



Vol. II

GENERAL PURPOSE

SOLID CARBIDE ENDMILLS



*New
Products*

**Corner
Radius**

Length	End Cut	No. of Flute	Series Description	Series No.	Page No.
Stub	Square	2	2 Flute Stub Length - Square End	EA302S	4
Stub	Square	4	4 Flute Stub Length - Square End	EA304S	4
Stub	Square	2	2 Flute Stub Length - Square End, ALTiN Coated	ZA302S	4
Stub	Square	4	4 Flute Stub Length - Square End, ALTiN Coated	ZA304S	4
Standard	Square	2	2 Flute Standard Length - Square End	EA302	5
Standard	Square	4	4 Flute Standard Length - Square End	EA304	5
Standard	Square	2	2 Flute Standard Length - Square End, ALTiN Coated	ZA302	6
Standard	Square	4	4 Flute Standard Length - Square End, ALTiN Coated	ZA304	6
Standard	Corner Radius	4	4 Flute Standard Length - Corner Radius, ALTiN Coated	ZR304	7
Standard	Ball	2	2 Flute Standard Length - Ball End	BA302	8
Standard	Ball	4	4 Flute Standard Length - Ball End	BA304	8
Standard	Ball	2	2 Flute Standard Length - Ball End, ALTiN Coated	ZB302	9
Standard	Ball	4	4 Flute Standard Length - Ball End, ALTiN Coated	ZB304	9
Long	Square	2	2 Flute Long Length - Square End	EA302L	10
Long	Square	4	4 Flute Long Length - Square End	EA304L	10
Long	Square	2	2 Flute Long Length - Square End, ALTiN Coated	ZA302L	10
Long	Square	4	4 Flute Long Length - Square End, ALTiN Coated	ZA304L	10
Long	Corner Radius	4	4 Flute Long Length - Corner Radius, ALTiN Coated	ZR304L	11
Extra Long	Square	2	2 Flute Extra Long Length - Square End	EA302X & LS	12
Extra Long	Square	4	4 Flute Extra Long Length - Square End	EA304X & LS	12
Extra Long	Square	2	2 Flute Extra Long Length - Square End, ALTiN Coated	ZA302X & LS	13
Extra Long	Square	4	4 Flute Extra Long Length - Square End, ALTiN Coated	ZA304X & LS	13
Extra Long	Corner Radius	4	4 Flute Extra Long Length - Corner Radius, ALTiN Coated	ZR304L	14
Extra Long	Ball	2	2 Flute Extra Long Length - Ball End	BA302X & LS	15
Extra Long	Ball	4	4 Flute Extra Long Length - Ball End	BA304X & LS	15
Extra Long	Ball	2	2 Flute Extra Long Length - Ball End, ALTiN Coated	ZB302X & LS	16
Extra Long	Ball	4	4 Flute Extra Long Length - Ball End, ALTiN Coated	ZB304X & LS	16

WIDIN offers a wide selection of high performance tools, see the 2016 Inch & Metric Catalogue or consult an authorized WIDIN sales representative for additional product offerings.

Aluminum

Catalogue	Series Number	Page	Series Description
2016 Inch & Metric	WAE, WAF & WAR	253 - 265	ALU-STAR - 2 & 3 Flute, Bright & DLC Coated
General Purpose	EA302	5	2 Flute Standard Length - Square End, Bright
General Purpose	BA302	8	2 Flute Standard Length - Ball End, Bright

Note: For different lengths see these series in S-Stub, L-Long Length, X-Extra Long Length and LS-Long Shank.

Stainless Steels

Catalogue	Series Number	Page	Series Description
2016 Inch & Metric	DS, SM & ZF	237 - 240	SUS-MATE - 2,3 & 4 Flute, Bright
General Purpose	ZR304	7	4 Flute Standard Length - Corner Radius, ALTiN Coated
General Purpose	ZR304	9	4 Flute Standard Length - Ball End, ALTiN Coated

Note: For different lengths see these series in S-Stub, L-Long Length, X-Extra Long Length and LS-Long Shank.

Tool Steels & Medium Alloys

Catalogue	Series Number	Page	Series Description
2016 Inch & Metric	XXE, XXB & XXR	120 - 128	X-STAR - 4 Flutes, ALTiN Coated
2016 Inch & Metric	DA, ZA & ZR	172 - 192	ZAMUS CLASSIC - 2,4 & 6 Flