000	1"	25.400	1"	4"	1-1/2"	BALL	-	-
50675	-	1.000	1"	25.400	1"	4-1/2"	2"	-	-	-
50149	-	1.000	1"	25.400	1"	4-1/2"	2"	.020"		
50151	-	1.000	1"	25.400	1"	4-1/2"	2"	.030"	-	-
50152	-	1.000	1"	25.400	1"	4-1/2"	2"	.060"	-	-
50153	-	1.000	1"	25.400	1"	4-1/2"	2"	.090"	-	-
50154	-	1.000	1"	25.400	1"	4-1/2"	2"	.120"	-	-
50155	-	1.000	1"	25.400	1"	4-1/2"	2"	.156"	-	-
50156	-	1.000	1"	25.400	1"	4-1/2"	2"	.190"	-	-
50157	-	1.000	1"	25.400	1"	4-1/2"	2"	.250"	-	-
50158	-	1.000	1"	25.400	1"	4-1/2"	2"	.3125"	-	-
50706	-	1.000	1"	25.400	1"	4-1/2"	2"	BALL	-	-
50234	50282	1.000	1"	25.400	1"	5"	2-1/8"	.030"	-	-
50676	-	1.000	1"	25.400	1"	5"	2-1/2"	-	-	-
50159	-	1.000	1"	25.400	1"	5"	2-1/2"	.020"	-	-
50161	-	1.000	1"	25.400	1"	5"	2-1/2"	.030"	-	-
50162	-	1.000	1"	25.400	1"	5"	2-1/2"	.060"	-	-
50163	-	1.000	1"	25.400	1"	5"	2-1/2"	.090"	-	-
50164	-	1.000	1"	25.400	1"	5"	2-1/2"	.120"	-	-
50165	-	1.000	1"	25.400	1"	5"	2-1/2"	.156"	-	-
50166	-	1.000	1"	25.400	1"	5"	2-1/2"	.190"	-	-
50167	-	1.000	1"	25.400	1"	5"	2-1/2"	.250"	-	-
50168	-	1.000	1"	25.400	1"	5"	2-1/2"	.3125"	-	-
50707	-	1.000	1"	25.400	1"	5"	2-1/2"	BALL	-	-

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MATERIAL HARDNESS (Rc)

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This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



SERIES HIGHLIGHT

Series V5

HIGH PERFORMANCE
END MILLS

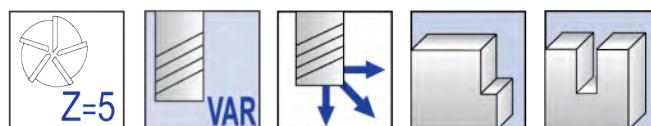
S M P K

High Performance End Mills
AlCrN Coated

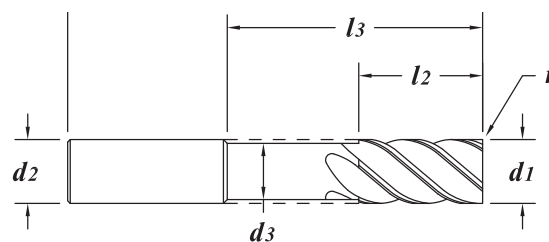
Target Materials:

Titanium

Tool steels under 45Rc



CALCULATE IDEAL PARAMETERS
FOR THE V5 AND V5C IN YOUR
APPLICATION WITH THE
GARR TECHNICAL ADVISOR



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MATERIAL HARDNESS (Rc)

V5

V5C

View the V5 →



Series V5

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

HIGH EFFICIENCY MILLING



TOLERANCES

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

Recommended for titanium and tool steels under 45Rc

Variable Helix End Mill

AlCrN Coating

Solid submicron grain carbide end mill - center cutting

Engineered for High Efficiency Milling

Staggered flutes to control harmonics

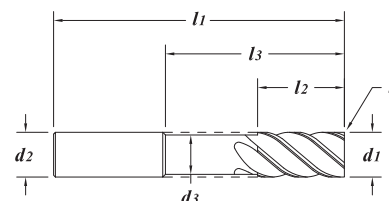
Variable flute design helps with chip evacuation in slots and pockets

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



EDP#		$d1$ †		$d2$	$l1$	$l2$	r	$l3$	$d3$
		Decimal	Diameter						
(plain)	(weldon)			Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter
50000	-	.2362		6.000	50	13	-	-	-
50001	-	.2362		6.000	50	13	0.5	-	-
50002	-	.2362		6.000	65	19	-	-	-
50003	-	.2362		6.000	65	19	0.5	-	-
50004	-	.2362		6.000	65	13	-	20	5.4
50005	-	.2362		6.000	65	13	0.5	20	5.4
50006	-	.2362		6.000	65	13	1.0	20	5.4
50007	-	.2500	1/4"	6.350	2"	3/8"	-	-	-
51000	-	.2500	1/4"	6.350	2"	3/8"	.010"	-	-
50008	-	.2500	1/4"	6.350	2"	3/8"	.015"	-	-
51001	-	.2500	1/4"	6.350	2"	3/8"	.020"	-	-
50009	-	.2500	1/4"	6.350	2"	3/8"	.030"	-	-
51002	-	.2500	1/4"	6.350	2"	1/2"	-	-	-
51003	-	.2500	1/4"	6.350	2"	1/2"	.010"	-	-
51004	-	.2500	1/4"	6.350	2"	1/2"	.015"	-	-
50011	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	-	-
51005	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"	-
50012	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	-
50013	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"	-
50014	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	-
50015	-	.2500	1/4"	6.350	1/4"	3"	1"	-	-
51006	-	.2500	1/4"	6.350	1/4"	3"	1"	.010"	-
51007	-	.2500	1/4"	6.350	1/4"	3"	1"	.015"	-
50016	-	.2500	1/4"	6.350	1/4"	3"	1"	.030"	-
50113	-	.2500	1/4"	6.350	1/4"	3"	1-1/8"	.030"	-
50017	-	.2500	1/4"	6.350	1/4"	4"	1/2"	.015"	1-1/4"
51008	-	.2500	1/4"	6.350	1/4"	4"	1/2"	.015"	2-1/8"
50023	-	.2756		7.000	8.0	22	0.2	-	-
50018	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	-	-
50019	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.015"	-
50021	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.020"	-
50022	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.030"	-

EDP#		$d1$ †		$d2$	$l1$	$l2$	r	$l3$	$d3$
		Decimal	Metric						
(plain)	(weldon)			Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter
50024	-	.3150	8.000	8.0	65	22	0.2	-	-
50025	-	.3150	8.000	8.0	65	22	0.5	-	-
50026	-	.3150	8.000	8.0	75	19	-	26	7.2
50027	-	.3150	8.000	8.0	75	19	0.5	26	7.2
50028	-	.3150	8.000	8.0	75	19	1.0	26	7.2
50029	-	.3750	3/8"	9.525	3/8"	2"	1/2"	-	-
50031	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.015"	-
50032	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.020"	-
50033	-	.3750	3/8"	9.525	3/8"	2"	1/2"	.030"	-
50034	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	-	-
50035	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.015"	-
50036	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.020"	-
50037	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.030"	-
50038	-	.3750	3/8"	9.525	3/8"	2-1/2"	1"	.060"	-
51009	-	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.015"	-
50114	-	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.030"	-
51010	-	.3750	3/8"	9.525	3/8"	4"	1-1/2"	.015"	-
50039	-	.3750	3/8"	9.525	3/8"	4"	2"	-	-
50041	-	.3750	3/8"	9.525	3/8"	4"	2"	.030"	-
51011	-	.3750	3/8"	9.525	3/8"	4"	1/2"	.015"	1-1/8"
50042	-	.3750	3/8"	9.525	3/8"	4"	7/8"	.015"	1-7/8"
51012	-	.3750	3/8"	9.525	3/8"	6"	1/2"	.015"	2-1/8"
51013	-	.3750	3/8"	9.525	3/8"	6"	1/2"	.015"	3-1/8"
51014	-	.3750	3/8"	9.525	3/8"	6"	1/2"	.015"	4-1/8"
50043	-	.3937	10.000	10.0	70	22	-	-	-
51015	-	.3937	10.000	10.0	70	22	0.30	-	-
50044	-	.3937	10.000	10.0	70	22	0.50	-	-
51016	-	.3937	10.000	10.0	70	22	0.75	-	-
51017	-	.3937	10.000	10.0	70	22	1.00	-	-
50045	-	.3937	10.000	10.0	75	22	-	32	9.0
50046	-	.3937	10.000	10.0	75	22	0.50	32	9.0
51018	-	.3937	10.000	10.0	75	22	0.75	32	9.0
50047	-	.3937	10.000	10.0	75	22	1.00	32	9.0
51019	-	.4724	12.000	12.0	65	19	-	-	-
51020	-	.4724	12.000	12.0	65	19	0.50	-	-
50484	50485	.4724	12.000	12.0	75	26	-	-	-
51021	-	.4724	12.000	12.0	75	26	0.30	-	-
50486	50487	.4724	12.000	12.0	75	26	0.50	-	-
51022	-	.4724	12.000	12.0	75	26	0.75	-	-
51023	-	.4724	12.000	12.0	75	26	1.00	-	-
50112	-	.4724	12.000	12.0	75	26	2.00	-	-
50115	-	.4724	12.000	12.0	75	26	2.50	-	-
50048	50299	.4724	12.000	12.0	75	32	-	-	-
51024	-	.4724	12.000	12.0	75	32	0.30	-	-
50049	50300	.4724	12.000	12.0	75	32	0.50	-	-
51025	-	.4724	12.000	12.0	75	32	0.75	-	-
51026	-	.4724	12.000	12.0	75	32	1.00	-	-
51027	-	.4724	12.000	12.0	100	38	-	-	-
51028	-	.4724	12.000	12.0	100	38	0.50	-	-
50423	-	.4724	12.000	12.0	100	42	-	-	-
50425	-	.4724	12.000	12.0	100	42	0.30	-	-
50427	-	.4724	12.000	12.0	100	42	0.50	-	-
50429	-	.4724	12.000	12.0	100	42	1.00	-	-
50431	-	.4724	12.000	12.0	100	42	2.00	-	-
51029	-	.4724	12.000	12.0	100	52	-	-	-
51030	-	.4724	12.000	12.0	100	52	0.50	-	-
50051	50301	.4724	12.000	12.0	100	26	-	38	10.8
50052	50302	.4724	12.000	12.0	100	26	0.50	38	10.8
50053	50303	.4724	12.000	12.0	100	26	1.00	38	10.8

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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
(plain)	(weldon)	Decimal	1/2"	Metric						
50054	50304	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	-	-	-
50106	50305	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.010"	-	-
50055	50306	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.020"	-	-
50107	50307	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"	-	-
50056	50308	.5000	1/2"	12.700	1/2"	3"	1"	-	-	-
50108	50309	.5000	1/2"	12.700	1/2"	3"	1"	.010"	-	-
50057	50310	.5000	1/2"	12.700	1/2"	3"	1"	.020"	-	-
50109	50311	.5000	1/2"	12.700	1/2"	3"	1"	.030"	-	-
50058	50312	.5000	1/2"	12.700	1/2"	3"	1-1/4"	-	-	-
50111	50313	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.010"	-	-
50059	50314	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.015"	-	-
50061	50315	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.020"	-	-
50062	50316	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	-
50063	50317	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.045"	-	-
50064	50318	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"	-	-
50065	50319	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.090"	-	-
50433	50435	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.010"	-	-
51031	-	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.015"	-	-
51032	-	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.030"	-	-
50436	50437	.5000	1/2"	12.700	1/2"	4"	1-5/8"	-	-	-
50438	50439	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.010"	-	-
50440	50441	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.020"	-	-
50442	50443	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.030"	-	-
50444	50445	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.040"	-	-
50446	50447	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.060"	-	-
50067	50321	.5000	1/2"	12.700	1/2"	4"	2-1/8"	-	-	-
51033	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.015"	-	-
50068	50322	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.030"	-	-
51034	-	.5000	1/2"	12.700	1/2"	6"	1"	.030"	-	-
51035	-	.5000	1/2"	12.700	1/2"	6"	3-1/8"	-	-	-
51036	-	.5000	1/2"	12.700	1/2"	6"	3-1/8"	.030"	-	-
51037	-	.5000	1/2"	12.700	1/2"	4"	5/8"	.015"	1-1/2"	.475"
51038	-	.5000	1/2"	12.700	1/2"	4"	5/8"	.015"	2-1/4"	.475"
50066	50320	.5000	1/2"	12.700	1/2"	4"	1-1/4"	.030"	2-1/4"	.475"
51039	-	.5000	1/2"	12.700	1/2"	6"	5/8"	.015"	3-3/8"	.475"
51040	-	.5000	1/2"	12.700	1/2"	6"	5/8"	.015"	4-1/8"	.475"

EDP#		$d1^{\dagger}$ Diameter			$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	$l3$ Reach Length	$d3$ Neck Diameter
(plain)	(weldon)	Decimal		Metric						
50069	50323	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	-	-	-
51041	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.020"	-	-
50071	50324	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	-	-
50072	50325	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	-	-
50401	50402	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.120"	-	-
51042	-	.6250	5/8"	15.875	5/8"	4"	1-5/8"	-	-	-
51043	-	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.030"	-	-
51044	-	.6250	5/8"	15.875	5/8"	4"	2-1/8"	-	-	-
51045	-	.6250	5/8"	15.875	5/8"	4"	2-1/8"	.030"	-	-
51046	-	.6250	5/8"	15.875	5/8"	6"	2-1/2"	.030"	-	-
50403	50404	.6250	5/8"	15.875	5/8"	6"	3-1/8"	.030"	-	-
51047	-	.6250	5/8"	15.875	5/8"	6"	3-1/8"	.060"	-	-
51048	-	.6250	5/8"	15.875	5/8"	6"	3-1/2"	.030"	-	-
51049	-	.6250	5/8"	15.875	5/8"	4"	3/4"	.030"	1-5/8"	.590"
50073	50326	.6250	5/8"	15.875	5/8"	4"	1-1/4"	.030"	2-1/4"	.590"
51050	-	.6250	5/8"	15.875	5/8"	6"	3/4"	.030"	2-3/8"	.590"
51051	-	.6250	5/8"	15.875	5/8"	6"	3/4"	.030"	3-3/8"	.590"
51052	-	.6250	5/8"	15.875	5/8"	6"	3/4"	.030"	4-1/8"	.590"
51053	-	.6299		16.000	16.0	75	19	-	-	-
51054	-	.6299		16.000	16.0	75	19	0.50	-	-
50074	50327	.6299		16.000	16.0	88	32	-	-	-
50075	50328	.6299		16.000	16.0	88	32	0.50	-	-
50420	-	.6299		16.000	16.0	88	32	1.00	-	-
51055	-	.6299		16.000	16.0	88	32	2.00	-	-
50422	-	.6299		16.000	16.0	88	32	3.00	-	-
50424	-	.6299		16.000	16.0	88	32	4.00	-	-
50430	-	.6299		16.000	16.0	100	40	0.50	-	-
50432	-	.6299		16.000	16.0	100	40	1.00	-	-
50434	-	.6299		16.000	16.0	100	40	3.00	-	-
50076	50329	.6299		16.000	16.0	100	32	-	50	14.4
50077	-	.6299		16.000	16.0	100	32	0.50	50	14.4
50426	-	.6299		16.000	16.0	100	32	1.00	50	14.4
51056	-	.6299		16.000	16.0	100	32	2.00	50	14.4
50428	-	.6299		16.000	16.0	100	32	3.00	50	14.4
50078	-	.7087		18.000	18.0	100	32	0.75	-	-

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MATERIAL HARDNESS (Rc)

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continued →

Series V5 (continued)

.7500"
(19.050mm)

EDP#		$d1$ †			$d2$	$l1$	$l2$	r	$l3$	$d3$
(plain)	(weldon)	Decimal	Diameter	Metric	Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter
50079	50332	.7500	3/4"	19.050	3/4"	3"	7/8"	-	-	-
51103	-	.7500	3/4"	19.050	3/4"	3"	7/8"	.015"	-	-
50081	50333	.7500	3/4"	19.050	3/4"	3"	7/8"	.030"	-	-
51057	-	.7500	3/4"	19.050	3/4"	3"	7/8"	.060"	-	-
51105	-	.7500	3/4"	19.050	3/4"	3"	7/8"	.120"	-	-
51107	-	.7500	3/4"	19.050	3/4"	4"	1-1/4"	.015"	-	-
51058	-	.7500	3/4"	19.050	3/4"	4"	1-1/4"	.030"	-	-
51109	-	.7500	3/4"	19.050	3/4"	4"	1-1/4"	.060"	-	-
50082	50334	.7500	3/4"	19.050	3/4"	4"	1-1/2"	-	-	-
51111	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"	-	-
50083	50335	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	-	-
50084	50336	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	-	-
51059	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.078"	-	-
50085	50337	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.120"	-	-
51113	-	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.190"	-	-
51060	-	.7500	3/4"	19.050	3/4"	4"	1-5/8"	-	-	-
51115	-	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.015"	-	-
51061	-	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.030"	-	-
51119	-	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.060"	-	-
51062	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	-	-	-
51121	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.015"	-	-
51063	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.030"	-	-
50086	50338	.7500	3/4"	19.050	3/4"	5"	2-1/8"	-	-	-
51125	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.015"	-	-
50087	50339	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.030"	-	-
51064	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.060"	-	-
51065	-	.7500	3/4"	19.050	3/4"	5"	2-1/8"	.120"	-	-
51127	-	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.015"	-	-
51066	-	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.030"	-	-
51129	-	.7500	3/4"	19.050	3/4"	5"	2-1/4"	.060"	-	-
51131	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.015"	-	-
51067	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.030"	-	-
51133	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.060"	-	-
51135	-	.7500	3/4"	19.050	3/4"	5"	2-3/4"	.015"	-	-
51068	-	.7500	3/4"	19.050	3/4"	5"	2-3/4"	.030"	-	-
51137	-	.7500	3/4"	19.050	3/4"	5"	2-3/4"	.060"	-	-
50089	50341	.7500	3/4"	19.050	3/4"	6"	3-1/4"	-	-	-
51139	-	.7500	3/4"	19.050	3/4"	6"	3-1/4"	.015"	-	-
50091	50342	.7500	3/4"	19.050	3/4"	6"	3-1/4"	.030"	-	-
51141	-	.7500	3/4"	19.050	3/4"	6"	3-1/4"	.060"	-	-
51143	-	.7500	3/4"	19.050	3/4"	7"	4-1/4"	.015"	-	-
51145	-	.7500	3/4"	19.050	3/4"	7"	4-1/4"	.030"	-	-
51147	-	.7500	3/4"	19.050	3/4"	7"	4-1/4"	.060"	-	-
51069	-	.7500	3/4"	19.050	3/4"	4"	1"	.030"	2"	.705"
51070	-	.7500	3/4"	19.050	3/4"	5"	1"	.030"	2-1/2"	.705"
50088	50340	.7500	3/4"	19.050	3/4"	5-1/2"	1-1/2"	.030"	3-1/4"	.705"
51071	-	.7500	3/4"	19.050	3/4"	6"	1"	.030"	4-1/8"	.705"

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
(plain)	(weldon)	Decimal	Metric						
50092	50343	.7874	20.000	20.0	100	38	-	-	-
51072	-	.7874	20.000	20.0	100	38	0.50	-	-
50093	50344	.7874	20.000	20.0	100	38	0.75	-	-
51073	-	.7874	20.000	20.0	100	38	1.00	-	-
51074	-	.7874	20.000	20.0	100	38	1.50	-	-
51075	-	.7874	20.000	20.0	100	38	2.00	-	-
51076	-	.7874	20.000	20.0	100	38	3.00	-	-
51077	-	.9843	25.000	25.0	100	38	-	-	-
51078	-	.9843	25.000	25.0	100	38	0.50	-	-
51079	-	.9843	25.000	25.0	100	38	0.75	-	-
51080	-	.9843	25.000	25.0	100	38	1.50	-	-
51081	-	.9843	25.000	25.0	100	38	3.00	-	-
50094	-	1.000	1"	25.400	1"	4"	1-1/4"	-	-
50095	-	1.000	1"	25.400	1"	4"	1-1/4"	.030"	-
51082	-	1.000	1"	25.400	1"	4"	1-1/4"	.120"	-
-	50348	1.000	1"	25.400	1"	4"	1-1/2"	-	-
-	50349	1.000	1"	25.400	1"	4"	1-1/2"	.030"	-
-	50350	1.000	1"	25.400	1"	4"	1-1/2"	.060"	-
51083	-	1.000	1"	25.400	1"	4"	1-1/2"	.120"	-
50116	-	1.000	1"	25.400	1"	4"	1-1/2"	.125"	-
50097	-	1.000	1"	25.400	1"	4"	1-3/4"	-	-
50098	-	1.000	1"	25.400	1"	4"	1-3/4"	.030"	-
50099	-	1.000	1"	25.400	1"	4"	1-3/4"	.060"	-
51084	-	1.000	1"	25.400	1"	4"	1-3/4"	.120"	-
51085	-	1.000	1"	25.400	1"	4-1/2"	2"	.030"	-
51087	-	1.000	1"	25.400	1"	4-1/2"	2"	.120"	-
51088	-	1.000	1"	25.400	1"	4-1/2"	2"	.250"	-
51089	-	1.000	1"	25.400	1"	5"	2-1/2"	.030"	-
51090	-	1.000	1"	25.400	1"	5"	2-5/8"	.030"	-
50104	50354	1.000	1"	25.400	1"	6"	3-1/4"	-	-
50105	-	1.000	1"	25.400	1"	6"	3-1/4"	.030"	-
51091	-	1.000	1"	25.400	1"	6"	3-3/8"	.060"	-
51092	-	1.000	1"	25.400	1"	7"	4-1/4"	.030"	-
51093	-	1.000	1"	25.400	1"	7"	4-1/4"	.060"	-
51094	-	1.000	1"	25.400	1"	5"	1-1/4"	.030"	2-5/8"
50101	-	1.000	1"	25.400	1"	5-1/2"	1-3/4"	.030"	3-1/4"
50102	50352	1.000	1"	25.400	1"	5-1/2"	1-3/4"	.060"	3-1/4"
51095	-	1.000	1"	25.400	1"	6"	1-1/4"	.030"	3-3/8"
51096	-	1.000	1"	25.400	1"	7"	1-1/4"	.030"	4-1/4"

70

35

MATERIAL HARDNESS (Rc)

0

Series V5C - Chip Splitter

HIGH EFFICIENCY MILLING

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



TECH
PAGES
312-313

TOLERANCES

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

Recommended for titanium and tool steels under 45Rc

Variable Helix End Mill

AlCrN Coating

Solid submicron grain carbide end mill - center cutting

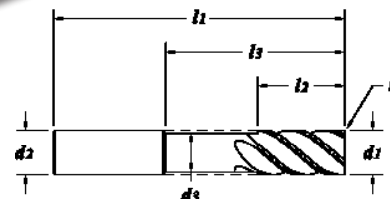
Chip splitter to help break long chips

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



EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	$l3$ Reach Length	$d3$ Neck Diameter
	Decimal	Metric						
50801	.4724	12.000	12.0	100	42	0.30	-	-
50800	.4724	12.000	12.0	100	42	1.00	-	-
50803	.5000	12.700	1/2"	3"	1"	-	-	-
50807	.5000	12.700	1/2"	3"	1"	.015"	-	-
50805	.5000	12.700	1/2"	3"	1"	.020"	-	-
50809	.5000	12.700	1/2"	3"	1"	.030"	-	-
50811	.5000	12.700	1/2"	3"	1-1/4"	.015"	-	-
50810	.5000	12.700	1/2"	3"	1-1/4"	.020"	-	-
50815	.5000	12.700	1/2"	3"	1-1/4"	.030"	-	-
50813	.5000	12.700	1/2"	3"	1-1/4"	.060"	-	-
50820	.5000	12.700	1/2"	3"	1-1/4"	.090"	-	-
50825	.5000	12.700	1/2"	4"	1-1/2"	.010"	-	-
50817	.5000	12.700	1/2"	4"	1-1/2"	.030"	-	-
50830	.5000	12.700	1/2"	4"	1-5/8"	-	-	-
50819	.5000	12.700	1/2"	4"	1-5/8"	.030"	-	-
50835	.5000	12.700	1/2"	4"	2-1/8"	-	-	-
50836	.5000	12.700	1/2"	4"	2-1/8"	.030"	-	-
50821	.5000	12.700	1/2"	4"	5/8"	.015"	1-1/2"	.475"
50823	.6250	15.875	5/8"	3-1/2"	1-1/4"	.020"	-	-
50840	.6250	15.875	5/8"	3-1/2"	1-1/4"	.030"	-	-
50827	.6250	15.875	5/8"	4"	1-5/8"	-	-	-
50829	.6250	15.875	5/8"	4"	1-5/8"	.030"	-	-
50845	.6250	15.875	5/8"	4"	2-1/8"	.030"	-	-
50831	.6250	15.875	5/8"	6"	2-1/2"	.030"	-	-
50833	.6299	16.000	16.0	100	40	0.50	-	-
50837	.6299	16.000	16.0	100	40	1.00	-	-
50839	.7500	19.050	3/4"	3"	7/8"	-	-	-
50841	.7500	19.050	3/4"	3"	7/8"	.030"	-	-
50843	.7500	19.050	3/4"	4"	1-1/2"	.030"	-	-
50847	.7500	19.050	3/4"	4"	1-1/2"	.060"	-	-
50850	.7500	19.050	3/4"	4"	1-1/2"	.120"	-	-
50849	.7500	19.050	3/4"	4"	1-3/4"	-	-	-
50851	.7500	19.050	3/4"	4"	1-3/4"	.030"	-	-
50855	.7500	19.050	3/4"	5"	2-1/8"	.030"	-	-
50853	.7500	19.050	3/4"	5"	2-1/4"	.030"	-	-
50857	.7500	19.050	3/4"	5"	2-1/2"	.030"	-	-
50859	.7500	19.050	3/4"	5"	2-3/4"	.015"	-	-
50861	.7500	19.050	3/4"	5"	2-3/4"	.030"	-	-
50863	.7500	19.050	3/4"	6"	3-1/4"	-	-	-
50860	.7500	19.050	3/4"	6"	3-1/4"	.030"	-	-
50867	.7500	19.050	3/4"	7"	4-1/4"	.015"	-	-
50869	1.000	25.400	1"	5"	2-1/2"	.030"	-	-
50871	1.000	25.400	1"	5"	2-5/8"	.030"	-	-
50873	1.000	25.400	1"	6"	3-1/4"	.030"	-	-

MATERIAL HARDNESS (Rc)

70

35

0

SERIES HIGHLIGHT

Series VRX

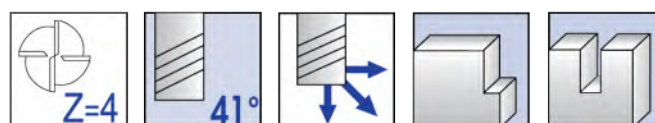
HIGH PERFORMANCE
END MILLS

S M P K

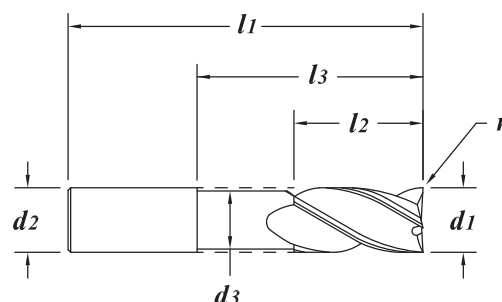
High Performance End Mills AlTiN Coated

Target Materials:

Inconel
pH Materials
Titanium
Tool steels over 40Rc



CALCULATE IDEAL PARAMETERS
FOR THE VRX IN YOUR APPLICATION
WITH THE GARR
TECHNICAL ADVISOR



VRX



View the VRX →



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



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308-309

TOLERANCES

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

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

Square End, Corner Radius, Ball End

AlTiN Coating

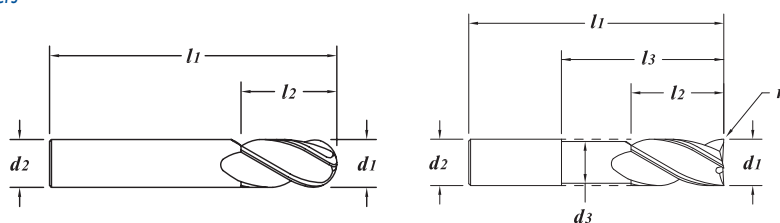
Solid submicron grain carbide end mill - center cutting

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



EDP#		d_1 †		d_2	l_1	l_2	r	l_3	d_3
		Decimal	Metric	Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter
61084	(plain)	.0591	1.500	3.0	38	3.0	-	-	-
61086	(weldon)	.0591	1.500	3.0	38	3.0	0.20	-	-
61088	(plain)	.0591	1.500	3.0	38	3.0	BALL	-	-
61090	(weldon)	.0591	1.500	3.0	38	6.0	-	-	-
61092	(plain)	.0591	1.500	3.0	38	6.0	0.20	-	-
61094	(weldon)	.0591	1.500	3.0	38	6.0	BALL	-	-
61096	(plain)	.0625	1/16"	1.588	1/8"	1-1/2"	-	-	-
61098	(weldon)	.0625	1/16"	1.588	1/8"	1-1/2"	.010"	-	-
61100	(plain)	.0625	1/16"	1.588	1/8"	1-1/2"	BALL	-	-
61102	(weldon)	.0625	1/16"	1.588	1/8"	1-1/2"	-	-	-
61104	(plain)	.0625	1/16"	1.588	1/8"	1-1/2"	.010"	-	-
61106	(weldon)	.0625	1/16"	1.588	1/8"	1-1/2"	BALL	-	-
61108	(plain)	.0787	2.000	3.0	38	4.0	-	-	-
61110	(weldon)	.0787	2.000	3.0	38	4.0	0.20	-	-
61112	(plain)	.0787	2.000	3.0	38	4.0	BALL	-	-
61114	(weldon)	.0787	2.000	3.0	38	8.0	-	-	-
61116	(plain)	.0787	2.000	3.0	38	8.0	0.20	-	-
61118	(weldon)	.0787	2.000	3.0	38	8.0	BALL	-	-
61120	(plain)	.0938	3/32"	2.383	1/8"	1-1/2"	-	-	-
61122	(weldon)	.0938	3/32"	2.383	1/8"	1-1/2"	.010"	-	-
61124	(plain)	.0938	3/32"	2.383	1/8"	1-1/2"	BALL	-	-
61126	(weldon)	.0938	3/32"	2.383	1/8"	1-1/2"	-	-	-
61128	(plain)	.0938	3/32"	2.383	1/8"	1-1/2"	.010"	-	-
61130	(weldon)	.0938	3/32"	2.383	1/8"	1-1/2"	BALL	-	-
61877	(plain)	.1181	3.000	3.0	38	8	-	-	-
27420	(weldon)	.1181	3.000	3.0	50	8	0.20	-	-
61132	(plain)	.1181	3.000	3.0	50	8	0.30	-	-
27425	(weldon)	.1181	3.000	3.0	50	8	0.50	-	-
61134	(plain)	.1181	3.000	3.0	50	8	BALL	-	-
61887	(weldon)	.1181	3.000	3.0	38	12	-	-	-
27430	(plain)	.1181	3.000	3.0	50	12	0.20	-	-
61136	(weldon)	.1181	3.000	3.0	50	12	0.30	-	-
27435	(plain)	.1181	3.000	3.0	50	12	0.50	-	-
61138	(weldon)	.1181	3.000	3.0	50	12	BALL	-	-

EDP#		$d1^{\dagger}$			$d2$	$l1$	$l2$	r	$l3$	$d3$
(plain)	(weldon)	Decimal	Diameter	Metric	Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter
61917	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	-	-	-
27440	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.010"	-	-
61140	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.015"	-	-
61073	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.030"	-	-
61142	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	BALL	-	-
61144	-	.1250	1/8"	3.175	1/8"	1-1/2"	3/8"	-	-	-
61146	-	.1250	1/8"	3.175	1/8"	1-1/2"	3/8"	.010"	-	-
61148	-	.1250	1/8"	3.175	1/8"	1-1/2"	3/8"	.015"	-	-
61074	-	.1250	1/8"	3.175	1/8"	1-1/2"	3/8"	.030"	-	-
61149	-	.1250	1/8"	3.175	1/8"	1-1/2"	3/8"	BALL	-	-
61927	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	-	-	-
27450	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.010"	-	-
61150	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.015"	-	-
27455	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.020"	-	-
61075	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.030"	-	-
61152	-	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	BALL	-	-
NEW 61929	-	.1250	1/8"	3.175	1/8"	2-1/2"	3/4"	-	-	-
61154	-	.1562	5/32"	3.967	3/16"	2"	5/16"	-	-	-
27460	-	.1562	5/32"	3.967	3/16"	2"	5/16"	.010"	-	-
61156	-	.1562	5/32"	3.967	3/16"	2"	5/16"	.015"	-	-
61076	-	.1562	5/32"	3.967	3/16"	2"	5/16"	.030"	-	-
61077	-	.1562	5/32"	3.967	3/16"	2"	5/16"	BALL	-	-
61158	-	.1562	5/32"	3.967	3/16"	2"	1/2"	-	-	-
27470	-	.1562	5/32"	3.967	3/16"	2"	1/2"	.010"	-	-
61160	-	.1562	5/32"	3.967	3/16"	2"	1/2"	.015"	-	-
61078	-	.1562	5/32"	3.967	3/16"	2"	1/2"	.030"	-	-
61079	-	.1562	5/32"	3.967	3/16"	2"	1/2"	BALL	-	-
NEW 61083	-	.1562	5/32"	3.967	3/16"	2-1/2"	3/4"	-	-	-
NEW 61085	-	.1562	5/32"	3.967	3/16"	2-1/2"	3/4"	.010"	-	-
NEW 61087	-	.1562	5/32"	3.967	3/16"	2-1/2"	3/4"	.015"	-	-
61162	-	.1575		4.000	6.0	50	8	-	-	-
27480	-	.1575		4.000	6.0	50	8	0.30	-	-
61164	-	.1575		4.000	6.0	50	8	0.50	-	-
28470	-	.1575		4.000	6.0	50	8	BALL	-	-
61977	-	.1575		4.000	6.0	50	12	-	-	-
27490	-	.1575		4.000	6.0	50	12	0.30	-	-
27495	-	.1575		4.000	6.0	50	12	0.50	-	-
28480	-	.1575		4.000	6.0	50	12	BALL	-	-
61166	-	.1575		4.000	6.0	65	19	-	-	-
61168	-	.1575		4.000	6.0	65	19	0.30	-	-
62007	-	.1875	3/16"	4.763	3/16"	2"	5/16"	-	-	-
27500	-	.1875	3/16"	4.763	3/16"	2"	5/16"	.010"	-	-
61170	-	.1875	3/16"	4.763	3/16"	2"	5/16"	.015"	-	-
61172	-	.1875	3/16"	4.763	3/16"	2"	5/16"	.020"	-	-
28490	-	.1875	3/16"	4.763	3/16"	2"	5/16"	BALL	-	-
61174	-	.1875	3/16"	4.763	3/16"	2"	7/16"	-	-	-
61176	-	.1875	3/16"	4.763	3/16"	2"	7/16"	.010"	-	-
61178	-	.1875	3/16"	4.763	3/16"	2"	7/16"	.015"	-	-
62017	-	.1875	3/16"	4.763	3/16"	2"	9/16"	-	-	-
27520	-	.1875	3/16"	4.763	3/16"	2"	9/16"	.010"	-	-
61180	-	.1875	3/16"	4.763	3/16"	2"	9/16"	.015"	-	-
27521	-	.1875	3/16"	4.763	3/16"	2"	9/16"	.020"	-	-
61182	-	.1875	3/16"	4.763	3/16"	2"	9/16"	.030"	-	-
28500	-	.1875	3/16"	4.763	3/16"	2"	9/16"	BALL	-	-
61184	-	.1875	3/16"	4.763	3/16"	3"	1"	.010"	-	-
61186	-	.1875	3/16"	4.763	3/16"	3"	1-1/4"	.010"	-	-
63100	-	.1875	3/16"	4.763	3/16"	4"	5/16"	.010"	-	-

continued →

Series VRX (continued)

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

EDP#		$d1$ †		$d2$	$l1$	$l2$	r	$l3$	$d3$
(plain)	(weldon)	Decimal	Diameter	Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter
61188	-	.1969	5.000	6.0	50	10	-	-	-
27522	-	.1969	5.000	6.0	50	10	0.30	-	-
61190	-	.1969	5.000	6.0	50	10	0.50	-	-
28510	-	.1969	5.000	6.0	50	10	BALL	-	-
62057	-	.1969	5.000	6.0	65	15	-	-	-
27524	-	.1969	5.000	6.0	65	15	0.30	-	-
27526	-	.1969	5.000	6.0	65	15	0.50	-	-
27528	-	.1969	5.000	6.0	65	15	1.00	-	-
28520	-	.1969	5.000	6.0	65	15	BALL	-	-
63110	-	.1969	5.000	6.0	100	10	0.30	-	-
61192	-	.1969	5.000	6.0	100	10	0.30	55	4.70
61194	-	.2188	7/32"	5.558	1/4"	2"	3/8"	-	-
61196	-	.2188	7/32"	5.558	1/4"	2"	3/8"	.010"	-
27525	-	.2188	7/32"	5.558	1/4"	2"	3/8"	.015"	-
61198	-	.2188	7/32"	5.558	1/4"	2"	3/8"	BALL	-
61200	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	-	-
61202	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	.010"	-
27530	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	.015"	-
61204	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	.020"	-
61206	-	.2188	7/32"	5.558	1/4"	2-1/2"	3/4"	BALL	-
61208	-	.2188	7/32"	5.558	1/4"	3"	1-1/4"	.015"	-
63120	-	.2188	7/32"	5.558	1/4"	4"	3/8"	.015"	-
61210	-	.2188	7/32"	5.558	1/4"	4"	3/8"	.015"	2-1/4"
62077	-	.2362	6.000	6.0	50	12	-	-	-
27535	-	.2362	6.000	6.0	50	12	0.30	-	-
61212	-	.2362	6.000	6.0	50	12	0.50	-	-
61214	-	.2362	6.000	6.0	50	12	0.75	-	-
28530	-	.2362	6.000	6.0	50	12	BALL	-	-
62087	-	.2362	6.000	6.0	65	19	-	-	-
61216	-	.2362	6.000	6.0	65	19	0.20	-	-
27540	-	.2362	6.000	6.0	65	19	0.30	-	-
27545	-	.2362	6.000	6.0	65	19	0.50	-	-
61218	-	.2362	6.000	6.0	65	19	0.75	-	-
27547	-	.2362	6.000	6.0	65	19	1.00	-	-
27548	-	.2362	6.000	6.0	65	19	1.50	-	-
28540	-	.2362	6.000	6.0	65	19	BALL	-	-
61220	-	.2362	6.000	6.0	75	26	0.30	-	-
61222	-	.2362	6.000	6.0	75	26	0.50	-	-
61224	-	.2362	6.000	6.0	75	38	0.30	-	-
61226	-	.2362	6.000	6.0	75	38	0.50	-	-
63130	-	.2362	6.000	6.0	100	12	0.30	32	5.70
62137	-	.2500	1/4"	6.350	1/4"	2"	3/8"	-	-
61228	-	.2500	1/4"	6.350	1/4"	2"	3/8"	.010"	-
27560	-	.2500	1/4"	6.350	1/4"	2"	3/8"	.015"	-
61230	-	.2500	1/4"	6.350	1/4"	2"	3/8"	.020"	-
28570	-	.2500	1/4"	6.350	1/4"	2"	3/8"	BALL	-
61232	-	.2500	1/4"	6.350	1/4"	2"	1/2"	-	-
61234	-	.2500	1/4"	6.350	1/4"	2"	1/2"	.015"	-
62147	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	-	-
27570	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"	-
27580	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	-
61236	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"	-
27581	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	-
61238	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.040"	-

EDP# (plain) (weldon)	d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	l_3 Reach Length	d_3 Neck Diameter
	Decimal		Metric						
27583	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.060"	-
28580	-	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	BALL	-
61240	-	.2500	1/4"	6.350	1/4"	3"	1"	.015"	-
61241	-	.2500	1/4"	6.350	1/4"	3"	1-1/8"	.030"	-
61242	-	.2500	1/4"	6.350	1/4"	3"	1-1/2"	.015"	-
61244	-	.2500	1/4"	6.350	1/4"	4"	3/8"	.015"	3/4"
63140	-	.2500	1/4"	6.350	1/4"	4"	3/8"	.015"	1-1/4"
61246	-	.2500	1/4"	6.350	1/4"	4"	3/8"	.015"	2-1/8"
27585	-	.2756		7.000	8.0	50	12	0.30	-
27590	-	.2756		7.000	8.0	65	22	0.30	-
61248	-	.2812	9/32"	7.142	5/16"	2"	7/16"	-	-
27595	-	.2812	9/32"	7.142	5/16"	2"	7/16"	.015"	-
61250	-	.2812	9/32"	7.142	5/16"	2-1/2"	13/16"	-	-
61252	-	.2812	9/32"	7.142	5/16"	2-1/2"	13/16"	.010"	-
27597	-	.2812	9/32"	7.142	5/16"	2-1/2"	13/16"	.015"	-
61254	-	.2812	9/32"	7.142	5/16"	2-1/2"	13/16"	.020"	-
63150	-	.2812	9/32"	7.142	5/16"	4"	7/16"	.015"	-
62207	-	.3125	5/16"	7.938	5/16"	2"	7/16"	-	-
61256	-	.3125	5/16"	7.938	5/16"	2"	7/16"	.010"	-
61258	-	.3125	5/16"	7.938	5/16"	2"	7/16"	.015"	-
27600	-	.3125	5/16"	7.938	5/16"	2"	7/16"	.020"	-
61260	-	.3125	5/16"	7.938	5/16"	2"	7/16"	.030"	-
28610	-	.3125	5/16"	7.938	5/16"	2"	7/16"	BALL	-
62217	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	-	-
27610	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.010"	-
61262	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.015"	-
27620	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.020"	-
27622	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.030"	-
61264	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.040"	-
27624	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.060"	-
28620	-	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	BALL	-
61266	-	.3125	5/16"	7.938	5/16"	3"	1-1/4"	.015"	-
63160	-	.3125	5/16"	7.938	5/16"	4"	7/16"	.020"	1-7/8"
62257	-	.3150		8.000	8.0	50	12	-	-
61268	-	.3150		8.000	8.0	50	12	0.30	-
27630	-	.3150		8.000	8.0	50	12	0.50	-
61270	-	.3150		8.000	8.0	50	12	0.75	-
28630	-	.3150		8.000	8.0	50	12	BALL	-
62267	-	.3150		8.000	8.0	65	22	-	-
27635	-	.3150		8.000	8.0	65	22	0.30	-
27640	-	.3150		8.000	8.0	65	22	0.50	-
61272	-	.3150		8.000	8.0	65	22	0.75	-
27642	-	.3150		8.000	8.0	65	22	1.00	-
27643	-	.3150		8.000	8.0	65	22	1.50	-
61274	-	.3150		8.000	8.0	65	22	2.00	-
28640	-	.3150		8.000	8.0	65	22	BALL	-
61276	-	.3150		8.000	8.0	75	38	0.50	-
61278	-	.3150		8.000	8.0	100	50	0.50	-
63170	-	.3150		8.000	8.0	100	12	0.50	47
61280	-	.3438	11/32"	8.733	3/8"	2"	1/2"	-	-
27645	-	.3438	11/32"	8.733	3/8"	2"	1/2"	.020"	-
61282	-	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	-	-
27650	-	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"	.020"	-
61284	-	.3438	11/32"	8.733	3/8"	3"	1-1/4"	.015"	-

continued →

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MATERIAL HARDNESS (Rc)

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Series VRX (continued)

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



TECH
PAGES
308-309

TOLERANCES

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

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#		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
		Decimal	Metric							
63180	(plain)	.3438	11/32"	8.733	3/8"	4"	1/2"	.020"	-	-
27655	(weldon)	.3543		9.000	10.0	50	14	0.50	-	-
62287		.3543		9.000	10.0	65	22	-	-	-
27657		.3543		9.000	10.0	65	22	0.50	-	-
62317		.3750	3/8"	9.525	3/8"	2"	1/2"	-	-	-
27658		.3750	3/8"	9.525	3/8"	2"	1/2"	.010"	-	-
61286		.3750	3/8"	9.525	3/8"	2"	1/2"	.015"	-	-
27660		.3750	3/8"	9.525	3/8"	2"	1/2"	.020"	-	-
27662		.3750	3/8"	9.525	3/8"	2"	1/2"	.030"	-	-
61288		.3750	3/8"	9.525	3/8"	2"	1/2"	.060"	-	-
28670		.3750	3/8"	9.525	3/8"	2"	1/2"	BALL	-	-
28676	NEW	.3750	3/8"	9.525	3/8"	2"	5/8"	.045"	-	-
62327		.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	-	-	-
27670		.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.010"	-	-
61290		.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.015"	-	-
27680		.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.020"	-	-
27682		.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	-	-
61292		.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.040"	-	-
61294		.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.050"	-	-
27684		.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.060"	-	-
61296		.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.094"	-	-
28680		.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	BALL	-	-
61298		.3750	3/8"	9.525	3/8"	3"	1-1/4"	.015"	-	-
61299		.3750	3/8"	9.525	3/8"	3"	1-1/4"	.030"	-	-
61300		.3750	3/8"	9.525	3/8"	4"	1-1/2"	.015"	-	-
61302		.3750	3/8"	9.525	3/8"	4"	1-1/2"	BALL	-	-
61304		.3750	3/8"	9.525	3/8"	4"	2"	.015"	-	-
61306		.3750	3/8"	9.525	3/8"	4"	1/2"	.015"	1-1/8"	.360"
63190		.3750	3/8"	9.525	3/8"	4"	1/2"	.020"	1-7/8"	.360"
61308		.3750	3/8"	9.525	3/8"	4"	1/2"	.015"	2-1/8"	.360"
61310		.3750	3/8"	9.525	3/8"	6"	1/2"	.015"	3-1/8"	.360"
61312		.3937		10.000	10.0	50	16	-	-	-
27690		.3937		10.000	10.0	50	16	0.50	-	-
61314		.3937		10.000	10.0	50	16	1.00	-	-
28690		.3937		10.000	10.0	50	16	BALL	-	-
62397		.3937		10.000	10.0	70	22	-	-	-
27698		.3937		10.000	10.0	70	22	0.30	-	-
27700		.3937		10.000	10.0	70	22	0.50	-	-
61316		.3937		10.000	10.0	70	22	0.75	-	-
27702		.3937		10.000	10.0	70	22	1.00	-	-
28700		.3937		10.000	10.0	70	22	BALL	-	-
61318		.3937		10.000	10.0	70	32	0.50	-	-
61320		.3937		10.000	10.0	100	38	0.50	-	-
61322		.3937		10.000	10.0	100	50	0.50	-	-
63200		.3937		10.000	10.0	100	14	0.50	47	9.50

MATERIAL HARDNESS (Rc)

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EDP#		d_1 †			d_2	l_1	l_2	r	l_3	d_3
(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"	-	-
28705	-	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	BALL	-	-
62437	-	.4375	7/16"	11.113	7/16"	2-3/4"	7/8"	-	-	-
27708	-	.4375	7/16"	11.113	7/16"	2-3/4"	7/8"	.010"	-	-
27710	-	.4375	7/16"	11.113	7/16"	2-3/4"	7/8"	.020"	-	-
28710	-	.4375	7/16"	11.113	7/16"	2-3/4"	7/8"	BALL	-	-
63210	-	.4375	7/16"	11.113	7/16"	6"	1"	.020"	-	-
62475	-	.4724		12.000	12.0	65	19	-	-	-
27712	-	.4724		12.000	12.0	65	19	0.30	-	-
27715	-	.4724		12.000	12.0	65	19	0.50	-	-
28715	-	.4724		12.000	12.0	65	19	BALL	-	-
61324	-	.4724		12.000	12.0	75	26	-	-	-
61326	-	.4724		12.000	12.0	75	26	0.50	-	-
62485	-	.4724		12.000	12.0	75	32	-	-	-
27718	-	.4724		12.000	12.0	75	32	0.30	-	-
27720	-	.4724		12.000	12.0	75	32	0.50	-	-
61328	-	.4724		12.000	12.0	75	32	0.75	-	-
27722	-	.4724		12.000	12.0	75	32	1.00	-	-
27730	-	.4724		12.000	12.0	75	32	1.50	-	-
27735	-	.4724		12.000	12.0	75	32	2.00	-	-
61330	-	.4724		12.000	12.0	75	32	3.00	-	-
28720	-	.4724		12.000	12.0	75	32	BALL	-	-
61332	-	.4724		12.000	12.0	100	38	-	-	-
61334	-	.4724		12.000	12.0	100	38	0.50	-	-
61336	-	.4724		12.000	12.0	100	42	-	-	-
61338	-	.4724		12.000	12.0	100	42	0.50	-	-
61340	-	.4724		12.000	12.0	100	52	-	-	-
61342	-	.4724		12.000	12.0	100	52	0.50	-	-
63220	-	.4724		12.000	12.0	150	19	0.50	57	11.50
62525	62527	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	-	-	-
27739	27738	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.010"	-	-
61344	-	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.015"	-	-
27741	27740	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.020"	-	-
27743	27742	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"	-	-
61346	-	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.060"	-	-
28751	28750	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	BALL	-	-
61348	-	.5000	1/2"	12.700	1/2"	3"	1"	-	-	-
61350	-	.5000	1/2"	12.700	1/2"	3"	1"	.015"	-	-
61352	-	.5000	1/2"	12.700	1/2"	3"	1"	.030"	-	-
61354	-	.5000	1/2"	12.700	1/2"	3"	1"	.060"	-	-
61356	-	.5000	1/2"	12.700	1/2"	3"	1"	.125"	-	-
61358	-	.5000	1/2"	12.700	1/2"	3"	1"	BALL	-	-
62535	62537	.5000	1/2"	12.700	1/2"	3"	1-1/4"	-	-	-
27751	27750	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.010"	-	-
61360	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.015"	-	-
27761	27760	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.020"	-	-
27763	27762	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	-
61362	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.040"	-	-
61364	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.050"	-	-
27767	27764	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"	-	-
61366	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.078"	-	-
63398	63399	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.090"	-	-

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MATERIAL HARDNESS (Rc)

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continued →

Series VRX (continued)

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

EDP#		$d1$ † Diameter			$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	$l3$ Reach Length	$d3$ Neck Diameter
(plain)	(weldon)	Decimal	1/2"	Metric						
61368	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.094"	-	-
61370	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.100"	-	-
27769	27768	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.120"	-	-
61372	-	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.125"	-	-
28761	28760	.5000	1/2"	12.700	1/2"	3"	1-1/4"	BALL	-	-
28771	28770	.5000	1/2"	12.700	1/2"	4"	5/8"	BALL	-	-
61374	-	.5000	1/2"	12.700	1/2"	4"	1-1/2"	-	-	-
63401	63400	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.010"	-	-
61376	-	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.015"	-	-
63411	63410	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.030"	-	-
63421	63420	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.060"	-	-
63424	-	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.125"	-	-
61378	-	.5000	1/2"	12.700	1/2"	4"	1-1/2"	BALL	-	-
61380	-	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.015"	-	-
61382	-	.5000	1/2"	12.700	1/2"	4"	1-3/4"	.015"	-	-
62565	62567	.5000	1/2"	12.700	1/2"	4"	2"	-	-	-
63431	63430	.5000	1/2"	12.700	1/2"	4"	2"	.010"	-	-
61384	-	.5000	1/2"	12.700	1/2"	4"	2"	.015"	-	-
63441	63440	.5000	1/2"	12.700	1/2"	4"	2"	.030"	-	-
63451	63450	.5000	1/2"	12.700	1/2"	4"	2"	.060"	-	-
61386	-	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.015"	-	-
63241	63240	.5000	1/2"	12.700	1/2"	6"	2"	.020"	-	-
61388	-	.5000	1/2"	12.700	1/2"	6"	2-1/2"	.015"	-	-
61390	-	.5000	1/2"	12.700	1/2"	6"	2-1/2"	.030"	-	-
61392	-	.5000	1/2"	12.700	1/2"	6"	3-1/4"	.030"	-	-
61394	-	.5000	1/2"	12.700	1/2"	4"	5/8"	.015"	1-1/2"	.480"
61396	-	.5000	1/2"	12.700	1/2"	4"	5/8"	.015"	2-1/4"	.480"
63231	63230	.5000	1/2"	12.700	1/2"	4"	5/8"	.020"	2-1/4"	.480"
61398	-	.5000	1/2"	12.700	1/2"	6"	5/8"	.015"	3-3/8"	.480"
61400	-	.5000	1/2"	12.700	1/2"	6"	5/8"	.015"	4-1/8"	.480"
27766	27765	.5512		14.000	14.0	75	19	0.50	-	-
28781	28780	.5512		14.000	14.0	75	19	BALL	-	-
27771	27770	.5512		14.000	14.0	88	32	0.50	-	-
28786	28785	.5512		14.000	14.0	88	32	BALL	-	-
63261	63260	.5512		14.000	14.0	150	50	0.50	-	-
63251	-	.5512		14.000	14.0	150	19	0.50	57	13.50
62625	62627	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"	-	-	-
61402	-	.6250	5/8"	15.875	5/8"	3"	3/4"	-	-	-
63461	63460	.6250	5/8"	15.875	5/8"	3"	3/4"	.010"	-	-
61404	-	.6250	5/8"	15.875	5/8"	3"	3/4"	.015"	-	-
27781	27780	.6250	5/8"	15.875	5/8"	3"	3/4"	.025"	-	-
61406	-	.6250	5/8"	15.875	5/8"	3"	3/4"	.060"	-	-
28796	28795	.6250	5/8"	15.875	5/8"	3"	3/4"	BALL	-	-
62655	62657	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	-	-	-
27791	27790	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.010"	-	-
61408	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"	-	-
61410	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.020"	-	-
27801	27800	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.025"	-	-
61412	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	-	-
61414	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.040"	-	-
27803	27802	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	-	-
61416	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.078"	-	-
61418	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.094"	-	-
27805	27804	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.120"	-	-
61420	-	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.125"	-	-
28801	28800	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	BALL	-	-

EDP#		$d1$ †			$d2$	$l1$	$l2$	r	$l3$	$d3$
(plain)	(weldon)	Decimal	Diameter	Metric	Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter
61422	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	-	-	-
63501	63500	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.010"	-	-
61424	-	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.015"	-	-
63511	63510	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.030"	-	-
63521	63520	.6250	5/8"	15.875	5/8"	4"	1-1/2"	.060"	-	-
61426	-	.6250	5/8"	15.875	5/8"	4"	1-5/8"	-	-	-
61428	-	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.015"	-	-
61430	-	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.030"	-	-
61432	-	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.060"	-	-
62675	62677	.6250	5/8"	15.875	5/8"	4"	1-3/4"	-	-	-
63531	63530	.6250	5/8"	15.875	5/8"	4"	1-3/4"	.010"	-	-
63541	63540	.6250	5/8"	15.875	5/8"	4"	1-3/4"	.030"	-	-
63551	63550	.6250	5/8"	15.875	5/8"	4"	1-3/4"	.060"	-	-
63281	63280	.6250	5/8"	15.875	5/8"	6"	2"	.025"	-	-
63283	-	.6250	5/8"	15.875	5/8"	6"	2"	.090"	-	-
63285	-	.6250	5/8"	15.875	5/8"	6"	2"	.125"	-	-
28806	28805	.6250	5/8"	15.875	5/8"	6"	2"	BALL	-	-
61434	-	.6250	5/8"	15.875	5/8"	6"	2-1/2"	.030"	-	-
61436	-	.6250	5/8"	15.875	5/8"	6"	3-1/4"	.030"	-	-
61438	-	.6250	5/8"	15.875	5/8"	4"	3/4"	.030"	1-5/8"	.600"
61440	-	.6250	5/8"	15.875	5/8"	6"	3/4"	.030"	2-3/8"	.600"
63271	63270	.6250	5/8"	15.875	5/8"	6"	3/4"	.025"	3-1/4"	.600"
61442	-	.6250	5/8"	15.875	5/8"	6"	3/4"	.030"	4-1/8"	.600"
61444	-	.6299		16.000	16.0	75	19	-	-	-
27809	-	.6299		16.000	16.0	75	19	0.30	-	-
27811	27810	.6299		16.000	16.0	75	19	0.50	-	-
61446	-	.6299		16.000	16.0	75	19	1.00	-	-
28811	28810	.6299		16.000	16.0	75	19	BALL	-	-
62715	62717	.6299		16.000	16.0	88	32	-	-	-
27819	27818	.6299		16.000	16.0	88	32	0.30	-	-
27821	27820	.6299		16.000	16.0	88	32	0.50	-	-
61448	-	.6299		16.000	16.0	88	32	0.75	-	-
27823	27822	.6299		16.000	16.0	88	32	1.00	-	-
61450	-	.6299		16.000	16.0	88	32	1.50	-	-
27825	27824	.6299		16.000	16.0	88	32	2.00	-	-
61452	-	.6299		16.000	16.0	88	32	3.00	-	-
28821	28820	.6299		16.000	16.0	88	32	BALL	-	-
63581	63580	.6299		16.000	16.0	100	38	0.30	-	-
61454	-	.6299		16.000	16.0	100	38	0.50	-	-
61456	-	.6299		16.000	16.0	100	42	0.50	-	-
63291	63290	.6299		16.000	16.0	150	19	0.50	82	15.25
27831	-	.7087		18.000	18.0	75	22	0.80	-	-
28831	-	.7087		18.000	18.0	75	22	BALL	-	-
27836	27835	.7087		18.000	18.0	100	38	0.80	-	-
28836	28835	.7087		18.000	18.0	100	38	BALL	-	-
63301	-	.7087		18.000	18.0	150	25	0.80	82	17.25
61458	-	.7500	3/4"	19.050	3/4"	3"	7/8"	-	-	-
27841	27840	.7500	3/4"	19.050	3/4"	3"	7/8"	.030"	-	-
61460	-	.7500	3/4"	19.050	3/4"	3"	7/8"	.060"	-	-
28841	28840	.7500	3/4"	19.050	3/4"	3"	7/8"	BALL	-	-
61462	-	.7500	3/4"	19.050	3/4"	4"	1-1/4"	-	-	-
61464	-	.7500	3/4"	19.050	3/4"	4"	1-1/4"	.030"	-	-
62775	62777	.7500	3/4"	19.050	3/4"	4"	1-1/2"	-	-	-
27851	27850	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"	-	-
27861	27860	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	-	-
27865	27864	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	-	-
27867	27866	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.120"	-	-
28861	28860	.7500	3/4"	19.050	3/4"	4"	1-1/2"	BALL	-	-

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MATERIAL HARDNESS (Rc)

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continued →

Series VRX (continued)

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

EDP#		d_1 †			d_2	l_1	l_2	r	l_3	d_3
(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"	-	-	-
61468	-	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.015"	-	-
61470	-	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.030"	-	-
61472	-	.7500	3/4"	19.050	3/4"	4"	1-5/8"	.060"	-	-
61474	-	.7500	3/4"	19.050	3/4"	4"	1-5/8"	BALL	-	-
62785	62787	.7500	3/4"	19.050	3/4"	4"	1-3/4"	-	-	-
63601	63600	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.015"	-	-
27869	27868	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.030"	-	-
63611	63610	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.060"	-	-
61476	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.094"	-	-
63621	63620	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.120"	-	-
61478	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	.190"	-	-
61480	-	.7500	3/4"	19.050	3/4"	4"	1-3/4"	BALL	-	-
62795	62797	.7500	3/4"	19.050	3/4"	5"	2"	-	-	-
63631	63630	.7500	3/4"	19.050	3/4"	5"	2"	.015"	-	-
63311	63310	.7500	3/4"	19.050	3/4"	5"	2"	.030"	-	-
63641	63640	.7500	3/4"	19.050	3/4"	5"	2"	.060"	-	-
61482	-	.7500	3/4"	19.050	3/4"	5"	2"	.094"	-	-
61484	-	.7500	3/4"	19.050	3/4"	5"	2"	.125"	-	-
28866	28865	.7500	3/4"	19.050	3/4"	5"	2"	BALL	-	-
61486	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	-	-	-
61488	-	.7500	3/4"	19.050	3/4"	5"	2-1/2"	.030"	-	-
62805	62807	.7500	3/4"	19.050	3/4"	6"	3"	-	-	-
63651	63650	.7500	3/4"	19.050	3/4"	6"	3"	.015"	-	-
63661	63660	.7500	3/4"	19.050	3/4"	6"	3"	.030"	-	-
63671	63670	.7500	3/4"	19.050	3/4"	6"	3"	.060"	-	-
61490	-	.7500	3/4"	19.050	3/4"	6"	3-1/4"	-	-	-
61492	-	.7500	3/4"	19.050	3/4"	6"	3-1/4"	.030"	-	-
61494	-	.7500	3/4"	19.050	3/4"	7"	4-1/4"	-	-	-
61496	-	.7500	3/4"	19.050	3/4"	7"	4-1/4"	.030"	-	-
63321	63320	.7500	3/4"	19.050	3/4"	6"	1"	.030"	3-1/4"	.730"
63323	-	.7500	3/4"	19.050	3/4"	6"	1"	.060"	3-1/4"	.730"
63325	-	.7500	3/4"	19.050	3/4"	6"	1"	.090"	3-1/4"	.730"
63327	-	.7500	3/4"	19.050	3/4"	6"	1"	.125"	3-1/4"	.730"
63329	-	.7500	3/4"	19.050	3/4"	6"	1"	.190"	3-1/4"	.730"
61498	-	.7874		20.000	20.0	75	22	-	-	-
61500	-	.7874		20.000	20.0	75	22	0.50	-	-
27871	27870	.7874		20.000	20.0	75	22	1.00	-	-
28871	28870	.7874		20.000	20.0	75	22	BALL	-	-
62825	62827	.7874		20.000	20.0	100	38	-	-	-
27879	27878	.7874		20.000	20.0	100	38	0.50	-	-
61502	-	.7874		20.000	20.0	100	38	0.75	-	-
27881	27880	.7874		20.000	20.0	100	38	1.00	-	-
27891	27890	.7874		20.000	20.0	100	38	1.50	-	-
61504	-	.7874		20.000	20.0	100	38	3.00	-	-
28881	28880	.7874		20.000	20.0	100	38	BALL	-	-
61506	-	.7874		20.000	20.0	100	42	0.50	-	-
61508	-	.7874		20.000	20.0	125	52	0.50	-	-
63331	63330	.7874		20.000	20.0	150	25	1.00	82	19.30
27911	-	.8661		22.000	22.0	100	38	1.00	-	-

EDP#		d_1 †		d_2	l_1	l_2	r	l_3	d_3
(plain)	(weldon)	Decimal	Diameter	Shank Diameter	Overall Length	Flute Length	Corner Radius	Reach Length	Neck Diameter
61510	-	.9843	25.000	25.0	100	26	-	-	-
62855	62857	.9843	25.000	25.0	100	38	-	-	-
61514	-	.9843	25.000	25.0	100	38	0.50	-	-
27941	27940	.9843	25.000	25.0	100	38	1.00	-	-
27951	-	.9843	25.000	25.0	100	38	1.50	-	-
61516	-	.9843	25.000	25.0	100	38	3.00	-	-
28901	28900	.9843	25.000	25.0	100	38	BALL	-	-
61518	-	.9843	25.000	25.0	100	42	-	-	-
61520	-	.9843	25.000	25.0	100	42	0.50	-	-
61522	-	.9843	25.000	25.0	125	50	0.50	-	-
63351	63350	.9843	25.000	25.0	125	50	1.00	-	-
63361	63360	.9843	25.000	25.0	150	32	1.00	82	24.40
61524	-	1.000	1"	25.400	1"	4"	1"	-	-
27959	27958	1.000	1"	25.400	1"	4"	1"	.015"	-
27961	27960	1.000	1"	25.400	1"	4"	1"	.035"	-
-	27962	1.000	1"	25.400	1"	4"	1"	.060"	-
28911	28910	1.000	1"	25.400	1"	4"	1"	BALL	-
62885	62887	1.000	1"	25.400	1"	4"	1-1/2"	-	-
27967	27966	1.000	1"	25.400	1"	4"	1-1/2"	.015"	-
61526	-	1.000	1"	25.400	1"	4"	1-1/2"	.025"	-
27971	27970	1.000	1"	25.400	1"	4"	1-1/2"	.035"	-
27981	27980	1.000	1"	25.400	1"	4"	1-1/2"	.060"	-
27991	-	1.000	1"	25.400	1"	4"	1-1/2"	.090"	-
61528	-	1.000	1"	25.400	1"	4"	1-1/2"	.125"	-
61532	-	1.000	1"	25.400	1"	4"	1-1/2"	.250"	-
28916	28915	1.000	1"	25.400	1"	4"	1-1/2"	BALL	-
61534	-	1.000	1"	25.400	1"	4"	1-5/8"	.030"	-
62895	62897	1.000	1"	25.400	1"	4"	1-3/4"	-	-
28001	28000	1.000	1"	25.400	1"	4"	1-3/4"	.015"	-
61536	-	1.000	1"	25.400	1"	4"	1-3/4"	.030"	-
28011	28012	1.000	1"	25.400	1"	4"	1-3/4"	.060"	-
28021	-	1.000	1"	25.400	1"	4"	1-3/4"	.090"	-
61538	-	1.000	1"	25.400	1"	4"	1-3/4"	.125"	-
61540	-	1.000	1"	25.400	1"	4"	1-3/4"	.190"	-
61542	-	1.000	1"	25.400	1"	4"	1-3/4"	.250"	-
62905	62907	1.000	1"	25.400	1"	5"	2"	-	-
63369	63368	1.000	1"	25.400	1"	5"	2"	.015"	-
63371	63370	1.000	1"	25.400	1"	5"	2"	.035"	-
63373	63372	1.000	1"	25.400	1"	5"	2"	.060"	-
63375	63374	1.000	1"	25.400	1"	5"	2"	.090"	-
61544	-	1.000	1"	25.400	1"	5"	2"	.125"	-
61546	-	1.000	1"	25.400	1"	5"	2"	.250"	-
28931	28930	1.000	1"	25.400	1"	5"	2"	BALL	-
61548	-	1.000	1"	25.400	1"	5"	2-1/2"	-	-
61550	-	1.000	1"	25.400	1"	5"	2-1/2"	.030"	-
62915	62917	1.000	1"	25.400	1"	6"	3"	-	-
61552	-	1.000	1"	25.400	1"	6"	3-1/4"	.030"	-
61554	-	1.000	1"	25.400	1"	7"	4-1/4"	.030"	-
61556	-	1.000	1"	25.400	1"	7"	4-1/4"	.060"	-
61558	-	1.000	1"	25.400	1"	6"	1-1/4"	.030"	2-5/8"
63381	63380	1.000	1"	25.400	1"	6"	1-1/4"	.035"	3-1/4"
61562	-	1.000	1"	25.400	1"	7"	1-1/4"	.030"	4-1/4"

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MATERIAL HARDNESS (Rc)

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P K H

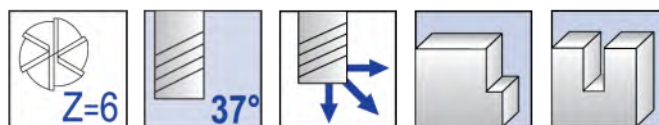
High Performance End Mills
AlTiN Coated**Target Materials:**

Inconel

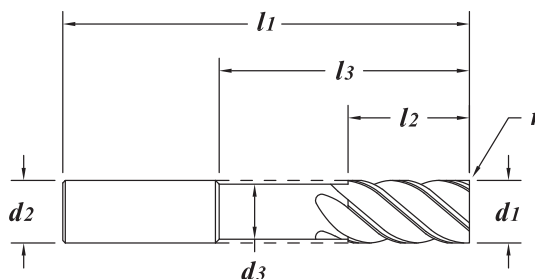
pH Materials

Titanium

Tool steels over 40Rc



**CALCULATE IDEAL PARAMETERS
FOR THE VRX-6 IN YOUR
APPLICATION WITH THE GARR
TECHNICAL ADVISOR**

**VRX-6**

MATERIAL HARDNESS (Rc)

70

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**← View the VRX-6**

TOLERANCES

$d1$	$+0.000" -0.002" (+.000mm -.050mm)$
$d2$	$h6$
r	$+0.001" -0.001" (+.025 -.025mm)$

HIGH EFFICIENCY MILLING

Series VRX-6



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

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

Square End, Corner Radius

AlTiN Coating

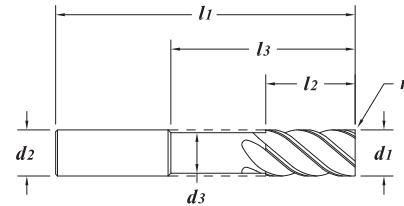
Solid submicron grain carbide end mill - center cutting

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



EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	$l3$ Reach Length	$d3$ Neck Diameter
	Decimal	Metric						
60101	.2362	6.000	6.0	65	20	-	-	-
60103	.2362	6.000	6.0	65	20	0.50	-	-
60100	.2500 1/4"	6.350	1/4"	2-1/2"	3/4"	-	-	-
60102	.2500 1/4"	6.350	1/4"	2-1/2"	3/4"	.010"	-	-
60104	.2500 1/4"	6.350	1/4"	2-1/2"	3/4"	.015"	-	-
60105	.2500 1/4"	6.350	1/4"	2-1/2"	3/4"	.020"	-	-
60106	.2500 1/4"	6.350	1/4"	2-1/2"	3/4"	.030"	-	-
60162	.3150	8.000	8.0	65	22	-	-	-
60107	.3150	8.000	8.0	65	22	0.50	-	-
60109	.3750 3/8"	9.525	3/8"	2"	1/2"	-	-	-
60111	.3750 3/8"	9.525	3/8"	2"	1/2"	.020"	-	-
60108	.3750 3/8"	9.525	3/8"	2-1/2"	7/8"	-	-	-
60110	.3750 3/8"	9.525	3/8"	2-1/2"	7/8"	.015"	-	-
60113	.3750 3/8"	9.525	3/8"	2-1/2"	7/8"	.020"	-	-
60112	.3750 3/8"	9.525	3/8"	2-1/2"	7/8"	.030"	-	-
60114	.3750 3/8"	9.525	3/8"	2-1/2"	7/8"	.060"	-	-
60184	.3750 3/8"	9.525	3/8"	3"	1-1/4"	.030"	-	-
60164	.3937	10.000	10.0	70	22	-	-	-
60115	.3937	10.000	10.0	70	22	0.50	-	-
60117	.3937	10.000	10.0	70	22	1.00	-	-
60119	.4724	12.000	12.0	65	20	-	-	-
60121	.4724	12.000	12.0	65	20	0.50	-	-
60123	.4724	12.000	12.0	75	26	-	-	-
60125	.4724	12.000	12.0	75	26	0.75	-	-
60166	.4724	12.000	12.0	75	32	-	-	-
60127	.4724	12.000	12.0	75	32	0.50	-	-
60129	.4724	12.000	12.0	75	32	1.00	-	-

HIGH PERFORMANCE
END MILLS

70

35

MATERIAL HARDNESS (Rc)

0

Series VRX-6 (continued)

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

EDP#	$d1$ †			$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	$l3$ Reach Length	$d3$ Neck Diameter
	Decimal	Diameter	Metric						
60131	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	-	-	-
60185	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.010"	-	-
60157	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.015"	-	-
60133	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.020"	-	-
60159	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"	-	-
60189	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.060"	-	-
60186	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.125"	-	-
60135	.5000	1/2"	12.700	1/2"	3"	1"	-	-	-
60201	.5000	1/2"	12.700	1/2"	3"	1"	.030"	-	-
60116	.5000	1/2"	12.700	1/2"	3"	1-1/4"	-	-	-
60118	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.010"	-	-
60120	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.015"	-	-
60122	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.020"	-	-
60124	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"	-	-
60126	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"	-	-
60128	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.125"	-	-
60137	.5000	1/2"	12.700	1/2"	4"	1-1/2"	-	-	-
60139	.5000	1/2"	12.700	1/2"	4"	1-1/2"	.030"	-	-
60190	.5000	1/2"	12.700	1/2"	4"	1-5/8"	-	-	-
60194	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.030"	-	-
60196	.5000	1/2"	12.700	1/2"	4"	1-5/8"	.060"	-	-
60130	.5000	1/2"	12.700	1/2"	4"	2-1/8"	-	-	-
60132	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.010"	-	-
60134	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.020"	-	-
60136	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.030"	-	-
60200	.5000	1/2"	12.700	1/2"	4"	2-1/8"	.060"	-	-
60141	.6250	5/8"	15.875	5/8"	3"	3/4"	-	-	-
60143	.6250	5/8"	15.875	5/8"	3"	3/4"	.020"	-	-
60138	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	-	-	-
60140	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"	-	-
60145	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.020"	-	-
60142	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"	-	-
60144	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"	-	-
60146	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.125"	-	-
60148	.6250	5/8"	15.875	5/8"	4"	1-5/8"	-	-	-
60150	.6250	5/8"	15.875	5/8"	4"	1-5/8"	.030"	-	-
60168	.6299		16.000	16.0	88	32	-	-	-
60170	.6299		16.000	16.0	88	32	0.50	-	-
60174	.6299		16.000	16.0	100	40	-	-	-
60176	.6299		16.000	16.0	100	40	0.50	-	-
60180	.6299		16.000	16.0	100	32	-	50	14.50
60182	.6299		16.000	16.0	100	32	0.50	50	14.50
60152	.7500	3/4"	19.050	3/4"	4"	1-1/2"	-	-	-
60154	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"	-	-
60147	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.020"	-	-
60156	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"	-	-
60158	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"	-	-
60160	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.125"	-	-
60149	.7500	3/4"	19.050	3/4"	6"	3"	-	-	-
60151	.7500	3/4"	19.050	3/4"	6"	3"	.030"	-	-
60188	1.000	1"	25.400	1"	4"	1-1/2"	.125"	-	-
60153	1.000	1"	25.400	1"	6"	3"	.030"	-	-
60155	1.000	1"	25.400	1"	7"	1-1/4"	-	4-1/8"	.980"

TOLERANCES

$d1$	$+0.000" -0.001" (+.000 -0.025\text{mm})$
$d2$	$h6$



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Series 242M, 842M

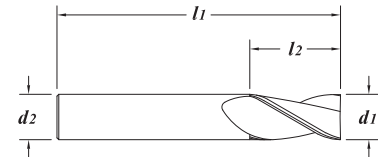
HIGH PERFORMANCE
END MILLS

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#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length
	Decimal	Metric			
08910	.1181	3.000	3.0	38	8
08920	.1181	3.000	3.0	50	12
85160	.1250 1/8"	3.175	1/8"	1-1/2"	1/4"
85170	.1250 1/8"	3.175	1/8"	2"	1/2"
08950	.1575	4.000	6.0	50	8
08960	.1575	4.000	6.0	50	12
85180	.1875 3/16"	4.763	3/16"	2"	5/16"
85190	.1875 3/16"	4.763	3/16"	2"	9/16"
08990	.1969	5.000	6.0	50	10
09000	.1969	5.000	6.0	65	15
09010	.2362	6.000	6.0	50	12
09020	.2362	6.000	6.0	65	25
09030	.2362	6.000	6.0	100	50
85200	.2500 1/4"	6.350	1/4"	2"	1/2"
85220	.2500 1/4"	6.350	1/4"	2-1/2"	1"
85240	.2500 1/4"	6.350	1/4"	4"	2"
85300	.3125 5/16"	7.938	5/16"	3"	1-1/8"
09240	.3150	8.000	8.0	65	20
09040	.3150	8.000	8.0	75	30
09050	.3150	8.000	8.0	100	50
85400	.3750 3/8"	9.525	3/8"	2"	5/8"
85420	.3750 3/8"	9.525	3/8"	2-1/2"	1"
85440	.3750 3/8"	9.525	3/8"	4"	2"
09060	.3937	10.000	10.0	50	16
09070	.3937	10.000	10.0	70	25
09080	.3937	10.000	10.0	100	50
09090	.4724	12.000	12.0	65	20
09100	.4724	12.000	12.0	75	32
09110	.4724	12.000	12.0	100	50
85500	.5000 1/2"	12.700	1/2"	2-1/2"	3/4"
85520	.5000 1/2"	12.700	1/2"	3"	1-1/4"
85540	.5000 1/2"	12.700	1/2"	4"	2"
85600	.6250 5/8"	15.875	5/8"	3-1/2"	1-5/8"
85620	.6250 5/8"	15.875	5/8"	6"	3"
09120	.6299	16.000	16.0	88	40
09130	.6299	16.000	16.0	150	75
09140	.7087	18.000	18.0	100	45
85700	.7500 3/4"	19.050	3/4"	4"	1-3/4"
85720	.7500 3/4"	19.050	3/4"	6"	3"
09350	.7874	20.000	20.0	100	38
09150	.7874	20.000	20.0	150	75
09160	.9843	25.000	25.0	100	45
09170	.9843	25.000	25.0	150	75
85800	1.000 1"	25.400	1"	4"	1-3/4"
85820	1.000 1"	25.400	1"	6"	3"

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MATERIAL HARDNESS (Rc)

35

0

Series 253M, 253MC, 253MA, 853M, 853MA

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



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TOLERANCES

d_1	$+0.000" - .002" (+.000 - .050\text{mm})$
d_2	$h6$

Recommended for stainless steel

Square End

Bright Finish, TiCN or AlTiN Coating

Solid submicron grain carbide end mill - center cutting

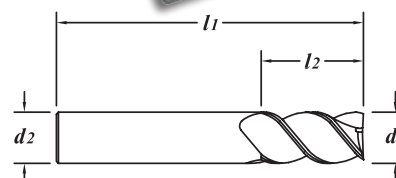
High performance machining

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)



(253M/853M)	(253MC)	(253MA/853MA)	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
BRIGHT EDP#	TiCN EDP#	AlTiN EDP#	Decimal	Metric			
10340	-	10347	.1181	3.000	3.0	38	8
10350	-	10357	.1181	3.000	3.0	50	12
86134	-	86137	.1250	1/8"	3.175	1-1/2"	1/4"
86140	-	86147	.1250	1/8"	3.175	2"	1/2"
10380	-	10387	.1575	4.000	6.0	50	8
10390	-	10397	.1575	4.000	6.0	50	12
86150	86154	86157	.1875	3/16"	4.763	2"	5/16"
86160	86164	86167	.1875	3/16"	4.763	2"	9/16"
86180	86184	86187	.1875	3/16"	4.763	3"	1"
10400	-	10407	.1969	5.000	5.0	50	8
10410	-	10417	.1969	5.000	5.0	50	14
-	-	10507	.1969	5.000	6.0	50	8
-	-	10517	.1969	5.000	6.0	65	16
10010	-	10017	.2362	6.000	6.0	50	12
10020	-	10027	.2362	6.000	6.0	65	19
10030	-	10037	.2362	6.000	6.0	75	32
86200	86204	86207	.2500	1/4"	6.350	2"	1/2"
86220	86224	86227	.2500	1/4"	6.350	2-1/2"	3/4"
86240	86244	86247	.2500	1/4"	6.350	3"	1-1/4"
86260	86264	86267	.3125	5/16"	7.938	2"	7/16"
86270	86274	86277	.3125	5/16"	7.938	2-1/2"	13/16"
86280	86284	86287	.3125	5/16"	7.938	4"	1-1/4"
10420	-	10427	.3150	8.000	8.0	50	11
10040	-	10047	.3150	8.000	8.0	65	20
10050	-	10057	.3150	8.000	8.0	75	32
86300	86304	86307	.3750	3/8"	9.525	2"	1/2"
86320	86324	86327	.3750	3/8"	9.525	2-1/2"	1"
86340	86344	86347	.3750	3/8"	9.525	3-1/2"	1-1/2"
10060	-	10067	.3937	10.000	10.0	50	12
10070	-	10077	.3937	10.000	10.0	75	25
10080	-	10087	.3937	10.000	10.0	88	38
86360	86364	86367	.4375	7/16"	11.113	2-1/2"	9/16"
86370	86374	86377	.4375	7/16"	11.113	2-3/4"	1"
86380	86384	86387	.4375	7/16"	11.113	4"	2"
10090	-	10097	.4724	12.000	12.0	65	16
10100	-	10107	.4724	12.000	12.0	75	26
10110	-	10117	.4724	12.000	12.0	100	50
86400	86404	86407	.5000	1/2"	12.700	2-1/2"	5/8"
86420	86424	86427	.5000	1/2"	12.700	3"	1"
86440	86444	86447	.5000	1/2"	12.700	4"	2"
10430	-	10437	.5512	14.000	14.0	65	16
10440	-	10447	.5512	14.000	14.0	75	25
10450	-	10457	.5512	14.000	14.0	100	50

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35

MATERIAL HARDNESS (Rc)

0

Series 253M, 253MC, 253MA, 853M, 853MA (continued)

.5625" - 1.000"
(14.288mm - 25.400mm)

HIGH PERFORMANCE
END MILLS

(253M/853M)	(253MC)	(253MA/853MA)	$d1$ †		$d2$	$l1$	$l2$	
BRIGHT EDP#	TiCN EDP#	AlTiN EDP#	Diameter		Diameter	Overall Length	Flute Length	
			Decimal		Metric			
86460	86464	86467	.5625	9/16"	14.288	9/16"	3"	7/8"
86470	-	86477	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"
86480	86484	-	.5625	9/16"	14.288	9/16"	6"	2-1/2"
86500	86504	86507	.6250	5/8"	15.875	5/8"	3"	7/8"
86520	86524	86527	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"
86540	86544	86547	.6250	5/8"	15.875	5/8"	6"	2-1/2"
10120	-	-	.6299		16.000	16.0	75	20
10130	-	10137	.6299		16.000	16.0	88	32
10140	-	10147	.6299		16.000	16.0	150	65
10160	-	10167	.7087		18.000	18.0	100	38
10170	-	-	.7087		18.000	18.0	150	75
86600	86604	86607	.7500	3/4"	19.050	3/4"	3-1/2"	1"
86620	86624	86627	.7500	3/4"	19.050	3/4"	4"	1-1/2"
86640	86644	86647	.7500	3/4"	19.050	3/4"	6"	3"
10460	-	-	.7874		20.000	20.0	75	22
10180	-	10187	.7874		20.000	20.0	100	38
10190	-	10197	.7874		20.000	20.0	150	75
10480	-	-	.9843		25.000	25.0	100	50
10490	-	-	.9843		25.000	25.0	150	82
86690	86694	86697	1.000	1"	25.400	1"	4"	1-1/8"
86720	86724	86727	1.000	1"	25.400	1"	4"	2"
86740	86744	86747	1.000	1"	25.400	1"	6"	3-1/4"

70

35

0

MATERIAL HARDNESS (Rc)

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



TOLERANCES

$d1$	$+0.000" -0.002" (+0.000 -0.050\text{mm})$
$d2$	$h6$

Recommended for steels, stainless steel, high-temperature alloys

Square End

Bright Finish, TiCN, or AlTiN Coating

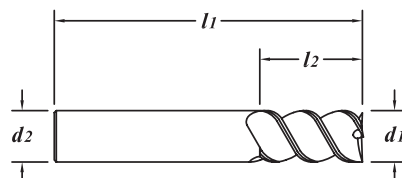
Solid submicron grain carbide end mill - center cutting

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



(263M) BRIGHT EDP#	(263MC) TiCN EDP#	(263MA/863MA) AlTiN EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length
			Decimal		Metric		
23010	-	-	.2500	1/4"	6.350	1/4"	2-1/2"
23020	-	-	.3125	5/16"	7.938	5/16"	7/8"
23030	-	-	.3750	3/8"	9.525	3/8"	7/8"
23040	-	-	.4375	7/16"	11.113	7/16"	1"
23050	-	-	.5000	1/2"	12.700	1/2"	1"
23060	-	-	.6250	5/8"	15.875	5/8"	1-1/4"
23070	-	-	.7500	3/4"	19.050	3/4"	1-1/2"
23080	-	-	1.000	1"	25.400	1"	1-1/2"
-	23014	-	.2500	1/4"	6.350	1/4"	3/4"
-	23024	-	.3125	5/16"	7.938	5/16"	7/8"
-	23034	-	.3750	3/8"	9.525	3/8"	7/8"
-	23054	-	.5000	1/2"	12.700	1/2"	1"
-	23064	-	.6250	5/8"	15.875	5/8"	1-1/4"
-	23074	-	.7500	3/4"	19.050	3/4"	1-1/2"
-	23084	-	1.000	1"	25.400	1"	1-1/2"
-	-	23517	.2362		6.000	6.0	65
-	-	23017	.2500	1/4"	6.350	1/4"	3/4"
-	-	23027	.3125	5/16"	7.938	5/16"	7/8"
-	-	23527	.3150		8.000	8.0	65
-	-	23037	.3750	3/8"	9.525	3/8"	7/8"
-	-	23537	.3937		10.000	10.0	70
-	-	23047	.4375	7/16"	11.113	7/16"	1"
-	-	23547	.4724		12.000	12.0	75
-	-	23057	.5000	1/2"	12.700	1/2"	1"
-	-	23067	.6250	5/8"	15.875	5/8"	1-1/4"
-	-	23557	.6299		16.000	16.0	88
-	-	23077	.7500	3/4"	19.050	3/4"	1-1/2"
-	-	23087	1.000	1"	25.400	1"	1-1/2"

MATERIAL HARDNESS (Rc)

70

35

0

TOLERANCES

$d1$	$+0.000" -0.002" (+.000 - .050\text{mm})$
$d2$	$h6$

Series 255M, 255MC, 255MA, 855M, 855MA



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

Recommended for steels, stainless steel, and exotics

Square End

Bright Finish, TiCN, or AlTiN Coating

Solid submicron grain carbide end mill - center cutting

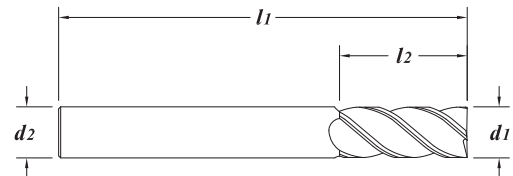
High performance milling

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

Dry or semi-dry machining

Improved finishes in titanium

Heavy core, Sharp corners



(255M/855M)	(255MC)	(255MA/855MA)	$d1$ †		$d2$	$l1$	$l2$
BRIGHT EDP#	TiCN EDP#	AlTiN EDP#	Decimal	Diameter	Shank Diameter	Overall Length	Flute Length
40040	-	40047	.1181	3.000	3.0	38	8
40050	-	40057	.1181	3.000	3.0	50	12
52080	-	52087	.1250	1/8"	3.175	1-1/2"	1/4"
52090	-	52097	.1250	1/8"	3.175	2"	1/2"
40080	-	40087	.1575	4.000	6.0	50	8
40090	-	40097	.1575	4.000	6.0	50	12
52100	52104	52107	.1875	3/16"	4.763	2"	5/16"
52120	52124	52127	.1875	3/16"	4.763	2"	9/16"
40100	-	40107	.1969	5.000	5.0	50	8
40120	-	40127	.1969	5.000	5.0	50	14
-	-	40117	.1969	5.000	6.0	50	8
-	-	40137	.1969	5.000	6.0	65	16
40200	-	40207	.2362	6.000	6.0	50	10
40220	-	40227	.2362	6.000	6.0	65	20
40240	-	40247	.2362	6.000	6.0	100	32
52200	52204	52207	.2500	1/4"	6.350	2"	3/8"
52220	52224	52227	.2500	1/4"	6.350	2-1/2"	3/4"
-	-	52237	.2500	1/4"	6.350	3"	1-1/8"
52240	52244	52247	.2500	1/4"	6.350	4"	1-1/4"
52300	52304	52307	.3125	5/16"	7.938	2"	7/16"
52320	52324	52327	.3125	5/16"	7.938	2-1/2"	13/16"
52340	52344	52347	.3125	5/16"	7.938	4"	1-1/4"
-	-	40307	.3150	8.000	8.0	50	11
40320	-	40327	.3150	8.000	8.0	65	21
40340	-	40347	.3150	8.000	8.0	100	32
-	-	40367	.3543	9.000	10.0	65	22
52400	52404	52407	.3750	3/8"	9.525	2"	1/2"
52420	52424	52427	.3750	3/8"	9.525	2-1/2"	7/8"
-	-	52437	.3750	3/8"	9.525	3"	1-1/4"
52440	52444	52447	.3750	3/8"	9.525	3-1/2"	1-1/2"
-	-	40407	.3937	10.000	10.0	50	12
40420	-	40427	.3937	10.000	10.0	70	22
40440	-	40447	.3937	10.000	10.0	88	38
52500	52504	52507	.4375	7/16"	11.113	2-1/2"	9/16"
52520	52524	52527	.4375	7/16"	11.113	2-3/4"	1"
52540	52544	52547	.4375	7/16"	11.113	4"	2"
-	-	40507	.4724	12.000	12.0	65	16
40520	-	40527	.4724	12.000	12.0	75	32
40540	-	40547	.4724	12.000	12.0	100	50

HIGH
PERFORMANCE
END MILLS

70

35

MATERIAL HARDNESS (Rc)

0

Series 255M, 255MC, 255MA, 855M, 855MA (continued)

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

(255M/855M) BRIGHT EDP#	(255MC) TiCN EDP#	(255MA/855MA) AlTiN EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
Decimal	Metric						
52600	52604	52607	.5000	1/2"	12.700	1/2"	2-1/2"
52620	52624	52627	.5000	1/2"	12.700	1/2"	3"
52640	52644	52647	.5000	1/2"	12.700	1/2"	4"
52700	52704	52707	.6250	5/8"	15.875	5/8"	3"
52720	52724	52727	.6250	5/8"	15.875	5/8"	3-1/2"
52740	52744	52747	.6250	5/8"	15.875	5/8"	6"
40600	-	40607	.6299		16.000	16.0	75
40620	-	40627	.6299		16.000	16.0	88
40640	-	40647	.6299		16.000	16.0	150
52800	52804	52807	.7500	3/4"	19.050	3/4"	3"
52820	52824	52827	.7500	3/4"	19.050	3/4"	4"
52830	-	52837	.7500	3/4"	19.050	3/4"	5"
52840	52844	52847	.7500	3/4"	19.050	3/4"	6"
40700	-	-	.7874		20.000	20.0	75
40720	-	40727	.7874		20.000	20.0	100
40740	-	40747	.7874		20.000	20.0	150
40780	-	40787	.9843		25.000	25.0	100
40820	-	40827	.9843		25.000	25.0	100
40840	-	40847	.9843		25.000	25.0	150
-	52894	52897	1.000	1"	25.400	1"	4"
52920	52924	52927	1.000	1"	25.400	1"	4"
52940	52944	52947	1.000	1"	25.400	1"	6"



End Mill Manufacturing

TOLERANCES

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

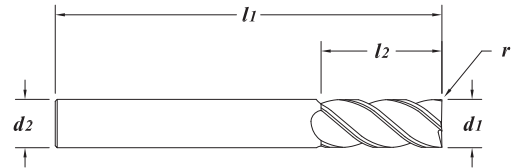
High performance milling

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

Dry or semi-dry machining

Improved finishes in titanium

Heavy core



EDP#	$d1$ †		$d2$	$l1$	$l2$	r	
	Decimal	Diameter Metric					
83527	.1181		3.000	3.0	38	8	0.20
83537	.1181		3.000	3.0	38	8	0.50
83547	.1181		3.000	3.0	50	12	0.20
83550	.1181		3.000	3.0	50	12	0.30
83557	.1181		3.000	3.0	50	12	0.50
83567	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.010"
83577	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"	.020"
83587	.1250	1/8"	3.175	1/8"	2"	1/2"	.010"
83597	.1250	1/8"	3.175	1/8"	2"	1/2"	.020"
83600	.1250	1/8"	3.175	1/8"	2"	1/2"	.030"
83607	.1575		4.000	6.0	50	8	0.30
83617	.1575		4.000	6.0	50	8	0.50
83627	.1575		4.000	6.0	50	12	0.30
83637	.1575		4.000	6.0	50	12	0.50
83647	.1875	3/16"	4.763	3/16"	2"	5/16"	.010"
83657	.1875	3/16"	4.763	3/16"	2"	5/16"	.020"
83667	.1875	3/16"	4.763	3/16"	2"	9/16"	.010"
83677	.1875	3/16"	4.763	3/16"	2"	9/16"	.020"
83680	.1875	3/16"	4.763	3/16"	2"	9/16"	.030"
83707	.1969		5.000	6.0	65	15	0.30
83717	.1969		5.000	6.0	65	15	0.50
83767	.2362		6.000	6.0	50	12	0.30
83777	.2362		6.000	6.0	50	12	0.50
83780	.2362		6.000	6.0	65	19	0.20
83787	.2362		6.000	6.0	65	19	0.30
83797	.2362		6.000	6.0	65	19	0.50
83807	.2362		6.000	6.0	65	19	1.00
83827	.2500	1/4"	6.350	1/4"	2"	3/8"	.015"
83837	.2500	1/4"	6.350	1/4"	2"	3/8"	.030"
83845	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"
83847	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"
83857	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"
83877	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.060"
83907	.2500	1/4"	6.350	1/4"	3"	1-1/8"	.030"
83927	.3125	5/16"	7.938	5/16"	2"	7/16"	.020"
83937	.3125	5/16"	7.938	5/16"	2"	7/16"	.030"
83940	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.010"
83947	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.020"
83957	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.030"
83977	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	.060"

continued →

Series 255RA, 855RA (continued)

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

EDP#	$d1$ †		$d2$	$l1$	$l2$	r	
	Diameter						
	Decimal	Metric	Shank Diameter	Overall Length	Flute Length	Corner Radius	
83987	.3150	8.000	8.0	50	12	0.50	
83997	.3150	8.000	8.0	50	12	1.00	
84000	.3150	8.000	8.0	65	22	0.30	
84007	.3150	8.000	8.0	65	22	0.50	
84017	.3150	8.000	8.0	65	22	1.00	
84027	.3150	8.000	8.0	65	22	1.50	
84087	.3750	3/8"	9.525	3/8"	2"	1/2"	.020"
84097	.3750	3/8"	9.525	3/8"	2"	1/2"	.030"
84100	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.010"
84107	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.020"
84117	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"
84137	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.060"
84147	.3750	3/8"	9.525	3/8"	3"	1-1/4"	.030"
84167	.3937		10.000	10.0	70	22	0.50
84177	.3937		10.000	10.0	70	22	1.00
84257	.4724		12.000	12.0	75	32	0.30
84267	.4724		12.000	12.0	75	32	0.50
84277	.4724		12.000	12.0	75	32	1.00
84287	.4724		12.000	12.0	75	32	1.50
84307	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.010"
84317	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.020"
84327	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.030"
84337	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.060"
84357	.5000	1/2"	12.700	1/2"	3"	1-1/4"	.120"
84367	.5000	1/2"	12.700	1/2"	4"	2"	.030"
84377	.5000	1/2"	12.700	1/2"	4"	2"	.060"
84397	.5000	1/2"	12.700	1/2"	4"	2"	.120"
84467	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"
84487	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"
84497	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"
84507	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.120"
84567	.6299		16.000	16.0	88	32	1.00
84577	.6299		16.000	16.0	88	32	2.00
84587	.6299		16.000	16.0	150	65	1.00
84597	.6299		16.000	16.0	150	65	2.00
84667	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"
84687	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"
84697	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"
84700	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.120"
84707	.7500	3/4"	19.050	3/4"	5"	2"	.030"
84717	.7500	3/4"	19.050	3/4"	5"	2"	.060"
84747	.7500	3/4"	19.050	3/4"	5"	2"	.120"
84757	.7500	3/4"	19.050	3/4"	5"	2"	.190"
84767	.7874		20.000	20.0	100	38	1.00
84777	.7874		20.000	20.0	100	38	3.00
84887	.9843		25.000	25.0	100	38	1.00
84897	.9843		25.000	25.0	100	38	3.00
84957	1.000	1"	25.400	1"	4"	1-1/2"	.015"
84967	1.000	1"	25.400	1"	4"	1-1/2"	.030"
84970	1.000	1"	25.400	1"	4"	1-1/2"	.060"
84977	1.000	1"	25.400	1"	4"	1-1/2"	.120"
84987	1.000	1"	25.400	1"	5"	2"	.030"
84990	1.000	1"	25.400	1"	5"	2"	.060"
84997	1.000	1"	25.400	1"	5"	2"	.120"
85007	1.000	1"	25.400	1"	5"	2"	.190"

70

35

MATERIAL HARDNESS (Rc)

0

TOLERANCES

d_1	$+0.000" - .002" (+.000 - .050\text{mm})$
d_2	$h6$

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

TECH
PAGES
292-293

Recommended for steels

Square End

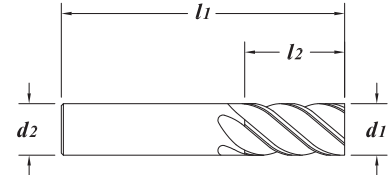
Bright Finish, TiCN, or AlTiN Coating

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) BRIGHT EDP#	(246MC) TiCN EDP#	(246MA/846MA) AlTiN EDP#	d_1 †		d_2	l_1	l_2
			Decimal	Diameter	Metric	Shank Diameter	Overall Length
							Flute Length
51110	-	-	.1875	3/16"	4.763	3/16"	2"
51510	-	-	.1969		5.000	5.0	50
51520	-	-	.2362		6.000	6.0	65
51150	-	-	.2500	1/4"	6.350	1/4"	2-1/2"
51190	-	-	.3125	5/16"	7.938	5/16"	2-1/2"
51530	-	-	.3150		8.000	8.0	65
51230	-	-	.3750	3/8"	9.525	3/8"	2-1/2"
51540	-	-	.3937		10.000	10.0	70
51270	-	-	.4375	7/16"	11.113	7/16"	2-3/4"
51310	-	-	.5000	1/2"	12.700	1/2"	3"
51330	-	-	.6250	5/8"	15.875	5/8"	3-1/2"
51560	-	-	.6299		16.000	16.0	88
51350	-	-	.7500	3/4"	19.050	3/4"	4"
51370	-	-	1.000	1"	25.400	1"	4"
51400	-	-	1.250	1-1/4"	31.750	1-1/4"	4-1/2"
-	51114	-	.1875	3/16"	4.763	3/16"	2"
-	51154	-	.2500	1/4"	6.350	1/4"	2-1/2"
-	51194	-	.3125	5/16"	7.938	5/16"	2-1/2"
-	51234	-	.3750	3/8"	9.525	3/8"	2-1/2"
-	51274	-	.4375	7/16"	11.113	7/16"	2-3/4"
-	51314	-	.5000	1/2"	12.700	1/2"	3"
-	51334	-	.6250	5/8"	15.875	5/8"	3-1/2"
-	51354	-	.7500	3/4"	19.050	3/4"	4"
-	51374	-	1.000	1"	25.400	1"	4"
-	51434	-	1.250	1-1/4"	31.750	1-1/4"	6"
-	-	51117	.1875	3/16"	4.763	3/16"	2"
-	-	51517	.1969		5.000	5.0	50
-	-	51597	.1969		5.000	6.0	65
-	-	51527	.2362		6.000	6.0	65
-	-	51157	.2500	1/4"	6.350	1/4"	2-1/2"
-	-	51197	.3125	5/16"	7.938	5/16"	2-1/2"
-	-	51537	.3150		8.000	8.0	65
-	-	51237	.3750	3/8"	9.525	3/8"	2-1/2"
-	-	51547	.3937		10.000	10.0	70
-	-	51277	.4375	7/16"	11.113	7/16"	2-3/4"
-	-	51557	.4724		12.000	12.0	75
-	-	51317	.5000	1/2"	12.700	1/2"	3"
-	-	51337	.6250	5/8"	15.875	5/8"	3-1/2"
-	-	51567	.6299		16.000	16.0	88
-	-	51357	.7500	3/4"	19.050	3/4"	4"
-	-	51577	.7874		20.000	20.0	100
-	-	51587	.9843		25.000	25.0	100
-	-	51377	1.000	1"	25.400	1"	4"
-	-	51407	1.250	1-1/4"	31.750	1-1/4"	4-1/2"
-	-	51437	1.250	1-1/4"	31.750	1-1/4"	6"

HIGH
PERFORMANCE
END MILLS

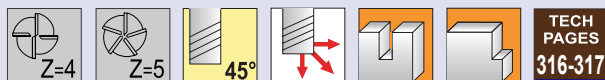
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MATERIAL HARDNESS (Rc)

0

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



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

Square End

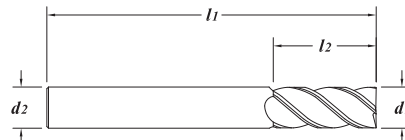
BALINIT® Durana Coating

Solid submicron grain carbide end mill - center cutting

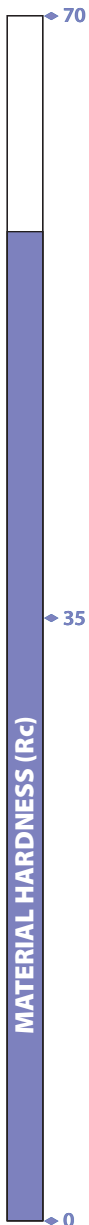
High performance tool for use in high Rockwell and difficult to machine materials

Corner Radius - page [205](#)

Ball End - page [206](#)



EDP#	$d1$ †		$d2$	$l1$	$l2$	Number of Flutes	
	Decimal	Diameter Metric					
21200	.1181		3.000	3.0	38	12	4
21230	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	4
21260	.1575		4.000	6.0	50	12	4
21290	.1875	3/16"	4.763	3/16"	2"	9/16"	4
21320	.1969		5.000	6.0	65	15	4
21350	.2362		6.000	6.0	65	19	4
21380	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	4
21410	.2756		7.000	8.0	65	22	5
21440	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	5
21470	.3150		8.000	8.0	65	22	5
21500	.3543		9.000	10.0	65	22	5
21530	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	5
21560	.3937		10.000	10.0	70	22	5
21620	.4724		12.000	12.0	75	32	5
21660	.5000	1/2"	12.700	1/2"	3"	1-1/4"	5
21710	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	5
21740	.6299		16.000	16.0	88	32	5
21800	.7500	3/4"	19.050	3/4"	4"	1-1/2"	5
21830	.7874		20.000	20.0	100	38	5
21920	1.000	1"	25.400	1"	4"	1-1/2"	5

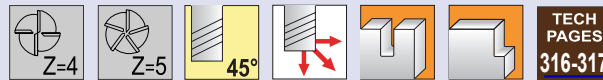


TOLERANCES

d_1	$+0.000" -0.002" (+.000mm -.050mm)$
d_2	$h6$
r	$+0.001" -0.001" (+.025 -.025mm)$

HIGH ROCKWELL END MILLS

Series 545RA



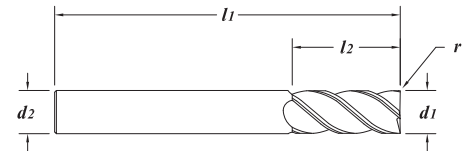
Recommended for inconel, tool steels, hardened die mold >40Rc

Corner Radius

BALINIT® Durana 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 [204](#)Ball End - page [206](#)

EDP#	d_1 †		d_2	l_1	l_2	r	Number of Flutes
	Decimal	Diameter Metric					
21202	.1181	3.000	3.0	38	12	0.20	4
21212	.1181	3.000	3.0	38	12	0.50	4
21232	.1250	1/8"	3.175	1/8"	1-1/2"	.010"	4
21242	.1250	1/8"	3.175	1/8"	1-1/2"	.020"	4
21262	.1575	4.000	6.0	50	12	0.30	4
21292	.1875	3/16"	4.763	3/16"	2"	.010"	4
21302	.1875	3/16"	4.763	3/16"	2"	.020"	4
21322	.1969	5.000	6.0	65	15	0.30	4
21342	.2362	6.000	6.0	65	19	0.20	4
21352	.2362	6.000	6.0	65	19	0.50	4
21372	.2500	1/4"	6.350	1/4"	2-1/2"	.010"	4
21382	.2500	1/4"	6.350	1/4"	2-1/2"	.015"	4
21392	.2500	1/4"	6.350	1/4"	2-1/2"	.030"	4
21412	.2756	7.000	8.0	65	22	0.50	5
21432	.3125	5/16"	7.938	5/16"	2-1/2"	.010"	5
21442	.3125	5/16"	7.938	5/16"	2-1/2"	.015"	5
21452	.3125	5/16"	7.938	5/16"	2-1/2"	.030"	5
21462	.3150	8.000	8.0	65	22	0.20	5
21472	.3150	8.000	8.0	65	22	0.50	5
21502	.3543	9.000	10.0	65	22	0.50	5
21522	.3750	3/8"	9.525	3/8"	2-1/2"	.010"	5
21532	.3750	3/8"	9.525	3/8"	2-1/2"	.015"	5
21542	.3750	3/8"	9.525	3/8"	2-1/2"	.030"	5
21552	.3937	10.000	10.0	70	22	0.20	5
21562	.3937	10.000	10.0	70	22	0.50	5
21612	.4724	12.000	12.0	75	32	0.50	5
21622	.4724	12.000	12.0	75	32	1.00	5
21642	.5000	1/2"	12.700	1/2"	3"	.010"	5
21652	.5000	1/2"	12.700	1/2"	3"	.015"	5
21662	.5000	1/2"	12.700	1/2"	3"	.030"	5
21672	.5000	1/2"	12.700	1/2"	3"	.060"	5
21692	.6250	5/8"	15.875	5/8"	3-1/2"	.010"	5
21702	.6250	5/8"	15.875	5/8"	3-1/2"	.015"	5
21712	.6250	5/8"	15.875	5/8"	3-1/2"	.030"	5
21722	.6250	5/8"	15.875	5/8"	3-1/2"	.060"	5
21732	.6299	16.000	16.0	88	32	0.50	5
21742	.6299	16.000	16.0	88	32	1.00	5
21772	.7087	18.000	18.0	100	38	0.50	5
21802	.7500	3/4"	19.050	3/4"	4"	.015"	5
21812	.7500	3/4"	19.050	3/4"	4"	.030"	5
21822	.7500	3/4"	19.050	3/4"	4"	.060"	5
21832	.7874	20.000	20.0	100	38	0.50	5
21922	1.000	1"	25.400	1"	4"	.015"	5
21932	1.000	1"	25.400	1"	4"	.030"	5
21942	1.000	1"	25.400	1"	4"	.060"	5

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MATERIAL HARDNESS (Rc)

0



TECH
PAGES
316-317

TOLERANCES

d_1	$+0.000" - .002" (+.000 - .050\text{mm})$
d_2	$h6$
ball radius	$+0.000" - .001" (+.000 - .025\text{mm})$

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

Ball End

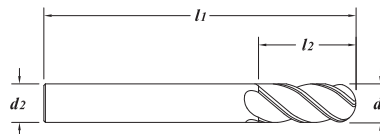
BALINIT® Durana Coating

Solid submicron grain carbide end mill - center cutting

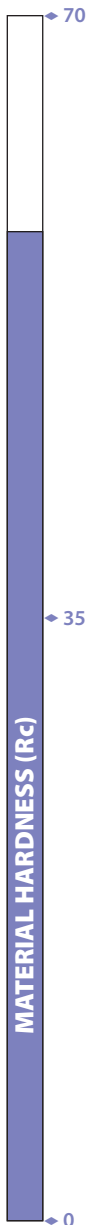
High performance tool for use in high Rockwell and difficult to machine materials

Square End - page [204](#)

Corner Radius - page [205](#)



EDP#	$d1$ †		$d2$	$l1$	$l2$	Number of Flutes	
	Decimal	Metric					
21204	.1181		3.000	3.0	38	12	4
21234	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	4
21264	.1575		4.000	6.0	50	12	4
21294	.1875	3/16"	4.763	3/16"	2"	9/16"	4
21324	.1969		5.000	6.0	65	15	4
21354	.2362		6.000	6.0	65	19	4
21384	.2500	1/4"	6.353	1/4"	2-1/2"	3/4"	4
21414	.2756		7.000	8.0	65	22	5
21444	.3125	5/16"	7.938	5/16"	2-1/2"	13/16"	5
21474	.3150		8.000	8.0	65	22	5
21504	.3543		9.000	10.0	65	22	5
21534	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	5
21564	.3937		10.000	10.0	70	22	5
21624	.4724		12.000	12.0	75	32	5
21664	.5000	1/2"	12.700	1/2"	3"	1-1/4"	5
21714	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	5
21744	.6299		16.000	16.0	88	32	5
21774	.7087		18.000	18.0	100	38	5
21804	.7500	3/4"	19.050	3/4"	4"	1-1/2"	5
21924	1.000	1"	25.400	1"	4"	1-1/2"	5



TOLERANCES	
d_1	$+0.000" -0.002" (+.000mm -.050mm)$
d_2	$h6$
r	$+0.001" -.001" (+.025 -.025mm)$

HIGH FEED END MILLS

Series H-45



Recommended for die mold applications

Corner Radius

BALINIT® Durana Coating

Solid submicron grain carbide end mill - center cutting

For light axial / radial depths of cut

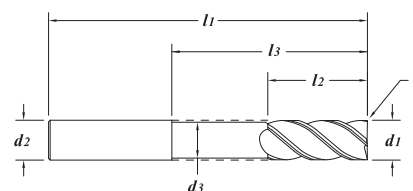
Rigid work holding, machine stability and part integrity are critical!

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



EDP#	d_1 †		d_2	l_1	l_2	r	l_3	d_3
	Decimal	Diameter						
48300	.1181		3.000	6.0	65	3	0.75	2.80
48305	.1250	1/8"	3.175	1/8"	3"	1/8"	.015"	-
48310	.1250	1/8"	3.175	1/8"	3"	1/8"	.030"	-
48315	.1250	1/8"	3.175	3/16"	2-1/2"	1/8"	.010"	3/4"
48320	.1250	1/8"	3.175	3/16"	2-1/2"	1/8"	.015"	3/4"
48325	.1250	1/8"	3.175	3/16"	2-1/2"	1/8"	.020"	3/4"
* 48330	.1250	1/8"	3.175	3/16"	3"	1/8"	.030"	-
48335	.1575		4.000	6.0	65	4	1.00	3.70
48340	.1875	3/16"	4.763	3/16"	3"	3/16"	.015"	-
48345	.1875	3/16"	4.763	3/16"	3"	3/16"	.030"	-
48350	.1875	3/16"	4.763	3/16"	3"	3/16"	.060"	-
48355	.1875	3/16"	4.763	1/4"	2-1/2"	3/16"	.020"	7/8"
48360	.1875	3/16"	4.763	1/4"	2-1/2"	3/16"	.030"	7/8"
48365	.1875	3/16"	4.763	1/4"	2-1/2"	3/16"	.060"	7/8"
48370	.1875	3/16"	4.763	1/4"	4"	3/16"	.020"	1-1/2"
48375	.1875	3/16"	4.763	1/4"	4"	3/16"	.030"	1-1/2"
* 48380	.1875	3/16"	4.763	1/4"	4"	3/16"	.030"	-
* 48385	.1969		5.000	6.0	100	5	1.20	4.90
48390	.2362		6.000	6.0	100	6	1.50	5.70
48395	.2500	1/4"	6.350	1/4"	3"	1/4"	.015"	-
48400	.2500	1/4"	6.350	1/4"	3"	1/4"	.030"	-
48405	.2500	1/4"	6.350	1/4"	3"	1/4"	.060"	-
* 48410	.2756		7.000	6.0	100	7	1.50	-
48415	.3125	5/16"	7.938	5/16"	2-1/2"	5/16"	.020"	-
48420	.3125	5/16"	7.938	5/16"	3"	5/16"	.078"	1-5/8"
48425	.3125	5/16"	7.938	5/16"	3"	5/16"	.094"	1-5/8"
48430	.3150		8.000	8.0	75	8	2.00	-
48435	.3150		8.000	8.0	100	8	2.00	40.0
48440	.3750	3/8"	9.525	3/8"	3"	3/8"	.015"	-
48445	.3750	3/8"	9.525	3/8"	3"	3/8"	.030"	-
48450	.3750	3/8"	9.525	3/8"	3"	3/8"	.060"	-
48455	.3750	3/8"	9.525	3/8"	3"	3/8"	.094"	2.00"
48460	.3750	3/8"	9.525	3/8"	4"	3/8"	.030"	2-1/2"
48465	.3750	3/8"	9.525	3/8"	4"	3/8"	.094"	2-1/2"
48470	.3937		10.000	10.0	100	10	2.00	50.0
48475	.4724		12.000	12.0	100	12	3.00	60.0
48480	.5000	1/2"	12.700	1/2"	3"	1/2"	.015"	-
48485	.5000	1/2"	12.700	1/2"	3"	1/2"	.030"	-
48490	.5000	1/2"	12.700	1/2"	3"	1/2"	.060"	-
48495	.5000	1/2"	12.700	1/2"	3"	1/2"	.125"	-
48500	.5000	1/2"	12.700	1/2"	4"	1/2"	.125"	-

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HIGH PERFORMANCE
END MILLS

MATERIAL HARDNESS (Rc)



TOLERANCES

$d1$	$+0.000'' - .001'' (+.000 - .025\text{mm})$
$d2$	$h6$
ball radius	$+0.0000'' - .0005'' (+.0000 - .0127\text{mm})$

Recommended for die mold applications

Die Mold Cutter - Ball End

BALINIT® Durana Coating

Solid submicron grain carbide end mill - center cutting

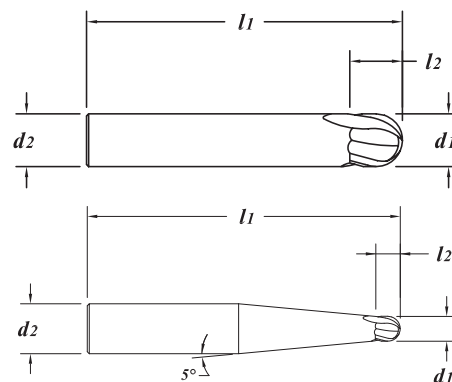
High performance machining in the die mold industry

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

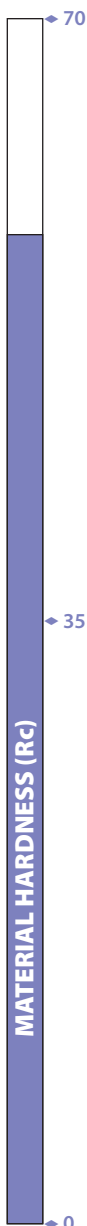
≤5mm (.1969") diameter have 5° per side taper to shank

Recommended for high Rockwell materials

Can be modified with a neck in 48 hours



EDP#	$d1$ †		$d2$	$l1$	$l2$
	Decimal	Diameter			
14210	.0312	1/32"	0.792	1/4"	3"
15210	.0394		1.000	6.0	75
15220	.0591		1.500	6.0	75
14220	.0625	1/16"	1.588	1/4"	3"
15230	.0787		2.000	6.0	75
14230	.0938	3/32"	2.383	1/4"	3"
15240	.1181		3.000	6.0	75
14240	.1250	1/8"	3.175	1/4"	3"
15250	.1575		4.000	6.0	75
14250	.1875	3/16"	4.763	1/4"	3"
15260	.1969		5.000	6.0	75
15270	.2362		6.000	6.0	75
14260	.2500	1/4"	6.350	1/4"	3"
14270	.3125	5/16"	7.938	5/16"	4"
15280	.3150		8.000	8.0	100
14280	.3750	3/8"	9.525	3/8"	4"
15290	.3937		10.000	10.0	100
15300	.4724		12.000	12.0	100
14290	.5000	1/2"	12.700	1/2"	4"



TOLERANCES

$d1$	$+0.000" - .002" (+.000 - .050\text{mm})$
$d2$	$h6$

TECH
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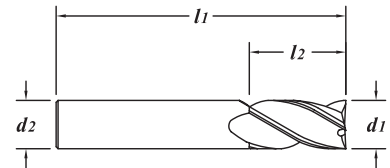
Series 210D

HIGH
PERFORMANCE
END MILLS

Recommended for graphite, fiber-reinforced plastics, carbon fiber

Square End Diamond Coating

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



EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length
	Decimal	Metric			
10018	.0312	1/32"	0.792	1/8"	1-1/2"
46018	.0394		1.000	3.0	38
10028	.0469	3/64"	1.191	1/8"	1-1/2"
46028	.0591		1.500	3.0	38
10038	.0625	1/16"	1.588	1/8"	1-1/2"
46038	.0787		2.000	3.0	38
10058	.0938	3/32"	2.383	1/8"	1-1/2"
46058	.1181		3.000	3.0	38
10078	.1250	1/8"	3.175	1/8"	1-1/2"
46078	.1575		4.000	4.0	50
10118	.1875	3/16"	4.763	3/16"	2"
46098	.1969		5.000	5.0	50
46108	.2362		6.000	6.0	65
10158	.2500	1/4"	6.350	1/4"	2-1/2"
10198	.3125	5/16"	7.938	5/16"	2-1/2"
46128	.3150		8.000	8.0	65
10238	.3750	3/8"	9.525	3/8"	2-1/2"
46148	.3937		10.000	10.0	70
46168	.4724		12.000	12.0	75
10318	.5000	1/2"	12.700	1/2"	3"
13338	.6250	5/8"	15.875	5/8"	3-1/2"
46188	.6299		16.000	16.0	88
13358	.7500	3/4"	19.050	3/4"	4"
13378	1.000	1"	25.400	1"	4"

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MATERIAL HARDNESS (Rc)

35

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Series 210RD



TECH
PAGES
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TOLERANCES

d_1	$+0.000" - .002" (+.000 - .050\text{mm})$
d_2	$h6$
r	$+0.001" - .001" (+.025 - .025\text{mm})$

Recommended for graphite, fiber-reinforced plastics, carbon fiber

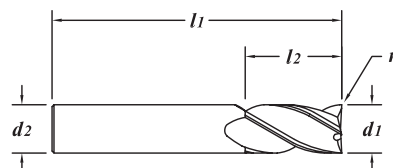
Corner Radius

Diamond Coating

Solid grade C-2 carbide end mill - center cutting

Crystalline diamond coating

For stronger corners and part radius



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MATERIAL HARDNESS (Rc)

35

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EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	
	Decimal	Metric					
24118	.1181	3.000	3.0	38	12	0.50	
80018	.1250	1/8"	3.175	1/8"	1-1/2"	.015"	
80028	.1250	1/8"	3.175	1/8"	1-1/2"	.020"	
24148	.1575	4.000	4.0	50	14	0.30	
24158	.1575	4.000	4.0	50	14	0.50	
80058	.1875	3/16"	4.763	3/16"	2"	5/8"	.015"
80068	.1875	3/16"	4.763	3/16"	2"	5/8"	.020"
24178	.2362	6.000	6.0	65	20	0.50	
24208	.2362	6.000	6.0	65	20	1.50	
80108	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"
80118	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"
80128	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"
24248	.3150	8.000	8.0	65	20	1.00	
80248	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.020"
80258	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"
24318	.3937	10.000	10.0	70	25	1.00	
24378	.4724	12.000	12.0	75	25	0.50	
24398	.4724	12.000	12.0	75	25	1.00	
80328	.5000	1/2"	12.700	1/2"	3"	1"	.030"
80348	.5000	1/2"	12.700	1/2"	3"	1"	.060"

TOLERANCES

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



TECH
PAGES
321

Series 310D

HIGH PERFORMANCE
END MILLS

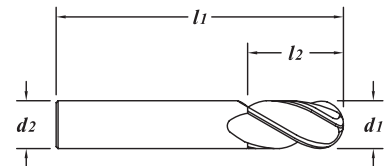
Recommended for graphite, fiber-reinforced plastics, carbon fiber

Ball End

Diamond Coating

Solid grade C-2 carbide end mill - center cutting

Crystalline diamond coating



EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
	Decimal	Metric			
15018	.0312	1/32"	0.792	1/8"	1-1/2"
48018	.0394		1.000	3.0	38
15028	.0469	3/64"	1.191	1/8"	1-1/2"
48028	.0591		1.500	3.0	38
15038	.0625	1/16"	1.588	1/8"	1-1/2"
48038	.0787		2.000	3.0	38
15058	.0938	3/32"	2.383	1/8"	1-1/2"
48058	.1181		3.000	3.0	38
15078	.1250	1/8"	3.175	1/8"	1-1/2"
48078	.1575		4.000	4.0	50
15118	.1875	3/16"	4.763	3/16"	2"
48098	.1969		5.000	5.0	50
48108	.2362		6.000	6.0	65
15158	.2500	1/4"	6.350	1/4"	2-1/2"
15198	.3125	5/16"	7.938	5/16"	2-1/2"
48128	.3150		8.000	8.0	65
15238	.3750	3/8"	9.525	3/8"	2-1/2"
48168	.4724		12.000	12.0	75
15318	.5000	1/2"	12.700	1/2"	3"

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MATERIAL HARDNESS (Rc)

35

0



TOLERANCES

d_1	$+0.000^{\circ} - .002^{\circ} (+.000 - .050\text{mm})$
d_2	$h6$

Recommended for graphite, fiber-reinforced plastics, carbon fiber

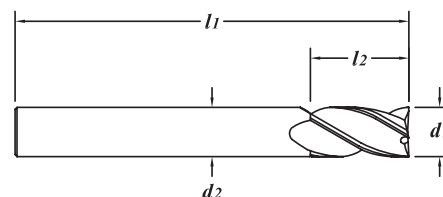
Extra Length - Square End

Diamond Coating

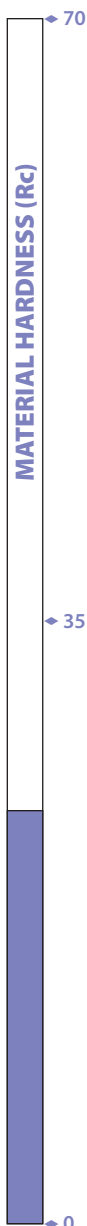
Solid grade C-2 carbide end mill - center cutting

Crystalline diamond coating

Can be modified with a neck in 48 hours



EDP#	$d_1^{\dagger}$ Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
	Decimal	Metric			
94028	.1181	3.000	3.0	75	20
38038	.1250 1/8"	3.175	1/8"	3"	1"
94068	.1575	4.000	4.0	75	25
38048	.1875 3/16"	4.763	3/16"	4"	1"
38058	.2500 1/4"	6.350	1/4"	3"	1"
38068	.2500 1/4"	6.350	1/4"	4"	1"
38078	.2500 1/4"	6.350	1/4"	6"	1-1/2"
38098	.3125 5/16"	7.938	5/16"	4"	1"
94168	.3150	8.000	8.0	100	25
38128	.3750 3/8"	9.525	3/8"	4"	1"
38138	.3750 3/8"	9.525	3/8"	6"	1-1/2"
94208	.3937	10.000	10.0	100	25
94248	.4724	12.000	12.0	100	25
38168	.5000 1/2"	12.700	1/2"	4"	1"
38178	.5000 1/2"	12.700	1/2"	4"	2"



TOLERANCES

d_1	$+0.000" - .002" (+.000 - .050\text{mm})$
d_2	$h6$
ball radius	$+0.000" - .001" (+.000 - .025\text{mm})$



TECH
PAGES
321

Series 710D

HIGH PERFORMANCE
END MILLS

Recommended for graphite, fiber-reinforced plastics, carbon fiber

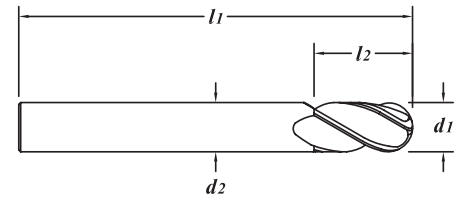
Extra Length - Ball End

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
	Decimal	Metric			
99028	.1181	3.000	3.0	75	20
40038	.1250 1/8"	3.175	1/8"	3"	1"
99068	.1575	4.000	4.0	75	25
40048	.1875 3/16"	4.763	3/16"	4"	1"
99108	.2362	6.000	6.0	100	25
99128	.2362	6.000	6.0	150	38
40058	.2500 1/4"	6.350	1/4"	3"	1"
40068	.2500 1/4"	6.350	1/4"	4"	1"
40078	.2500 1/4"	6.350	1/4"	6"	1-1/2"
40098	.3125 5/16"	7.938	5/16"	4"	1"
99168	.3150	8.000	8.0	100	25
40128	.3750 3/8"	9.525	3/8"	4"	1"
40138	.3750 3/8"	9.525	3/8"	6"	1-1/2"
99208	.3937	10.000	10.0	100	25
40168	.5000 1/2"	12.700	1/2"	4"	1"
40178	.5000 1/2"	12.700	1/2"	4"	2"

70

MATERIAL HARDNESS (Rc)

35

0



INTRODUCING ...

GARR Technical Advisor

Features ease of use, including an extensive material list
and setup versatility

Uses a dynamic function based on spindle interface,
toolholding, stability of workpiece and *most importantly*,
specific material condition

Adaptability of the GARR Technical Advisor is beneficial
when setup factors are sub-optimal



CHECK IT OUT ON OUR WEBSITE

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



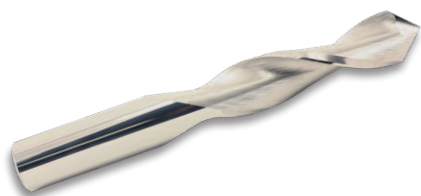
SERIES 780 - 8-FACET POINT

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 BALINIT® MAYURA 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:

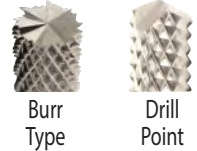
- Polycrystalline Diamond
- Amorphous Diamond / BALINIT® MAYURA
- AlCrN Coated



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 / BALINIT® MAYURA
- 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

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



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

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

GENERAL PURPOSE
END MILLS

Stub Length - Square End

Solid submicron grain carbide end mill - center cutting

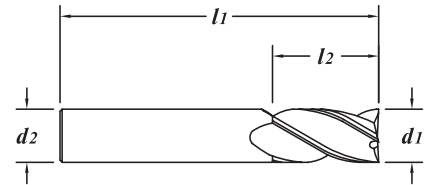
Shorter flute length for rigidity

Extremely versatile

TiALN Coated - page 221

Standard Length - page 228

Extended length - page 248



(160M/860M) 2 Flute EDP#	(170M/870M) 4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length
		Decimal				
01350	-	.0200	.0200"	0.508	1/8"	1-1/2"
01360	-	.0210	.0210"	0.533	1/8"	1-1/2"
01370	-	.0220	.0220"	0.559	1/8"	1-1/2"
01380	-	.0230	.0230"	0.584	1/8"	1-1/2"
01390	-	.0240	.0240"	0.610	1/8"	1-1/2"
01400	-	.0250	.0250"	0.635	1/8"	1-1/2"
01410	-	.0260	.0260"	0.660	1/8"	1-1/2"
01420	-	.0270	.0270"	0.686	1/8"	1-1/2"
01430	-	.0280	.0280"	0.711	1/8"	1-1/2"
01440	-	.0290	.0290"	0.737	1/8"	1-1/2"
01450	-	.0300	.0300"	0.762	1/8"	1-1/2"
01010	02010	.0312	1/32"	0.792	1/8"	1-1/2"
01510	02510	.0394		1.000	3.0	38
01020	02020	.0469	3/64"	1.191	1/8"	1-1/2"
01520	02520	.0591		1.500	3.0	38
01030	02030	.0625	1/16"	1.588	1/8"	1-1/2"
01530	02530	.0787		2.000	3.0	38
01040	02040	.0938	3/32"	2.383	1/8"	1-1/2"
01540	02540	.0984		2.500	3.0	38
01550	02550	.1181		3.000	3.0	38
01050	02050	.1250	1/8"	3.175	1/8"	1-1/2"
01560	02560	.1378		3.500	4.0	50
01060	02060	.1562	5/32"	3.967	3/16"	2"
01570	02570	.1575		4.000	4.0	50
01580	02580	.1772		4.500	5.0	50
01070	02070	.1875	3/16"	4.763	3/16"	2"
01590	02590	.1969		5.000	5.0	50
01080	02080	.2188	7/32"	5.558	1/4"	2"
01600	02600	.2362		6.000	6.0	50

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	
		Decimal		Metric			
01090	02090	.2500	1/4"	6.350	1/4"	2"	1/2"
01610	02610	.2756		7.000	7.0	50	12
01100	02100	.3125	5/16"	7.938	5/16"	2"	1/2"
01620	02620	.3150		8.000	8.0	50	12
01630	02630	.3543		9.000	9.0	50	14
01110	02110	.3750	3/8"	9.525	3/8"	2"	5/8"
01640	02640	.3937		10.000	10.0	50	16
01650	02650	.4331		11.000	11.0	65	19
01120	02120	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"
01660	02660	.4724		12.000	12.0	65	19
01130	02130	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"
01140	02140	.6250	5/8"	15.875	5/8"	3"	3/4"
-	02670	.6299		16.000	16.0	75	19
01150	02150	.7500	3/4"	19.050	3/4"	3"	1"
-	02680	.7874		20.000	20.0	75	25
-	02160	1.000	1"	25.400	1"	3"	1"



Micro Tool Manufacturing

TOLERANCES

d_1	$+0.000" - .002" (+.000 - .050\text{mm})$
d_2	$h6$

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

Stub Length - Square End
TiALN Coating

Solid submicron grain carbide end mill - center cutting

Shorter flute length for rigidity

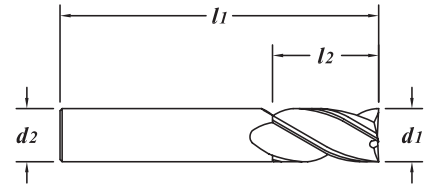
Dry or semi-dry machining

Extremely versatile

Bright Finish - page [219](#)

Standard Length - page [232](#)

Extended length - page [251](#)



(160MA/860MA) 2 Flute EDP#	(170MA/870MA) 4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
		Decimal	Metric			
01017	02017	.0312	1/32"	0.792	1/8"	1-1/2"
01517	02517	.0394		1.000	3.0	38
01027	02027	.0469	3/64"	1.191	1/8"	1-1/2"
01527	02527	.0591		1.500	3.0	38
01037	02037	.0625	1/16"	1.588	1/8"	1-1/2"
01537	02537	.0787		2.000	3.0	38
01047	02047	.0938	3/32"	2.383	1/8"	1-1/2"
01547	02547	.0984		2.500	3.0	38
01557	02557	.1181		3.000	3.0	38
01057	02057	.1250	1/8"	3.175	1/8"	1-1/2"
01567	02567	.1378		3.500	4.0	50
01067	02067	.1562	5/32"	3.967	3/16"	2"
01577	02577	.1575		4.000	4.0	50
01587	02587	.1772		4.500	5.0	50
01077	02077	.1875	3/16"	4.763	3/16"	2"
01597	02597	.1969		5.000	5.0	50
01087	02087	.2188	7/32"	5.558	1/4"	2"
01607	02607	.2362		6.000	6.0	50
01097	02097	.2500	1/4"	6.350	1/4"	2"
01617	02617	.2756		7.000	7.0	50
01107	02107	.3125	5/16"	7.938	5/16"	2"
01627	02627	.3150		8.000	8.0	50
01637	02637	.3543		9.000	9.0	50
01117	02117	.3750	3/8"	9.525	3/8"	2"
01647	02647	.3937		10.000	10.0	50
01657	02657	.4331		11.000	11.0	65
01127	02127	.4375	7/16"	11.113	7/16"	2-1/2"
01667	02667	.4724		12.000	12.0	65
01137	02137	.5000	1/2"	12.700	1/2"	2-1/2"
01147	02147	.6250	5/8"	15.875	5/8"	3"
-	02677	.6299		16.000	16.0	75
01157	02157	.7500	3/4"	19.050	3/4"	3"
-	02687	.7874		20.000	20.0	75
-	02167	1.000	1"	25.400	1"	3"

GENERAL PURPOSE
END MILLS

70

35

MATERIAL HARDNESS (Rc)

0

Series 170R, 870R

.0625" - .3150"
(1.588mm - 8.000mm)TECH
PAGES
290-291

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

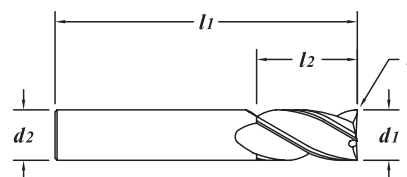
For stronger corners and part radius

Extremely versatile

TiALN Coating - page 224

Standard Length - page 234

Extended Length - page 253



EDP#	d_1 †		d_2	l_1	l_2	r
	Decimal	Diameter Metric				
30701	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"
30703	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"
30705	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"
30707	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"
30709	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"
30711	.1181		3.000	3/8"	6"	0.20"
30713	.1181		3.000	3/8"	6"	0.50"
30715	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"
30717	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"
30719	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"
30721	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"
30904	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"
30909	.1562	5/32"	3.967	3/16"	2"	5/16"
30911	.1562	5/32"	3.967	3/16"	2"	5/16"
30913	.1562	5/32"	3.967	3/16"	2"	5/16"
30723	.1575		4.000	4.0"	50"	8"
30725	.1575		4.000	4.0"	50"	8"
30727	.1875	3/16"	4.763	3/16"	2"	3/8"
30729	.1875	3/16"	4.763	3/16"	2"	3/8"
30731	.1875	3/16"	4.763	3/16"	2"	3/8"
30733	.1875	3/16"	4.763	3/16"	2"	3/8"
30735	.1969		5.000	5.0"	50"	10"
30737	.1969		5.000	5.0"	50"	10"
30739	.2362		6.000	6.0"	50"	12"
30741	.2362		6.000	6.0"	50"	12"
30743	.2362		6.000	6.0"	50"	12"
30747	.2362		6.000	6.0"	50"	12"
30749	.2500	1/4"	6.350	1/4"	2"	1/2"
30751	.2500	1/4"	6.350	1/4"	2"	1/2"
30753	.2500	1/4"	6.350	1/4"	2"	1/2"
30755	.2500	1/4"	6.350	1/4"	2"	1/2"
30757	.2500	1/4"	6.350	1/4"	2"	1/2"
30759	.2500	1/4"	6.350	1/4"	2"	1/2"
30761	.3125	5/16"	7.938	5/16"	2"	1/2"
30763	.3125	5/16"	7.938	5/16"	2"	1/2"
30765	.3125	5/16"	7.938	5/16"	2"	1/2"
30767	.3125	5/16"	7.938	5/16"	2"	1/2"
30769	.3125	5/16"	7.938	5/16"	2"	1/2"
30771	.3150		8.000	8.0"	50"	12"
30773	.3150		8.000	8.0"	50"	12"
30775	.3150		8.000	8.0"	50"	12"
30779	.3150		8.000	8.0"	50"	12"
30781	.3150		8.000	8.0"	50"	12"

EDP#	$d1^{\dagger}$			$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius
	Decimal	Diameter	Metric				
30785	.3750	3/8"	9.525	3/8"	2"	5/8"	.010"
30787	.3750	3/8"	9.525	3/8"	2"	5/8"	.015"
30789	.3750	3/8"	9.525	3/8"	2"	5/8"	.020"
30791	.3750	3/8"	9.525	3/8"	2"	5/8"	.030"
30793	.3750	3/8"	9.525	3/8"	2"	5/8"	.045"
30795	.3750	3/8"	9.525	3/8"	2"	5/8"	.060"
30799	.3937		10.000	10.0	50	16	0.80
30801	.3937		10.000	10.0	50	16	1.00
30803	.3937		10.000	10.0	50	16	1.50
30805	.3937		10.000	10.0	50	16	2.00
30807	.3937		10.000	10.0	50	16	2.50
30809	.3937		10.000	10.0	50	16	3.00
30811	.3937		10.000	10.0	50	16	3.20
30813	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.010"
30815	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.015"
30817	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.020"
30819	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.030"
30821	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.045"
30823	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.060"
30825	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.090"
30827	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.125"
30829	.4724		12.000	12.0	65	19	0.50
30831	.4724		12.000	12.0	65	19	0.80
30835	.4724		12.000	12.0	65	19	1.50
30837	.4724		12.000	12.0	65	19	2.00
30839	.4724		12.000	12.0	65	19	2.50
30841	.4724		12.000	12.0	65	19	3.00
30843	.4724		12.000	12.0	65	19	3.20
30845	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.010"
30847	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.015"
30849	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.020"
30851	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"
30853	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.045"
30855	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.060"
30857	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.090"
30859	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.125"
30861	.6250	5/8"	15.875	5/8"	3"	3/4"	.015"
30863	.6250	5/8"	15.875	5/8"	3"	3/4"	.020"
30865	.6250	5/8"	15.875	5/8"	3"	3/4"	.030"
30867	.6250	5/8"	15.875	5/8"	3"	3/4"	.045"
30869	.6250	5/8"	15.875	5/8"	3"	3/4"	.060"
30871	.6250	5/8"	15.875	5/8"	3"	3/4"	.090"
30875	.6299		16.000	16.0	75	19	1.00
30877	.6299		16.000	16.0	75	19	2.00
30879	.6299		16.000	16.0	75	19	2.50
30881	.6299		16.000	16.0	75	19	3.00
30883	.6299		16.000	16.0	75	19	4.00
30885	.6299		16.000	16.0	75	19	5.00
30887	.7500	3/4"	19.050	3/4"	3"	1"	.015"
30889	.7500	3/4"	19.050	3/4"	3"	1"	.020"
30891	.7500	3/4"	19.050	3/4"	3"	1"	.030"
30895	.7500	3/4"	19.050	3/4"	3"	1"	.060"
30899	.7500	3/4"	19.050	3/4"	3"	1"	.125"
30901	.7500	3/4"	19.050	3/4"	3"	1"	.250"

70

35

MATERIAL HARDNESS (Rc)

0

Series 170RA, 870RA

.0625" - .3150"
(1.588mm - 8.000mm)TECH
PAGES
290-291

TOLERANCES

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

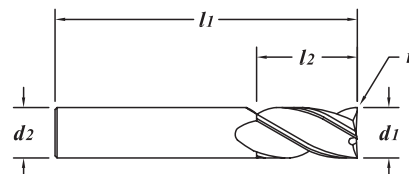
For stronger corners and part radius

Extremely versatile

Bright Finish - page 222

Standard Length - page 237

Extended Length - page 256



EDP#	d_1 †		d_2	l_1	l_2	r
	Decimal	Diameter Metric				
30702	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"
30704	.0625	1/16"	1.588	1/8"	1-1/2"	1/8"
30706	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"
30708	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"
30710	.0938	3/32"	2.383	1/8"	1-1/2"	3/16"
30712	.1181		3.000	3.0	38	6
30714	.1181		3.000	3.0	38	6
30716	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"
30718	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"
30720	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"
30722	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"
30906	.1250	1/8"	3.175	1/8"	1-1/2"	1/4"
30910	.1562	5/32"	3.967	3/16"	2"	5/16"
30912	.1562	5/32"	3.967	3/16"	2"	5/16"
30914	.1562	5/32"	3.967	3/16"	2"	5/16"
30724	.1575		4.000	4.0	50	8
30726	.1575		4.000	4.0	50	8
30728	.1875	3/16"	4.763	3/16"	2"	3/8"
30730	.1875	3/16"	4.763	3/16"	2"	3/8"
30732	.1875	3/16"	4.763	3/16"	2"	3/8"
30734	.1875	3/16"	4.763	3/16"	2"	3/8"
30736	.1969		5.000	5.0	50	10
30738	.1969		5.000	5.0	50	10
24117	.1969		5.000	5.0	50	16
30740	.2362		6.000	6.0	50	12
30742	.2362		6.000	6.0	50	12
30744	.2362		6.000	6.0	50	12
30746	.2362		6.000	6.0	50	12
30748	.2362		6.000	6.0	50	12
30750	.2500	1/4"	6.350	1/4"	2"	1/2"
30752	.2500	1/4"	6.350	1/4"	2"	1/2"
30754	.2500	1/4"	6.350	1/4"	2"	1/2"
30756	.2500	1/4"	6.350	1/4"	2"	1/2"
30758	.2500	1/4"	6.350	1/4"	2"	1/2"
30760	.2500	1/4"	6.350	1/4"	2"	1/2"
30762	.3125	5/16"	7.938	5/16"	2"	1/2"
30764	.3125	5/16"	7.938	5/16"	2"	1/2"
30766	.3125	5/16"	7.938	5/16"	2"	1/2"
30768	.3125	5/16"	7.938	5/16"	2"	1/2"
30770	.3125	5/16"	7.938	5/16"	2"	1/2"
30772	.3150		8.000	8.0	50	12
30774	.3150		8.000	8.0	50	12
30776	.3150		8.000	8.0	50	12
30778	.3150		8.000	8.0	50	12
30780	.3150		8.000	8.0	50	12
30782	.3150		8.000	8.0	50	12

EDP#	$d1^{\dagger}$			$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius
	Decimal	Diameter	Metric				
30786	.3750	3/8"	9.525	3/8"	2"	5/8"	.010"
30788	.3750	3/8"	9.525	3/8"	2"	5/8"	.015"
30790	.3750	3/8"	9.525	3/8"	2"	5/8"	.020"
30792	.3750	3/8"	9.525	3/8"	2"	5/8"	.030"
30794	.3750	3/8"	9.525	3/8"	2"	5/8"	.045"
30796	.3750	3/8"	9.525	3/8"	2"	5/8"	.060"
30798	.3937		10.000	10.0	50	16	0.50
30800	.3937		10.000	10.0	50	16	0.80
30802	.3937		10.000	10.0	50	16	1.00
30804	.3937		10.000	10.0	50	16	1.50
30806	.3937		10.000	10.0	50	16	2.00
30808	.3937		10.000	10.0	50	16	2.50
30810	.3937		10.000	10.0	50	16	3.00
30812	.3937		10.000	10.0	50	16	3.20
30814	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.010"
30816	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.015"
30820	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.030"
30822	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.045"
30824	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.060"
30828	.4375	7/16"	11.113	7/16"	2-1/2"	5/8"	.125"
30830	.4724		12.000	12.0	65	19	0.50
30832	.4724		12.000	12.0	65	19	0.80
30834	.4724		12.000	12.0	65	19	1.00
30836	.4724		12.000	12.0	65	19	1.50
30838	.4724		12.000	12.0	65	19	2.00
30840	.4724		12.000	12.0	65	19	2.50
30844	.4724		12.000	12.0	65	19	3.20
30846	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.010"
30848	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.015"
30850	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.020"
30852	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.030"
30854	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.045"
30856	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.060"
30858	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.090"
30860	.5000	1/2"	12.700	1/2"	2-1/2"	5/8"	.125"
30866	.6250	5/8"	15.875	5/8"	3"	3/4"	.030"
30868	.6250	5/8"	15.875	5/8"	3"	3/4"	.045"
30870	.6250	5/8"	15.875	5/8"	3"	3/4"	.060"
30872	.6250	5/8"	15.875	5/8"	3"	3/4"	.090"
30874	.6299		16.000	16.0	75	19	0.50
30878	.6299		16.000	16.0	75	19	2.00
30880	.6299		16.000	16.0	75	19	2.50
30882	.6299		16.000	16.0	75	19	3.00
30884	.6299		16.000	16.0	75	19	4.00
30886	.6299		16.000	16.0	75	19	5.00
30888	.7500	3/4"	19.050	3/4"	3"	1"	.015"
30890	.7500	3/4"	19.050	3/4"	3"	1"	.020"
30892	.7500	3/4"	19.050	3/4"	3"	1"	.030"
30894	.7500	3/4"	19.050	3/4"	3"	1"	.045"
30896	.7500	3/4"	19.050	3/4"	3"	1"	.060"
30898	.7500	3/4"	19.050	3/4"	3"	1"	.090"
30900	.7500	3/4"	19.050	3/4"	3"	1"	.125"
30902	.7500	3/4"	19.050	3/4"	3"	1"	.250"

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MATERIAL HARDNESS (Rc)

0

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



TOLERANCES

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

Stub Length - Ball End

Solid submicron grain carbide end mill - center cutting

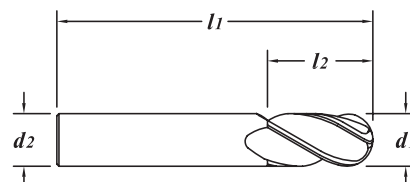
Shorter flute length for rigidity

Extremely versatile

TiALN Coating - page 227

Standard Length - page 240

Extended length - page 259



(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
		Decimal	Metric			
03350	-	.0200	.0200"	0.508	1/8"	1-1/2"
03400	-	.0250	.0250"	0.635	1/8"	1-1/2"
03450	-	.0300	.0300"	0.762	1/8"	1-1/2"
03010	04010	.0312	1/32"	0.792	1/8"	1-1/2"
03510	04510	.0394		1.000	3/8"	2"
03020	04020	.0469	3/64"	1.191	1/8"	1-1/2"
03520	-	.0591		1.500	3/8"	3"
03030	04030	.0625	1/16"	1.588	1/8"	1-1/2"
03530	04530	.0787		2.000	3/8"	4"
03040	04040	.0938	3/32"	2.383	1/8"	1-1/2"
03540	04540	.0984		2.500	3/8"	5"
03550	04550	.1181		3.000	3/8"	6"
03050	04050	.1250	1/8"	3.175	1/8"	1-1/2"
03560	04560	.1378		3.500	4.0"	50"
03060	04060	.1562	5/32"	3.967	3/16"	2"
03570	04570	.1575		4.000	4.0"	50"
03580	04580	.1772		4.500	5.0"	50"
03070	04070	.1875	3/16"	4.763	3/16"	2"
03590	04590	.1969		5.000	5.0"	50"
03080	04080	.2188	7/32"	5.558	1/4"	2"
03600	04600	.2362		6.000	6.0"	50"
03090	04090	.2500	1/4"	6.350	1/4"	2"
03610	04610	.2756		7.000	7.0"	50"
03100	04100	.3125	5/16"	7.938	5/16"	2"
03620	04620	.3150		8.000	8.0"	50"
03630	04630	.3543		9.000	9.0"	50"
03110	04110	.3750	3/8"	9.525	3/8"	2"
03640	04640	.3937		10.000	10.0"	50"
03120	04120	.4375	7/16"	11.113	7/16"	2-1/2"
03660	04660	.4724		12.000	12.0"	65"
03130	04130	.5000	1/2"	12.700	1/2"	2-1/2"
03150	04150	.7500	3/4"	19.050	3/4"	3"

TOLERANCES

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

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

Stub Length - Ball End
TiALN Coating

Solid submicron grain carbide end mill - center cutting

Shorter flute length for rigidity

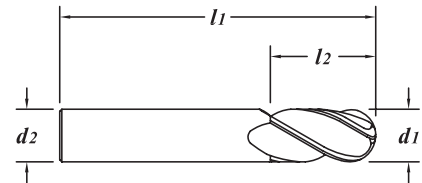
Dry or semi-dry machining

Extremely versatile

Bright Finish - page [226](#)

Standard Length - page [244](#)

Extended length - page [262](#)



(180MA/980MA) 2 Flute EDP#	(190MA/990MA) 4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
		Decimal	Metric			
03017	04017	.0312	1/32"	0.792	1/8"	1-1/2"
03517	04517	.0394		1.000	3.0	38
03027	04027	.0469	3/64"	1.191	1/8"	1-1/2"
03527	04527	.0591		1.500	3.0	38
03037	04037	.0625	1/16"	1.588	1/8"	1-1/2"
03537	04537	.0787		2.000	3.0	38
03047	04047	.0938	3/32"	2.383	1/8"	1-1/2"
03547	04547	.0984		2.500	3.0	38
03557	04557	.1181		3.000	3.0	38
03057	04057	.1250	1/8"	3.175	1/8"	1-1/2"
03567	04567	.1378		3.500	4.0	50
03067	04067	.1562	5/32"	3.967	3/16"	2"
03577	04577	.1575		4.000	4.0	50
03587	04587	.1772		4.500	5.0	50
03077	04077	.1875	3/16"	4.763	3/16"	2"
03597	04597	.1969		5.000	5.0	50
03087	04087	.2188	7/32"	5.558	1/4"	2"
03607	04607	.2362		6.000	6.0	50
03097	04097	.2500	1/4"	6.350	1/4"	2"
03617	04617	.2756		7.000	7.0	50
03107	04107	.3125	5/16"	7.938	5/16"	2"
03627	04627	.3150		8.000	8.0	50
03637	04637	.3543		9.000	9.0	50
03117	04117	.3750	3/8"	9.525	3/8"	2"
03647	04647	.3937		10.000	10.0	50
03657	04657	.4331		11.000	11.0	65
03127	04127	.4375	7/16"	11.113	7/16"	2-1/2"
03667	04667	.4724		12.000	12.0	65
03137	04137	.5000	1/2"	12.700	1/2"	2-1/2"
-	04147	.6250	5/8"	15.875	5/8"	3"
-	04157	.7500	3/4"	19.050	3/4"	3"
-	04687	.7874		20.000	20.0	75

GENERAL PURPOSE
END MILLS

70

35

MATERIAL HARDNESS (Rc)

0

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

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

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

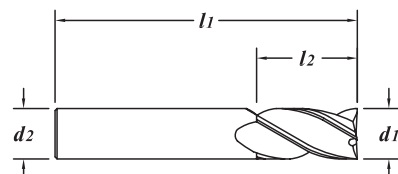
TiN Coating - page 230

TiCN Coating - page 231

TiAlN Coating - page 232

Stub Length - page 219

Extended length - page 248



(220M/820M) 2 Flute EDP#	(223M/823M) 3 Flute EDP#	(230M/830M) 4 Flute EDP#	d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
			Decimal		Metric			
11650	-	13650	.0200	.0200"	0.508	1/8"	1-1/2"	.060"
11660	-	-	.0210	.0210"	0.533	1/8"	1-1/2"	.063"
11670	-	-	.0220	.0220"	0.559	1/8"	1-1/2"	.066"
11680	-	-	.0230	.0230"	0.584	1/8"	1-1/2"	.069"
11690	-	-	.0240	.0240"	0.610	1/8"	1-1/2"	.072"
11700	-	13700	.0250	.0250"	0.635	1/8"	1-1/2"	.075"
11710	-	-	.0260	.0260"	0.660	1/8"	1-1/2"	.078"
11720	-	-	.0270	.0270"	0.686	1/8"	1-1/2"	.081"
11730	-	-	.0280	.0280"	0.711	1/8"	1-1/2"	.084"
11740	-	-	.0290	.0290"	0.737	1/8"	1-1/2"	.087"
11750	-	13750	.0300	.0300"	0.762	1/8"	1-1/2"	.090"
11010	12010	13010	.0312	1/32"	0.792	1/8"	1-1/2"	3/32"
45010	37010	46010	.0394		1.000	3.0	38	4
11020	12020	13020	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"
45020	37020	46020	.0591		1.500	3.0	38	6
11030	12030	13030	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"
11040	12040	13040	.0781	5/64"	1.984	1/8"	1-1/2"	1/4"
45030	37030	46030	.0787		2.000	3.0	38	8
11050	12050	13050	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"
45040	37040	46040	.0984		2.500	3.0	38	12
11060	12060	13060	.1094	7/64"	2.779	1/8"	1-1/2"	3/8"
45050	37050	46050	.1181		3.000	3.0	38	12
11070	12070	13070	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"
45060	37060	46060	.1378		3.500	4.0	50	12
11080	12080	13080	.1406	9/64"	3.571	3/16"	2"	9/16"
11090	12090	13090	.1562	5/32"	3.967	3/16"	2"	9/16"
45070	37070	46070	.1575		4.000	4.0	50	14
11100	12100	13100	.1719	11/64"	4.366	3/16"	2"	9/16"
45080	37080	46080	.1772		4.500	5.0	50	14
11110	12110	13110	.1875	3/16"	4.763	3/16"	2"	5/8"
92070	93070	94070	.1969		5.000	5.0	50	16
45090	37090	46090	.1969		5.000	5.0	65	16
11120	12120	13120	.2031	13/64"	5.159	1/4"	2-1/2"	5/8"
11130	12130	13130	.2188	7/32"	5.558	1/4"	2-1/2"	5/8"
11140	12140	13140	.2344	15/64"	5.954	1/4"	2-1/2"	3/4"
45100	37100	46100	.2362		6.000	6.0	65	19

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#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	
			Decimal		Metric			
11150	12150	13150	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"
11160	12160	13160	.2656	17/64"	6.746	5/16"	2-1/2"	7/8"
45110	37110	46110	.2756		7.000	7.0	65	22
11170	12170	13170	.2812	9/32"	7.142	5/16"	2-1/2"	7/8"
11180	12180	13180	.2969	19/64"	7.541	5/16"	2-1/2"	7/8"
11190	12190	13190	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"
45120	37120	46120	.3150		8.000	8.0	65	22
11200	12200	13200	.3281	21/64"	8.334	3/8"	2-1/2"	7/8"
11210	12210	13210	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"
45130	37130	46130	.3543		9.000	9.0	65	22
11220	12220	13220	.3594	23/64"	9.129	3/8"	2-1/2"	7/8"
11230	12230	13230	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"
11240	12240	13240	.3906	25/64"	9.921	7/16"	2-3/4"	7/8"
45140	37140	46140	.3937		10.000	10.0	70	25
11250	12250	13250	.4062	13/32"	10.317	7/16"	2-3/4"	7/8"
11260	12260	13260	.4219	27/64"	10.716	7/16"	2-3/4"	7/8"
45150	37150	46150	.4331		11.000	11.0	75	25
11270	12270	13270	.4375	7/16"	11.113	7/16"	2-3/4"	1"
11280	12280	13280	.4531	29/64"	11.509	1/2"	3"	1"
11290	-	13290	.4688	15/32"	11.908	1/2"	3"	1"
45160	37160	46160	.4724		12.000	12.0	75	25
11300	12300	13300	.4844	31/64"	12.304	1/2"	3"	1"
11310	12310	13310	.5000	1/2"	12.700	1/2"	3"	1"
45170	37170	46170	.5512		14.000	14.0	88	32
11320	12320	13320	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"
11330	12330	13330	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"
45180	37180	46180	.6299		16.000	16.0	88	38
11340	12340	13340	.6875	11/16"	17.463	3/4"	4"	1-1/2"
45190	37190	46190	.7087		18.000	18.0	100	38
11350	12350	13350	.7500	3/4"	19.050	3/4"	4"	1-1/2"
45200	37200	46200	.7874		20.000	20.0	100	38
45210	37210	46210	.8661		22.000	22.0	100	38
11360	12360	13360	.8750	7/8"	22.225	7/8"	4"	1-1/2"
45220	37220	46220	.9843		25.000	25.0	100	38
11370	12370	13370	1.000	1"	25.400	1"	4"	1-1/2"
-	-	13390	1.250	1-1/4"	31.750	1-1/4"	4-1/2"	2"

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MATERIAL HARDNESS (Rc)

0

Series 220MT, 230MT



TOLERANCES

d_1	$+0.000" - .002" (+.000 - .050\text{mm})$
d_2	$h6$

Standard Length - Square End

TiN Coating

Solid submicron grain carbide end mill - center cutting

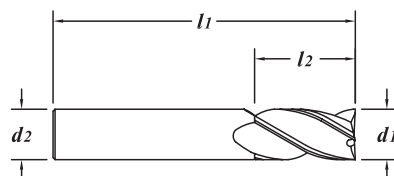
Improved lubricity

Extremely versatile

Bright Finish - page [228](#)

TiCN Coating - page [231](#)

TiALN Coating - page [232](#)



(220MT) 2 Flute EDP#	(230MT) 4 Flute EDP#	d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
		Decimal		Metric			
11073	13073	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"
11113	13113	.1875	3/16"	4.763	3/16"	2"	5/8"
11153	13153	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"
11193	13193	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"
11233	13233	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"
11273	13273	.4375	7/16"	11.113	7/16"	2-3/4"	1"
11313	13313	.5000	1/2"	12.700	1/2"	3"	1"
11333	13333	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"
11353	13353	.7500	3/4"	19.050	3/4"	4"	1-1/2"
-	13373	1.000	1"	25.400	1"	4"	1-1/2"



TOLERANCES

$d1$	$+0.000^{\circ} -0.002^{\circ} (+.000 -0.050\text{mm})$
$d2$	$h6$

Series 220MC, 223MC, 230MC

Standard Length - Square End
TiCN Coating

Solid submicron grain carbide end mill - center cutting

Improved abrasion resistance and lubricity

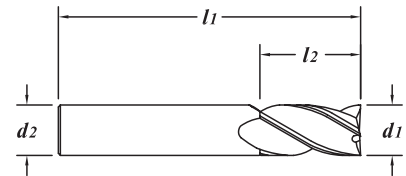
Extremely versatile

Bright Finish - page [228](#)

TiN Coating - page [230](#)

TiALN Coating - page [232](#)

Extended length - page [250](#)



(220MC) 2 Flute EDP#	(223MC) 3 Flute EDP#	(230MC) 4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length
			Decimal				
11014	12014	13014	.0312	1/32"	0.792	1/8"	1-1/2"
11024	12024	13024	.0469	3/64"	1.191	1/8"	1-1/2"
11034	12034	13034	.0625	1/16"	1.588	1/8"	1-1/2"
11044	12044	13044	.0781	5/64"	1.984	1/8"	1-1/2"
11054	12054	13054	.0938	3/32"	2.383	1/8"	1-1/2"
11064	12064	13064	.1094	7/64"	2.779	1/8"	1-1/2"
11074	12074	13074	.1250	1/8"	3.175	1/8"	1-1/2"
11084	12084	13084	.1406	9/64"	3.571	3/16"	2"
11094	12094	13094	.1562	5/32"	3.967	3/16"	2"
11104	12104	13104	.1719	11/64"	4.366	3/16"	2"
11114	12114	13114	.1875	3/16"	4.763	3/16"	2"
11124	12124	13124	.2031	13/64"	5.159	1/4"	2-1/2"
11134	12134	13134	.2188	7/32"	5.558	1/4"	2-1/2"
11144	12144	13144	.2344	15/64"	5.954	1/4"	2-1/2"
11154	12154	13154	.2500	1/4"	6.350	1/4"	2-1/2"
11164	12164	13164	.2656	17/64"	6.746	5/16"	2-1/2"
11174	12174	13174	.2812	9/32"	7.142	5/16"	2-1/2"
11184	12184	13184	.2969	19/64"	7.541	5/16"	2-1/2"
11194	12194	13194	.3125	5/16"	7.938	5/16"	2-1/2"
11204	12204	13204	.3281	21/64"	8.334	3/8"	2-1/2"
11214	12214	13214	.3438	11/32"	8.733	3/8"	2-1/2"
11224	12224	13224	.3594	23/64"	9.129	3/8"	2-1/2"
11234	12234	13234	.3750	3/8"	9.525	3/8"	2-1/2"
11244	-	13244	.3906	25/64"	9.921	7/16"	2-3/4"
11254	12254	13254	.4062	13/32"	10.317	7/16"	2-3/4"
11264	-	13264	.4219	27/64"	10.716	7/16"	2-3/4"
11274	12274	13274	.4375	7/16"	11.113	7/16"	2-3/4"
-	-	13284	.4531	29/64"	11.509	1/2"	3"
11294	12294	13294	.4688	15/32"	11.908	1/2"	3"
-	12304	13304	.4844	31/64"	12.304	1/2"	3"
11314	12314	13314	.5000	1/2"	12.700	1/2"	3"
11324	12324	13324	.5625	9/16"	14.288	9/16"	3-1/2"
11334	12334	13334	.6250	5/8"	15.875	5/8"	3-1/2"
11344	-	13344	.6875	11/16"	17.463	3/4"	4"
11354	12354	13354	.7500	3/4"	19.050	3/4"	4"
11364	-	13364	.8750	7/8"	22.225	7/8"	4"
11374	12374	13374	1.000	1"	25.400	1"	4"

GENERAL PURPOSE
END MILLS

70

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MATERIAL HARDNESS (Rc)

0

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

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

TOLERANCES

d_1	$+0.000" - .002" (+0.000 - .050\text{mm})$
d_2	$h6$

Standard Length - Square End

TiAlN Coating

Solid submicron grain carbide end mill - center cutting

Dry or semi-dry machining

Extremely versatile

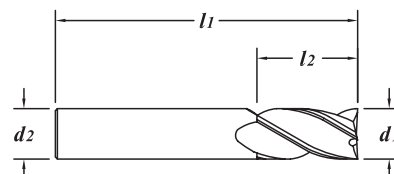
Bright Finish - page 228

TiN Coating - page 230

TiCN Coating - page 231

Stub Length - page 221

Extended Length - page 251



(220MA/820MA) 2 Flute EDP#	(223MA/823MA) 3 Flute EDP#	(230MA/830MA) 4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
Decimal	Metric						
11017	12017	13017	.0312	1/32"	0.792	1/8"	1-1/2"
45017	37017	46017	.0394		1.000	3.0	3/32"
11027	12027	13027	.0469	3/64"	1.191	1/8"	1/8"
45027	37027	46027	.0591		1.500	3.0	6
11037	12037	13037	.0625	1/16"	1.588	1/8"	1-1/2"
11047	12047	13047	.0781	5/64"	1.984	1/8"	1-1/2"
45037	37037	46037	.0787		2.000	3.0	38
11057	12057	13057	.0938	3/32"	2.383	1/8"	1-1/2"
45047	37047	46047	.0984		2.500	3.0	38
11067	12067	13067	.1094	7/64"	2.779	1/8"	1-1/2"
45057	37057	46057	.1181		3.000	3.0	38
11077	12077	13077	.1250	1/8"	3.175	1/8"	1-1/2"
45067	37067	46067	.1378		3.500	4.0	50
11087	12087	13087	.1406	9/64"	3.571	3/16"	2"
11097	12097	13097	.1562	5/32"	3.967	3/16"	2"
45077	37077	46077	.1575		4.000	4.0	50
11107	12107	13107	.1719	11/64"	4.366	3/16"	2"
45087	37087	46087	.1772		4.500	5.0	50
11117	12117	13117	.1875	3/16"	4.763	3/16"	2"
92077	93077	94077	.1969		5.000	5.0	50
45097	37097	46097	.1969		5.000	5.0	65
11127	12127	13127	.2031	13/64"	5.159	1/4"	2-1/2"
11137	12137	13137	.2188	7/32"	5.558	1/4"	2-1/2"
11147	12147	13147	.2344	15/64"	5.954	1/4"	2-1/2"
45107	37107	46107	.2362		6.000	6.0	65
11157	12157	13157	.2500	1/4"	6.350	1/4"	2-1/2"
11167	12167	13167	.2656	17/64"	6.746	5/16"	2-1/2"
45117	37117	46117	.2756		7.000	7.0	65
11177	12177	13177	.2812	9/32"	7.142	5/16"	2-1/2"
11187	12187	13187	.2969	19/64"	7.541	5/16"	2-1/2"
11197	12197	13197	.3125	5/16"	7.938	5/16"	2-1/2"
45127	37127	46127	.3150		8.000	8.0	65
11207	12207	13207	.3281	21/64"	8.334	3/8"	2-1/2"
11217	12217	13217	.3438	11/32"	8.733	3/8"	2-1/2"
45137	37137	46137	.3543		9.000	9.0	65
11227	12227	13227	.3594	23/64"	9.129	3/8"	2-1/2"

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
			Decimal		Metric			
11237	12237	13237	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"
11247	12247	13247	.3906	25/64"	9.921	7/16"	2-3/4"	7/8"
45147	37147	46147	.3937		10.000	10.0	70	25
11257	12257	13257	.4062	13/32"	10.317	7/16"	2-3/4"	7/8"
11267	12267	13267	.4219	27/64"	10.716	7/16"	2-3/4"	7/8"
45157	37157	46157	.4331		11.000	11.0	75	25
11277	12277	13277	.4375	7/16"	11.113	7/16"	2-3/4"	1"
11287	12287	13287	.4531	29/64"	11.509	1/2"	3"	1"
11297	12297	13297	.4688	15/32"	11.908	1/2"	3"	1"
45167	37167	46167	.4724		12.000	12.0	75	25
11307	12307	13307	.4844	31/64"	12.304	1/2"	3"	1"
11317	12317	13317	.5000	1/2"	12.700	1/2"	3"	1"
45177	37177	46177	.5512		14.000	14.0	88	32
11327	12327	13327	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"
11337	12337	13337	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"
45187	37187	46187	.6299		16.000	16.0	88	38
11347	12347	13347	.6875	11/16"	17.463	3/4"	4"	1-1/2"
45197	37197	46197	.7087		18.000	18.0	100	38
11357	12357	13357	.7500	3/4"	19.050	3/4"	4"	1-1/2"
45207	37207	46207	.7874		20.000	20.0	100	38
45217	37217	46217	.8661		22.000	22.0	100	38
11367	12367	13367	.8750	7/8"	22.225	7/8"	4"	1-1/2"
45227	37227	46227	.9843		25.000	25.0	100	38
11377	12377	13377	1.000	1"	25.400	1"	4"	1-1/2"
-	-	13397	1.250	1-1/4"	31.750	1-1/4"	4-1/2"	2"

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MATERIAL HARDNESS (Rc)

0



End Mill Manufacturing

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

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

TOLERANCES

d_1	+0.000" - .002" (+0.00 - .050mm)
d_2	h6
r	+0.001" - .001" (+0.025 - .025mm)

Standard Length - Corner Radius

Solid submicron grain carbide end mill - center cutting

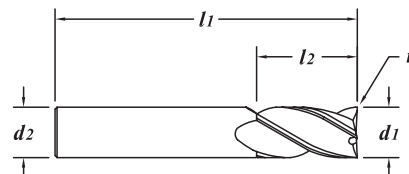
For stronger corners and part radius

Extremely versatile

TiAlN Coating - page 237

Stub Length - page 222

Extended Length - page 253



(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
Decimal					Metric				
79580	36100	80580	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	.010"
79590	36102	80590	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	.015"
79600	36104	80600	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.010"
79610	36106	80610	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.015"
79620	36108	80620	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.020"
36500	36110	24070	.1181		3.000	3.0	38	12	0.20
36502	36112	24080	.1181		3.000	3.0	38	12	0.50
79000	36114	80000	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.010"
79010	36116	80010	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.015"
79020	36118	80020	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.020"
79030	36120	80030	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.030"
-	-	80035	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.040"
36504	36122	24090	.1575		4.000	4.0	50	14	0.30
36506	36124	24100	.1575		4.000	4.0	50	14	0.50
79040	36126	80040	.1875	3/16"	4.763	3/16"	2"	5/8"	.010"
79050	36128	80050	.1875	3/16"	4.763	3/16"	2"	5/8"	.015"
79060	36130	80060	.1875	3/16"	4.763	3/16"	2"	5/8"	.020"
79070	36132	80070	.1875	3/16"	4.763	3/16"	2"	5/8"	.030"
-	-	80080	.1875	3/16"	4.763	3/16"	2"	5/8"	.060"
36508	36134	24110	.1969		5.000	5.0	65	16	0.30
36510	36136	24120	.1969		5.000	5.0	65	16	0.50
36512	36138	24170	.2362		6.000	6.0	65	19	0.50
36514	36140	24180	.2362		6.000	6.0	65	19	0.80
36516	36142	24190	.2362		6.000	6.0	65	19	1.00
36518	36144	24200	.2362		6.000	6.0	65	19	1.50
36520	36146	24210	.2362		6.000	6.0	65	19	2.00
36522	36148	80090	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"
79100	36150	80100	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"
79110	36152	80110	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"
79120	36154	80120	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"
79130	36156	80130	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.045"
79140	36158	80140	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.060"
79160	36160	80160	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.015"
79170	36162	80170	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.020"
79180	36164	80180	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.030"
79190	36166	80190	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.045"
79200	36168	80200	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.060"

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

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

GENERAL PURPOSE
END MILLS

(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	
			Decimal	Metric					
36524	36170	24220	.3150		8.000	8.0	65	22	0.50
36526	36172	24230	.3150		8.000	8.0	65	22	0.80
36528	36174	24240	.3150		8.000	8.0	65	22	1.00
36530	36176	24250	.3150		8.000	8.0	65	22	1.50
36532	36178	24260	.3150		8.000	8.0	65	22	2.00
36534	36180	24270	.3150		8.000	8.0	65	22	2.50
36536	36182	24280	.3150		8.000	8.0	65	22	3.00
36538	36184	80220	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.010"
79230	36186	80230	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.015"
79240	36188	80240	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.020"
79250	36190	80250	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"
79260	36192	80260	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.045"
79270	36194	80270	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.060"
36540	36196	24290	.3937		10.000	10.0	70	25	0.50
36542	36198	-	.3937		10.000	10.0	70	25	0.80
36544	36200	24310	.3937		10.000	10.0	70	25	1.00
36546	36202	24320	.3937		10.000	10.0	70	25	1.50
36548	36204	24330	.3937		10.000	10.0	70	25	2.00
36550	36206	24340	.3937		10.000	10.0	70	25	2.50
36552	36208	24350	.3937		10.000	10.0	70	25	3.00
36554	-	-	.3937		10.000	10.0	70	25	3.20
36556	36212	80700	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.010"
36558	36214	80705	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.015"
-	36216	80710	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.020"
36562	36218	80715	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.030"
-	36220	80720	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.045"
36566	36222	80725	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.060"
-	36224	80730	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.090"
36570	36226	80735	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.125"
36572	36228	24370	.4724		12.000	12.0	75	25	0.50
36574	36230	24380	.4724		12.000	12.0	75	25	0.80
36576	36232	24390	.4724		12.000	12.0	75	25	1.00
36578	36234	24400	.4724		12.000	12.0	75	25	1.50
36580	36236	24410	.4724		12.000	12.0	75	25	2.00
36582	36238	24420	.4724		12.000	12.0	75	25	2.50
36584	36240	24430	.4724		12.000	12.0	75	25	3.00
36586	36242	24440	.4724		12.000	12.0	75	25	3.20
36588	36244	80290	.5000	1/2"	12.700	1/2"	3"	1"	.010"
79300	36246	80300	.5000	1/2"	12.700	1/2"	3"	1"	.015"
79310	36248	80310	.5000	1/2"	12.700	1/2"	3"	1"	.020"
79320	36250	80320	.5000	1/2"	12.700	1/2"	3"	1"	.030"
79330	36252	80330	.5000	1/2"	12.700	1/2"	3"	1"	.045"
79340	36254	80340	.5000	1/2"	12.700	1/2"	3"	1"	.060"
79350	36256	80350	.5000	1/2"	12.700	1/2"	3"	1"	.090"
79360	36258	80360	.5000	1/2"	12.700	1/2"	3"	1"	.125"
79370	36260	80370	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"
79380	36262	80380	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.020"
79390	36264	80390	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"
79400	36266	80400	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.045"
79410	36268	80410	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"
79420	36270	80420	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.090"

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MATERIAL HARDNESS (Rc)

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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#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius
			Decimal	Metric				
36590	36272	24450	.6299	16.000	16.0	88	38	0.50
-	36274	24460	.6299	16.000	16.0	88	38	1.00
-	36276	24470	.6299	16.000	16.0	88	38	2.00
36596	-	24480	.6299	16.000	16.0	88	38	2.50
-	36280	24490	.6299	16.000	16.0	88	38	3.00
36600	36282	24500	.6299	16.000	16.0	88	38	4.00
36602	36284	24510	.6299	16.000	16.0	88	38	5.00
79440	36286	80440	.7500	3/4"	19.050	3/4"	4"	1-1/2"
79450	36288	80450	.7500	3/4"	19.050	3/4"	4"	1-1/2"
79460	36290	80460	.7500	3/4"	19.050	3/4"	4"	1-1/2"
79470	36292	80470	.7500	3/4"	19.050	3/4"	4"	1-1/2"
79480	36294	80480	.7500	3/4"	19.050	3/4"	4"	1-1/2"
79490	36296	80490	.7500	3/4"	19.050	3/4"	4"	1-1/2"
79500	36298	80500	.7500	3/4"	19.050	3/4"	4"	1-1/2"
79630	36300	80630	.7500	3/4"	19.050	3/4"	4"	1-1/2"
36604	36302	24520	.7874	20.000	20.0	100	38	0.50
-	36304	24530	.7874	20.000	20.0	100	38	1.00
-	36306	24540	.7874	20.000	20.0	100	38	2.00
36610	-	24550	.7874	20.000	20.0	100	38	3.00
-	36310	-	.7874	20.000	20.0	100	38	5.00
79510	36312	80510	1.000	1"	25.400	1"	4"	1-1/2"
79520	36314	80520	1.000	1"	25.400	1"	4"	1-1/2"
79530	36316	80530	1.000	1"	25.400	1"	4"	1-1/2"
79540	36318	80540	1.000	1"	25.400	1"	4"	1-1/2"
79550	36320	80550	1.000	1"	25.400	1"	4"	1-1/2"
79560	36322	80560	1.000	1"	25.400	1"	4"	1-1/2"
79570	36324	80570	1.000	1"	25.400	1"	4"	1-1/2"
79640	36326	80640	1.000	1"	25.400	1"	4"	1-1/2"

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TOLERANCES

$d1$	$+0.000^{\circ} - .002^{\circ} (+.000 - .050\text{mm})$
$d2$	$h6$
r	$+0.001^{\circ} - .001^{\circ} (+.025 - .025\text{mm})$

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



.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

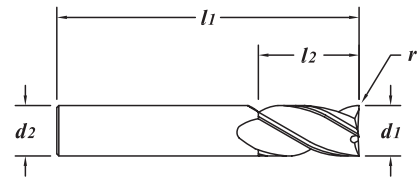
For stronger corners and part radius

Extremely versatile

Bright Finish - page 234

Stub Length - page 224

Extended Length - page 256



(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
			Decimal	Diameter	Metric				
79587	36101	80587	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	.010"
79597	36103	80597	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"	.015"
79607	36105	80607	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.010"
79617	36107	80617	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.015"
79627	36109	80627	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"	.020"
-	36111	24077	.1181		3.000	3.0	38	12	0.20
-	36113	24087	.1181		3.000	3.0	38	12	0.50
79007	36115	80007	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.010"
79017	36117	80017	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.015"
79027	36119	80027	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.020"
79037	36121	80037	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.030"
-	-	80038	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"	.040"
-	36123	24097	.1575		4.000	4.0	50	14	0.30
-	36125	24107	.1575		4.000	4.0	50	14	0.50
79047	36127	80047	.1875	3/16"	4.763	3/16"	2"	5/8"	.010"
79057	-	80057	.1875	3/16"	4.763	3/16"	2"	5/8"	.015"
79067	36131	80067	.1875	3/16"	4.763	3/16"	2"	5/8"	.020"
79077	36133	80077	.1875	3/16"	4.763	3/16"	2"	5/8"	.030"
-	-	80087	.1875	3/16"	4.763	3/16"	2"	5/8"	.060"
-	-	24117	.1969		5.000	5.0	50	16	0.30
-	36135	24119	.1969		5.000	5.0	65	16	0.30
-	-	24127	.1969		5.000	5.0	65	16	0.50
-	36139	24177	.2362		6.000	6.0	65	19	0.50
-	36141	24187	.2362		6.000	6.0	65	19	0.80
-	36143	24197	.2362		6.000	6.0	65	19	1.00
-	36145	24207	.2362		6.000	6.0	65	19	1.50
-	36147	24217	.2362		6.000	6.0	65	19	2.00
-	36149	80097	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.010"
79107	36151	80107	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.015"
79117	36153	80117	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.020"
79127	36155	80127	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.030"
79137	36157	80137	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.045"
79147	36159	80147	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"	.060"
79167	36161	80167	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.015"
79177	36163	80177	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.020"
79187	36165	80187	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.030"
79197	36167	80197	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.045"
79207	36169	80207	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"	.060"

continued →

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

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

(220RA) 2 Flute EDP#	(223RA/823RA) 3 Flute EDP#	(230RA/830RA) 4 Flute EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	
			Decimal	Metric					
-	36171	24227	.3150		8.000	8.0	65	22	0.50
-	36173	24237	.3150		8.000	8.0	65	22	0.80
-	36175	24247	.3150		8.000	8.0	65	22	1.00
-	36177	24257	.3150		8.000	8.0	65	22	1.50
-	36179	24267	.3150		8.000	8.0	65	22	2.00
-	36181	24277	.3150		8.000	8.0	65	22	2.50
-	36183	24287	.3150		8.000	8.0	65	22	3.00
-	36185	80227	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.010"
79237	36187	80237	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.015"
79247	36189	80247	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.020"
79257	36191	80257	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.030"
79267	36193	80267	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.045"
79277	36195	80277	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"	.060"
-	36197	24297	.3937		10.000	10.0	70	25	0.50
-	36199	24307	.3937		10.000	10.0	70	25	0.80
-	36201	24317	.3937		10.000	10.0	70	25	1.00
-	36203	24327	.3937		10.000	10.0	70	25	1.50
-	36205	24337	.3937		10.000	10.0	70	25	2.00
-	36207	24347	.3937		10.000	10.0	70	25	2.50
-	36209	24357	.3937		10.000	10.0	70	25	3.00
-	36211	24367	.3937		10.000	10.0	70	25	3.20
-	36213	80279	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.010"
-	36215	80281	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.015"
-	36217	80283	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.020"
-	36219	80285	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.030"
-	36221	80287	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.045"
-	36223	80289	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.060"
-	-	80291	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.090"
-	-	80293	.4375	7/16"	11.113	7/16"	2-3/4"	1"	.125"
-	36229	24377	.4724		12.000	12.0	75	25	0.50
-	36231	24387	.4724		12.000	12.0	75	25	0.80
-	36233	24397	.4724		12.000	12.0	75	25	1.00
-	36235	24407	.4724		12.000	12.0	75	25	1.50
-	36237	24417	.4724		12.000	12.0	75	25	2.00
-	36239	24427	.4724		12.000	12.0	75	25	2.50
-	36241	24437	.4724		12.000	12.0	75	25	3.00
-	36243	24447	.4724		12.000	12.0	75	25	3.20
-	36245	80297	.5000	1/2"	12.700	1/2"	3"	1"	.010"
79307	36247	80307	.5000	1/2"	12.700	1/2"	3"	1"	.015"
79317	36249	80317	.5000	1/2"	12.700	1/2"	3"	1"	.020"
79327	36251	80327	.5000	1/2"	12.700	1/2"	3"	1"	.030"
79337	36253	80337	.5000	1/2"	12.700	1/2"	3"	1"	.045"
79347	36255	80347	.5000	1/2"	12.700	1/2"	3"	1"	.060"
79357	36257	80357	.5000	1/2"	12.700	1/2"	3"	1"	.090"
79367	36259	80367	.5000	1/2"	12.700	1/2"	3"	1"	.125"
79377	36261	80377	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.015"
-	36263	80387	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.020"
79397	36265	80397	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.030"
79407	36267	80407	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.045"
79417	36269	80417	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.060"
79427	36271	80427	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"	.090"
-	36273	24457	.6299		16.000	16.0	88	38	0.50
-	36275	24467	.6299		16.000	16.0	88	38	1.00
-	36277	24477	.6299		16.000	16.0	88	38	2.00
-	36279	24487	.6299		16.000	16.0	88	38	2.50
-	36281	24497	.6299		16.000	16.0	88	38	3.00
-	36283	24507	.6299		16.000	16.0	88	38	4.00
-	-	24517	.6299		16.000	16.0	88	38	5.00

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#	$d1$ † Diameter			$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius
Decimal					Metric				
79447	36287	80447	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.015"
79457	36289	80457	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.020"
79467	36291	80467	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.030"
79477	36293	80477	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.045"
79487	36295	80487	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.060"
79497	36297	80497	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.090"
79507	36299	80507	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.125"
79637	36301	80637	.7500	3/4"	19.050	3/4"	4"	1-1/2"	.250"
-	36303	24527	.7874		20.000	20.0	100	38	0.50
-	-	24537	.7874		20.000	20.0	100	38	1.00
-	-	24547	.7874		20.000	20.0	100	38	2.00
-	36309	24557	.7874		20.000	20.0	100	38	3.00
-	-	24567	.7874		20.000	20.0	100	38	5.00
-	36313	80517	1.000	1"	25.400	1"	4"	1-1/2"	.015"
-	36315	80527	1.000	1"	25.400	1"	4"	1-1/2"	.020"
-	36317	80537	1.000	1"	25.400	1"	4"	1-1/2"	.030"
-	36319	80547	1.000	1"	25.400	1"	4"	1-1/2"	.045"
-	36321	80557	1.000	1"	25.400	1"	4"	1-1/2"	.060"
-	36323	80567	1.000	1"	25.400	1"	4"	1-1/2"	.090"
79577	36325	80577	1.000	1"	25.400	1"	4"	1-1/2"	.125"
79647	36327	80647	1.000	1"	25.400	1"	4"	1-1/2"	.250"



End Mill Manufacturing

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MATERIAL HARDNESS (Rc)

0

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

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

TOLERANCES

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

Standard Length - Ball End

Solid submicron grain carbide end mill - center cutting

Extremely versatile

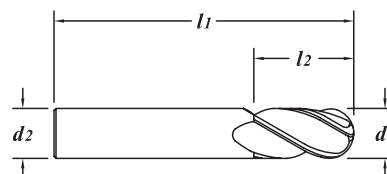
TiN Coating - page 242

TiCN Coating - page 243

TiAlN Coating - page 244

Stub Length - page 226

Extended length - page 259



(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
			Decimal		Metric			
16650	-	-	.0200	.0200"	0.508	1/8"	1-1/2"	.060"
16700	-	-	.0250	.0250"	0.635	1/8"	1-1/2"	.075"
16750	-	-	.0300	.0300"	0.762	1/8"	1-1/2"	.090"
16010	17010	18010	.0312	1/32"	0.792	1/8"	1-1/2"	3/32"
47010	38010	48010	.0394		1.000	3.0	38	4
16020	17020	18020	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"
47020	38020	48020	.0591		1.500	3.0	38	6
16030	17030	18030	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"
16040	17040	18040	.0781	5/64"	1.984	1/8"	1-1/2"	1/4"
47030	38030	48030	.0787		2.000	3.0	38	8
16050	17050	18050	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"
47040	38040	48040	.0984		2.500	3.0	38	12
16060	17060	18060	.1094	7/64"	2.779	1/8"	1-1/2"	3/8"
47050	38050	48050	.1181		3.000	3.0	38	12
16070	17070	18070	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"
47060	38060	48060	.1378		3.500	4.0	50	12
16080	17080	18080	.1406	9/64"	3.571	3/16"	2"	9/16"
16090	17090	18090	.1562	5/32"	3.967	3/16"	2"	9/16"
47070	38070	48070	.1575		4.000	4.0	50	14
16100	17100	18100	.1719	11/64"	4.366	3/16"	2"	9/16"
47080	38080	48080	.1772		4.500	5.0	50	14
16110	17110	18110	.1875	3/16"	4.763	3/16"	2"	5/8"
97070	98070	99070	.1969		5.000	5.0	50	16
47090	38090	48090	.1969		5.000	5.0	65	16
16120	17120	18120	.2031	13/64"	5.159	1/4"	2-1/2"	5/8"
16130	17130	18130	.2188	7/32"	5.558	1/4"	2-1/2"	5/8"
16140	17140	18140	.2344	15/64"	5.954	1/4"	2-1/2"	3/4"
47100	38100	48100	.2362		6.000	6.0	65	19
16150	17150	18150	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"
16160	17160	18160	.2656	17/64"	6.746	5/16"	2-1/2"	7/8"

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

.2756" - 1.000"
(7.000mm - 25.400mm)

GENERAL PURPOSE
END MILLS

(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	
			Decimal		Metric			
47110	38110	48110	.2756		7.000	7.0	65	22
16170	17170	18170	.2812	9/32"	7.142	5/16"	2-1/2"	7/8"
16180	-	18180	.2969	19/64"	7.541	5/16"	2-1/2"	7/8"
16190	17190	18190	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"
47120	38120	48120	.3150		8.000	8.0	65	22
16200	17200	18200	.3281	21/64"	8.334	3/8"	2-1/2"	7/8"
16210	17210	18210	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"
47130	38130	48130	.3543		9.000	9.0	65	22
16220	-	18220	.3594	23/64"	9.129	3/8"	2-1/2"	7/8"
16230	17230	18230	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"
16240	17240	18240	.3906	25/64"	9.921	7/16"	2-3/4"	7/8"
47140	38140	48140	.3937		10.000	10.0	70	25
16250	17250	18250	.4062	13/32"	10.317	7/16"	2-3/4"	7/8"
16260	17260	18260	.4219	27/64"	10.716	7/16"	2-3/4"	7/8"
47150	38150	48150	.4331		11.000	11.0	75	25
16270	17270	18270	.4375	7/16"	11.113	7/16"	2-3/4"	1"
16280	-	18280	.4531	29/64"	11.509	1/2"	3"	1"
16290	17290	18290	.4688	15/32"	11.908	1/2"	3"	1"
47160	38160	48160	.4724		12.000	12.0	75	25
16300	-	18300	.4844	31/64"	12.304	1/2"	3"	1"
16310	17310	18310	.5000	1/2"	12.700	1/2"	3"	1"
47170	38170	48170	.5512		14.000	14.0	88	32
16320	17320	18320	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"
16330	17330	18330	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"
47180	38180	48180	.6299		16.000	16.0	88	38
16340	17340	18340	.6875	11/16"	17.463	3/4"	4"	1-1/2"
47190	-	48190	.7087		18.000	18.0	100	38
16350	17350	18350	.7500	3/4"	19.050	3/4"	4"	1-1/2"
47200	38200	48200	.7874		20.000	20.0	100	38
47210	-	48210	.8661		22.000	22.0	100	38
16360	17360	18360	.8750	7/8"	22.225	7/8"	4"	1-1/2"
47220	-	-	.9843		25.000	25.0	100	38
16370	17370	18370	1.000	1"	25.400	1"	4"	1-1/2"

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MATERIAL HARDNESS (Rc)

0

Series 320MT, 330MT



TOLERANCES

d_1	$+0.000" - .002" (+.000 - .050\text{mm})$
d_2	$h6$
ball radius	$+0.000" - .001" (+.000 - .025\text{mm})$

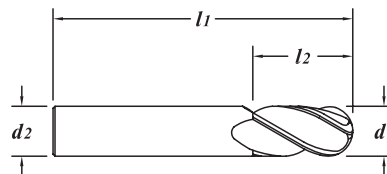
Standard Length - Ball End

TiN Coating

Solid submicron grain carbide end mill - center cutting

Improved lubricity

Extremely versatile

Bright Finish - page [240](#)TiCN Coating - page [243](#)TiALN Coating - page [244](#)

(320MT) 2 Flute EDP#	(330MT) 4 Flute EDP#	d_1 †			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
		Decimal		Metric			
16073	18073	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"
16113	18113	.1875	3/16"	4.763	3/16"	2"	5/8"
16153	18153	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"
16193	18193	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"
16233	18233	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"
16273	18273	.4375	7/16"	11.113	7/16"	2-3/4"	1"
16313	18313	.5000	1/2"	12.700	1/2"	3"	1"
16333	18333	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"
16353	18353	.7500	3/4"	19.050	3/4"	4"	1-1/2"
16373	18373	1.000	1"	25.400	1"	4"	1-1/2"

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MATERIAL HARDNESS (Rc)

0

TOLERANCES

d_1	$+0.000" - .002" (+.000 - .050\text{mm})$
d_2	$h6$
ball radius	$+0.000" - .001" (+.000 - .025\text{mm})$


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

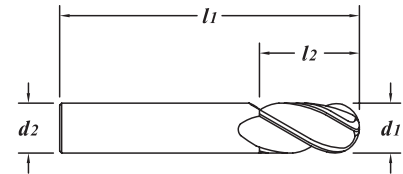
Extremely versatile

Bright Finish - page [240](#)

TiN Coating - page [242](#)

TiALN Coating - page [244](#)

Extended length - page [261](#)



(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
Decimal			Metric				
16014	17014	18014	.0312	1/32"	0.792	1/8"	3/32"
16024	17024	18024	.0469	3/64"	1.191	1/8"	1/8"
16034	17034	18034	.0625	1/16"	1.588	1/8"	1/4"
16044	17044	18044	.0781	5/64"	1.984	1/8"	1/4"
16054	17054	18054	.0938	3/32"	2.383	1/8"	3/8"
16064	17064	18064	.1094	7/64"	2.779	1/8"	3/8"
16074	17074	18074	.1250	1/8"	3.175	1/8"	1/2"
16084	17084	18084	.1406	9/64"	3.571	3/16"	9/16"
16094	17094	18094	.1562	5/32"	3.967	3/16"	9/16"
16104	-	18104	.1719	11/64"	4.366	3/16"	9/16"
16114	17114	18114	.1875	3/16"	4.763	3/16"	5/8"
16124	17124	18124	.2031	13/64"	5.159	1/4"	5/8"
16134	17134	18134	.2188	7/32"	5.558	1/4"	5/8"
16144	17144	18144	.2344	15/64"	5.954	1/4"	3/4"
16154	17154	18154	.2500	1/4"	6.350	1/4"	3/4"
-	17164	18164	.2656	17/64"	6.746	5/16"	7/8"
16174	17174	18174	.2812	9/32"	7.142	5/16"	7/8"
-	-	18184	.2969	19/64"	7.541	5/16"	7/8"
16194	17194	18194	.3125	5/16"	7.938	5/16"	7/8"
16204	-	-	.3281	21/64"	8.334	3/8"	7/8"
-	-	18214	.3438	11/32"	8.733	3/8"	7/8"
-	-	18224	.3594	23/64"	9.129	3/8"	7/8"
16234	17234	18234	.3750	3/8"	9.525	3/8"	7/8"
16244	-	-	.3906	25/64"	9.921	7/16"	7/8"
16254	17254	18254	.4062	13/32"	10.317	7/16"	7/8"
16274	17274	18274	.4375	7/16"	11.113	7/16"	1"
-	-	18284	.4531	29/64"	11.509	1/2"	1"
-	17294	18294	.4688	15/32"	11.908	1/2"	1"
16304	-	18304	.4844	31/64"	12.304	1/2"	1"
16314	17314	18314	.5000	1/2"	12.700	1/2"	1"
16324	17324	18324	.5625	9/16"	14.288	9/16"	1-1/4"
16334	17334	18334	.6250	5/8"	15.875	5/8"	1-1/4"
16354	17354	18354	.7500	3/4"	19.050	3/4"	1-1/2"
16364	17364	18364	.8750	7/8"	22.225	7/8"	1-1/2"
16374	-	18374	1.000	1"	25.400	1"	1-1/2"

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MATERIAL HARDNESS (Rc)

0

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

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

TOLERANCES

d_1	+0.000" -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

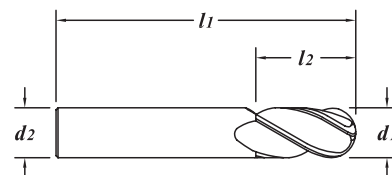
Bright Finish - page 240

TiN Coating - page 242

TiCN Coating - page 243

Stub Length - page 227

Extended length - page 262



(320MA/920MA)	(323MA/923MA)	(330MA/930MA)	d_1 †			d_2	l_1	l_2
2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	Decimal	Diameter	Metric	Shank Diameter	Overall Length	Flute Length
16017	17017	18017	.0312	1/32"	0.792	1/8"	1-1/2"	3/32"
47017	38017	48017	.0394		1.000	3.0	38	4
16027	17027	18027	.0469	3/64"	1.191	1/8"	1-1/2"	1/8"
47027	38027	48027	.0591		1.500	3.0	38	6
16037	17037	18037	.0625	1/16"	1.588	1/8"	1-1/2"	1/4"
16047	17047	18047	.0781	5/64"	1.984	1/8"	1-1/2"	1/4"
47037	38037	48037	.0787		2.000	3.0	38	8
16057	17057	18057	.0938	3/32"	2.383	1/8"	1-1/2"	3/8"
47047	38047	48047	.0984		2.500	3.0	38	12
16067	17067	18067	.1094	7/64"	2.779	1/8"	1-1/2"	3/8"
47057	38057	48057	.1181		3.000	3.0	38	12
16077	17077	18077	.1250	1/8"	3.175	1/8"	1-1/2"	1/2"
47067	38067	48067	.1378		3.500	4.0	50	12
16087	17087	18087	.1406	9/64"	3.571	3/16"	2"	9/16"
16097	17097	18097	.1562	5/32"	3.967	3/16"	2"	9/16"
47077	38077	48077	.1575		4.000	4.0	50	14
16107	17107	18107	.1719	11/64"	4.366	3/16"	2"	9/16"
47087	38087	48087	.1772		4.500	5.0	50	14
16117	17117	18117	.1875	3/16"	4.763	3/16"	2"	5/8"
97077	98077	99077	.1969		5.000	5.0	50	16
47097	38097	48097	.1969		5.000	5.0	65	16
16127	17127	18127	.2031	13/64"	5.159	1/4"	2-1/2"	5/8"
16137	17137	18137	.2188	7/32"	5.558	1/4"	2-1/2"	5/8"
16147	17147	18147	.2344	15/64"	5.954	1/4"	2-1/2"	3/4"
47107	38107	48107	.2362		6.000	6.0	65	19
16157	17157	18157	.2500	1/4"	6.350	1/4"	2-1/2"	3/4"
16167	17167	18167	.2656	17/64"	6.746	5/16"	2-1/2"	7/8"
47117	38117	48117	.2756		7.000	7.0	65	22
16177	17177	18177	.2812	9/32"	7.142	5/16"	2-1/2"	7/8"
16187	17187	18187	.2969	19/64"	7.541	5/16"	2-1/2"	7/8"
16197	17197	18197	.3125	5/16"	7.938	5/16"	2-1/2"	7/8"
47127	38127	48127	.3150		8.000	8.0	65	22

MATERIAL HARDNESS (Rc)

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

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

GENERAL PURPOSE
END MILLS

(320MA/920MA)	(323MA/923MA)	(330MA/930MA)	$d1$ †			$d2$	$l1$	$l2$
2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	Diameter		Metric	Shank Diameter	Overall Length	Flute Length
16207	17207	18207	.3281	21/64"	8.334	3/8"	2-1/2"	7/8"
16217	17217	18217	.3438	11/32"	8.733	3/8"	2-1/2"	7/8"
47137	38137	48137	.3543		9.000	9.0	65	22
16227	17227	18227	.3594	23/64"	9.129	3/8"	2-1/2"	7/8"
16237	17237	18237	.3750	3/8"	9.525	3/8"	2-1/2"	7/8"
16247	17247	18247	.3906	25/64"	9.921	7/16"	2-3/4"	7/8"
47147	38147	48147	.3937		10.000	10.0	70	25
16257	17257	18257	.4062	13/32"	10.317	7/16"	2-3/4"	7/8"
16267	-	18267	.4219	27/64"	10.716	7/16"	2-3/4"	7/8"
47157	38157	48157	.4331		11.000	11.0	75	25
16277	17277	18277	.4375	7/16"	11.113	7/16"	2-3/4"	1"
16287	17287	18287	.4531	29/64"	11.509	1/2"	3"	1"
16297	17297	18297	.4688	15/32"	11.908	1/2"	3"	1"
47167	38167	48167	.4724		12.000	12.0	75	25
16307	17307	18307	.4844	31/64"	12.304	1/2"	3"	1"
16317	17317	18317	.5000	1/2"	12.700	1/2"	3"	1"
47177	38177	48177	.5512		14.000	14.0	88	32
16327	17327	18327	.5625	9/16"	14.288	9/16"	3-1/2"	1-1/4"
16337	17337	18337	.6250	5/8"	15.875	5/8"	3-1/2"	1-1/4"
47187	38187	48187	.6299		16.000	16.0	88	38
16347	17347	18347	.6875	11/16"	17.463	3/4"	4"	1-1/2"
47197	38197	48197	.7087		18.000	18.0	100	38
16357	17357	18357	.7500	3/4"	19.050	3/4"	4"	1-1/2"
47207	38207	48207	.7874		20.000	20.0	100	38
47217	38217	48217	.8661		22.000	22.0	100	38
-	17367	18367	.8750	7/8"	22.225	7/8"	4"	1-1/2"
47227	38227	48227	.9843		25.000	25.0	100	38
16377	17377	18377	1.000	1"	25.400	1"	4"	1-1/2"

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MATERIAL HARDNESS (Rc)

Series 222M, 234M, 334MA



TOLERANCES

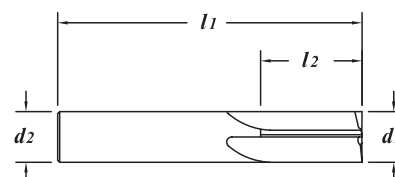
d_1	+0.000" - .002" (+.000 - .050mm)
d_2	h6
ball radius	+0.000" - .001" (+.000 - .025mm)

Standard Length - Straight Flute - Square End

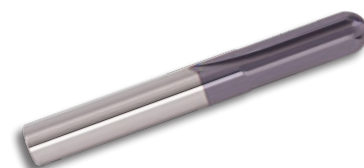
Solid submicron grain carbide end mill - center cutting

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
		Decimal	Diameter Metric			
81070	82070	.1250	1/8"	3.175	1-1/2"	1/2"
81110	82110	.1875	3/16"	4.763	2"	5/8"
81150	82150	.2500	1/4"	6.350	2-1/2"	3/4"
81190	82190	.3125	5/16"	7.938	2-1/2"	7/8"
81230	82230	.3750	3/8"	9.525	2-1/2"	7/8"
81270	82270	.4375	7/16"	11.113	2-3/4"	1"
81310	82310	.5000	1/2"	12.700	3"	1"
81330	82330	.6250	5/8"	15.875	3-1/2"	1-1/4"
81350	82350	.7500	3/4"	19.050	4"	1-1/2"
81370	82370	1.000	1"	25.400	4"	1-1/2"



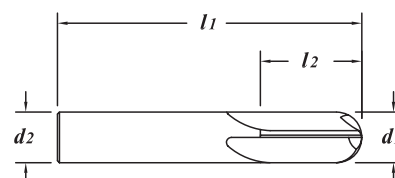
Standard Length - Straight Flute - Ball End

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
	Decimal	Diameter Metric			
84077	.1250	1/8"	3.175	1-1/2"	1/2"
84115	.1875	3/16"	4.763	2"	5/8"
84157	.2500	1/4"	6.350	2-1/2"	3/4"
84237	.3750	3/8"	9.525	2-1/2"	7/8"

TOLERANCES

d_1	$+0.003" - .000" (+.075 - .000\text{mm})$
d_2	$h6$



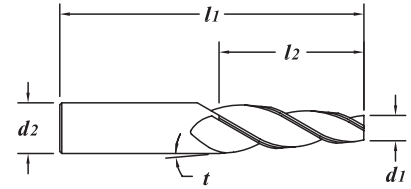
Series 273M, 373M

GENERAL PURPOSE
END MILLS

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#	d_2 Shank Diameter	t Taper Per Side	d_1 † Tip Diameter		l_1 Overall Length	l_2 Flute Length
			Decimal	Metric		
49010	1/4"	1°	.1250	1/8"	3"	1-1/2"
49020	1/4"	1° 30'	.1250	1/8"	3"	1-1/2"
49030	1/4"	2°	.1250	1/8"	3"	1"
49040	1/4"	3°	.1250	1/8"	3"	1-1/4"
49050	1/4"	5°	.1250	1/8"	3"	3/4"
49060	1/4"	7°	.1250	1/8"	3"	1/2"
49070	3/8"	1°	.1875	3/16"	3-1/2"	1-3/4"
49080	3/8"	1° 30'	.1875	3/16"	3-1/2"	1-3/4"
49090	3/8"	2°	.1875	3/16"	3-1/2"	1-3/4"
49100	3/8"	3°	.1562	5/32"	3-1/2"	1-3/4"
49110	3/8"	5°	.1250	1/8"	3-1/2"	1-1/2"
49120	3/8"	7°	.1562	5/32"	3-1/2"	1"
49130	1/2"	3°	.2500	1/4"	4"	2"
49140	1/2"	5°	.2500	1/4"	4"	1-1/2"
49150	1/2"	7°	.1875	3/16"	4"	1-5/16"

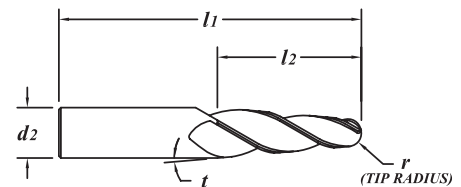


Standard Length - Tapered - Ball End

Solid submicron grain carbide end mill - center cutting

Excellent for holding draft angles in mold and die applications

Radius tolerance $+0.003" - .000" (+.075\text{mm} - .000\text{mm})$



(373M) EDP#	d_2 Shank Diameter	t Taper Per Side	r † Tip Radius		l_1 Overall Length	l_2 Flute Length
			Decimal	Metric		
50010	1/4"	1°	.0620	.062"	3"	1-1/2"
50020	1/4"	1° 30'	.0620	.062"	3"	1-1/2"
50030	1/4"	2°	.0620	.062"	3"	1"
50040	1/4"	3°	.0620	.062"	3"	1-1/4"
50050	1/4"	5°	.0620	.062"	3"	3/4"
50060	1/4"	7°	.0620	.062"	3"	1/2"
50070	3/8"	1°	.0930	.093"	3-1/2"	1-3/4"
50080	3/8"	1° 30'	.0930	.093"	3-1/2"	1-3/4"
50090	3/8"	2°	.0930	.093"	3-1/2"	1-3/4"
50100	3/8"	3°	.0780	.078"	3-1/2"	1-3/4"
50110	3/8"	5°	.0620	.062"	3-1/2"	1-1/2"
50120	3/8"	7°	.0780	.078"	3-1/2"	1"
50130	1/2"	3°	.1250	.125"	4"	2"
50140	1/2"	5°	.1250	.125"	4"	1-1/2"
50150	1/2"	7°	.0930	.093"	4"	1-5/16"

70

35

MATERIAL HARDNESS (Rc)

0

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

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

TOLERANCES

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

Extra Length

Solid submicron grain carbide end mill - center cutting

Extended reach

Can be modified with a neck within 48 hours

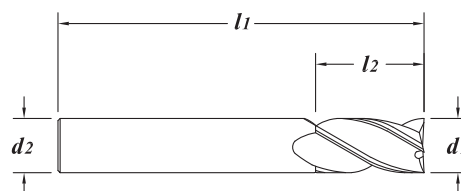
Extremely versatile

TiCN Coating - page 250

TiALN Coating - page 251

Stub Length - page 219

Standard length - page 228



(620M/640M) 2 Flute EDP#	(623M/643M) 3 Flute EDP#	(630M/650M) 4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
			Decimal	Metric			
92010	93010	94010	.1181	3.000	3.0	50	16
92020	93020	94020	.1181	3.000	3.0	75	20
92030	93030	94030	.1181	3.000	3.0	75	25
41010	54510	42010	.1250	1/8"	3.175	1/8"	2"
41020	54520	42020	.1250	1/8"	3.175	1/8"	3"
41030	54530	42030	.1250	1/8"	3.175	1/8"	3"
92040	93040	94040	.1575	4.000	4.0	50	16
92050	93050	94050	.1575	4.000	4.0	75	20
92060	93060	94060	.1575	4.000	4.0	75	25
41040	54540	42040	.1875	3/16"	4.763	3/16"	3"
41050	54550	42050	.1875	3/16"	4.763	3/16"	3"
41060	54560	42060	.1875	3/16"	4.763	3/16"	4"
92080	93080	94080	.1969	5.000	5.0	75	20
92090	93090	94090	.1969	5.000	5.0	75	25
92100	93100	94100	.2362	6.000	6.0	75	25
92110	93110	94110	.2362	6.000	6.0	100	25
92120	93120	94120	.2362	6.000	6.0	100	32
92130	93130	94130	.2362	6.000	6.0	150	38
41070	54570	42070	.2500	1/4"	6.350	1/4"	3"
41080	54580	42080	.2500	1/4"	6.350	1/4"	4"
41090	54590	42090	.2500	1/4"	6.350	1/4"	4"
41100	54600	42100	.2500	1/4"	6.350	1/4"	6"
41110	54610	42110	.3125	5/16"	7.938	5/16"	3"
41120	54620	42120	.3125	5/16"	7.938	5/16"	4"
41130	54630	42130	.3125	5/16"	7.938	5/16"	4"
41140	54640	42140	.3125	5/16"	7.938	5/16"	6"
92140	93140	94140	.3150	8.000	8.0	75	25
92150	93150	94150	.3150	8.000	8.0	100	25
92160	93160	94160	.3150	8.000	8.0	100	41
92170	93170	94170	.3150	8.000	8.0	150	50

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#	$d1$ † Diameter			$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length
Decimal					Metric			
41150	54650	42150	.3750	3/8"	9.525	3/8"	3"	1"
41160	54660	42160	.3750	3/8"	9.525	3/8"	4"	1"
41170	54670	42170	.3750	3/8"	9.525	3/8"	4"	2"
41180	54680	42180	.3750	3/8"	9.525	3/8"	6"	1-1/2"
41190	54690	42190	.3750	3/8"	9.525	3/8"	6"	3"
92180	93180	94180	.3937		10.000	10.0	75	25
92190	93190	94190	.3937		10.000	10.0	100	25
92200	93200	94200	.3937		10.000	10.0	100	50
92210	93210	94210	.3937		10.000	10.0	150	38
92220	93220	94220	.3937		10.000	10.0	150	75
41200	54700	42200	.4375	7/16"	11.113	7/16"	4"	1"
41210	54710	42210	.4375	7/16"	11.113	7/16"	4"	2"
41220	54720	42220	.4375	7/16"	11.113	7/16"	6"	1-1/2"
41230	54730	42230	.4375	7/16"	11.113	7/16"	6"	3"
92230	93230	94230	.4724		12.000	12.0	100	25
92240	93240	94240	.4724		12.000	12.0	100	50
92250	93250	94250	.4724		12.000	12.0	150	50
92260	93260	94260	.4724		12.000	12.0	150	75
41240	54740	42240	.5000	1/2"	12.700	1/2"	4"	1"
41250	54750	42250	.5000	1/2"	12.700	1/2"	4"	2"
41260	54760	42260	.5000	1/2"	12.700	1/2"	6"	1-1/2"
41270	54770	42270	.5000	1/2"	12.700	1/2"	6"	3"
92270	93270	94270	.5512		14.000	14.0	100	25
92280	93280	94280	.5512		14.000	14.0	100	50
92290	93290	94290	.5512		14.000	14.0	150	50
92300	93300	94300	.5512		14.000	14.0	150	75
41280	54780	42280	.5625	9/16"	14.288	9/16"	6"	2"
41290	54790	42290	.5625	9/16"	14.288	9/16"	6"	3"
41300	54800	42300	.6250	5/8"	15.875	5/8"	6"	2"
41310	54810	42310	.6250	5/8"	15.875	5/8"	6"	3"
92310	93310	94310	.6299		16.000	16.0	150	50
92320	93320	94320	.6299		16.000	16.0	150	75
92330	93330	94330	.7087		18.000	18.0	150	50
92340	93340	94340	.7087		18.000	18.0	150	75
41320	54820	42320	.7500	3/4"	19.050	3/4"	6"	2"
41330	54830	42330	.7500	3/4"	19.050	3/4"	6"	3"
92350	93350	94350	.7874		20.000	20.0	150	50
92360	93360	94360	.7874		20.000	20.0	150	75
92370	93370	94370	.9843		25.000	25.0	150	50
-	93380	94380	.9843		25.000	25.0	150	75
41340	54840	42340	1.000	1"	25.400	1"	6"	2"
41350	54850	42350	1.000	1"	25.400	1"	6"	3"
-	-	42360	1.000	1"	25.400	1"	6"	4"
-	-	42390	1.250	1-1/4"	31.750	1-1/4"	6"	3"

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MATERIAL HARDNESS (Rc)

0

Series 620MC, 623MC, 630MC



TOLERANCES

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

Extra Length

TiCN Coating

Solid submicron grain carbide end mill - center cutting

Extended reach

Improved abrasion resistance and lubricity

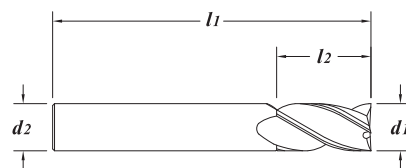
Can be modified with a neck within 48 hours

Extremely versatile

Bright Finish - page 248

TiALN Coating - page 251

Standard length - page 231



(620MC) 2 Flute EDP#	(623MC) 3 Flute EDP#	(630MC) 4 Flute EDP#	d_1 †			d_2	l_1	l_2
			Decimal	Diameter	Metric	Shank Diameter	Overall Length	Flute Length
41014	54514	42014	.1250	1/8"	3.175	1/8"	2"	5/8"
41024	54524	42024	.1250	1/8"	3.175	1/8"	3"	3/4"
41034	54534	42034	.1250	1/8"	3.175	1/8"	3"	1"
41044	54544	42044	.1875	3/16"	4.763	3/16"	3"	1"
41054	54554	42054	.1875	3/16"	4.763	3/16"	3"	1-1/8"
41064	54564	42064	.1875	3/16"	4.763	3/16"	4"	1"
41074	54574	42074	.2500	1/4"	6.350	1/4"	3"	1"
41084	54584	42084	.2500	1/4"	6.350	1/4"	4"	1"
41094	54594	42094	.2500	1/4"	6.350	1/4"	4"	1-1/2"
41104	54604	42104	.2500	1/4"	6.350	1/4"	6"	1-1/2"
41114	54614	42114	.3125	5/16"	7.938	5/16"	3"	1"
41124	54624	42124	.3125	5/16"	7.938	5/16"	4"	1"
41134	54634	42134	.3125	5/16"	7.938	5/16"	4"	1-5/8"
41144	54644	42144	.3125	5/16"	7.938	5/16"	6"	1-1/2"
41154	54654	42154	.3750	3/8"	9.525	3/8"	3"	1"
41164	54664	42164	.3750	3/8"	9.525	3/8"	4"	1"
41174	54674	42174	.3750	3/8"	9.525	3/8"	4"	2"
41184	54684	42184	.3750	3/8"	9.525	3/8"	6"	1-1/2"
41194	54694	42194	.3750	3/8"	9.523	3/8"	6"	3"
41204	54704	42204	.4375	7/16"	11.113	7/16"	4"	1"
-	54714	42214	.4375	7/16"	11.113	7/16"	4"	2"
-	54724	42224	.4375	7/16"	11.113	7/16"	6"	1-1/2"
-	54734	42234	.4375	7/16"	11.113	7/16"	6"	3"
41244	54744	42244	.5000	1/2"	12.700	1/2"	4"	1"
41254	54754	42254	.5000	1/2"	12.700	1/2"	4"	2"
41264	54764	42264	.5000	1/2"	12.700	1/2"	6"	1-1/2"
41274	54774	42274	.5000	1/2"	12.700	1/2"	6"	3"
41284	54784	42284	.5625	9/16"	14.288	9/16"	6"	2"
-	-	42294	.5625	9/16"	14.288	9/16"	6"	3"
41304	54804	42304	.6250	5/8"	15.875	5/8"	6"	2"
41314	54814	42314	.6250	5/8"	15.875	5/8"	6"	3"
41324	54824	42324	.7500	3/4"	19.050	3/4"	6"	2"
41334	54834	42334	.7500	3/4"	19.050	3/4"	6"	3"
-	54844	42344	1.000	1"	25.400	1"	6"	2"
-	54854	42354	1.000	1"	25.400	1"	6"	3"
-	-	42364	1.000	1"	25.400	1"	6"	4"
-	-	42394	1.250	1-1/4"	31.750	1-1/4"	6"	3"

TOLERANCES

$d1$	$+0.000^{\circ} -0.002^{\circ} (+.000 -.050\text{mm})$
$d2$	$h6$

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

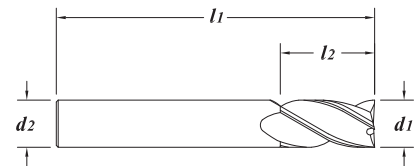
Extremely versatile

Bright Finish - page [248](#)

TiCN Coating - page [250](#)

Stub Length - page [221](#)

Standard length - page [232](#)



(620MA/640MA)	(623MA/643MA)	(630MA/650MA)	$d1$ †		$d2$	$l1$	$l2$
2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	Decimal	Diameter	Shank Diameter	Overall Length	Flute Length
92017	93017	94017	.1181		3.000	3.0	16
92027	93027	94027	.1181		3.000	3.0	20
92037	93037	94037	.1181		3.000	3.0	25
41017	54517	42017	.1250	1/8"	3.175	1/8"	5/8"
41027	54527	42027	.1250	1/8"	3.175	1/8"	3/4"
41037	54537	42037	.1250	1/8"	3.175	1/8"	1"
92047	93047	94047	.1575		4.000	4.0	16
92057	93057	94057	.1575		4.000	4.0	20
92067	93067	94067	.1575		4.000	4.0	25
41047	54547	42047	.1875	3/16"	4.763	3/16"	1"
41057	54557	42057	.1875	3/16"	4.763	3/16"	1-1/8"
41067	54567	42067	.1875	3/16"	4.763	3/16"	1"
92087	93087	94087	.1969		5.000	5.0	20
92097	93097	94097	.1969		5.000	5.0	25
92107	93107	94107	.2362		6.000	6.0	25
92117	93117	94117	.2362		6.000	6.0	100
92127	93127	94127	.2362		6.000	6.0	100
92137	93137	94137	.2362		6.000	6.0	150
41077	54577	42077	.2500	1/4"	6.350	1/4"	1"
41087	54587	42087	.2500	1/4"	6.350	1/4"	1"
41097	54597	42097	.2500	1/4"	6.350	1/4"	1-1/2"
41107	54607	42107	.2500	1/4"	6.350	1/4"	1-1/2"
41117	54617	42117	.3125	5/16"	7.938	5/16"	1"
41127	54627	42127	.3125	5/16"	7.938	5/16"	1"
41137	54637	42137	.3125	5/16"	7.938	5/16"	1-5/8"
41147	54647	42147	.3125	5/16"	7.938	5/16"	1-1/2"
92147	93147	94147	.3150		8.000	8.0	25
92157	93157	94157	.3150		8.000	8.0	100
92167	93167	94167	.3150		8.000	8.0	100
92177	93177	94177	.3150		8.000	8.0	150

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#	d_1 † Diameter			d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
Decimal	Metric							
41157	54657	42157	.3750	3/8"	9.525	3/8"	3"	1"
41167	54667	42167	.3750	3/8"	9.525	3/8"	4"	1"
41177	54677	42177	.3750	3/8"	9.525	3/8"	4"	2"
41187	54687	42187	.3750	3/8"	9.525	3/8"	6"	1-1/2"
41197	54697	42197	.3750	3/8"	9.525	3/8"	6"	3"
92187	93187	94187	.3937		10.000	10.0	75	25
92197	93197	94197	.3937		10.000	10.0	100	25
92207	93207	94207	.3937		10.000	10.0	100	50
92217	93217	94217	.3937		10.000	10.0	150	38
92227	93227	94227	.3937		10.000	10.0	150	75
41207	54707	42207	.4375	7/16"	11.113	7/16"	4"	1"
41217	54717	42217	.4375	7/16"	11.113	7/16"	4"	2"
41227	54727	42227	.4375	7/16"	11.113	7/16"	6"	1-1/2"
41237	54737	42237	.4375	7/16"	11.113	7/16"	6"	3"
92237	-	94237	.4724		12.000	12.0	100	25
92247	93247	94247	.4724		12.000	12.0	100	50
92257	93257	94257	.4724		12.000	12.0	150	50
92267	93267	94267	.4724		12.000	12.0	150	75
41247	54747	42247	.5000	1/2"	12.700	1/2"	4"	1"
41257	54757	42257	.5000	1/2"	12.700	1/2"	4"	2"
41267	54767	42267	.5000	1/2"	12.700	1/2"	6"	1-1/2"
41277	54777	42277	.5000	1/2"	12.700	1/2"	6"	3"
92277	93277	94277	.5512		14.000	14.0	100	25
92287	93287	94287	.5512		14.000	14.0	100	50
-	93297	94297	.5512		14.000	14.0	150	50
92307	93307	94307	.5512		14.000	14.0	150	75
41287	54787	42287	.5625	9/16"	14.288	9/16"	6"	2"
-	54797	42297	.5625	9/16"	14.288	9/16"	6"	3"
41307	54807	42307	.6250	5/8"	15.875	5/8"	6"	2"
41317	54817	42317	.6250	5/8"	15.875	5/8"	6"	3"
92317	93317	94317	.6299		16.000	16.0	150	50
92327	93327	94327	.6299		16.000	16.0	150	75
-	-	94337	.7087		18.000	18.0	150	50
-	93347	94347	.7087		18.000	18.0	150	75
41327	54827	42327	.7500	3/4"	19.050	3/4"	6"	2"
41337	54837	42337	.7500	3/4"	19.050	3/4"	6"	3"
92357	93357	94357	.7874		20.000	20.0	150	50
92367	93367	94367	.7874		20.000	20.0	150	75
-	93377	94377	.9843		25.000	25.0	150	50
92387	93387	94387	.9843		25.000	25.0	150	75
41347	54847	42347	1.000	1"	25.400	1"	6"	2"
41357	54857	42357	1.000	1"	25.400	1"	6"	3"
-	-	42367	1.000	1"	25.400	1"	6"	4"
-	-	42397	1.250	1-1/4"	31.750	1-1/4"	6"	3"

TOLERANCES

d_1	$+0.000^{\circ} - .002^{\circ} (+.000 - .050\text{mm})$
d_2	$h6$
r	$+0.001^{\circ} - .001^{\circ} (+.025 - .025\text{mm})$


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

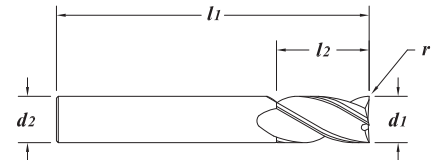
Can be modified with a neck within 48 hours

Extremely versatile

TiALN Coating - page [256](#)

Stub length - page [222](#)

Standard length - page [234](#)



EDP#	d_1 †		d_2	l_1	l_2	r	
	Decimal	Diameter Metric					
20100	.1250	1/8"	3.175	1/8"	3"	1"	.010"
20110	.1250	1/8"	3.175	1/8"	3"	1"	.015"
20120	.1250	1/8"	3.175	1/8"	3"	1"	.020"
20130	.1250	1/8"	3.175	1/8"	3"	1"	.030"
20140	.1250	1/8"	3.175	1/8"	3"	1"	.045"
20150	.1875	3/16"	4.763	3/16"	3"	1"	.010"
20160	.1875	3/16"	4.763	3/16"	3"	1"	.015"
20170	.1875	3/16"	4.763	3/16"	3"	1"	.020"
20180	.1875	3/16"	4.763	3/16"	3"	1"	.030"
20190	.1875	3/16"	4.763	3/16"	3"	1"	.045"
20200	.1875	3/16"	4.763	3/16"	3"	1"	.060"
20210	.1875	3/16"	4.763	3/16"	4"	1"	.010"
20220	.1875	3/16"	4.763	3/16"	4"	1"	.015"
20230	.1875	3/16"	4.763	3/16"	4"	1"	.020"
20240	.1875	3/16"	4.763	3/16"	4"	1"	.030"
20250	.1875	3/16"	4.763	3/16"	4"	1"	.045"
20260	.1875	3/16"	4.763	3/16"	4"	1"	.060"
20270	.2500	1/4"	6.350	1/4"	3"	1"	.010"
20280	.2500	1/4"	6.350	1/4"	3"	1"	.020"
20290	.2500	1/4"	6.350	1/4"	3"	1"	.030"
20300	.2500	1/4"	6.350	1/4"	3"	1"	.045"
20310	.2500	1/4"	6.350	1/4"	3"	1"	.060"
20320	.2500	1/4"	6.350	1/4"	4"	1"	.010"
20330	.2500	1/4"	6.350	1/4"	4"	1"	.020"
20340	.2500	1/4"	6.350	1/4"	4"	1"	.030"
20350	.2500	1/4"	6.350	1/4"	4"	1"	.045"
20360	.2500	1/4"	6.350	1/4"	4"	1"	.060"
20370	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.010"
20380	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.020"
20390	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.030"
20400	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.045"
20410	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.060"
20420	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.010"
20430	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.020"
20440	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.030"
20450	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.045"
20460	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.060"
20470	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.090"
20480	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.125"

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MATERIAL HARDNESS (Rc)

0

continued →

Series 630R (continued)

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

EDP#	$d1$ †			$d2$	$l1$	$l2$	r
	Decimal	Diameter	Metric	Shank Diameter	Overall Length	Flute Length	Corner Radius
20490	.3750	3/8"	9.525	3/8"	4"	1"	.010"
20500	.3750	3/8"	9.525	3/8"	4"	1"	.020"
20510	.3750	3/8"	9.525	3/8"	4"	1"	.030"
20520	.3750	3/8"	9.525	3/8"	4"	1"	.045"
20530	.3750	3/8"	9.525	3/8"	4"	1"	.060"
20540	.3750	3/8"	9.525	3/8"	4"	1"	.090"
20550	.3750	3/8"	9.525	3/8"	4"	1"	.125"
20560	.3750	3/8"	9.525	3/8"	4"	2"	.010"
20570	.3750	3/8"	9.525	3/8"	4"	2"	.020"
20580	.3750	3/8"	9.525	3/8"	4"	2"	.030"
20590	.3750	3/8"	9.525	3/8"	4"	2"	.045"
20600	.3750	3/8"	9.525	3/8"	4"	2"	.060"
20610	.3750	3/8"	9.525	3/8"	4"	2"	.090"
20620	.3750	3/8"	9.525	3/8"	4"	2"	.125"
20630	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.010"
20640	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.020"
20650	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.030"
20660	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.045"
20670	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.060"
20680	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.090"
20690	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.125"
20700	.5000	1/2"	12.700	1/2"	4"	1"	.015"
20710	.5000	1/2"	12.700	1/2"	4"	1"	.020"
20720	.5000	1/2"	12.700	1/2"	4"	1"	.030"
20730	.5000	1/2"	12.700	1/2"	4"	1"	.045"
20740	.5000	1/2"	12.700	1/2"	4"	1"	.060"
20750	.5000	1/2"	12.700	1/2"	4"	1"	.090"
20760	.5000	1/2"	12.700	1/2"	4"	1"	.125"
20770	.5000	1/2"	12.700	1/2"	4"	2"	.015"
20780	.5000	1/2"	12.700	1/2"	4"	2"	.020"
20790	.5000	1/2"	12.700	1/2"	4"	2"	.030"
20800	.5000	1/2"	12.700	1/2"	4"	2"	.045"
20810	.5000	1/2"	12.700	1/2"	4"	2"	.060"
20820	.5000	1/2"	12.700	1/2"	4"	2"	.090"
20830	.5000	1/2"	12.700	1/2"	4"	2"	.125"
20840	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.015"
20850	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.020"
20860	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.030"
20870	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.045"
20880	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.060"
20890	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.090"
20900	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.125"
20910	.6250	5/8"	15.875	5/8"	6"	2"	.010"
20920	.6250	5/8"	15.875	5/8"	6"	2"	.015"
20930	.6250	5/8"	15.875	5/8"	6"	2"	.020"
20940	.6250	5/8"	15.875	5/8"	6"	2"	.030"
20950	.6250	5/8"	15.875	5/8"	6"	2"	.045"
20960	.6250	5/8"	15.875	5/8"	6"	2"	.060"
20970	.6250	5/8"	15.875	5/8"	6"	2"	.090"
20980	.6250	5/8"	15.875	5/8"	6"	2"	.125"

EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius	
	Decimal	Diameter Metric					
20990	.7500	3/4"	19.050	3/4"	6"	3"	.015"
21000	.7500	3/4"	19.050	3/4"	6"	3"	.020"
21010	.7500	3/4"	19.050	3/4"	6"	3"	.030"
21020	.7500	3/4"	19.050	3/4"	6"	3"	.045"
21030	.7500	3/4"	19.050	3/4"	6"	3"	.060"
21040	.7500	3/4"	19.050	3/4"	6"	3"	.090"
21050	.7500	3/4"	19.050	3/4"	6"	3"	.125"
21140	.7500	3/4"	19.050	3/4"	6"	3"	.250"
21060	1.000	1"	25.400	1"	6"	3"	.015"
21070	1.000	1"	25.400	1"	6"	3"	.020"
21080	1.000	1"	25.400	1"	6"	3"	.030"
21090	1.000	1"	25.400	1"	6"	3"	.045"
21100	1.000	1"	25.400	1"	6"	3"	.060"
21110	1.000	1"	25.400	1"	6"	3"	.090"
21120	1.000	1"	25.400	1"	6"	3"	.125"
21130	1.000	1"	25.400	1"	6"	3"	.250"



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MATERIAL HARDNESS (Rc)

0

Series 630RA

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

TOLERANCES

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

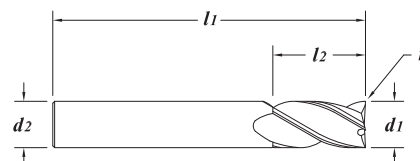
Can be modified with a neck within 48 hours

Extremely versatile

Bright Finish - page 253

Stub length - page 224

Standard length - page 237



EDP#	d_1 †		d_2	l_1	l_2	r	
	Decimal	Diameter Metric					
20107	.1250	1/8"	3.175	1/8"	3"	1"	.010"
20117	.1250	1/8"	3.175	1/8"	3"	1"	.015"
20127	.1250	1/8"	3.175	1/8"	3"	1"	.020"
20137	.1250	1/8"	3.175	1/8"	3"	1"	.030"
20147	.1250	1/8"	3.175	1/8"	3"	1"	.045"
20157	.1875	3/16"	4.763	3/16"	3"	1"	.010"
20167	.1875	3/16"	4.763	3/16"	3"	1"	.015"
20177	.1875	3/16"	4.763	3/16"	3"	1"	.020"
20187	.1875	3/16"	4.763	3/16"	3"	1"	.030"
20197	.1875	3/16"	4.763	3/16"	3"	1"	.045"
20207	.1875	3/16"	4.763	3/16"	3"	1"	.060"
20217	.1875	3/16"	4.763	3/16"	4"	1"	.010"
20227	.1875	3/16"	4.763	3/16"	4"	1"	.015"
20237	.1875	3/16"	4.763	3/16"	4"	1"	.020"
20247	.1875	3/16"	4.763	3/16"	4"	1"	.030"
20257	.1875	3/16"	4.763	3/16"	4"	1"	.045"
20267	.1875	3/16"	4.763	3/16"	4"	1"	.060"
20277	.2500	1/4"	6.350	1/4"	3"	1"	.010"
20287	.2500	1/4"	6.350	1/4"	3"	1"	.020"
20297	.2500	1/4"	6.350	1/4"	3"	1"	.030"
20307	.2500	1/4"	6.350	1/4"	3"	1"	.045"
20317	.2500	1/4"	6.350	1/4"	3"	1"	.060"
20327	.2500	1/4"	6.350	1/4"	4"	1"	.010"
20337	.2500	1/4"	6.350	1/4"	4"	1"	.020"
20347	.2500	1/4"	6.350	1/4"	4"	1"	.030"
20357	.2500	1/4"	6.350	1/4"	4"	1"	.045"
20367	.2500	1/4"	6.350	1/4"	4"	1"	.060"
20377	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.010"
20387	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.020"
20397	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.030"
20407	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.045"
20417	.2500	1/4"	6.350	1/4"	6"	1-1/2"	.060"
20427	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.010"
20437	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.020"
20447	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.030"
20457	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.045"
20467	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.060"
20477	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.090"
20487	.3125	5/16"	7.938	5/16"	4"	1-5/8"	.125"

EDP#	d_1 †		Metric	d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length	r Corner Radius
	Decimal	Diameter					
20497	.3750	3/8"	9.525	3/8"	4"	1"	.010"
20507	.3750	3/8"	9.525	3/8"	4"	1"	.020"
20517	.3750	3/8"	9.525	3/8"	4"	1"	.030"
20527	.3750	3/8"	9.525	3/8"	4"	1"	.045"
20537	.3750	3/8"	9.525	3/8"	4"	1"	.060"
20547	.3750	3/8"	9.525	3/8"	4"	1"	.090"
20557	.3750	3/8"	9.525	3/8"	4"	1"	.125"
20567	.3750	3/8"	9.525	3/8"	4"	2"	.010"
20577	.3750	3/8"	9.525	3/8"	4"	2"	.020"
20587	.3750	3/8"	9.525	3/8"	4"	2"	.030"
20597	.3750	3/8"	9.525	3/8"	4"	2"	.045"
20607	.3750	3/8"	9.525	3/8"	4"	2"	.060"
20617	.3750	3/8"	9.525	3/8"	4"	2"	.090"
20627	.3750	3/8"	9.525	3/8"	4"	2"	.125"
20637	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.010"
20647	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.020"
20657	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.030"
20667	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.045"
20677	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.060"
20687	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.090"
20697	.3750	3/8"	9.525	3/8"	6"	1-1/2"	.125"
21157	.4375	7/16"	11.113	7/16"	4"	1"	.010"
21167	.4375	7/16"	11.113	7/16"	4"	1"	.015"
21177	.4375	7/16"	11.113	7/16"	4"	1"	.020"
21187	.4375	7/16"	11.113	7/16"	4"	1"	.030"
21227	.4375	7/16"	11.113	7/16"	4"	1"	.125"
20707	.5000	1/2"	12.700	1/2"	4"	1"	.015"
20717	.5000	1/2"	12.700	1/2"	4"	1"	.020"
20727	.5000	1/2"	12.700	1/2"	4"	1"	.030"
20737	.5000	1/2"	12.700	1/2"	4"	1"	.045"
20747	.5000	1/2"	12.700	1/2"	4"	1"	.060"
20757	.5000	1/2"	12.700	1/2"	4"	1"	.090"
20767	.5000	1/2"	12.700	1/2"	4"	1"	.125"
20777	.5000	1/2"	12.700	1/2"	4"	2"	.015"
20787	.5000	1/2"	12.700	1/2"	4"	2"	.020"
20797	.5000	1/2"	12.700	1/2"	4"	2"	.030"
20807	.5000	1/2"	12.700	1/2"	4"	2"	.045"
20817	.5000	1/2"	12.700	1/2"	4"	2"	.060"
20827	.5000	1/2"	12.700	1/2"	4"	2"	.090"
20837	.5000	1/2"	12.700	1/2"	4"	2"	.125"
20847	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.015"
20857	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.020"
20867	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.030"
20877	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.045"
20887	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.060"
20897	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.090"
20907	.5000	1/2"	12.700	1/2"	6"	1-1/2"	.125"
20917	.6250	5/8"	15.875	5/8"	6"	2"	.010"
20927	.6250	5/8"	15.875	5/8"	6"	2"	.015"
20937	.6250	5/8"	15.875	5/8"	6"	2"	.020"
20947	.6250	5/8"	15.875	5/8"	6"	2"	.030"
20957	.6250	5/8"	15.875	5/8"	6"	2"	.045"
20967	.6250	5/8"	15.875	5/8"	6"	2"	.060"
20977	.6250	5/8"	15.875	5/8"	6"	2"	.090"
20987	.6250	5/8"	15.875	5/8"	6"	2"	.125"

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MATERIAL HARDNESS (Rc)

0

continued →

Series 630RA (continued)

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

EDP#	$d1$ †		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length	r Corner Radius	
	Decimal	Diameter Metric					
20997	.7500	3/4"	19.050	3/4"	6"	3"	.015"
21007	.7500	3/4"	19.050	3/4"	6"	3"	.020"
21017	.7500	3/4"	19.050	3/4"	6"	3"	.030"
21027	.7500	3/4"	19.050	3/4"	6"	3"	.045"
21037	.7500	3/4"	19.050	3/4"	6"	3"	.060"
21047	.7500	3/4"	19.050	3/4"	6"	3"	.090"
21057	.7500	3/4"	19.050	3/4"	6"	3"	.125"
21147	.7500	3/4"	19.050	3/4"	6"	3"	.250"
21067	1.000	1"	25.400	1"	6"	3"	.015"
21077	1.000	1"	25.400	1"	6"	3"	.020"
21087	1.000	1"	25.400	1"	6"	3"	.030"
21097	1.000	1"	25.400	1"	6"	3"	.045"
21107	1.000	1"	25.400	1"	6"	3"	.060"
21117	1.000	1"	25.400	1"	6"	3"	.090"
21127	1.000	1"	25.400	1"	6"	3"	.125"
21137	1.000	1"	25.400	1"	6"	3"	.250"



TOLERANCES

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

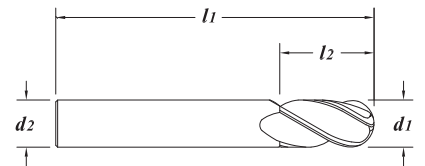
Extremely versatile

TiCN Coating - page [261](#)

TiAlN Coating - page [262](#)

Stub Length - page [226](#)

Standard length - page [240](#)



(720M/740M) 2 Flute EDP#	(723M/743M) 3 Flute EDP#	(730M/750M) 4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
			Decimal	Metric			
97010	98010	99010	.1181	3.000	3.0	50	16
97020	98020	99020	.1181	3.000	3.0	75	20
97030	98030	99030	.1181	3.000	3.0	75	25
43010	55510	44010	.1250	1/8"	3.175	1/8"	2"
43020	55520	44020	.1250	1/8"	3.175	1/8"	3"
43030	55530	44030	.1250	1/8"	3.175	1/8"	1"
97040	98040	99040	.1575		4.000	4.0	50
97050	98050	99050	.1575		4.000	4.0	75
97060	98060	99060	.1575		4.000	4.0	75
43040	55540	44040	.1875	3/16"	4.763	3/16"	3"
43050	55550	44050	.1875	3/16"	4.763	3/16"	1-1/8"
43060	55560	44060	.1875	3/16"	4.763	3/16"	4"
97080	98080	99080	.1969		5.000	5.0	75
97090	98090	99090	.1969		5.000	5.0	75
97100	98100	99100	.2362		6.000	6.0	75
97110	98110	99110	.2362		6.000	6.0	100
97120	98120	99120	.2362		6.000	6.0	100
97130	98130	99130	.2362		6.000	6.0	150
43070	55570	44070	.2500	1/4"	6.350	1/4"	3"
43080	55580	44080	.2500	1/4"	6.350	1/4"	4"
43090	55590	44090	.2500	1/4"	6.350	1/4"	4"
43100	55600	44100	.2500	1/4"	6.350	1/4"	6"
43110	55610	44110	.3125	5/16"	7.938	5/16"	3"
43120	55620	44120	.3125	5/16"	7.938	5/16"	4"
43130	55630	44130	.3125	5/16"	7.938	5/16"	4"
43140	55640	44140	.3125	5/16"	7.938	5/16"	6"
97140	98140	99140	.3150		8.000	8.0	75
97150	98150	99150	.3150		8.000	8.0	100
97160	98160	99160	.3150		8.000	8.0	100
97170	98170	99170	.3150		8.000	8.0	150

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#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
Decimal	Metric						
43150	55650	44150	.3750	3/8"	9.525	3/8"	3"
43160	55660	44160	.3750	3/8"	9.525	3/8"	4"
43170	55670	44170	.3750	3/8"	9.525	3/8"	4"
43180	55680	44180	.3750	3/8"	9.525	3/8"	6"
43190	55690	44190	.3750	3/8"	9.525	3/8"	6"
97180	98180	99180	.3937		10.000	10.0	75
97190	98190	99190	.3937		10.000	10.0	100
97200	98200	99200	.3937		10.000	10.0	100
97210	98210	99210	.3937		10.000	10.0	150
97220	98220	99220	.3937		10.000	10.0	150
43200	55700	44200	.4375	7/16"	11.113	7/16"	4"
43210	55710	44210	.4375	7/16"	11.113	7/16"	4"
43220	-	44220	.4375	7/16"	11.113	7/16"	6"
43230	-	44230	.4375	7/16"	11.113	7/16"	6"
97230	98230	99230	.4724		12.000	12.0	100
97240	98240	99240	.4724		12.000	12.0	100
97250	98250	99250	.4724		12.000	12.0	150
97260	98260	99260	.4724		12.000	12.0	150
43240	55740	44240	.5000	1/2"	12.700	1/2"	4"
43250	55750	44250	.5000	1/2"	12.700	1/2"	4"
43260	55760	44260	.5000	1/2"	12.700	1/2"	6"
43270	55770	44270	.5000	1/2"	12.700	1/2"	6"
97270	98270	-	.5512		14.000	14.0	100
97280	-	-	.5512		14.000	14.0	100
97290	-	99290	.5512		14.000	14.0	150
97300	98300	-	.5512		14.000	14.0	150
43280	55780	44280	.5625	9/16"	14.288	9/16"	6"
-	55790	44290	.5625	9/16"	14.288	9/16"	6"
43300	55800	44300	.6250	5/8"	15.875	5/8"	6"
43310	55810	44310	.6250	5/8"	15.875	5/8"	6"
97310	98310	99310	.6299		16.000	16.0	150
97320	98320	99320	.6299		16.000	16.0	150
97340	98340	99340	.7087		18.000	18.0	150
43320	55820	44320	.7500	3/4"	19.050	3/4"	6"
43330	55830	44330	.7500	3/4"	19.050	3/4"	6"
97350	98350	99350	.7874		20.000	20.0	150
97360	98360	99360	.7874		20.000	20.0	150
-	98370	-	.9843		25.000	25.0	150
97380	98380	-	.9843		25.000	25.0	150
43340	55840	44340	1.000	1"	25.400	1"	6"
43350	55850	44350	1.000	1"	25.400	1"	6"

TOLERANCES

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

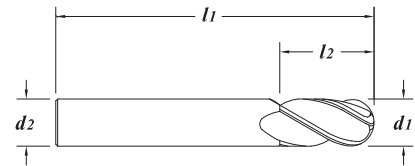
Can be modified with a neck within 48 hours

Extremely versatile

Bright Finish - page [259](#)

TiALN Coating - page [262](#)

Standard length - page [243](#)



(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
Decimal			Metric					
43014	55514	44014	.1250	1/8"	3.175	1/8"	2"	5/8"
43024	55524	44024	.1250	1/8"	3.175	1/8"	3"	3/4"
43034	55534	44034	.1250	1/8"	3.175	1/8"	3"	1"
43044	55544	44044	.1875	3/16"	4.763	3/16"	3"	1"
43054	55554	44054	.1875	3/16"	4.763	3/16"	3"	1-1/8"
43064	55564	44064	.1875	3/16"	4.763	3/16"	4"	1"
43074	55574	44074	.2500	1/4"	6.350	1/4"	3"	1"
43084	55584	44084	.2500	1/4"	6.350	1/4"	4"	1"
43094	55594	44094	.2500	1/4"	6.350	1/4"	4"	1-1/2"
43104	55604	44104	.2500	1/4"	6.350	1/4"	6"	1-1/2"
43114	55614	44114	.3125	5/16"	7.938	5/16"	3"	1"
43124	55624	44124	.3125	5/16"	7.938	5/16"	4"	1"
43134	-	44134	.3125	5/16"	7.938	5/16"	4"	1-5/8"
43144	55644	44144	.3125	5/16"	7.938	5/16"	6"	1-1/2"
43154	55654	44154	.3750	3/8"	9.525	3/8"	3"	1"
43164	55664	44164	.3750	3/8"	9.525	3/8"	4"	1"
43174	55674	44174	.3750	3/8"	9.525	3/8"	4"	2"
43184	55684	44184	.3750	3/8"	9.525	3/8"	6"	1-1/2"
-	55694	44194	.3750	3/8"	9.525	3/8"	6"	3"
-	-	44204	.4375	7/16"	11.113	7/16"	4"	1"
-	-	44214	.4375	7/16"	11.113	7/16"	4"	2"
43224	55724	44224	.4375	7/16"	11.113	7/16"	6"	1-1/2"
-	-	44234	.4375	7/16"	11.113	7/16"	6"	3"
43244	55744	44244	.5000	1/2"	12.700	1/2"	4"	1"
43254	55754	44254	.5000	1/2"	12.700	1/2"	4"	2"
43264	55764	44264	.5000	1/2"	12.700	1/2"	6"	1-1/2"
43274	55774	44274	.5000	1/2"	12.700	1/2"	6"	3"
43304	55804	44304	.6250	5/8"	15.875	5/8"	6"	2"
-	-	44314	.6250	5/8"	15.875	5/8"	6"	3"
43324	55824	44324	.7500	3/4"	19.050	3/4"	6"	2"
43334	55834	44334	.7500	3/4"	19.050	3/4"	6"	3"
-	-	44344	1.000	1"	25.400	1"	6"	2"
43354	55854	44354	1.000	1"	25.400	1"	6"	3"

70

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MATERIAL HARDNESS (Rc)

0

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

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

TOLERANCES

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

Extra Length - Ball End

TiAlN Coating

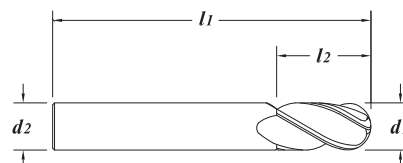
Solid submicron grain carbide end mill - center cutting

Extended reach

Dry or semi-dry machining

Can be modified with a neck within 48 hours

Extremely versatile

Bright Finish - page [259](#)TiCN Coating - page [261](#)Stub Length - page [227](#)Standard length - page [244](#)

(720MA/740MA)	(723MA/743MA)	(730MA/750MA)	d_1 †		d_2	l_1	l_2
2 Flute EDP#	3 Flute EDP#	4 Flute EDP#	Decimal	Diameter	Shank Diameter	Overall Length	Flute Length
97017	98017	99017	.1181		3.000	3.0	16
97027	98027	99027	.1181		3.000	3.0	20
97037	98037	99037	.1181		3.000	3.0	25
43017	55517	44017	.1250	1/8"	3.175	1/8"	5/8"
43027	55527	44027	.1250	1/8"	3.175	1/8"	3/4"
43037	55537	44037	.1250	1/8"	3.175	1/8"	1"
97047	98047	99047	.1575		4.000	4.0	16
97057	98057	99057	.1575		4.000	4.0	20
97067	98067	99067	.1575		4.000	4.0	25
43047	55547	44047	.1875	3/16"	4.763	3/16"	1"
43057	55557	44057	.1875	3/16"	4.763	3/16"	1-1/8"
43067	55567	44067	.1875	3/16"	4.763	3/16"	1"
97087	98087	99087	.1969		5.000	5.0	20
97097	98097	99097	.1969		5.000	5.0	25
97107	98107	99107	.2362		6.000	6.0	25
97117	98117	99117	.2362		6.000	6.0	100
97127	98127	99127	.2362		6.000	6.0	100
97137	98137	99137	.2362		6.000	6.0	150
43077	55577	44077	.2500	1/4"	6.350	1/4"	1"
43087	55587	44087	.2500	1/4"	6.350	1/4"	1"
43097	55597	44097	.2500	1/4"	6.350	1/4"	1-1/2"
43107	55607	44107	.2500	1/4"	6.350	1/4"	1-1/2"
43117	-	44117	.3125	5/16"	7.938	5/16"	1"
43127	55627	44127	.3125	5/16"	7.938	5/16"	1"
43137	55637	44137	.3125	5/16"	7.938	5/16"	1-5/8"
43147	55647	44147	.3125	5/16"	7.938	5/16"	1-1/2"
97147	98147	99147	.3150		8.000	8.0	25
97157	98157	99157	.3150		8.000	8.0	100
97167	98167	99167	.3150		8.000	8.0	100
97177	98177	99177	.3150		8.000	8.0	150

MATERIAL HARDNESS (Rc)

70

35

0

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#	$d1$ † Diameter			$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length
Decimal					Metric			
43157	55657	44157	.3750	3/8"	9.525	3/8"	3"	1"
43167	55667	44167	.3750	3/8"	9.525	3/8"	4"	1"
43177	55677	44177	.3750	3/8"	9.525	3/8"	4"	2"
43187	55687	44187	.3750	3/8"	9.525	3/8"	6"	1-1/2"
43197	55697	44197	.3750	3/8"	9.525	3/8"	6"	3"
97187	98187	99187	.3937		10.000	10.0	75	25
97197	98197	99197	.3937		10.000	10.0	100	25
97207	98207	99207	.3937		10.000	10.0	100	50
97217	98217	99217	.3937		10.000	10.0	150	38
97227	98227	99227	.3937		10.000	10.0	150	75
43207	-	44207	.4375	7/16"	11.113	7/16"	4"	1"
-	55717	44217	.4375	7/16"	11.113	7/16"	4"	2"
43227	-	44227	.4375	7/16"	11.113	7/16"	6"	1-1/2"
43237	55737	44237	.4375	7/16"	11.113	7/16"	6"	3"
97237	-	99237	.4724		12.000	12.0	100	25
97247	98247	99247	.4724		12.000	12.0	100	50
97257	98257	99257	.4724		12.000	12.0	150	50
97267	98267	99267	.4724		12.000	12.0	150	75
43247	55747	44247	.5000	1/2"	12.700	1/2"	4"	1"
43257	55757	44257	.5000	1/2"	12.700	1/2"	4"	2"
43267	55767	44267	.5000	1/2"	12.700	1/2"	6"	1-1/2"
43277	55777	44277	.5000	1/2"	12.700	1/2"	6"	3"
97277	-	99277	.5512		14.000	14.0	100	25
-	-	99287	.5512		14.000	14.0	100	50
97297	-	99297	.5512		14.000	14.0	150	50
-	-	99307	.5512		14.000	14.0	150	75
43287	-	44287	.5625	9/16"	14.288	9/16"	6"	2"
43297	-	44297	.5625	9/16"	14.288	9/16"	6"	3"
43307	55807	44307	.6250	5/8"	15.875	5/8"	6"	2"
43317	55817	44317	.6250	5/8"	15.875	5/8"	6"	3"
97317	98317	99317	.6299		16.000	16.0	150	50
97327	98327	99327	.6299		16.000	16.0	150	75
-	98337	99337	.7087		18.000	18.0	150	50
-	-	99347	.7087		18.000	18.0	150	75
43327	55827	44327	.7500	3/4"	19.050	3/4"	6"	2"
43337	55837	44337	.7500	3/4"	19.050	3/4"	6"	3"
97357	98357	99357	.7874		20.000	20.0	150	50
97367	98367	99367	.7874		20.000	20.0	150	75
-	-	99377	.9843		25.000	25.0	150	50
-	-	99387	.9843		25.000	25.0	150	75
-	55847	44347	1.000	1"	25.400	1"	6"	2"
43357	55857	44357	1.000	1"	25.400	1"	6"	3"

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	-.0001" -0.0005" (-.0025 -0.0127mm)

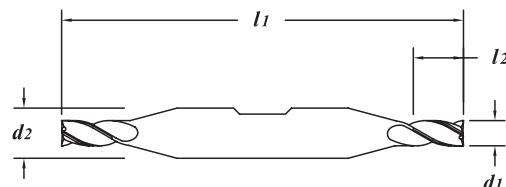


Standard Length - Double End - 3/8" Shank

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



(435M) EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
	Decimal	Diameter Metric			
34010	.1250	1/8"	3.175	3/8"	3/8"
34020	.1562	5/32"	3.967	3/8"	7/16"
34030	.1875	3/16"	4.763	3/8"	1/2"
34050	.2500	1/4"	6.350	3/8"	5/8"
34060	.2812	9/32"	7.142	4"	11/16"
34070	.3125	5/16"	7.938	4"	3/4"
34090	.3750	3/8"	9.525	4"	3/4"



Standard Length - Double End - 3/8" Shank

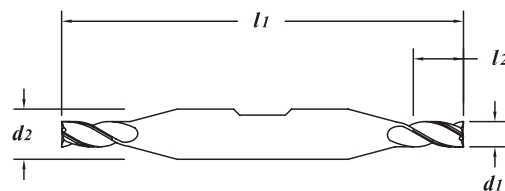
TiAlN Coated

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



(435MA) EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
	Decimal	Diameter Metric			
34017	.1250	1/8"	3.175	3/8"	3/8"
34027	.1562	5/32"	3.967	3/8"	7/16"
34037	.1875	3/16"	4.763	3/8"	1/2"
34047	.2188	7/32"	5.558	3/8"	9/16"
34057	.2500	1/4"	6.350	3/8"	5/8"
34067	.2812	9/32"	7.142	4"	11/16"
34077	.3125	5/16"	7.938	4"	3/4"
34097	.3750	3/8"	9.525	4"	3/4"

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35

MATERIAL HARDNESS (Rc)

0

TOLERANCES

d_1	+0.000" -0.002" (+.000 - .050mm)
d_2	-0.0001" -0.0005" (-.0025 - .0127mm)
ball radius	+0.000" -0.001" (+.000 - .025mm)



Series 535M, 535MA

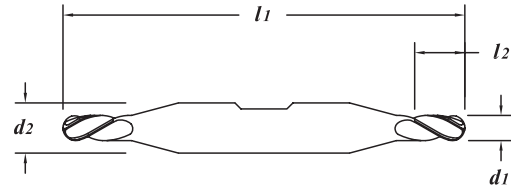
GENERAL PURPOSE
END MILLS

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



(535M) EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
	Decimal	Diameter Metric			
36010	.1250	1/8"	3.175	3/8"	3"
36030	.1875	3/16"	4.763	3/8"	1/2"

70



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

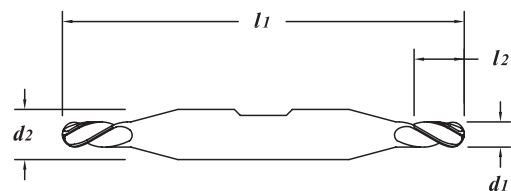
TiALN Coated

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



35

MATERIAL HARDNESS (Rc)

0

(535MA) EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
	Decimal	Diameter Metric			
36017	.1250	1/8"	3.175	3/8"	3"
36027	.1562	5/32"	3.967	3/8"	7/16"
36037	.1875	3/16"	4.763	3/8"	1/2"
36057	.2500	1/4"	6.350	3/8"	5/8"
36077	.3125	5/16"	7.938	3/8"	3/4"



TECH
PAGES
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TOLERANCES

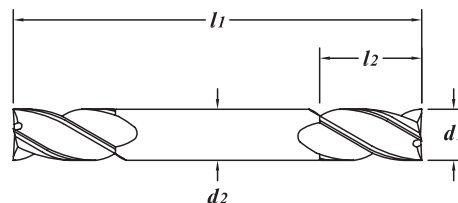
$d1$	$+0.000 - .002" (+.000 -.050\text{mm})$
$d2$	$h6$

Standard Length - Double End

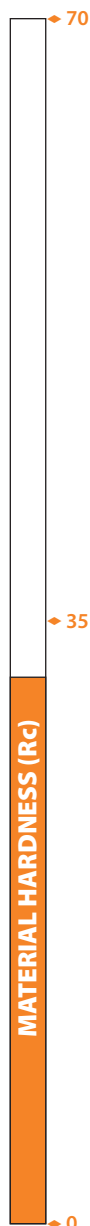
Solid submicron grain carbide end mill - center cutting

Extremely versatile

TiALN Coating - page [267](#)



EDP#	$d1$ †		$d2$	$l1$	$l2$
	Decimal	Diameter			
30030	.0625	1/16"	1.588	1/8"	2"
30040	.0938	3/32"	2.383	1/8"	2"
30050	.1250	1/8"	3.175	1/8"	2"
30060	.1562	5/32"	3.967	3/16"	2-1/2"
30070	.1875	3/16"	4.763	3/16"	2-1/2"
30090	.2500	1/4"	6.350	1/4"	2-1/2"
30100	.3125	5/16"	7.938	5/16"	3-1/2"
30110	.3750	3/8"	9.525	3/8"	3-1/2"
30130	.5000	1/2"	12.700	1/2"	4"



TOLERANCES

$d1$	$+0.000^{\circ} -0.002^{\circ} (+.000 -0.050\text{mm})$
$d2$	$h6$



TECH
PAGES
290-291

Series 430MA, 450MA

GENERAL PURPOSE
END MILLS

Standard Length - Double End

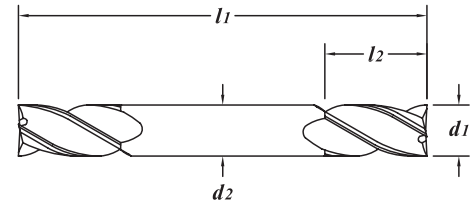
TiALN Coating

Solid submicron grain carbide end mill - center cutting

Dry or semi-dry machining

Extremely versatile

Bright Finish - page 266



(430MA/450MA) EDP#	$d1$ † Diameter		$d2$ Shank Diameter	$l1$ Overall Length	$l2$ Flute Length
	Decimal	Metric			
30017	.0312	1/32"	0.792	1/8"	2"
30027	.0469	3/64"	1.191	1/8"	2"
30037	.0625	1/16"	1.588	1/8"	2"
30047	.0938	3/32"	2.383	1/8"	2"
30057	.1250	1/8"	3.175	1/8"	2"
30067	.1562	5/32"	3.967	3/16"	2-1/2"
30077	.1875	3/16"	4.763	3/16"	2-1/2"
30087	.2188	7/32"	5.558	1/4"	2-1/2"
30607	.2362		6.000	6.0	16
30097	.2500	1/4"	6.350	1/4"	2-1/2"
30107	.3125	5/16"	7.938	5/16"	3-1/2"
30117	.3750	3/8"	9.525	3/8"	3-1/2"
30127	.4375	7/16"	11.113	7/16"	4"
30137	.5000	1/2"	12.700	1/2"	4"

70

35

MATERIAL HARDNESS (Rc)

0

TECH
PAGES
290-291

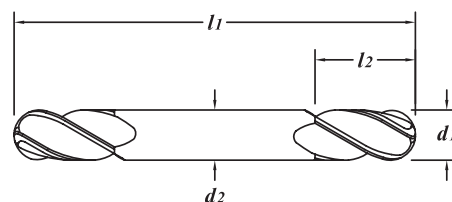
TOLERANCES

d_1	$+0.000" - .002" (+.000 - .050\text{mm})$
d_2	$h6$
ball radius	$+0.000" - .001" (+.000 - .025\text{mm})$

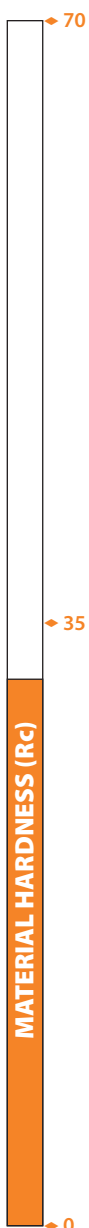
Standard Length - Double End - Ball End

Solid submicron grain carbide end mill - center cutting

Extremely versatile

TiALN Coating - page [269](#)

EDP#	d_1 †		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
	Decimal	Diameter Metric			
32050	.1250	1/8"	3.175	1/8"	2"
32070	.1875	3/16"	4.763	3/16"	2-1/2"
32090	.2500	1/4"	6.350	1/4"	2-1/2"
32110	.3750	3/8"	9.525	3/8"	3-1/2"
32130	.5000	1/2"	12.700	1/2"	4"



TOLERANCES

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



Series 530MA

GENERAL PURPOSE
END MILLS

Standard Length - Double End - Ball End

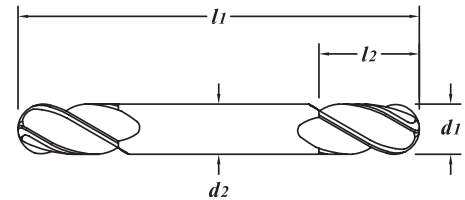
TiALN Coating

Solid submicron grain carbide end mill - center cutting

Dry or semi-dry machining

Extremely versatile

Bright Finish - page [268](#)



EDP#	d_1 †		d_2	l_1	l_2
	Decimal	Diameter			Flute Length
32017	.0312	1/32"	0.792	1/8"	2"
32027	.0469	3/64"	1.191	1/8"	2"
32037	.0625	1/16"	1.588	1/8"	2"
32047	.0938	3/32"	2.383	1/8"	2"
32057	.1250	1/8"	3.175	1/8"	2"
32067	.1562	5/32"	3.967	3/16"	2-1/2"
32077	.1875	3/16"	4.763	3/16"	2-1/2"
32097	.2500	1/4"	6.350	1/4"	2-1/2"
32117	.3750	3/8"	9.525	3/8"	3-1/2"
32137	.5000	1/2"	12.700	1/2"	4"

70

35

MATERIAL HARDNESS (Rc)

0

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



TOLERANCES

d_1	$+0.011" -0.000" (+0.025 -0.000\text{mm})$
d_2	$h6$

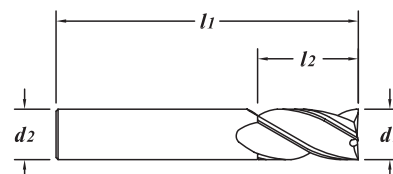
Standard Length - N/C Tolerance - Square End

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
		Decimal	Metric			
25010	26010	.0625	1/16"	1.588	1-1/2"	1/4"
25020	26020	.0938	3/32"	2.383	1-1/2"	5/16"
25030	26030	.1250	1/8"	3.175	1-1/2"	1/2"
25040	26040	.1875	3/16"	4.763	2"	9/16"
25050	26050	.2500	1/4"	6.350	2-1/2"	3/4"
*25070	*26070	.3750	3/8"	9.525	2-1/2"	7/8"
*25090	*26090	.5000	1/2"	12.700	3"	1"
-	*26100	.6250	5/8"	15.875	3-1/2"	1-1/4"



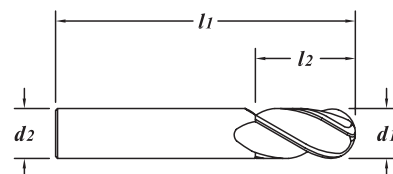
Standard Length - N/C Tolerance - Ball End

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 $+0.0005" -0.0000" (+0.0127\text{mm} -0.0000\text{mm})$ 

(380M) 2 Flute EDP#	(390M) 4 Flute EDP#	d_1 † Diameter		d_2 Shank Diameter	l_1 Overall Length	l_2 Flute Length
		Decimal	Metric			
27010	28010	.0625	1/16"	1.588	1-1/2"	1/4"
27030	28030	.1250	1/8"	3.175	1-1/2"	1/2"
-	28040	.1875	3/16"	4.763	2"	9/16"
27050	28050	.2500	1/4"	6.350	2-1/2"	3/4"
-	28060	.3125	5/16"	7.938	2-1/2"	7/8"
27070	28070	.3750	3/8"	9.525	2-1/2"	7/8"
-	28090	.5000	1/2"	12.700	3"	1"
-	28100	.6250	5/8"	15.875	3-1/2"	1-1/4"

* - Tools with weldon flats



Tool Packaging



SA (1/4" Steel Shank)

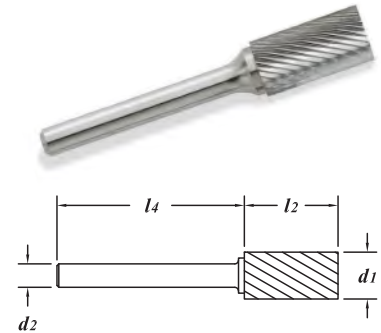
Carbide Rotary Files - Cylindrical Shape

Submicron Grain Carbide

A - Aluminum Cut

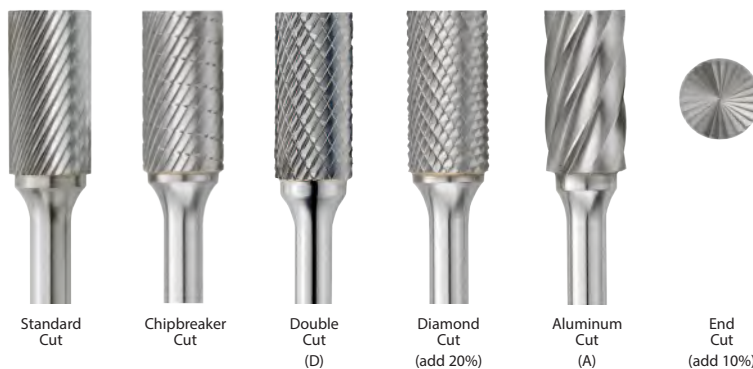
D - Double Cut

* - Solid Carbide



EDP#	TOOL #	$d1$ †		$d2$ Shank Diameter	$l2$ Flute Length	$l4$ Shank Length
		Decimal	Diameter Metric			
* 60010	SA-14	.1875	3/16"	4.763	1/4"	5/8"
* 60012	SA-14D	.1875	3/16"	4.763	1/4"	5/8"
* 60020	SA-1	.2500	1/4"	6.350	1/4"	5/8"
* 60021	SA-1A	.2500	1/4"	6.350	1/4"	5/8"
* 60022	SA-1D	.2500	1/4"	6.350	1/4"	5/8"
60030	SA-2	.3125	5/16"	7.938	1/4"	3/4"
60032	SA-2D	.3125	5/16"	7.938	1/4"	3/4"
60040	SA-3	.3750	3/8"	9.525	1/4"	3/4"
60041	SA-3A	.3750	3/8"	9.525	1/4"	3/4"
60042	SA-3D	.3750	3/8"	9.525	1/4"	3/4"
60050	SA-4	.4375	7/16"	11.113	1/4"	1"
60052	SA-4D	.4375	7/16"	11.113	1/4"	1"
60060	SA-5	.5000	1/2"	12.700	1/4"	1"
60061	SA-5A	.5000	1/2"	12.700	1/4"	1"
60062	SA-5D	.5000	1/2"	12.700	1/4"	1"
60070	SA-6	.6250	5/8"	15.875	1/4"	1"
60071	SA-6A	.6250	5/8"	15.875	1/4"	1"
60072	SA-6D	.6250	5/8"	15.875	1/4"	1"
60080	SA-7	.7500	3/4"	19.050	1/4"	1"
60081	SA-7A	.7500	3/4"	19.050	1/4"	1"
60082	SA-7D	.7500	3/4"	19.050	1/4"	1"
60090	SA-9	1.000	1"	25.400	1/4"	1"
60091	SA-9A	1.000	1"	25.400	1/4"	1"
60092	SA-9D	1.000	1"	25.400	1/4"	1"

Basic Rotary File Cut Styles Available



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

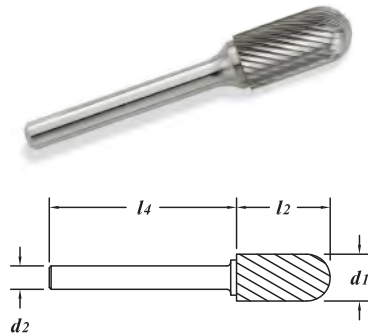
Carbide Rotary Files - Cylindrical-Radius Shape

Submicron Grain Carbide

A - Aluminum Cut

D - Double Cut

* - Solid Carbide



EDP#	TOOL #	$d1$ †			$d2$ Shank Diameter	$l2$ Flute Length	$l4$ Shank Length
		Decimal	Diameter	Metric			
* 61010	SC-14	.1875	3/16"	4.763	1/4"	5/8"	1-3/8"
* 61012	SC-14D	.1875	3/16"	4.763	1/4"	5/8"	1-3/8"
* 61020	SC-1	.2500	1/4"	6.350	1/4"	5/8"	1-3/8"
* 61021	SC-1A	.2500	1/4"	6.350	1/4"	5/8"	1-3/8"
* 61022	SC-1D	.2500	1/4"	6.350	1/4"	5/8"	1-3/8"
61030	SC-2	.3125	5/16"	7.938	1/4"	3/4"	1-3/4"
61032	SC-2D	.3125	5/16"	7.938	1/4"	3/4"	1-3/4"
61040	SC-3	.3750	3/8"	9.525	1/4"	3/4"	1-3/4"
61041	SC-3A	.3750	3/8"	9.525	1/4"	3/4"	1-3/4"
61042	SC-3D	.3750	3/8"	9.525	1/4"	3/4"	1-3/4"
61050	SC-4	.4375	7/16"	11.113	1/4"	1"	1-3/4"
61052	SC-4D	.4375	7/16"	11.113	1/4"	1"	1-3/4"
61060	SC-5	.5000	1/2"	12.700	1/4"	1"	1-3/4"
61061	SC-5A	.5000	1/2"	12.700	1/4"	1"	1-3/4"
61062	SC-5D	.5000	1/2"	12.700	1/4"	1"	1-3/4"
61070	SC-6	.6250	5/8"	15.875	1/4"	1"	1-3/4"
61071	SC-6A	.6250	5/8"	15.875	1/4"	1"	1-3/4"
61072	SC-6D	.6250	5/8"	15.875	1/4"	1"	1-3/4"
61080	SC-7	.7500	3/4"	19.050	1/4"	1"	1-3/4"
61081	SC-7A	.7500	3/4"	19.050	1/4"	1"	1-3/4"
61082	SC-7D	.7500	3/4"	19.050	1/4"	1"	1-3/4"

SD (1/4" Steel Shank)

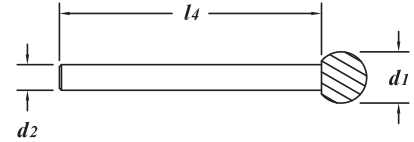
Carbide Rotary Files - Ball Shape

Submicron Grain Carbide

A - Aluminum Cut

D - Double Cut

* - Solid Carbide



EDP#	TOOL #	d_1 †		d_2 Shank Diameter	l_2 Flute Length	l_4 Shank Length
		Decimal	Diameter			
* 62010	SD-14	.1875	3/16"	4.763	1/4"	2"
* 62012	SD-14D	.1875	3/16"	4.763	1/4"	2"
* 62020	SD-1	.2500	1/4"	6.350	1/4"	2"
* 62021	SD-1A	.2500	1/4"	6.350	1/4"	2"
* 62022	SD-1D	.2500	1/4"	6.350	1/4"	2"
62030	SD-2	.3125	5/16"	7.938	1/4"	1-3/4"
62032	SD-2D	.3125	5/16"	7.938	1/4"	1-3/4"
62040	SD-3	.3750	3/8"	9.525	1/4"	1-3/4"
62041	SD-3A	.3750	3/8"	9.525	1/4"	1-3/4"
62042	SD-3D	.3750	3/8"	9.525	1/4"	1-3/4"
62050	SD-4	.4375	7/16"	11.113	1/4"	1-3/4"
62052	SD-4D	.4375	7/16"	11.113	1/4"	1-3/4"
62060	SD-5	.5000	1/2"	12.700	1/4"	1-3/4"
62061	SD-5A	.5000	1/2"	12.700	1/4"	1-3/4"
62062	SD-5D	.5000	1/2"	12.700	1/4"	1-3/4"
62070	SD-6	.6250	5/8"	15.875	1/4"	1-3/4"
62071	SD-6A	.6250	5/8"	15.875	1/4"	1-3/4"
62072	SD-6D	.6250	5/8"	15.875	1/4"	1-3/4"
62080	SD-7	.7500	3/4"	19.050	1/4"	1-3/4"
62082	SD-7D	.7500	3/4"	19.050	1/4"	1-3/4"
62090	SD-9	1.000	1"	25.400	1/4"	1-3/4"
62092	SD-9D	1.000	1"	25.400	1/4"	1-3/4"

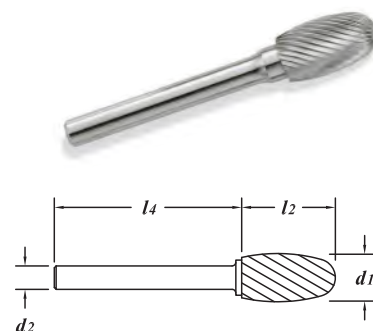
Carbide Rotary Files - Egg Shape

Submicron Grain Carbide

A - Aluminum Cut

D - Double Cut

* - Solid Carbide



EDP#	TOOL #	$d1$ †		$d2$ Shank Diameter	$l2$ Flute Length	$l4$ Shank Length
		Decimal	Diameter			
* 63010	SE-1	.2500	1/4"	6.350	1/4"	3/8"
* 63012	SE-1D	.2500	1/4"	6.350	1/4"	3/8"
63020	SE-3	.3750	3/8"	9.525	1/4"	5/8"
63021	SE-3A	.3750	3/8"	9.525	1/4"	5/8"
63022	SE-3D	.3750	3/8"	9.525	1/4"	5/8"
63030	SE-5	.5000	1/2"	12.700	1/4"	7/8"
63031	SE-5A	.5000	1/2"	12.700	1/4"	7/8"
63032	SE-5D	.5000	1/2"	12.700	1/4"	7/8"
63040	SE-6	.6250	5/8"	15.875	1/4"	1"
63041	SE-6A	.6250	5/8"	15.875	1/4"	1"
63042	SE-6D	.6250	5/8"	15.875	1/4"	1"
63050	SE-7	.7500	3/4"	19.050	1/4"	1"
63052	SE-7D	.7500	3/4"	19.050	1/4"	1"

SF (1/4" Steel Shank)
SG (1/4" Steel Shank)

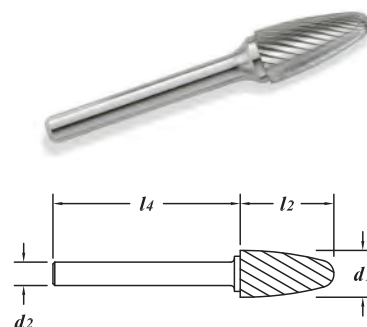
Carbide Rotary Files - Tree-Radius Shape

Submicron Grain Carbide

A - Aluminum Cut

D - Double Cut

* - Solid Carbide



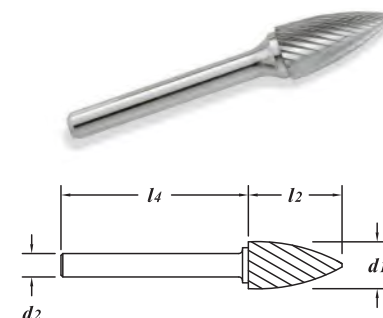
EDP#	TOOL #	$d1$ † Diameter			$d2$ Shank Diameter	$l2$ Flute Length	$l4$ Shank Length
		Decimal		Metric			
64010	SF-1	.2500	1/4"	6.350	1/4"	5/8"	2"
64011	SF-1A	.2500	1/4"	6.350	1/4"	5/8"	2"
64012	SF-1D	.2500	1/4"	6.350	1/4"	5/8"	2"
64020	SF-3	.3750	3/8"	9.525	1/4"	3/4"	1-3/4"
* 64021	SF-3A	.3750	3/8"	9.525	1/4"	3/4"	1-3/4"
* 64022	SF-3D	.3750	3/8"	9.525	1/4"	3/4"	1-3/4"
* 64030	SF-5	.5000	1/2"	12.700	1/4"	1"	1-3/4"
64031	SF-5A	.5000	1/2"	12.700	1/4"	1"	1-3/4"
64032	SF-5D	.5000	1/2"	12.700	1/4"	1"	1-3/4"
64040	SF-6	.6250	5/8"	15.875	1/4"	1"	1-3/4"
64041	SF-6A	.6250	5/8"	15.875	1/4"	1"	1-3/4"
64042	SF-6D	.6250	5/8"	15.875	1/4"	1"	1-3/4"
64050	SF-14	.7500	3/4"	19.050	1/4"	1-1/4"	1-3/4"
64052	SF-14D	.7500	3/4"	19.050	1/4"	1-1/4"	1-3/4"

Carbide Rotary Files - Tree-Pointed Shape

Submicron Grain Carbide

D - Double Cut

* - Solid Carbide

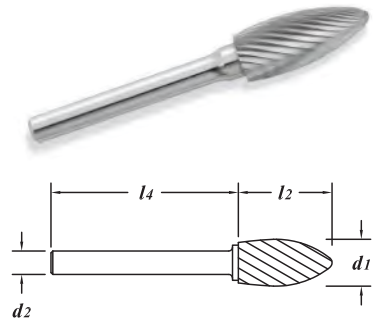


EDP#	TOOL #	$d1$ † Diameter			$d2$ Shank Diameter	$l2$ Flute Length	$l4$ Shank Length	
		Decimal		Metric				
*	65010	SG-1	.2500	1/4"	6.350	1/4"	5/8"	2"
*	65012	SG-1D	.2500	1/4"	6.350	1/4"	5/8"	2"
	65020	SG-3	.3750	3/8"	9.525	1/4"	3/4"	1-3/4"
	65022	SG-3D	.3750	3/8"	9.525	1/4"	3/4"	1-3/4"
	65030	SG-13	.5000	1/2"	12.700	1/4"	3/4"	1-3/4"
	65032	SG-13D	.5000	1/2"	12.700	1/4"	3/4"	1-3/4"
	65040	SG-5	.5000	1/2"	12.700	1/4"	1"	1-3/4"
	65042	SG-5D	.5000	1/2"	12.700	1/4"	1"	1-3/4"
	65050	SG-6	.6250	5/8"	15.875	1/4"	1"	1-3/4"
	65052	SG-6D	.6250	5/8"	15.875	1/4"	1"	1-3/4"
	65060	SG-7	.7500	3/4"	19.050	1/4"	1"	1-3/4"
	65062	SG-7D	.7500	3/4"	19.050	1/4"	1"	1-3/4"

Carbide Rotary Files - Flame Shape

Submicron Grain Carbide

D - Double Cut



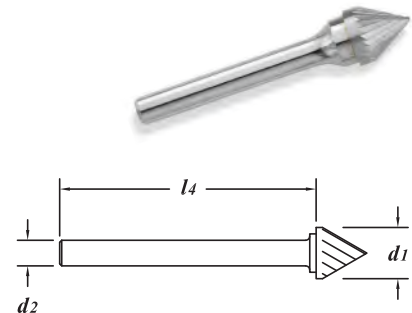
EDP#	TOOL #	$d1$ †			$d2$ Shank Diameter	$l2$ Flute Length	$l4$ Shank Length
		Decimal	Diameter	Metric			
66010	SH-2	.3125	5/16"	7.938	1/4"	3/4"	1-3/4"
66012	SH-2D	.3125	5/16"	7.938	1/4"	3/4"	1-3/4"
66020	SH-5	.5000	1/2"	12.700	1/4"	1-1/4"	1-3/4"
66022	SH-5D	.5000	1/2"	12.700	1/4"	1-1/4"	1-3/4"
66030	SH-6	.6250	5/8"	15.875	1/4"	1-7/16"	1-3/4"
66032	SH-6D	.6250	5/8"	15.875	1/4"	1-7/16"	1-3/4"
66040	SH-7	.7500	3/4"	19.050	1/4"	1-5/8"	1-3/4"
66042	SH-7D	.7500	3/4"	19.050	1/4"	1-5/8"	1-3/4"

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
		Decimal	Diameter	Metric		
** 67010	SJ-1	.2500	1/4"	6.350	1/4"	1-11/16"
** 67012	SJ-1D	.2500	1/4"	6.350	1/4"	1-11/16"
67020	SJ-3	.3750	3/8"	9.525	1/4"	1-3/4"
67022	SJ-3D	.3750	3/8"	9.525	1/4"	1-3/4"
67030	SJ-5	.5000	1/2"	12.700	1/4"	1-3/4"
67032	SJ-5D	.5000	1/2"	12.700	1/4"	1-3/4"
67040	SJ-6	.6250	5/8"	15.875	1/4"	1-3/4"
67042	SJ-6D	.6250	5/8"	15.875	1/4"	1-3/4"
67050	SJ-7	.7500	3/4"	19.050	1/4"	1-3/4"
67052	SJ-7D	.7500	3/4"	19.050	1/4"	1-3/4"

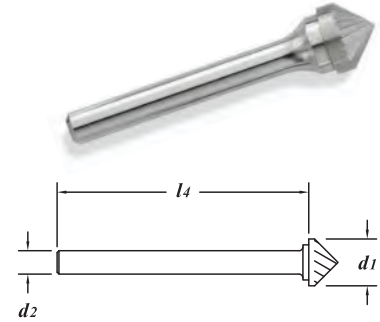
SK (1/4" Steel Shank)
SL (1/4" Steel Shank)

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

Submicron Grain Carbide

D - Double Cut

** - Solid Carbide/Double End



EDP#	TOOL #	$d1$ †		$d2$	$l4$
		Decimal	Diameter	Shank Diameter	Shank Length
**	68010	.2500	1/4"	6.350	1-11/16"
**	68012	.2500	1/4"	6.350	1-11/16"
	68020	.3750	3/8"	9.525	1-3/4"
	68022	.3750	3/8"	9.525	1-3/4"
	68030	.5000	1/2"	12.700	1-3/4"
	68032	.5000	1/2"	12.700	1-3/4"
	68040	.6250	5/8"	15.875	1-3/4"
	68042	.6250	5/8"	15.875	1-3/4"
	68050	.7500	3/4"	19.050	1-3/4"
	68052	.7500	3/4"	19.050	1-3/4"
	68070	1.000	1"	25.400	1-3/4"
	68072	1.000	1"	25.400	1-3/4"

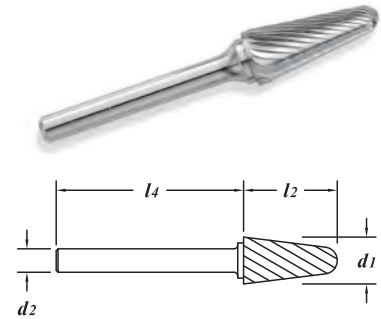
Carbide Rotary Files - Cone-Radius Shape (14° Included Angle)

Submicron Grain Carbide

A - Aluminum Cut

D - Double Cut

* - Solid Carbide



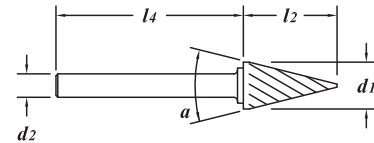
EDP#	TOOL #	$d1$ †		$d2$	$l2$	$l4$
		Decimal	Diameter	Shank Diameter	Flute Length	Shank Length
*	69010	.2500	1/4"	6.350	5/8"	2"
*	69012	.2500	1/4"	6.350	5/8"	2"
	69020	.3125	5/16"	7.938	7/8"	1-3/4"
	69022	.3125	5/16"	7.938	7/8"	1-3/4"
	69030	.3750	3/8"	9.525	1-1/16"	1-3/4"
	69031	.3750	3/8"	9.525	1-1/16"	1-3/4"
	69032	.3750	3/8"	9.525	1-1/16"	1-3/4"
	69040	.5000	1/2"	12.700	1-1/8"	1-3/4"
	69041	.5000	1/2"	12.700	1-1/8"	1-3/4"
	69042	.5000	1/2"	12.700	1-1/8"	1-3/4"
	69050	.6250	5/8"	15.875	1-3/16"	1-3/4"
	69051	.6250	5/8"	15.875	1-3/16"	1-3/4"
	69052	.6250	5/8"	15.875	1-3/16"	1-3/4"
	69060	.7500	3/4"	19.050	1-1/2"	1-3/4"
	69062	.7500	3/4"	19.050	1-1/2"	1-3/4"

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

Submicron Grain Carbide

D - Double Cut

* - Solid Carbide



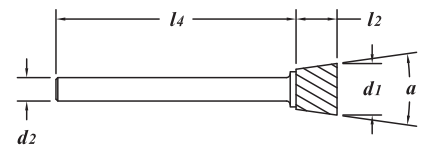
EDP#	TOOL #	$d1$ †			$d2$ Shank Diameter	a Included Angle	$l2$ Flute Length	$l4$ Shank Length	
		Decimal	Diameter	Metric					
*	70010	SM-1	.2500	1/4"	6.350	1/4"	22°	1/2"	2"
*	70012	SM-1D	.2500	1/4"	6.350	1/4"	22°	1/2"	2"
	70020	SM-4	.3750	3/8"	9.525	1/4"	28°	5/8"	1-3/4"
	70022	SM-4D	.3750	3/8"	9.525	1/4"	28°	5/8"	1-3/4"
	70030	SM-5	.5000	1/2"	12.700	1/4"	28°	7/8"	1-3/4"
	70032	SM-5D	.5000	1/2"	12.700	1/4"	28°	7/8"	1-3/4"
	70040	SM-6	.6250	5/8"	15.875	1/4"	31°	1"	1-3/4"
	70042	SM-6D	.6250	5/8"	15.875	1/4"	31°	1"	1-3/4"

Carbide Rotary Files - Inverted Cone Shape

Submicron Grain Carbide

D - Double Cut

* - Solid Carbide



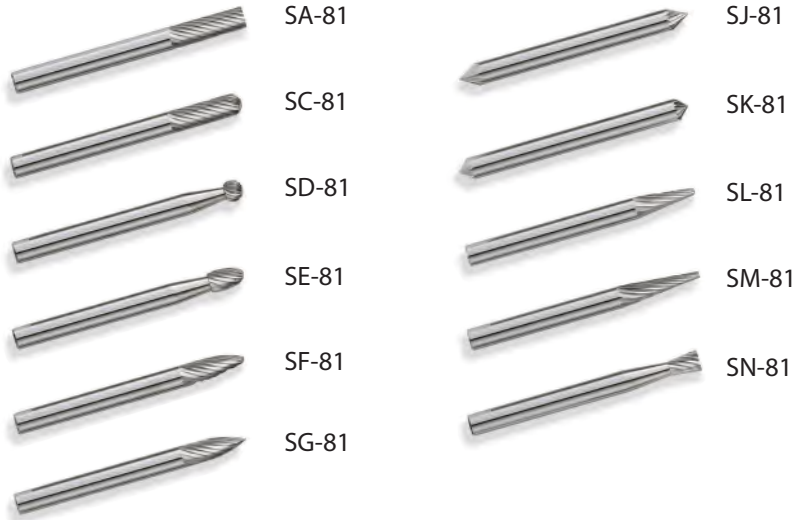
EDP#	TOOL #	d_1 †		d_2 Shank Diameter	a Included Angle	l_2 Flute Length	l_4 Shank Length
		Decimal	Diameter				
71010	SN-1	.2500	1/4"	6.350	10°	5/16"	2"
71012	SN-1D	.2500	1/4"	6.350	10°	5/16"	2"
71020	SN-2	.3750	3/8"	9.525	13°	3/8"	1-3/4"
71022	SN-2D	.3750	3/8"	9.525	13°	3/8"	1-3/4"
* 71030	SN-3	.5000	1/2"	12.700	16°	1/2"	1-3/4"
* 71032	SN-3D	.5000	1/2"	12.700	16°	1/2"	1-3/4"

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

Solid Carbide Rotary Files

Submicron Grain Carbide

D - Double Cut

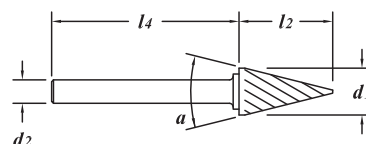
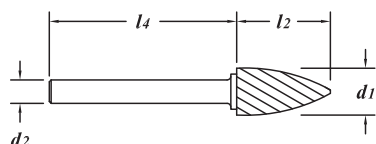


EDP#	TOOL #	d_1 †			l_1 Overall Length	α Included Angle	l_2 Flute Length
		Decimal	Diameter	Metric			
72010	SA-81	.1875	3/16"	4.763	2"	-	5/8"
72012	SA-81D	.1875	3/16"	4.763	2"	-	5/8"
72020	SC-81	.1875	3/16"	4.763	2"	-	5/8"
72030	SD-81	.1875	3/16"	4.763	2"	-	-
72032	SD-81D	.1875	3/16"	4.763	2"	-	-
72040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

Carbide Rotary Files

Submicron Grain Carbide

D - Double Cuts



EDP#	TOOL #	d_1 † Diameter		d_2 Shank Diameter	a Included Angle	l_2 Flute Length	l_4 Shank Length
		Decimal	Metric				
73010	SA-51	.2500	1/4"	6.350	-	1/2"	1-1/2"
73012	SA-51D	.2500	1/4"	6.350	-	1/2"	1-1/2"
73020	SB-51	.2500	1/4"	6.350	-	3/16"	1-1/2"
73022	SB-51D	.2500	1/4"	6.350	-	3/16"	1-1/2"
73030	SC-51	.2500	1/4"	6.350	-	1/2"	1-1/2"
73032	SC-51D	.2500	1/4"	6.350	-	1/2"	1-1/2"
73040	SD-51	.2500	1/4"	6.350	-	-	1-1/2"
73042	SD-51D	.2500	1/4"	6.350	-	-	1-1/2"
73050	SE-51	.2500	1/4"	6.350	-	3/8"	1-1/2"
73052	SE-51D	.2500	1/4"	6.350	-	3/8"	1-1/2"
73060	SF-51	.2500	1/4"	6.350	-	1/2"	1-1/2"
73062	SF-51D	.2500	1/4"	6.350	-	1/2"	1-1/2"
73070	SG-51	.2500	1/4"	6.350	-	1/2"	1-1/2"
73072	SG-51D	.2500	1/4"	6.350	-	1/2"	1-1/2"
73080	SM-51	.2500	1/4"	6.350	22°	1/2"	1-1/2"
73082	SM-51D	.2500	1/4"	6.350	22°	1/2"	1-1/2"
73090	SN-51	.2500	1/4"	6.350	10°	1/4"	1-1/2"
73092	SN-51D	.2500	1/4"	6.350	10°	1/4"	1-1/2"

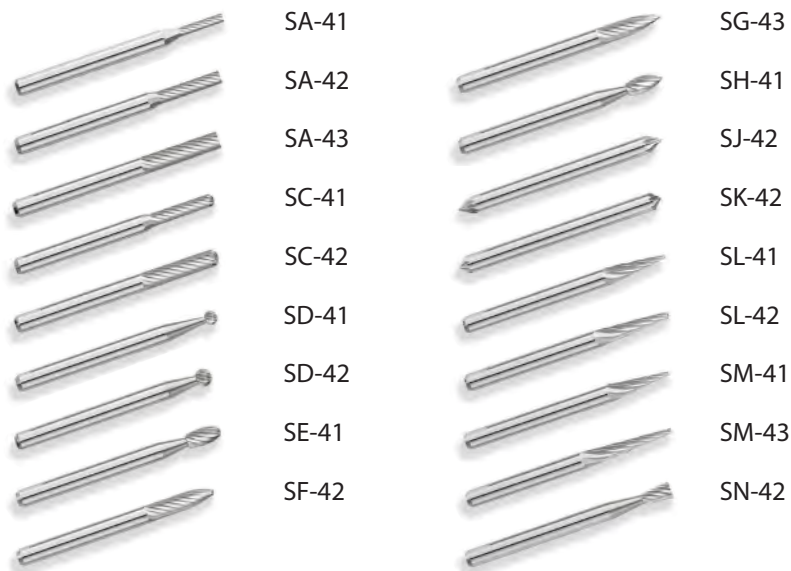
CAD drawings representative for dimension placement

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

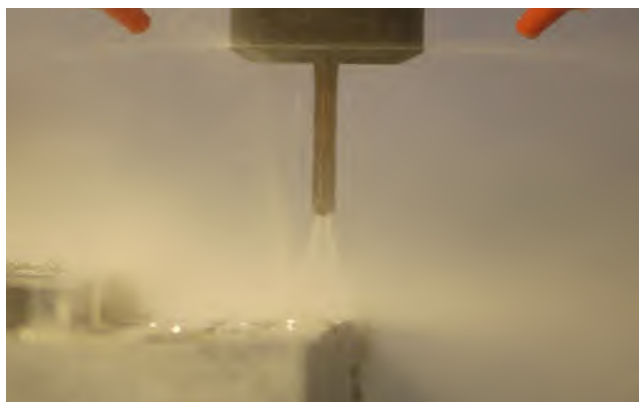
Solid Carbide Rotary Files

Submicron Grain Carbide

D - Double Cut



EDP#	TOOL #	d_1 †			l_1 Overall Length	a Included Angle	l_2 Flute Length
		Decimal	Diameter	Metric			
74010	SA-41	.0625	1/16"	1.588	1-1/2"	-	1/4"
74012	SA-41D	.0625	1/16"	1.588	1-1/2"	-	1/4"
74020	SA-42	.0938	3/32"	2.383	1-1/2"	-	7/16"
74022	SA-42D	.0938	3/32"	2.383	1-1/2"	-	7/16"
74030	SA-43	.1250	1/8"	3.175	1-1/2"	-	9/16"
74032	SA-43D	.1250	1/8"	3.175	1-1/2"	-	9/16"
74040	SC-41	.0938	3/32"	2.383	1-1/2"	-	7/16"
74042	SC-41D	.0938	3/32"	2.383	1-1/2"	-	7/16"
74050	SC-42	.1250	1/8"	3.175	1-1/2"	-	9/16"
74052	SC-42D	.1250	1/8"	3.175	1-1/2"	-	9/16"
74060	SD-41	.0938	3/32"	2.383	1-1/2"	-	-
74062	SD-41D	.0938	3/32"	2.383	1-1/2"	-	-
74070	SD-42	.1250	1/8"	3.175	1-1/2"	-	-
74072	SD-42D	.1250	1/8"	3.175	1-1/2"	-	-
74080	SE-41	.1250	1/8"	3.175	1-1/2"	-	7/32"
74082	SE-41D	.1250	1/8"	3.175	1-1/2"	-	7/32"
74090	SF-42	.1250	1/8"	3.175	1-1/2"	-	1/2"
74092	SF-42D	.1250	1/8"	3.175	1-1/2"	-	1/2"
74100	SG-43	.1250	1/8"	3.175	1-1/2"	-	3/8"
74102	SG-43D	.1250	1/8"	3.175	1-1/2"	-	3/8"
74110	SH-41	.1250	1/8"	3.175	1-1/2"	-	1/4"
74112	SH-41D	.1250	1/8"	3.175	1-1/2"	-	1/4"
74120	SJ-42	.1250	1/8"	3.175	1-1/2"	60°	-
74122	SJ-42D	.1250	1/8"	3.175	1-1/2"	60°	-
74130	SK-42	.1250	1/8"	3.175	1-1/2"	90°	-
74132	SK-42D	.1250	1/8"	3.175	1-1/2"	90°	-
74140	SL-41	.1250	1/8"	3.175	1-1/2"	8°	3/8"
74142	SL-41D	.1250	1/8"	3.175	1-1/2"	8°	3/8"
74150	SL-42	.1250	1/8"	3.175	1-1/2"	8°	1/2"
74152	SL-42D	.1250	1/8"	3.175	1-1/2"	8°	1/2"
74160	SM-41	.1250	1/8"	3.175	1-1/2"	12°	3/8"
74162	SM-41D	.1250	1/8"	3.175	1-1/2"	12°	3/8"
74170	SM-43	.1250	1/8"	3.175	1-1/2"	7°	5/8"
74172	SM-43D	.1250	1/8"	3.175	1-1/2"	7°	5/8"
74180	SN-42	.1250	1/8"	3.175	1-1/2"	10°	3/16"
74182	SN-42D	.1250	1/8"	3.175	1-1/2"	10°	3/16"



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

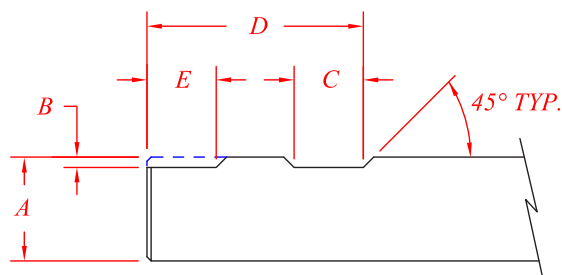
PROBLEM	SUGGESTIONS
Chipping	Check part rigidity
	Verify speeds and feeds
	Confirm concentricity of end mill in holder
	Decrease ramp angle or slow down approach
	Check coolant flow and location
Breakage	Decrease feed rate
	Decrease axial depth
	Use shorter tool or stub holder
	Resharpen earlier
Chattering	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
	Check coolant flow and location
Hole diameter too small	Leave more stock before reaming
	Reamer worn
	Check coolant flow and concentration
	Resharpen earlier
Hole not straight	Hole was not drilled properly
	Leave more stock before reaming
	Confirm concentricity of reamer in holder
	Check part rigidity
Part finish	Reamer worn
	Verify speeds and feeds
	Confirm concentricity of reamer in holder
	Check coolant flow and location
	Check part rigidity
Tool life	Work material harder than expected
	Verify speeds and feeds
	Not evacuating chips properly
	Too light of a cut
Wear	Speed too fast
	Too light of a feed
	Confirm concentricity of reamer in holder
	Check coolant flow, location, and concentration
Not evacuating	Verify speeds and feeds
	Check coolant flow, location, and concentration
	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"	.500"
1"	1.0000"	.075" - .090"	.515" - .517"	1.398"	.500"
1-1/4"	1.2500"	.094" - .109"	.515" - .517"	1.398"	.500"



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

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

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

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

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:

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

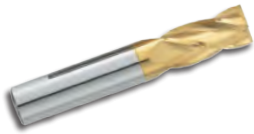
(Chip Thinning reference charts on pages 306-307)

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 (as taken from the Machinery's Handbook)		
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"

Definitions of Tool Coatings on GARR TOOL Standard Products



TiN
(Titanium Nitride)

A general purpose coating, BALINIT® A has low heat resistance and good lubricity.



TiCN
(Titanium Carbonitride)

With good abrasion resistance, BALINIT® B is recommended for aluminum, brass and bronze applications. It has low heat resistance and good lubricity.



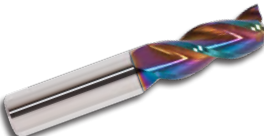
TiAlN
(Titanium Aluminum Nitride)

BALINIT® FUTURA is a multi-layer coating with good thermal stability for increased speeds and feeds. It is designed for semi-dry to dry cutting of most steels, high-nickel alloys, stainless steel and cast iron and has excellent heat resistance, good lubricity. It is useful in materials that are 40Rc and under.



AlTiN
(Aluminum Titanium Nitride)

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



MAYURA
(ta-C)

BALINIT® MAYURA is a carbon-based coating that minimizes material adhesion and increases tool life. The distinctive colors of the coating stand out from the others and can be used as a wear indicator. Ideal for non-ferrous metals; this extremely thin and smooth coating helps keep cutting edges sharp.



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. BALINIT® ALNOVA is well suited for Titanium, Inconel, and carbon fiber.



DURANA
(AlTiN-based with TiSiXN)

With a combination of AlTiN-based and TiSiXN layers, BALINIT® DURANA has a high degree of ductility and superior abrasive wear resistance even at extreme service temperatures, resulting in vastly improved performance during demanding machining operations and longer tool service life.



ALTINOS
(AlTiN-based)

This premium AlTiN-based coating, BALIQ® ALTINOS is highly wear-resistant, even at high operating temperatures, making it particularly beneficial even up to HRC 56. With its perfectly smooth surface, this coating offers significant performance advantages such as optimum chip removal and reduced built-up edge formation.



ALCRONOS
(AlCrN-based)

BALIQ® ALCRONOS, an AlCrN-based coating is considerably less prone to built-up edge formation. Its revolutionary smooth coating, with excellent adhesion to the substrate, ensures outstanding surfaces and high production quality, especially in ductile alloys like 300 series stainless and steels up to HRC 50.



TISINOS PRO
(AlTiSiN)

BALIQ® TISINOS PRO is a premium coating for hard machining up to HRC 70. Designed to withstand high thermal stress, this coating provides increased toughness and wear resistance. The smooth AlTiSiN coating provides longer tool life and greater reliability in heat resistant super alloys, PH stainless steels and conditioned 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														
50	3050	2040	1530	1220	1020	875	765	610	510	440	380	310	250	220	190
75	4580	3060	2290	1830	1530	1310	1150	920	760	570	570	460	380	330	285
100	6100	4080	3050	2450	2040	1750	1530	1220	1020	760	760	610	510	440	385
125	7630	5100	3820	3050	2550	2180	1920	1530	1270	950	950	770	630	550	475
150	9150	6120	4570	3670	3060	2620	2290	1830	1530	1140	1140	920	760	660	575
175	10,680	7140	5350	4270	3570	3060	2680	2140	1780	1330	1330	1080	880	770	665
200	12,200	8150	6100	4900	4070	3500	3100	2450	2000	1500	1500	1200	1000	875	750
300	18,500	12,200	9200	7300	6100	5250	4600	3700	3100	2300	2300	1800	1500	1300	1100
400	24,500	16,300	12,200	9800	8150	7000	6100	4900	4100	3050	3050	2450	2050	1750	1525
500	30,500	20,400	15,300	12,200	10,200	8700	7600	6100	5100	3800	3800	3100	2500	2200	1900
750	45,800	36,700	22,900	18,300	15,300	13,100	11,500	9200	7600	5700	5700	4600	3800	3770	2850
1000	-	40,800	30,600	24,500	20,400	17,500	15,300	12,200	10,200	7650	7650	6100	5100	4400	3800
1500	-	-	40,800	36,700	30,600	26,200	22,900	18,300	15,300	11,300	11,300	9200	7600	6500	5700
2000	-	-	-	49,000	40,800	35,000	30,600	24,400	20,400	15,300	15,300	12,200	10,200	8700	7600
3000	-	-	-	-	-	52,500	45,900	36,600	30,600	22,900	22,900	18,300	15,300	13,100	11,400
4000	-	-	-	-	-	-	-	48,800	40,800	30,600	30,600	24,400	20,400	17,500	15,200
5000	-	-	-	-	-	-	-	-	51,000	38,200	38,200	30,600	25,500	21,800	19,000

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

GARR TOOL General Purpose Milling Guide

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"	
S	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 Asccolloy	< 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 5553 / Beta Titanium	 	100 - 150 90 - 120	.0003" - .0008" .0003" - .0008"	.0003" - .0008" .0003" - .0008"	.0005" - .0012" .0004" - .0010"	.0005" - .0012" .0004" - .0010"	.0008" - .0015" .0005" - .0012"	.0010" - .0015" .0008" - .0014"	.0013" - .0020" .0010" - .0016"	.0018" - .0025" .0010" - .0020"	.0020" - .0030" .0015" - .0025"	.0025" - .0035" .0015" - .0025"	
M	STAINLESS STEELS													
	13/8, 15/5, 17-4, pHTypes	< 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"	
P	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"		
K	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"	
N	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"	
O	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 313)											

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

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
S	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	.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	.064 -.089 .038 -.051
	IRON BASE ALLOYS												
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascotloy	< 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	.064 -.089 .038 -.051
	TITANIUM ALLOYS												
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		39 - 59	.008 -.020	.008 -.020	.013 -.030	.013 -.030	.020 -.038	.025 -.038	.033 -.051	.046 -.064	.051 -.076	.064 -.089
5553 / Beta Titanium		35 - 47	.008 -.020	.008 -.020	.010 -.025	.010 -.025	.013 -.030	.020 -.036	.025 -.041	.025 -.051	.038 -.064	.038 -.064	
M	STAINLESS STEELS												
	13/8, 15/5, 17-4, pH Types	< 40 > 40	39 - 59 31 - 39	.005 -.013 .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	.051 -.071 .038 -.051
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	39 - 59 31 - 39	.008 -.015 .005 -.010	.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	59 - 79 39 - 59	.013 -.020 .008 -.018	.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, 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	.056 -.076 .038 -.056	
P	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	.056 -.076 .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	
K	CAST MATERIAL												
	Ductile Iron		69 - 89	.013 -.020	.020 -.031	.025 -.038	.038 -.064	.038 -.064	.051 -.076	.064 -.089	.089 -.114	.089 -.114	.114 -.140
	Gray Iron		69 - 89	.013 -.020	.020 -.031	.025 -.038	.038 -.064	.038 -.064	.051 -.076	.064 -.089	.089 -.114	.089 -.114	.114 -.140
N	NON-FERROUS												
	Aluminum		118 - 197	.008 -.013	.015 -.025	.020 -.036	.030 -.051	.036 -.071	.051 -.076	.089 -.122	.127 -.152	.147 -.178	.173 -.229
	Magnesium		118 - 197	.008 -.013	.015 -.025	.020 -.036	.030 -.051	.036 -.071	.051 -.076	.089 -.122	.127 -.152	.147 -.178	.173 -.229
	Copper		98 - 177	.008 -.013	.015 -.025	.020 -.036	.030 -.051	.036 -.071	.051 -.076	.089 -.122	.127 -.152	.147 -.178	.173 -.229
	Brass, Bronze		79 - 157	.008 -.013	.015 -.025	.020 -.036	.030 -.051	.036 -.071	.051 -.076	.089 -.122	.127 -.152	.147 -.178	.173 -.229
O	COMPOSITE (non-ISO)												
	Fiberglass, Plastics, G10		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 313)											

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 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, Waspaloy, 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"
P	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"
	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 313)										

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 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
S	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 Ascology	< 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 5553 / Beta Titanium		49 - 69 39 - 59	.013 - .025 .010 - .025	.013 - .030 .010 - .025	.020 - .038 .015 - .036	.025 - .056 .020 - .041	.046 - .069 .038 - .064	.058 - .081 .056 - .071	.064 - .084 .061 - .076	.069 - .089 .066 - .081	.071 - .094 .071 - .089
M	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	
P	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
K	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
N	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
O	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 313)										

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)

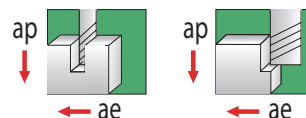
Series 242M/842M/A3 End Mills

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

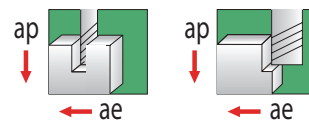
TECHNICAL

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)

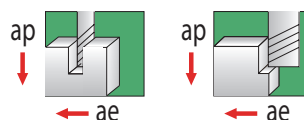
Series A3 End Mills

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.



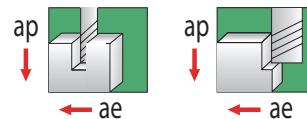
NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

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



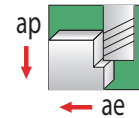
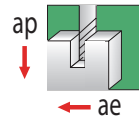
ARC SERIES TOOLS ARE NOT DESIGNED FOR OVER 28Rc MATERIALS

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"
	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"
	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"
P	HIGH STRENGTH TOOL STEELS									
	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									
	Carbon Steels: 1000 Series	275 - 425	.0006" - .0008"	.0008" - .0012"	.0010" - .0015"	.0010" - .0020"	.0015" - .0025"	.0020" - .0025"	.0020" - .0030"	.0025" - .0035"
K	CAST MATERIAL									
	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

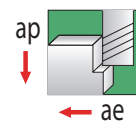
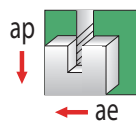


NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

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
	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
	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
P	HIGH STRENGTH TOOL STEELS										
	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										
	Carbon Steels: 1000 Series	85 - 130	.008 - .015	.015 - .020	.020 - .030	.025 - .038	.025 - .050	.038 - .063	.050 - .063	.050 - .076	.063 - .089
K	CAST MATERIAL										
	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

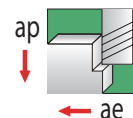


NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL Milling Guide for X3/G3

ISO Material		HRC	SFM (Vc)								
				1/32"	1/16"	3/32"	1/8"	5/32"	3/16"	1/4"	
S	COBALT BASE ALLOYS										
	Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 40 > 40	120 - 240 100 - 195	.0001" - .0003" .0001" - .0003"	.0002" - .0007" .0001" - .0005"	.0002" - .0008" .0001" - .0006"	.0004" - .0010" .0003" - .0009"	.0006" - .0011" .0004" - .0010"	.0007" - .0015" .0005" - .0013"	.0008" - .0020" .0006" - .0018"	
	NICKEL BASE ALLOYS										
	Invar, Kovar, Inconel-625/718, Waspaloy, Rene, Hastelloy, A286	< 40 > 40	120 - 240 100 - 195	.0001" - .0003" .0001" - .0003"	.0002" - .0007" .0001" - .0005"	.0002"" - .0008" .0001" - .0006"	.0004" - .0010" .0003" - .0009"	.0006" - .0011" .0004" - .0010"	.0007" - .0015" .0005" - .0013"	.0008" - .0020" .0006" - .0018"	
	IRON BASE ALLOYS										
	Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 40 > 40	120 - 240 100 - 195	.0001" - .0003" .0001" - .0003"	.0002" - .0007" .0001" - .0005"	.0002" - .0008" .0001" - .0006"	.0004" - .0010" .0003" - .0009"	.0006" - .0011" .0004" - .0010"	.0007" - .0015" .0005" - .0013"	.0008" - .0020" .0006" - .0018"	
	MONEL										
	Monel - 65% Nickel		160 - 290	.0001" - .0003"	.0002" - .0007"	.0002" - .0008"	.0005" - .0010"	.0006" - .0011"	.0007" - .0015"	.0008" - .0020"	
	TITANIUM ALLOYS										
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		260 - 490	.0001" - .0003"	.0003" - .0007"	.0003" - .0008"	.0005" - .0010"	.0006" - .0011"	.0007" - .0015"	.0009" - .0019"		
5553 / Beta Titanium		195 - 365	.0001" - .0003"	.0002" - .0007"	.0003" - .0007"	.0005" - .0010"	.0006" - .0011"	.0006" - .0014"	.0009" - .0017"		
M	STAINLESS STEELS										
	13/8, 15/5, 17-4, pH Types	< 40 > 40	290 - 490 225 - 360	.0001" - .0003" .0001" - .0003"	.0002" - .0007" .0001" - .0005"	.0003" - .0008" .0002" - .0006"	.0004" - .0010" .0003" - .0009"	.0006" - .0011" .0004" - .0010"	.0007" - .0015" .0005" - .0013"	.0007" - .0018" .0006" - .0015"	
	200 Series, 300 Series	< 40 > 40	355 - 555 290 - 455	.0001" - .0003" .0001" - .0003"	.0002" - .0007" .0001" - .0005"	.0003" - .0008" .0002" - .0006"	.0004" - .0010" .0003" - .0009"	.0006" - .0011" .0004" - .0010"	.0007" - .0015" .0005" - .0014"	.0007" - .0018" .0006" - .0015"	
	304L, 316L, Nitronic 50	< 40 > 40	325 - 520 225 - 360	.0001" - .0003" .0001" - .0003"	.0002" - .0007" .0001" - .0005"	.0003" - .0008" .0002" - .0006"	.0004" - .0010" .0003" - .0009"	.0006" - .0011" .0004" - .0010"	.0007" - .0015" .0005" - .0014"	.0007" - .0018" .0006" - .0014"	
	400 Series	< 40 > 40	290 - 555 225 - 425	.0001" - .0003" .0001" - .0003"	.0002" - .0007" .0001" - .0005"	.0003" - .0008" .0002" - .0006"	.0004" - .0010" .0003" - .0009"	.0006" - .0011" .0004" - .0010"	.0007" - .0015" .0005" - .0014"	.0007" - .0018" .0006" - .0014"	
P	HIGH STRENGTH TOOL STEELS										
	A2, D2, P20, H13, S7, O1	< 40 > 40	290 - 520 195 - 425	.0001" - .0003" .0001" - .0003"	.0002" - .0007" .0001" - .0005"	.0003" - .0008" .0002" - .0006"	.0004" - .0010" .0003" - .0009"	.0006" - .0011" .0004" - .0010"	.0007" - .0014" .0005" - .0011"	.0008" - .0018" .0007" - .0014"	
	MEDIUM ALLOY TOOL STEELS										
	4140, 4340, 52100, 6150, 8620	< 40 > 40	455 - 650 325 - 490	.0001" - .0003" .0001" - .0003"	.0002" - .0007" .0001" - .0005"	.0003" - .0008" .0002" - .0006"	.0004" - .0011" .0003" - .0010"	.0006" - .0011" .0004" - .0010"	.0007" - .0015" .0005" - .0014"	.0008" - .0019" .0007" - .0014"	
	CARBON STEELS										
1000's - 1018, 1020, 12L14	< 40	490 - 780	.0001" - .0003"	.0002" - .0007"	.0003" - .0008"	.0004" - .0012"	.0006" - .0011"	.0005" - .0016"	.0001" - .0015"		
K	CAST MATERIAL										
	Steel (Malleable)		455 - 685	.0001" - .0003"	.0002" - .007"	.0003" - .0008"	.0005" - .0010"	.0006" - .0011"	.0007" - .0018"	.0009" - .0023"	
	Ductile Iron		455 - 685	.0001" - .0003"	.0002" - .0007"	.0003" - .0008"	.0005" - .0010"	.0006" - .0011"	.0007" - .0018"	.0009" - .0023"	
Gray Iron		585 - 770	.0001" - .0003"	.0002" - .0007"	.0003" - .0008"	.0005" - .0010"	.0006" - .0011"	.0007" - .0018"	.0010" - .0022"		

	Profile/Trochoidal Milling	Slotting
Axial (ap)	MAX	0.5 to 1xD
Radial (ae)	Up to 15% Dia.	1xD

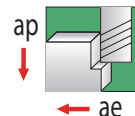


NOTE - DATA DOES NOT REFLECT CHIP THINNING.

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

ISO Material		HRC	M/Min. (Vc)						
				1.0mm	2.0mm	3.0mm	4.0mm	5.0mm	6.0mm
S	COBALT BASE ALLOYS								
	Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 40 > 40	37 - 75 30 - 60	.003 - .008 .003 - .008	.005 - .020 .003 - .015	.010 - .025 .008 - .023	.015 - .028 .010 - .025	.018 - .038 .013 - .033	.020 - .051 .015 - .046
	NICKEL BASE ALLOYS								
	Invar, Kovar, Inconel-625/718, Waspaloy, Rene, Hastelloy, A286	< 40 > 40	37 - 75 30 - 60	.003 - .008 .003 - .008	.005 - .020 .003 - .015	.010 - .025 .008 - .023	.015 - .028 .010 - .025	.018 - .038 .013 - .033	.020 - .051 .015 - .046
	IRON BASE ALLOYS								
	Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 40 > 40	37 - 75 30 - 60	.003 - .008 .003 - .008	.005 - .020 .003 - .015	.010 - .025 .008 - .023	.015 - .028 .010 - .025	.018 - .038 .013 - .033	.020 - .051 .015 - .046
	MONEL								
	Monel - 65% Nickel		50 - 90	.003 - .008	.005 - .020	.013 - .025	.015 - .028	.018 - .038	.020 - .051
	TITANIUM ALLOYS								
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		80 - 150	.003 - .008	.008 - .020	.013 - .025	.015 - .028	.018 - .038	.023 - .048	
5553 / Beta Titanium		60 - 110	.003 - .008	.008 - .018	.013 - .025	.015 - .028	.015 - .036	.023 - .043	
M	STAINLESS STEELS								
	13/8, 15/5, 17-4, pH Types	< 40 > 40	90 - 150 70 - 110	.003 - .008 .003 - .008	.008 - .020 .005 - .015	.010 - .025 .008 - .023	.015 - .028 .010 - .025	.018 - .038 .013 - .033	.018 - .046 .015 - .038
	200 Series, 300 Series	< 40 > 40	110 - 170 90 - 140	.003 - .008 .003 - .008	.008 - .020 .005 - .015	.010 - .025 .008 - .023	.015 - .028 .010 - .025	.018 - .038 .013 - .036	.018 - .046 .015 - .038
	304L, 316L, Nitronic 50	< 40 > 40	100 - 160 70 - 110	.003 - .008 .003 - .008	.008 - .020 .005 - .015	.010 - .025 .008 - .023	.015 - .028 .010 - .025	.018 - .038 .013 - .036	.018 - .046 .015 - .036
	400 Series	< 40 > 40	90 - 170 70 - 130	.003 - .008 .003 - .008	.008 - .020 .005 - .015	.010 - .025 .008 - .023	.015 - .028 .010 - .025	.018 - .038 .013 - .036	.018 - .046 .015 - .036
	HIGH STRENGTH TOOL STEELS								
A2, D2, P20, H13, S7, O1	< 40 > 40	90 - 160 60 - 130	.003 - .008 .003 - .008	.008 - .020 .005 - .015	.010 - .025 .008 - .023	.015 - .028 .010 - .025	.018 - .036 .013 - .028	.020 - .046 .018 - .036	
P	MEDIUM ALLOY TOOL STEELS								
	4140, 4340, 52100, 6150, 8620	< 40 > 40	140 - 200 100 - 150	.003 - .008 .003 - .008	.008 - .020 .005 - .015	.010 - .028 .008 - .025	.015 - .028 .010 - .025	.018 - .038 .013 - .036	.020 - .048 .018 - .036
	CARBON STEELS								
	1000's - 1018, 1020, 12L14	< 40	150 - 240	.003 - .008	.008 - .020	.010 - .030	.015 - .028	.013 - .041	.025 - .038
K	CAST MATERIAL								
	Steel (Malleable)		140 - 210	.003 - .008	.008 - .020	.013 - .025	.015 - .028	.018 - .046	.023 - .058
	Ductile Iron		140 - 210	.003 - .008	.008 - .020	.013 - .025	.015 - .028	.018 - .046	.023 - .058
	Gray Iron		180 - 235	.003 - .008	.008 - .020	.013 - .025	.015 - .028	.018 - .046	.025 - .056

	Profile/Trochoidal Milling	Slotting
Axial (ap)	MAX	0.5 to 1xD
Radial (ae)	Up to 15% Dia.	1xD



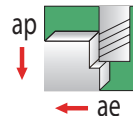
NOTE - DATA DOES NOT REFLECT CHIP THINNING.

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

GARR TOOL Milling Guide for X5/G5

ISO Material		HRC	SFM (Vc)								
				3/16"	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"
S	COBALT BASE ALLOYS										
	Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 40 > 40	120 - 240 100 - 195	.0005" - .0015" .0004" - .0012"	.0008" - .0020" .0006" - .0018"	.0009" - .0022" .0008" - .0020"	.0011" - .0024" .0009" - .0022"	.0016" - .0034" .0012" - .0029"	.0018" - .0041" .0014" - .0036"	.0022" - .0050" .0018 - .0046	.0032" - .0070" .0024" - .0060"
	NICKEL BASE ALLOYS										
	Invar, Kovar, Inconel-625/718, Waspaloy, Rene, Hastelloy, A286	< 40 > 40	120 - 240 100 - 195	.0005" - .0015" .0004" - .0012"	.0008" - .0020" .0006" - .0018"	.0009" - .0022" .0008" - .0020"	.0011" - .0024" .0009" - .0022"	.0016" - .0034" .0012" - .0029"	.0018" - .0041" .0014" - .0036"	.0022" - .0050" .0018 - .0046	.0032" - .0070" .0024" - .0060"
	IRON BASE ALLOYS										
	Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 40 > 40	120 - 240 100 - 195	.0005" - .0015" .0004" - .0012"	.0008" - .0020" .0006" - .0018"	.0009" - .0022" .0008" - .0020"	.0011" - .0024" .0009" - .0022"	.0016" - .0034" .0012" - .0029"	.0018" - .0041" .0014" - .0036"	.0022" - .0050" .0018 - .0046	.0032" - .0070" .0024" - .0060"
	MONEL										
	Monel - 65% Nickel		160 - 290	.0005" - .0015"	.0008" - .0020"	.0009" - .0022"	.0011" - .0024"	.0016" - .0034"	.0018" - .0041"	.0022" - .0050"	.0032" - .0070"
	TITANIUM ALLOYS										
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		260 - 490	.0005" - .0015"	.0009" - .0019"	.0010" - .0020"	.0012" - .0026"	.0018" - .0038"	.0020" - .0046"	.0024" - .0054"	.0036" - .0078"
5553 / Beta Titanium		195 - 365	.0004" - .0012"	.0009" - .0017"	.0010" - .0019"	.0012" - .0024"	.0018" - .0034"	.0020" - .0041"	.0024" - .0050"	.0032" - .0070"	
M	STAINLESS STEELS										
	13/8, 15/5, 17-4, pH Types	< 40 > 40	290 - 490 225 - 360	.0005" - .0015" .0004" - .0011"	.0007" - .0018" .0006" - .0015"	.0008" - .0020" .0007" - .0019"	.0011" - .0024" .0009" - .0022"	.0016" - .0034" .0012" - .0029"	.0018" - .0041" .0014" - .0037"	.0022" - .0050" .0018" - .0046"	.0032" - .0070" .0024" - .0060"
	200 Series, 300 Series	< 40 > 40	355 - 555 290 - 455	.0005" - .0015" .0004" - .0010"	.0007" - .0018" .0006" - .0015"	.0008" - .0020" .0007" - .0019"	.0011" - .0024" .0009" - .0022"	.0016" - .0039" .0012" - .0029"	.0018" - .0046" .0014" - .0037"	.0022" - .0056" .0018" - .0046"	.0032" - .0080" .0024" - .0060"
	304L, 316L, Nitronic 50	< 40 > 40	325 - 520 225 - 360	.0005" - .0015" .0004" - .0009"	.0007" - .0018" .0006" - .0014"	.0008" - .0020" .0007" - .0019"	.0011" - .0024" .0009" - .0022"	.0016" - .0034" .0012" - .0029"	.0018" - .0041" .0014" - .0037"	.0022" - .0050" .0018" - .0046"	.0032" - .0070" .0024" - .0060"
	400 Series	< 40 > 40	290 - 555 225 - 425	.0005" - .0015" .0004" - .0009"	.0007" - .0018" .0006" - .0014"	.0008" - .0020" .0007" - .0019"	.0011" - .0026" .0009" - .0023"	.0016" - .0036" .0012" - .0032"	.0018" - .0044" .0014" - .0039"	.0022" - .0054" .0018" - .0048"	.0032" - .0074" .0024" - .0066"
	P	HIGH STRENGTH TOOL STEELS									
A2, D2, P20, H13, S7, O1		< 40 > 40	290 - 520 195 - 425	.0006" - .0014" .0005" - .0010"	.0008" - .0018" .0007" - .0014"	.0009" - .0022" .0008" - .0018"	.0013" - .0026" .0012" - .0022"	.0016" - .0036" .0012" - .0029"	.0022" - .0044" .0020" - .0036"	.0026" - .0054" .0024" - .0046"	.0040" - .0074" .0036" - .0060"
MEDIUM ALLOY TOOL STEELS											
4140, 4340, 52100, 6150, 8620		< 40 > 40	455 - 650 325 - 490	.0006" - .0014" .0005" - .0010"	.0008" - .0019" .0007" - .0014"	.0009" - .0023" .0008" - .0018"	.0013" - .0027" .0012" - .0022"	.0016" - .0038" .0012" - .0031"	.0022" - .0046" .0020" - .0038"	.0026" - .0056" .0024" - .0046"	.0040" - .0078" .0036" - .0064"
CARBON STEELS											
1000's - 1018, 1020, 12L14	< 40	490 - 780	.0006" - .0014"	.0010" - .0015"	.0009" - .0018"	.0013" - .0028"	.0020" - .0041"	.0022" - .0048"	.0026" - .0058"	.0040" - .0084"	
K	CAST MATERIAL										
	Steel (Malleable)		455 - 685	.0006" - .0019"	.0009" - .0023"	.0010" - .0025"	.0015" - .0029"	.0020" - .0044"	.0026" - .0051"	.0030" - .0060"	.0040" - .0090"
	Ductile Iron		455 - 685	.0006" - .0019"	.0009" - .0023"	.0010" - .0025"	.0015" - .0029"	.0020" - .0044"	.0026" - .0051"	.0030" - .0060"	.0040" - .0090"
	Gray Iron		585 - 770	.0007" - .0019"	.0010" - .0022"	.0011" - .0026"	.0016" - .0030"	.0022" - .0046"	.0026" - .0053"	.0032" - .0062"	.0044" - .0094"

	Profile/Trochoidal Milling
Axial (ap)	up to 2xD
Radial (ae)	5% - 25% of Dia.



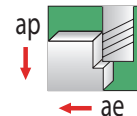
NOTE - DATA DOES NOT REFLECT CHIP THINNING.

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

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

ISO Material		HRC	M/Min. (Vc)									
				4.0mm	5.0mm	6.0mm	8.0mm	10.0mm	12.0mm	16.0mm	20.0mm	
S	COBALT BASE ALLOYS											
	Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 40 > 40	37 - 75 30 - 60	.010 - .025 .008 - .020	.013 - .038 .010 - .030	.020 - .051 .015 - .046	.023 - .056 .020 - .051	.028 - .061 .023 - .056	.041 - .086 .030 - .074	.046 - .104 .036 - .091	.056 - .127 .046 - .117	
	NICKEL BASE ALLOYS											
	Invar, Kovar, Inconel-625/718, Waspaloy, Rene, Hastelloy, A286	< 40 > 40	37 - 75 30 - 60	.010 - .025 .008 - .020	.013 - .038 .010 - .030	.020 - .051 .015 - .046	.023 - .056 .020 - .051	.028 - .061 .023 - .056	.041 - .086 .030 - .074	.046 - .104 .036 - .091	.056 - .127 .046 - .117	
	IRON BASE ALLOYS											
	Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 40 > 40	37 - 75 30 - 60	.010 - .025 .008 - .020	.013 - .038 .010 - .030	.020 - .051 .015 - .046	.023 - .056 .020 - .051	.028 - .061 .023 - .056	.041 - .086 .030 - .074	.046 - .104 .036 - .091	.056 - .127 .046 - .117	
	MONEL											
	Monel - 65% Nickel		50 - 90	.010 - .025	.013 - .038	.020 - .051	.023 - .056	.028 - .061	.041 - .086	.046 - .104	.056 - .127	
	TITANIUM ALLOYS											
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		80 - 150	.010 - .030	.013 - .038	.023 - .048	.025 - .051	.030 - .066	.046 - .097	.051 - .117	.061 - .137	
	5553 / Beta Titanium		60 - 110	.008 - .025	.010 - .030	.023 - .043	.025 - .048	.030 - .061	.046 - .086	.051 - .104	.061 - .127	
M	STAINLESS STEELS											
	13/8, 15/5, 17-4, pH Types	< 40 > 40	90 - 150 70 - 110	.010 - .025 .008 - .020	.013 - .038 .010 - .028	.018 - .046 .015 - .038	.020 - .051 .018 - .048	.028 - .061 .023 - .056	.041 - .086 .030 - .074	.046 - .104 .036 - .094	.056 - .127 .046 - .117	
	200 Series, 300 Series	< 40 > 40	110 - 170 90 - 140	.010 - .025 .008 - .020	.013 - .038 .010 - .025	.018 - .046 .015 - .038	.020 - .051 .018 - .048	.028 - .061 .023 - .056	.041 - .099 .030 - .074	.046 - .117 .036 - .094	.056 - .142 .046 - .117	
	304L, 316L, Nitronic 50	< 40 > 40	100 - 160 70 - 110	.010 - .025 .008 - .020	.013 - .038 .010 - .023	.018 - .046 .015 - .036	.020 - .051 .018 - .048	.028 - .061 .023 - .056	.041 - .086 .030 - .074	.046 - .104 .036 - .094	.056 - .127 .046 - .117	
	400 Series	< 40 > 40	90 - 170 70 - 130	.010 - .028 .008 - .023	.013 - .038 .010 - .023	.018 - .046 .015 - .036	.020 - .051 .018 - .048	.028 - .066 .023 - .058	.041 - .091 .030 - .081	.046 - .112 .036 - .099	.056 - .137 .046 - .122	
P	HIGH STRENGTH TOOL STEELS											
	A2, D2, P20, H13, S7, O1	< 40 > 40	90 - 160 60 - 130	.013 - .025 .008 - .020	.015 - .036 .013 - .025	.020 - .046 .018 - .036	.023 - .056 .020 - .046	.033 - .066 .030 - .056	.041 - .091 .030 - .074	.056 - .112 .051 - .091	.066 - .137 .061 - .117	
	MEDIUM ALLOY TOOL STEELS											
	4140, 4340, 52100, 6150, 8620	< 40 > 40	140 - 200 100 - 150	.013 - .030 .008 - .020	.015 - .036 .013 - .025	.020 - .048 .018 - .036	.023 - .058 .020 - .046	.033 - .069 .030 - .056	.041 - .097 .030 - .079	.056 - .117 .051 - .097	.066 - .142 .061 - .117	
	CARBON STEELS											
	1000's - 1018, 1020, 12L14	< 40	150 - 240	.013 - .030	.015 - .036	.025 - .038	.023 - .046	.033 - .071	.051 - .104	.056 - .122	.066 - .147	
K	CAST MATERIAL											
	Steel (Malleable)		140 - 210	.013 - .038	.015 - .048	.023 - .058	.025 - .064	.038 - .074	.051 - .112	.066 - .130	.076 - .152	
	Ductile Iron		140 - 210	.013 - .038	.015 - .048	.023 - .058	.025 - .064	.038 - .074	.051 - .112	.066 - .130	.076 - .152	
	Gray Iron		180 - 235	.018 - .038	.018 - .048	.025 - .056	.028 - .066	.041 - .076	.056 - .117	.066 - .135	.081 - .157	

	Profile/Trochoidal Milling
Axial (ap)	up to 2xD
Radial (ae)	5% - 25% of Dia.



NOTE - DATA DOES NOT REFLECT CHIP THINNING.

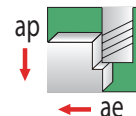
SPINDLE INTERFACE MUST BE SCRUTINIZED WHEN USING 16mm DIAMETER AND LARGER END MILLS

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

GARR TOOL Milling Guide for X7/G7

ISO Material		HRC	SFM (Vc)					
				3/8"	1/2"	5/8"	3/4"	1"
S	COBALT BASE ALLOYS							
	Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 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							
	Invar, Kovar, Inconel-625/718, Waspaloy, Rene, Hastelloy, A286	< 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							
	Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 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"
	MONEL							
	Monel - 65% Nickel		160 - 290	.0013" - .0026"	.0019" - .0036"	.0021" - .0043"	.0026" - .0052"	.0038" - .0072"
	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"
	200 Series, 300 Series	< 40 > 40	355 - 555 290 - 455	.0013" - .0029" .0010" - .0024"	.0019" - .0041" .0014" - .0031"	.0022" - .0048" .0017" - .0039"	.0026" - .0058" .0020" - .0048"	.0038" - .0082" .0028" - .0062"
	304L, 316L, Nitronic 50	< 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	< 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							
	Steel (Malleable)		455 - 685	.0018" - .0031"	.0029" - .0046"	.0031" - .0053"	.0036" - .0062"	.0058" - .0092"
	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.



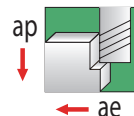
NOTE - DATA DOES NOT REFLECT CHIP THINNING.

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

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

ISO Material		HRC	M/Min. (Vc)					
				8.0mm	10.0mm	12.0mm	16.0mm	20.0mm
S	COBALT BASE ALLOYS							
	Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 40 > 40	37 - 75 30 - 60	.023 - .056 .020 - .051	.033 - .066 .025 - .061	.048 - .091 .036 - .079	.053 - .109 .043 - .097	.066 - .132 .051 - .122
	NICKEL BASE ALLOYS							
	Invar, Kovar, Inconel-625/718, Waspaloy, Rene, Hastelloy, A286	< 40 > 40	37 - 75 30 - 60	.023 - .056 .020 - .051	.033 - .066 .025 - .061	.048 - .091 .036 - .079	.053 - .109 .043 - .097	.066 - .132 .051 - .122
	IRON BASE ALLOYS							
	Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 40 > 40	37 - 75 30 - 60	.023 - .056 .020 - .051	.033 - .066 .025 - .061	.048 - .091 .036 - .079	.053 - .109 .043 - .097	.066 - .132 .051 - .122
	MONEL							
	Monel - 65% Nickel		50 - 90	.023 - .056	.033 - .066	.048 - .091	.053 - .109	.066 - .132
M	TITANIUM ALLOYS							
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		80 - 150	.025 - .051	.036 - .071	.053 - .102	.066 - .122	.071 - .142
	5553 / Beta Titanium		60 - 110	.025 - .048	.036 - .066	.053 - .091	.066 - .109	.071 - .132
	STAINLESS STEELS							
	13/8, 15/5, 17-4, pH Types	< 40 > 40	90 - 150 70 - 110	.020 - .051 .018 - .048	.033 - .066 .025 - .061	.048 - .091 .036 - .079	.056 - .109 .043 - .099	.066 - .132 .051 - .122
	200 Series, 300 Series	< 40 > 40	110 - 170 90 - 140	.020 - .051 .018 - .048	.033 - .074 .025 - .061	.048 - .104 .036 - .079	.056 - .122 .043 - .099	.066 - .147 .051 - .122
	304L, 316L, Nitronic 50	< 40 > 40	100 - 160 70 - 110	.020 - .051 .018 - .048	.033 - .066 .025 - .061	.048 - .091 .036 - .079	.056 - .109 .043 - .099	.066 - .132 .051 - .122
	400 Series	< 40 > 40	90 - 170 70 - 130	.020 - .051 .018 - .048	.033 - .071 .025 - .064	.048 - .097 .036 - .086	.056 - .117 .043 - .104	.066 - .142 .051 - .127
P	HIGH STRENGTH TOOL STEELS							
	A2, D2, P20, H13, S7, O1	< 40 > 40	90 - 160 60 - 130	.023 - .056 .020 - .046	.041 - .071 .036 - .061	.061 - .097 .056 - .079	.066 - .117 .061 - .097	.081 - .142 .071 - .122
	MEDIUM ALLOY TOOL STEELS							
	4140, 4340, 52100, 6150, 8620	< 40 > 40	140 - 200 100 - 150	.023 - .058 .020 - .046	.041 - .074 .036 - .061	.061 - .102 .056 - .084	.066 - .122 .061 - .102	.081 - .147 .071 - .122
	CARBON STEELS							
	1000's - 1018, 1020, 12L14	< 40	150 - 240	.023 - .046	.041 - .076	.061 - .109	.066 - .127	.081 - .152
K	CAST MATERIAL							
	Steel (Malleable)		140 - 210	.025 - .064	.046 - .079	.074 - .117	.079 - .135	.091 - .157
	Ductile Iron		140 - 210	.025 - .064	.046 - .079	.074 - .117	.079 - .135	.091 - .157
	Gray Iron		180 - 235	.028 - .066	.048 - .081	.079 - .122	.086 - .140	.097 - .163

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



NOTE - DATA DOES NOT REFLECT CHIP THINNING.

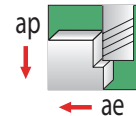
SPINDLE INTERFACE MUST BE SCRUTINIZED WHEN USING 16mm DIAMETER AND LARGER END MILLS

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

GARR TOOL Milling Guide for X9/G9

ISO Material		HRC	SFM (Vc)	CHIPLOAD PER TOOTH (Fz)			
				1/2"	5/8"	3/4"	1"
S	COBALT BASE ALLOYS						
	Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 40 > 40	120 - 240 100 - 195	.0019" - .0036" .0014" - .0031"	.0021" - .0043" .0017" - .0038"	.0026" - .0052" .0020" - .0048"	.0038" - .0072" .0028" - .0062"
	NICKEL BASE ALLOYS						
	Invar, Kovar, Inconel-625/718, Waspaloy, Rene, Hastelloy, A286	< 40 > 40	120 - 240 100 - 195	.0019" - .0036" .0014" - .0031"	.0021" - .0043" .0017" - .0038"	.0026" - .0052" .0020" - .0048"	.0038" - .0072" .0028" - .0062"
	IRON BASE ALLOYS						
	Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 40 > 40	120 - 240 100 - 195	.0019" - .0036" .0014" - .0031"	.0021" - .0043" .0017" - .0038"	.0026" - .0052" .0020" - .0048"	.0038" - .0072" .0028" - .0062"
	MONEL						
	Monel - 65% Nickel		160 - 290	.0019" - .0036"	.0021" - .0043"	.0026" - .0052"	.0038" - .0072"
	TITANIUM ALLOYS						
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si 5553 / Beta Titanium		260 - 490 195 - 365	.0021" - .0040" .0021" - .0036"	.0026" - .0048" .0026" - .0043"	.0028" - .0056" .0028" - .0052"	.0042" - .0080" .0042" - .0072"
M	STAINLESS STEELS						
	13/8, 15/5, 17-4, pH Types	< 40 > 40	290 - 490 225 - 360	.0019" - .0036" .0014" - .0031"	.0022" - .0043" .0017" - .0039"	.0026" - .0052" .0020" - .0048"	.0038" - .0072" .0028" - .0062"
	200 Series, 300 Series	< 40 > 40	355 - 555 290 - 455	.0019" - .0041" .0014" - .0031"	.0022" - .0048" .0017" - .0039"	.0026" - .0058" .0020" - .0048"	.0038" - .0082" .0028" - .0062"
	304L, 316L, Nitronic 50	< 40 > 40	325 - 520 225 - 360	.0019" - .0036" .0014" - .0031"	.0022" - .0043" .0017" - .0039"	.0026" - .0052" .0020" - .0048"	.0038" - .0072" .0028" - .0062"
	400 Series	< 40 > 40	290 - 555 225 - 425	.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	.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	.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	.0024" - .0043"	.0026" - .0050"	.0032" - .0060"	.0048" - .0086"
K	CAST MATERIAL						
	Steel (Malleable)		455 - 685	.0029" - .0046"	.0031" - .0053"	.0036" - .0062"	.0058" - .0092"
	Ductile Iron		455 - 685	.0029" - .0046"	.0031" - .0053"	.0036" - .0062"	.0058" - .0092"
	Gray Iron		585 - 770	.0031" - .0048"	.0034" - .0055"	.0038" - .0064"	.0062" - .0096"

	Profile/Trochoidal Milling
Axial (ap)	MAX
Radial (ae)	Up to 10%



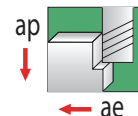
NOTE - DATA DOES NOT REFLECT CHIP THINNING.

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

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

ISO Material		HRC	M/Min. (Vc)	CHIPLOAD PER TOOTH (Fz)			
				12.0mm	16.0mm	20.0mm	25.0mm
S	COBALT BASE ALLOYS						
	Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 40 > 40	37 - 75 30 - 60	.048 - .091 .036 - .079	.053 - .109 .043 - .097	.066 - .132 .051 - .122	.097 - .183 .071 - .157
	NICKEL BASE ALLOYS						
	Invar, Kovar, Inconel-625/718, Waspaloy, Rene, Hastelloy, A286	< 40 > 40	37 - 75 30 - 60	.048 - .091 .036 - .079	.053 - .109 .043 - .097	.066 - .132 .051 - .122	.097 - .183 .071 - .157
	IRON BASE ALLOYS						
	Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 40 > 40	37 - 75 30 - 60	.048 - .091 .036 - .079	.053 - .109 .043 - .097	.066 - .132 .051 - .122	.097 - .183 .071 - .157
	MONEL						
	Monel - 65% Nickel		50 - 90	.048 - .091	.053 - .109	.066 - .132	.097 - .183
	TITANIUM ALLOYS						
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		80 - 150	.053 - .102	.066 - .122	.071 - .142	.107 - .203
5553 / Beta Titanium		60 - 110	.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	.048 - .091 .036 - .079	.056 - .109 .043 - .099	.066 - .132 .051 - .122	.097 - .183 .071 - .157
	200 Series, 300 Series	< 40 > 40	110 - 170 90 - 140	.048 - .104 .036 - .079	.056 - .122 .043 - .099	.066 - .147 .051 - .122	.097 - .208 .071 - .157
	304L, 316L, Nitronic 50	< 40 > 40	100 - 160 70 - 110	.048 - .091 .036 - .079	.056 - .109 .043 - .099	.066 - .132 .051 - .122	.097 - .183 .071 - .157
	400 Series	< 40 > 40	90 - 170 70 - 130	.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	.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	.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	.061 - .109	.066 - .127	.081 - .152	.122 - .218
K	CAST MATERIAL						
	Steel (Malleable)		140 - 210	.074 - .117	.079 - .135	.091 - .157	.147 - .234
	Ductile Iron		140 - 210	.074 - .117	.079 - .135	.091 - .157	.147 - .234
	Gray Iron		180 - 235	.079 - .122	.086 - .140	.097 - .163	.157 - .244

	Profile/Trochoidal Milling
Axial (ap)	MAX
Radial (ae)	Up to 10%



NOTE - DATA DOES NOT REFLECT CHIP THINNING.

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

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

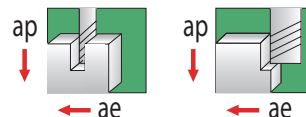
GARR TOOL Milling Guide for VRX

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"	
S	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"	
	M	STAINLESS STEELS												
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														
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"		
P	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"	
K	CAST MATERIAL													
	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.



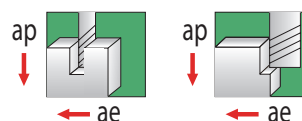
NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

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	
S	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, Waspalloy, 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		
M	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	
P	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	
K	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.

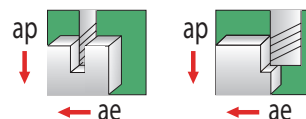
GARR TOOL Milling Guide for V4

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"	
S	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, Waspalloy, 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 Ascology	< 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"		
M	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"		
P	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"		
K	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.



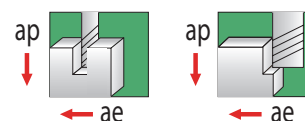
NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

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, Waspalloy, 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 Ascology	< 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		60 - 115	.023 -.043	.025 -.051	.030 -.061	.046 -.086	.051 -.102	.061 -.122	.091 -.173	
5553 / Beta Titanium		45 - 85	.023 -.038	.025 -.046	.030 -.056	.046 -.076	.051 -.091	.061 -.112	.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										
P	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.

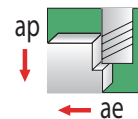
GARR TOOL Milling Guide for V5, V5C

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, Waspaloy, 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 Ascology	< 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"	
	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"		
M	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"		
P	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.



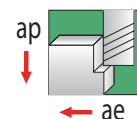
NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

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	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, Waspaloy, 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		
M	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	
P	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	
K	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.

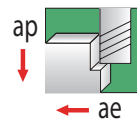
GARR TOOL Milling Guide for VRX-6

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"	
	TITANIUM ALLOYS									
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si 5553 / Beta Titanium		250 - 470 185 - 350	.0010" - .0015" .0008" - .0014"	.0015" - .0025" .0012" - .0022"	.0020" - .0030" .0016" - .0028"	.0025" - .0035" .0023" - .0034"	.0030" - .0050" .0024" - .0044"	.0040" - .0060" .0032" - .0056"	
M	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"	
	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"	
P	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.



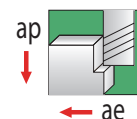
NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

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, Waspaloy, 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 Ascology	< 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.



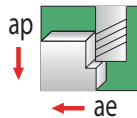
NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL Milling Guide for High Rc Finishers in Hardened Steel

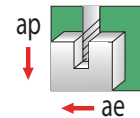
(Reference Series: 545MA, 545BA, 545RA, VRX)

	38 - 45 HRC		45 - 50 HRC		50 - 55 HRC		55 - 60 HRC		60 - 65 HRC		65 - 70 HRC	
	SFM = 450		SFM = 250		SFM = 175		SFM = 125		SFM = 75		SFM = 60	
DIAMETER	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

	38 - 45 HRC		45 - 50 HRC		50 - 55 HRC		55 - 60 HRC		60 - 65 HRC		65 - 70 HRC	
	SFM = 1200		SFM = 1000		SFM = 800		SFM = 600		SFM = 450		SFM = 375	
DIAMETER	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.

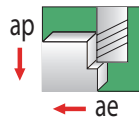
NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

GARR TOOL Milling Guide for High Rc Finishers in Hardened Steel

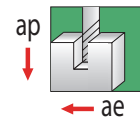
(Reference Series: 545MA, 545BA, 545RA, VRX)

	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	
DIAMETER	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

	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	
DIAMETER	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

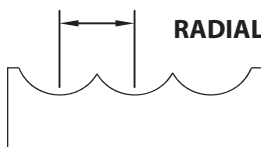
Roughing

(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.

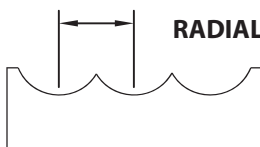
Roughing

(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.

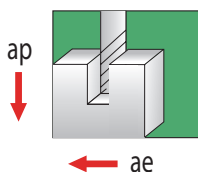
High pressure air is recommended for clearing chips away from the cut.

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

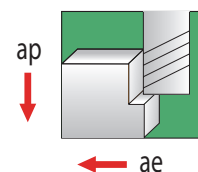
GARR TOOL Milling Guide for H-45 High Feed End Mills

	UP TO 40 HRC			40 - 45 HRC			45 - 55 HRC			55 - 60 HRC		
DIAMETER	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	-

	Slotting Pocket Milling
Axial (ap)	0.3 x Radius
Radial (ae)	1 x D



	Profiling Side Milling
Axial (ap)	1 x D
Radial (ae)	0.3 x Radius



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.

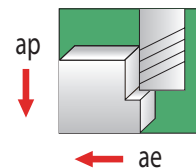
GARR TOOL Milling Guide for Diamond Coated End Mills in Graphite

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"
		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
	HIGH STRENGTH TOOL STEELS						
P	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
K	CAST MATERIAL						
	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 *

ISO Material		HRC	SFM (Vc)	CHIPLOAD PER TOOTH (Fz)							
			154M, 154MA 152M, 152MA	1/8"	3/16"	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"
S	COBALT BASE ALLOYS										
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	60 - 90 50 - 80	.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"
	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"	.0005" - .0010" .0003" - .0008"	.0008" - .0015" .0005" - .0010"	.0010" - .0018" .0008" - .0015"	.0015" - .0030" .0010" - .0015"	.0020" - .0030" .0015" - .0025"	.0025" - .0035" .0015" - .0020"
	IRON BASE ALLOYS										
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascolloy	< 40 > 40	55 - 90 50 - 80	.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"
	TITANIUM ALLOYS										
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si 5553 / Beta Titanium		100 - 150 90 - 120	.0003" - .0008" .0003" - .0008"	.0005" - .0012" .0004" - .0010"	.0005" - .0012" .0004" - .0010"	.0008" - .0015" .0008" - .0014"	.0010" - .0015" .0010" - .0016"	.0013" - .0020" .0010" - .0020"	.0018" - .0025" .0018" - .0025"	.0025" - .0035" .0015" - .0025"
M	STAINLESS STEELS										
	13/8, 15/5, 17-4, pH Types	< 40 > 40	100 - 150 80 - 100	.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"
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	150 - 225 125 - 220	.0002" - .0006" .0003" - .0005"	.0005" - .0008" .0003" - .0007"	.0008" - .0015" .0005" - .0010"	.0010" - .0018" .0008" - .0012"	.0010" - .0018" .0009" - .0015"	.0015" - .0025" .0013" - .0018"	.0018" - .0028" .0013" - .0018"	.0022" - .0032" .0017" - .0025"
	400 Series - 403, 405, 420, 455	< 40 > 40	150 - 200 100 - 150	.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"	.0030" - .0046" .0024" - .0042"
	HIGH STRENGTH TOOL STEELS										
P	A2, D2, P20, H13, S7, O1	< 40 > 40	150 - 200 100 - 150	.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" .0015" - .0022"
	MEDIUM ALLOY TOOL STEELS										
	4140, 4340, 52100, 6150, 8620	< 40 > 40	150 - 200 100 - 150	.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" .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"
K	CAST MATERIAL										
	Ductile Iron		175 - 225	.0008" - .0012"	.0010" - .0015"	.0015" - .0025"	.0015" - .0025"	.0020" - .0030"	.0025" - .0035"	.0035" - .0045"	.0035" - .0045"
	Gray Iron		175 - 225	.0008" - .0012"	.0010" - .0015"	.0015" - .0025"	.0015" - .0025"	.0020" - .0030"	.0025" - .0035"	.0035" - .0045"	.0035" - .0045"
N	NON-FERROUS										
	Aluminum (6061, 7075)		300 - 500	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"
	Magnesium		300 - 500	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"
	Copper		250 - 450	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"
	Brass, Bronze		200 - 400	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"
O	COMPOSITE (non-ISO)										
	Glass Epoxy, Fiberglass, Plastics		200 - 400	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"

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GARR TOOL Milling Guide for Drill Mills

* Chamfering *

ISO Material		HRC	M/Min. (Vc)	CHIPLOAD PER TOOTH (Fz)								
			154M, 154MA 152M, 152MA	3.0mm	4.0mm	5.0mm	6.0mm	8.0mm	10.0mm	12.0mm	16.00mm	20.0mm
S	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 Ascology	< 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	
M	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	
P	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
K	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
N	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
O	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

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GARR TOOL Drilling Guide for Drill Mills

* Through Hole *

ISO Material		HRC	SFM (Vc)	CHIPLOAD PER TOOTH (Fz)							
			152DA	1/8"	3/16"	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"
S	COBALT BASE ALLOYS										
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	60 - 90 50 - 80	.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"
	NICKEL BASE ALLOYS										
	Inconel-625/718, Waspalloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	55 - 90 45 - 80	.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"
	IRON BASE ALLOYS										
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascolloy	< 40 > 40	55 - 90 50 - 80	.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"
	TITANIUM ALLOYS										
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		100 - 150	.0003" - .0008"	.0005" - .0012"	.0005" - .0012"	.0008" - .0015"	.0010" - .0015"	.0013" - .0020"	.0018" - .0025"	.0025" - .0035"	
5553 / Beta Titanium		90 - 120	.0003" - .0008"	.0004" - .0010"	.0004" - .0010"	.0005" - .0012"	.0008" - .0014"	.0010" - .0016"	.0010" - .0020"	.0015" - .0025"	
M	STAINLESS STEELS										
	13/8, 15/5, 17-4, pH Types	< 40 > 40	100 - 150 80 - 100	.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"
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	150 - 225 125 - 220	.0002" - .0006" .0003" - .0005"	.0005" - .0008" .0003" - .0007"	.0008" - .0015" .0005" - .0010"	.0010" - .0018" .0008" - .0012"	.0010" - .0018" .0009" - .0015"	.0015" - .0025" .0013" - .0018"	.0018" - .0028" .0013" - .0018"	.0022" - .0032" .0017" - .0025"
	400 Series - 403, 405, 420, 455	< 40 > 40	150 - 200 100 - 150	.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"	.0030" - .0046" .0024" - .0042"
	HIGH STRENGTH TOOL STEELS										
A2, D2, P20, H13, S7, O1	< 40 > 40	150 - 200 100 - 150	.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" .0015" - .0022"	
P	MEDIUM ALLOY TOOL STEELS										
	4140, 4340, 52100, 6150, 8620	< 40 > 40	150 - 200 100 - 150	.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" .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"
K	CAST MATERIAL										
	Ductile Iron		175 - 225	.0008" - .0012"	.0010" - .0015"	.0015" - .0025"	.0015" - .0025"	.0020" - .0030"	.0025" - .0035"	.0035" - .0045"	.0035" - .0045"
	Gray Iron		175 - 225	.0008" - .0012"	.0010" - .0015"	.0015" - .0025"	.0015" - .0025"	.0020" - .0030"	.0025" - .0035"	.0035" - .0045"	.0035" - .0045"
N	NON-FERROUS										
	Aluminum (6061, 7075)		300 - 500	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"
	Magnesium		300 - 500	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"
	Copper		250 - 450	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"
	Brass, Bronze		200 - 400	.0006" - .0010"	.0008" - .0014"	.0012" - .0020"	.0014" - .0028"	.0020" - .0030"	.0035" - .0048"	.0050" - .0060"	.0058" - .0070"
O	COMPOSITE (non-ISO)										
	Glass Epoxy, Fiberglass, Plastics		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 *

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	
S	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, Waspalloy, 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 Ascology	< 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											
M	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											
P	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											
K	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
N	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
O	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)											
O	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 General Purpose Drilling Guide (Bright Finish)

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	- -	100 90	100 90	90 80
	NICKEL BASE ALLOYS					
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	- -	100 90	100 90	90 80
	IRON BASE ALLOYS					
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascolloy	< 40 > 40	- -	100 90	100 90	90 80
	TITANIUM ALLOYS					
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si 5553 / Beta Titanium	 < 40 > 40	 - -	 120 110	 120 110	 110 100
M	STAINLESS STEELS					
	13/8, 15/5, 17-4, pH Types	< 40 > 40	- -	130 120	130 120	120 110
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	- -	130 120	130 120	120 110
	400 Series - 403, 405, 420, 455	< 40 > 40	- -	130 120	130 120	120 110
	HIGH STRENGTH TOOL STEELS					
	A2, D2, P20, H13, S7, O1 Thompson Shaft, Armor Plate (Class 1)	< 40 > 40 > 50	- - -	180 170 120	180 170 120	170 160 110
P	MEDIUM ALLOY TOOL STEELS					
	4140, 4340, 52100, 6150, 8620	< 40 > 40	- -	235 225	235 225	225 215
	CARBON STEELS					
	1000's - 1018, 1020, 12L14	< 40	-	270	270	260
K	CAST MATERIAL					
	Ductile Iron		220	280	280	270
	Gray Iron		240	250	250	240
N	NON-FERROUS					
	Aluminum (6061, 7075)		-	250	-	300
	Magnesium		-	150	-	150
	Copper		-	120	-	120
	Brass, Bronze		-	160	-	130
O	COMPOSITE (non-ISO)					
	Glass Epoxy, Fiberglass, Plastics, Graphite, G10		140	-	140	-

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GARR TOOL General Purpose Drilling Guide (Bright Finish)

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 > 40	.0003" - .0008" .0002" - .0006"	.0006" - .0011" .0004" - .0009"	.0010" - .0017" .0008" - .0015"	.0014" - .0024" .0012" - .0022" .0019" - .0032" .0017" - .0030"
	NICKEL BASE ALLOYS					
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	.0003" - .0008" .0002" - .0006"	.0006" - .0011" .0004" - .0009"	.0010" - .0017" .0008" - .0015"	.0014" - .0024" .0012" - .0022" .0019" - .0032" .0017" - .0030"
	IRON BASE ALLOYS					
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	.0003" - .0008" .0002" - .0006"	.0006" - .0011" .0004" - .0009"	.0010" - .0017" .0008" - .0015"	.0014" - .0024" .0012" - .0022" .0019" - .0032" .0017" - .0030"
	TITANIUM ALLOYS					
M	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"
	STAINLESS STEELS					
	13/8, 15/5, 17-4, pH Types	< 40 > 40	.0004" - .0009" .0003" - .0007"	.0007" - .0013" .0006" - .0011"	.0011" - .0019" .0010" - .0017"	.0015" - .0026" .0014" - .0024" .0020" - .0032" .0019" - .0030"
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	.0004" - .0009" .0003" - .0007"	.0007" - .0013" .0006" - .0011"	.0011" - .0019" .0010" - .0017"	.0015" - .0026" .0014" - .0024" .0020" - .0032" .0019" - .0030"
	400 Series - 403, 405, 420, 455	< 40 > 40	.0004" - .0009" .0003" - .0007"	.0007" - .0013" .0006" - .0011"	.0011" - .0019" .0010" - .0017"	.0015" - .0026" .0014" - .0024" .0020" - .0032" .0019" - .0030"
	HIGH STRENGTH TOOL STEELS					
P	A2, D2, P20, H13, S7, O1	< 40 > 40	.0004" - .0009" .0003" - .0007"	.0007" - .0013" .0006" - .0011"	.0011" - .0019" .0010" - .0017"	.0015" - .0026" .0014" - .0024" .0020" - .0032" .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 > 40	.0004" - .0009" .0003" - .0007"	.0007" - .0013" .0006" - .0011"	.0011" - .0019" .0010" - .0017"	.0015" - .0026" .0014" - .0024" .0020" - .0032" .0019" - .0030"
	CARBON STEELS					
	1000's - 1018, 1020, 12L14	< 40	.0005" - .0010"	.0008" - .0014"	.0012" - .0020"	.0016" - .0027" .0021" - .0033"
	CAST MATERIAL					
K	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 (Bright Finish)

	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	- -	30 27	30 27	27 25
	NICKEL BASE ALLOYS					
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	- -	30 27	30 27	27 25
	IRON BASE ALLOYS					
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	- -	30 27	30 27	27 25
	TITANIUM ALLOYS					
M	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		-	37	37	35
	5553 / Beta Titanium		-	35	35	30
	STAINLESS STEELS					
	13/8, 15/5, 17-4, pH Types	< 40 > 40	- -	40 37	40 37	37 35
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	- -	40 37	40 37	37 35
	400 Series - 403, 405, 420, 455	< 40 > 40	- -	40 37	40 37	37 35
	HIGH STRENGTH TOOL STEELS					
P	A2, D2, P20, H13, S7, O1	< 40 > 40	- -	55 52	55 52	52 50
	Thompson Shaft, Armor Plate (Class 1)	> 50	-	37	37	35
	MEDIUM ALLOY TOOL STEELS					
	4140, 4340, 52100, 6150, 8620	< 40 > 40	- -	72 70	72 70	70 65
	CARBON STEELS					
	1000's - 1018, 1020, 12L14	< 40	-	82	82	80
	CAST MATERIAL					
K	Ductile Iron		67	85	85	82
	Gray Iron		72	75	75	72
N	NON-FERROUS					
	Aluminum (6061, 7075)		-	75	-	90
	Magnesium		-	45	-	45
	Copper		-	37	-	37
	Brass, Bronze		-	50	-	40
O	COMPOSITE (non-ISO)					
	Glass Epoxy, Fiberglass, Plastics, Graphite, G10		42	-	42	-

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

GARR TOOL General Purpose Drilling Guide (Bright Finish)

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 > 40	.008 - .020 .005 - .015	.015 - .028 .010 - .023	.025 - .043 .020 - .038	.036 - .061 .030 - .056	.048 - .081 .043 - .076
	NICKEL BASE ALLOYS						
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	.008 - .020 .005 - .015	.015 - .028 .010 - .023	.025 - .043 .020 - .038	.036 - .061 .030 - .056	.048 - .081 .043 - .076
	IRON BASE ALLOYS						
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascolloy	< 40 > 40	.008 - .020 .005 - .015	.015 - .028 .010 - .023	.025 - .043 .020 - .038	.036 - .061 .030 - .056	.048 - .081 .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 > 40	.010 - .023 .008 - .018	.018 - .033 .015 - .028	.028 - .048 .025 - .043	.038 - .066 .036 - .061	.051 - .081 .048 - .076
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	.010 - .023 .008 - .018	.018 - .033 .015 - .028	.028 - .048 .025 - .043	.038 - .066 .036 - .061	.051 - .081 .048 - .076
	400 Series - 403, 405, 420, 455	< 40 > 40	.010 - .023 .008 - .018	.018 - .033 .015 - .028	.028 - .048 .025 - .043	.038 - .066 .036 - .061	.051 - .081 .048 - .076
P	HIGH STRENGTH TOOL STEELS						
	A2, D2, P20, H13, S7, O1	< 40 > 40	.010 - .023 .008 - .018	.018 - .033 .015 - .028	.028 - .048 .025 - .043	.038 - .066 .036 - .061	.051 - .081 .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 > 40	.010 - .023 .008 - .018	.018 - .033 .015 - .028	.028 - .048 .025 - .043	.038 - .066 .036 - .061	.051 - .081 .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

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GARR TOOL General Purpose Drilling Guide (Durana 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 > 40	- -	120 105	120 105	- -
	NICKEL BASE ALLOYS					
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	- -	120 105	120 105	- -
	IRON BASE ALLOYS					
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascolloy	< 40 > 40	- -	120 105	120 105	- -
	TITANIUM ALLOYS					
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si 5553 / Beta Titanium	 	- -	140 130	140 130	- -
M	STAINLESS STEELS					
	13/8, 15/5, 17-4, pH Types	< 40 > 40	- -	145 135	145 135	- -
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	- -	145 135	145 135	- -
	400 Series - 403, 405, 420, 455	< 40 > 40	- -	145 135	145 135	- -
	HIGH STRENGTH TOOL STEELS					
P	A2, D2, P20, H13, S7, O1	< 40 > 40	- -	200 190	200 190	- -
	Thompson Shaft, Armor Plate (Class 1)	> 50	-	-	140	-
	MEDIUM ALLOY TOOL STEELS					
	4140, 4340, 52100, 6150, 8620	< 40 > 40	- -	255 245	255 245	- -
	CARBON STEELS					
	1000's - 1018, 1020, 12L14	< 40	-	290	290	-
K	CAST MATERIAL					
	Ductile Iron		300	300	300	-
	Gray Iron		270	270	270	-
N	NON-FERROUS					
	Aluminum (6061, 7075)		-	300	-	280
	Magnesium		-	180	-	220
	Copper		-	170	-	180
	Brass, Bronze		-	180	-	260
O	COMPOSITE (non-ISO)					
	Glass Epoxy, Fiberglass, Plastics, Graphite, G10		160	160	160	-

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

GARR TOOL General Purpose Drilling Guide (Durana Coated)

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 > 40	.0003" - .0008" .0002" - .0006"	.0006" - .0011" .0004" - .0009"	.0010" - .0017" .0008" - .0015"	.0014" - .0024" .0012" - .0022"	.0019" - .0032" .0017" - .0030"
	NICKEL BASE ALLOYS						
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	.0003" - .0008" .0002" - .0006"	.0006" - .0011" .0004" - .0009"	.0010" - .0017" .0008" - .0015"	.0014" - .0024" .0012" - .0022"	.0019" - .0032" .0017" - .0030"
	IRON BASE ALLOYS						
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	.0003" - .0008" .0002" - .0006"	.0006" - .0011" .0004" - .0009"	.0010" - .0017" .0008" - .0015"	.0014" - .0024" .0012" - .0022"	.0019" - .0032" .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 > 40	.0004" - .0009" .0003" - .0007"	.0007" - .0013" .0006" - .0011"	.0011" - .0019" .0010" - .0017"	.0015" - .0026" .0014" - .0024"	.0020" - .0032" .0019" - .0030"
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	.0004" - .0009" .0003" - .0007"	.0007" - .0013" .0006" - .0011"	.0011" - .0019" .0010" - .0017"	.0015" - .0026" .0014" - .0024"	.0020" - .0032" .0019" - .0030"
	400 Series - 403, 405, 420, 455	< 40 > 40	.0004" - .0009" .0003" - .0007"	.0007" - .0013" .0006" - .0011"	.0011" - .0019" .0010" - .0017"	.0015" - .0026" .0014" - .0024"	.0020" - .0032" .0019" - .0030"
	HIGH STRENGTH TOOL STEELS						
	A2, D2, P20, H13, S7, O1	< 40 > 40	.0004" - .0009" .0003" - .0007"	.0007" - .0013" .0006" - .0011"	.0011" - .0019" .0010" - .0017"	.0015" - .0026" .0014" - .0024"	.0020" - .0032" .0019" - .0030"
P	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 > 40	.0004" - .0009" .0003" - .0007"	.0007" - .0013" .0006" - .0011"	.0011" - .0019" .0010" - .0017"	.0015" - .0026" .0014" - .0024"	.0020" - .0032" .0019" - .0030"
	CARBON STEELS						
	1000's - 1018, 1020, 12L14	< 40	.0005" - .0010"	.0008" - .0014"	.0012" - .0020"	.0016" - .0027"	.0021" - .0033"
	CAST MATERIAL						
K	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 (Durana 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 > 40	- -	37 32	37 32	- -
	NICKEL BASE ALLOYS					
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	- -	37 32	37 32	- -
	IRON BASE ALLOYS					
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascolloy	< 40 > 40	- -	37 32	37 32	- -
	TITANIUM ALLOYS					
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si 5553 / Beta Titanium	 < 40 > 40	 - -	 42 40	 42 40	 - -
M	STAINLESS STEELS					
	13/8, 15/5, 17-4, pH Types	< 40 > 40	- -	45 40	45 40	- -
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	- -	45 40	45 40	- -
	400 Series - 403, 405, 420, 455	< 40 > 40	- -	45 40	45 40	- -
	HIGH STRENGTH TOOL STEELS					
P	A2, D2, P20, H13, S7, O1	< 40 > 40	- -	60 57	60 57	- -
	Thompson Shaft, Armor Plate (Class 1)	> 50	-	-	42	-
	MEDIUM ALLOY TOOL STEELS					
	4140, 4340, 52100, 6150, 8620	< 40 > 40	- -	77 75	77 75	- -
	CARBON STEELS					
	1000's - 1018, 1020, 12L14	< 40	-	87	87	-
K	CAST MATERIAL					
	Ductile Iron		90	90	90	-
	Gray Iron		82	82	82	-
N	NON-FERROUS					
	Aluminum (6061, 7075)		-	90	-	85
	Magnesium		-	55	-	67
	Copper		-	52	-	55
	Brass, Bronze		-	55	-	80
O	COMPOSITE (non-ISO)					
	Glass Epoxy, Fiberglass, Plastics, Graphite, G10		50	50	50	-

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

GARR TOOL General Purpose Drilling Guide (Durana Coated)

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 > 40	.008 - .020 .005 - .015	.015 - .028 .010 - .023	.025 - .043 .020 - .038	.036 - .061 .030 - .056	.048 - .081 .043 - .076
	NICKEL BASE ALLOYS						
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	.008 - .020 .005 - .015	.015 - .028 .010 - .023	.025 - .043 .020 - .038	.036 - .061 .030 - .056	.048 - .081 .043 - .076
	IRON BASE ALLOYS						
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	.008 - .020 .005 - .015	.015 - .028 .010 - .023	.025 - .043 .020 - .038	.036 - .061 .030 - .056	.048 - .081 .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 > 40	.010 - .023 .008 - .018	.018 - .033 .015 - .028	.028 - .048 .025 - .043	.038 - .066 .036 - .061	.051 - .081 .048 - .076
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	.010 - .023 .008 - .018	.018 - .033 .015 - .028	.028 - .048 .025 - .043	.038 - .066 .036 - .061	.051 - .081 .048 - .076
	400 Series - 403, 405, 420, 455	< 40 > 40	.010 - .023 .008 - .018	.018 - .033 .015 - .028	.028 - .048 .025 - .043	.038 - .066 .036 - .061	.051 - .081 .048 - .076
P	HIGH STRENGTH TOOL STEELS						
	A2, D2, P20, H13, S7, O1	< 40 > 40	.010 - .023 .008 - .018	.018 - .033 .015 - .028	.028 - .048 .025 - .043	.038 - .066 .036 - .061	.051 - .081 .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 > 40	.010 - .023 .008 - .018	.018 - .033 .015 - .028	.028 - .048 .025 - .043	.038 - .066 .036 - .061	.051 - .081 .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 Drilling Guide for Mini Drills

(Series 1550H,1250H,1850H)

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	140 130	.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	140 130	.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	140 130	.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 5553 / Beta Titanium		160 150	.0003" - .0006" .0002" - .0004"	.0004" - .0008" .0003" - .0006"	.0006" - .0012" .0005" - .0010"
M	STAINLESS STEELS					
	13/8, 15/5, 17-4, pH Types	< 40 > 40	165 155	.0002" - .0004" .0002" - .0004"	.0004" - .0007" .0003" - .0006"	.0006" - .0010" .0005" - .0009"
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	165 155	.0002" - .0004" .0002" - .0004"	.0004" - .0007" .0003" - .0006"	.0006" - .0010" .0005" - .0009"
	400 Series - 403, 405, 420, 455	< 40 > 40	165 155	.0002" - .0004" .0002" - .0004"	.0004" - .0007" .0003" - .0006"	.0006" - .0010" .0005" - .0009"
	HIGH STRENGTH TOOL STEELS					
	A2, D2, P20, H13, S7, O1	< 40 > 40	220 210	.0003" - .0006" .0002" - .0004"	.0004" - .0008" .0003" - .0006"	.0006" - .0012" .0005" - .0010"
P	MEDIUM ALLOY TOOL STEELS					
	4140, 4340, 52100, 6150, 8620	< 40 > 40	270 260	.0004" - .0008" .0003" - .0005"	.0006" - .0012" .0004" - .0008"	.0008" - .0015" .0006" - .0012"
	CARBON STEELS					
	1000's - 1018, 1020, 12L14	< 40	320	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
	CAST MATERIAL					
K	Ductile Iron		320	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
	Gray Iron		290	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
N	NON-FERROUS					
	Aluminum 2014, 2024, 6061-(T1-T6), 7075, Extruded		350	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
	Magnesium		200	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
	Copper		190	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
	Brass		200	.0003" - .0008"	.0004" - .0012"	.0006" - .0015"
	Bronze		200	.0003" - .0008"	.0004" - .0012"	.0006" - .0015"

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GARR TOOL 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	42 40	.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	42 40	.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	42 40	.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 5553 / Beta Titanium	 	50 45	.008 - .015 .005 - .010	.010 - .020 .008 - .015	.015 - .030 .013 - .025
M	STAINLESS STEELS					
	13/8, 15/5, 17-4, pH Types	< 40 > 40	50 47	.005 - .010 .005 - .010	.010 - .018 .008 - .015	.015 - .025 .013 - .023
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	50 47	.005 - .010 .005 - .010	.010 - .018 .008 - .015	.015 - .025 .013 - .023
	400 Series - 403, 405, 420, 455	< 40 > 40	50 47	.005 - .010 .005 - .010	.010 - .018 .008 - .015	.015 - .025 .013 - .023
	HIGH STRENGTH TOOL STEELS					
P	A2, D2, P20, H13, S7, O1	< 40 > 40	67 65	.008 - .015 .005 - .010	.010 - .020 .008 - .015	.015 - .030 .013 - .025
	MEDIUM ALLOY TOOL STEELS					
	4140, 4340, 52100, 6150, 8620	< 40 > 40	82 80	.010 - .020 .008 - .013	.015 - .030 .010 - .020	.020 - .038 .015 - .030
	CARBON STEELS					
	1000's - 1018, 1020, 12L14	< 40	100	.010 - .020	.015 - .030	.020 - .038
K	CAST MATERIAL					
	Ductile Iron		100	.010 - .020	.015 - .030	.020 - .038
	Gray Iron		90	.010 - .020	.015 - .030	.020 - .038
N	NON-FERROUS					
	Aluminum 2014, 2024, 6061-(T1-T6), 7075, Extruded		107	.010 - .020	.015 - .030	.020 - .038
	Magnesium		60	.010 - .020	.015 - .030	.020 - .038
	Copper		57	.010 - .020	.015 - .030	.020 - .038
	Brass		60	.008 - .020	.010 - .030	.015 - .038
	Bronze		60	.008 - .020	.010 - .030	.015 - .038

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

GARR TOOL HTD Drilling Guide

ISO Material		HRC	SFM (Vc)	CHIPLOAD PER TOOTH (Fz)		
				1/8" - 1/4"	1/4" - 3/8"	3/8" - 1/2"
S	COBALT BASE ALLOYS					
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	110 70	.0006" - .0016" .0004" - .0012"	.0016" - .0022" .0012" - .0018"	.0022" - .0035" .0018" - .0031"
	NICKEL BASE ALLOYS					
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	120 80	.0006" - .0016" .0004" - .0012"	.0016" - .0022" .0012" - .0018"	.0022" - .0035" .0018" - .0031"
	IRON BASE ALLOYS					
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	120 80	.0006" - .0016" .0004" - .0012"	.0016" - .0022" .0012" - .0018"	.0022" - .0035" .0018" - .0031"
	TITANIUM ALLOYS					
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si 5553 / Beta Titanium		170 120	.0006" - .0026" .0005" - .0023"	.0026" - .0040" .0023" - .0034"	.0040" - .0055" .0034" - .0047"
M	STAINLESS STEELS					
	13/8, 15/5, 17-4, pH Types	< 40 > 40	150 105	.0006" - .0018" .0005" - .0013"	.0018" - .0035" .0013" - .0030"	.0035" - .0049" .0030" - .0043"
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	150 105	.0006" - .0018" .0005" - .0013"	.0018" - .0035" .0013" - .0030"	.0035" - .0049" .0030" - .0043"
	400 Series - 403, 405, 420, 455	< 40 > 40	160 105	.0006" - .0018" .0005" - .0013"	.0018" - .0035" .0013" - .0030"	.0035" - .0049" .0030" - .0043"
P	HIGH STRENGTH TOOL STEELS					
	A2, D2, P20, H13, S7, O1	< 40 > 40	170 105	.0008" - .0026" .0006" - .0020"	.0026" - .0038" .0020" - .0032"	.0038" - .0050" .0032" - .0043"
	MEDIUM ALLOY TOOL STEELS					
	4140, 4340, 52100, 6150, 8620	< 40 > 40	260 110	.0008" - .0026" .0006" - .0020"	.0026" - .0038" .0020" - .0032"	.0038" - .0050" .0032" - .0043"
	CARBON STEELS					
	1000's - 1018, 1020, 12L14	< 40	320	.0008" - .0029"	.0030" - .0045"	.0045" - .0060"
K	CAST MATERIAL					
	Ductile Iron		340	.0008" - .0029"	.0029" - .0045"	.0045" - .0060"
	Gray Iron		350	.0008" - .0029"	.0029" - .0045"	.0045" - .0060"
N	NON-FERROUS					
	Aluminum 2014, 2024, 6061-(T1-T6), 7075		400	.0016" - .0030"	.0030" - .0046"	.0046" - .0062"
	Aluminum Die Cast		375	.0014" - .0027"	.0027" - .0040"	.0040" - .0054"
	Magnesium		275	.0014" - .0026"	.0026" - .0037"	.0037" - .0049"
	Copper		250	.0013" - .0024"	.0024" - .0031"	.0031" - .0044"
	Brass		360	.0016" - .0030"	.0030" - .0044"	.0044" - .0060"
	Bronze		260	.0013" - .0024"	.0024" - .0031"	.0031" - .0044"

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

ISO Material		HRC	M/Min. (Vc)	CHIPLOAD PER TOOTH (Fz)		
				3.0 - 6.0mm	6.0 - 10.0mm	10.0 - 13.0mm
S	COBALT BASE ALLOYS					
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	33 21	.015 - .041 .010 - .030	.041 - .056 .030 - .046	.056 - .089 .046 - .079
	NICKEL BASE ALLOYS					
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	36 24	.015 - .041 .010 - .030	.041 - .056 .030 - .046	.056 - .089 .046 - .079
	IRON BASE ALLOYS					
	A286, Discaloy, Haynes 556, Carpenter 22, Greek Ascology	< 40 > 40	36 24	.015 - .041 .010 - .030	.041 - .056 .030 - .046	.056 - .089 .046 - .079
	TITANIUM ALLOYS					
	Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si 5553 / Beta Titanium		52 36	.015 - .066 .013 - .058	.066 - .102 .058 - .086	.102 - .140 .086 - .119
M	STAINLESS STEELS					
	13/8, 15/5, 17-4, pH Types	< 40 > 40	45 32	.015 - .046 .013 - .033	.046 - .089 .033 - .076	.089 - .124 .076 - .109
	300 Series, 304L, Nitronic 50, Duplex, Super-Austenitic	< 40 > 40	45 32	.015 - .046 .013 - .033	.046 - .089 .033 - .076	.089 - .124 .076 - .109
	400 Series - 403, 405, 420, 455	< 40 > 40	48 32	.015 - .046 .013 - .033	.046 - .089 .033 - .076	.089 - .124 .076 - .109
	HIGH STRENGTH TOOL STEELS					
	A2, D2, P20, H13, S7, O1	< 40 > 40	52 32	.020 - .066 .015 - .051	.066 - .097 .051 - .081	.097 - .127 .081 - .109
P	MEDIUM ALLOY TOOL STEELS					
	4140, 4340, 52100, 6150, 8620	< 40 > 40	79 33	.020 - .066 .015 - .051	.066 - .097 .051 - .081	.097 - .127 .081 - .109
	CARBON STEELS					
	1000's - 1018, 1020, 12L14	< 40	97	.020 - .074	.074 - .114	.114 - .152
K	CAST MATERIAL					
	Ductile Iron		103	.020 - .074	.074 - .114	.114 - .152
	Gray Iron		106	.020 - .074	.074 - .114	.114 - .152
N	NON-FERROUS					
	Aluminum 2014, 2024, 6061-(T1-T6), 7075		122	.041 - .076	.076 - .117	.117 - .157
	Aluminum Die Cast		114	.036 - .069	.069 - .102	.102 - .137
	Magnesium		83	.036 - .066	.066 - .094	.094 - .124
	Copper		76	.033 - .061	.061 - .079	.079 - .112
	Brass		109	.041 - .076	.076 - .112	.112 - .152
	Bronze		79	.033 - .061	.061 - .079	.079 - .112

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)					
				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	140 130	.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	140 130	.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	140 130	.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		160	.0010" - .0018"	.0015" - .0023"	.0020" - .0029"	.0025" - .0035"	.0030" - .0041"		
5553 / Beta Titanium		150	.0008" - .0015"	.0012" - .0020"	.0017" - .0026"	.0022" - .0032"	.0027" - .0038"		
M	STAINLESS STEELS								
	13/8, 15/5, 17-4, pH Types	< 40 > 40	165 155	.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	165 155	.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	165 155	.0010" - .0017" .0007" - .0015"	.0014" - .0022" .0011" - .0020"	.0019" - .0028" .0016" - .0026"	.0024" - .0034" .0021" - .0032"	.0029" - .0040" .0026" - .0038"	
	HIGH STRENGTH TOOL STEELS								
A2, D2, P20, H13, S7, O1	< 40 > 40	220 210	.0011" - .0020" .0007" - .0014"	.0015" - .0025" .0011" - .0019"	.0020" - .0031" .0016" - .0025"	.0025" - .0037" .0021" - .0031"	.0030" - .0043" .0026" - .0037"		
P	MEDIUM ALLOY TOOL STEELS								
	4140, 4340, 52100, 6150, 8620	< 40 > 40	270 260	.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	320	.0014" - .0023"	.0018" - .0027"	.0023" - .0033"	.0028" - .0039"	.0033" - .0045"		
K	CAST MATERIAL								
	Ductile Iron		320	.0015" - .0023"	.0019" - .0028"	.0024" - .0034"	.0029" - .0040"	.0034" - .0046"	
	Gray Iron		290	.0016" - .0024"	.0020" - .0029"	.0025" - .0035"	.0030" - .0041"	.0035" - .0047"	
N	NON-FERROUS								
	Aluminum 2014, 2024, 6061-(T1-T6), 7075		350	.0023" - .0033"	.0027" - .0038"	.0033" - .0044"	.0038" - .0050"	.0043" - .0056"	
	Aluminum Die Cast		320	.0018" - .0028"	.0022" - .0033"	.0027" - .0039"	.0032" - .0045"	.0037" - .0051"	
	Magnesium		200	.0020" - .0030"	.0024" - .0035"	.0029" - .0041"	.0034" - .0047"	.0039" - .0053"	
	Copper		190	.0017" - .0025"	.0021" - .0030"	.0026" - .0036"	.0031" - .0042"	.0036" - .0048"	
	Brass		200	.0020" - .0032"	.0024" - .0037"	.0029" - .0043"	.0034" - .0049"	.0039" - .0055"	
	Bronze		200	.0018" - .0025"	.0022" - .0030"	.0027" - .0036"	.0032" - .0042"	.0037" - .0048"	

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

GARR TOOL High Performance Drilling Guide

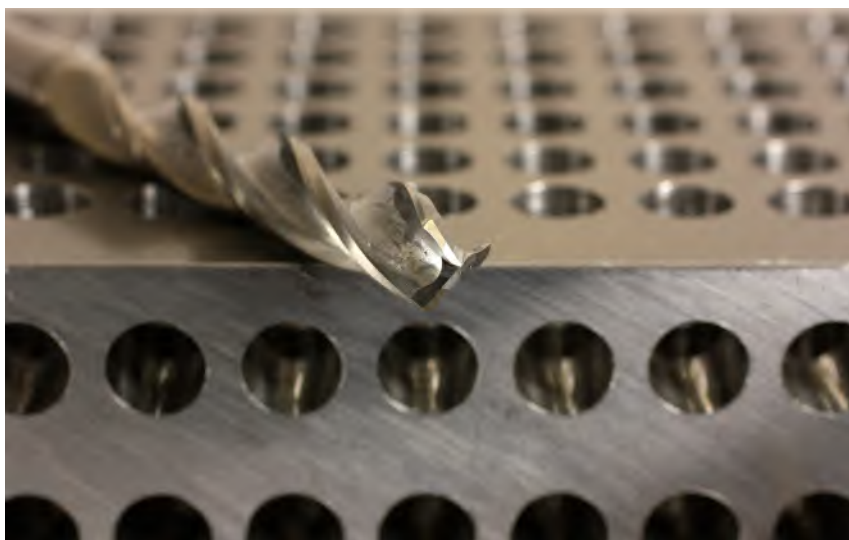
ISO Material		HRC	M/Min. (Vc)	CHIPLOAD PER TOOTH (Fz)				
				3.0 - 6.0mm	6.0 - 10.0mm	10.0 - 13.0mm	13.0 - 16.0mm	16.0 - 20.0mm
S	COBALT BASE ALLOYS							
	Haynes 25/188, Stellite 21, Cobalt Chrome	< 40 > 40	42 40	.020 - .038 .013 - .030	.030 - .051 .023 - .043	.043 - .066 .036 - .058	.056 - .081 .048 - .074	.069 - .097 .061 - .089
	NICKEL BASE ALLOYS							
	Inconel-625/718, Waspaloy, Invar, Rene, Hastelloy, Monel	< 40 > 40	42 40	.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	42 40	.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			50	.025 - .046	.038 - .058	.051 - .074	.064 - .089	.076 - .104
5553 / Beta Titanium			45	.020 - .038	.030 - .051	.043 - .066	.056 - .081	.069 - .097
M	STAINLESS STEELS							
	13/8, 15/5, 17-4, pH Types	< 40 > 40	50 47	.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	50 47	.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	50 47	.025 - .043 .018 - .038	.036 - .056 .028 - .051	.048 - .071 .041 - .066	.061 - .086 .053 - .081	.074 - .102 .066 - .097
P	HIGH STRENGTH TOOL STEELS							
	A2, D2, P20, H13, S7, O1	< 40 > 40	67 65	.028 - .051 .018 - .036	.038 - .064 .028 - .048	.051 - .079 .041 - .064	.064 - .094 .053 - .079	.076 - .109 .066 - .094
	MEDIUM ALLOY TOOL STEELS							
	4140, 4340, 52100, 6150, 8620	< 40 > 40	82 80	.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	100	.036 - .058	.048 - .069	.058 - .064	.071 - .099	.084 - .114
K	CAST MATERIAL							
	Ductile Iron		100	.038 - .058	.048 - .071	.061 - .086	.074 - .102	.086 - .117
	Gray Iron		90	.041 - .061	.051 - .074	.064 - .089	.076 - .104	.089 - .119
N	NON-FERROUS							
	Aluminum 2014, 2024, 6061-(T1-T6), 7075		107	.058 - .084	.069 - .097	.084 - .112	.097 - .127	.109 - .142
	Aluminum Die Cast		100	.046 - .071	.056 - .084	.069 - .099	.081 - .114	.094 - .130
	Magnesium		60	.051 - .076	.061 - .089	.074 - .104	.086 - .119	.099 - .135
	Copper		57	.043 - .064	.053 - .076	.066 - .091	.079 - .107	.091 - .122
	Brass		60	.051 - .081	.061 - .094	.074 - .109	.086 - .124	.099 - .140
	Bronze		60	.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"
	Cast Aluminum	380	300 - 500	.0015" - .0030"	.0020" - .0040"	.0030" - .0050"	.0030" - .0060"	.0035" - .0070"
	Magnesium		250 - 500	.0015" - .0030"	.0020" - .0040"	.0030" - .0050"	.0030" - .0060"	.0035" - .0070"
	Copper & Brass		250 - 400	.0010" - .0025"	.0020" - .0030"	.0020" - .0030"	.0020" - .0040"	.0030" - .0050"
	Titanium	6Al-4V	100 - 300	.0010" - .0020"	.0020" - .0030"	.0020" - .0030"	.0020" - .0040"	.0030" - .0050"

			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
	Cast Aluminum	380	90 - 150	.038 - .075	.050 - .100	.075 - .125	.075 - .150	.090 - .175
	Magnesium		75 - 150	.038 - .075	.050 - .100	.075 - .125	.075 - .150	.090 - .175
	Copper, Brass		75 - 120	.025 - .060	.050 - .075	.050 - .075	.050 - .100	.075 - .125
	Titanium	6Al-4V	30 - 90	.025 - .050	.050 - .075	.050 - .075	.050 - .100	.075 - .125



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

TECHNICAL

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



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 website, 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.

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Please see our Safety Data Sheet at sds.garrtool.com

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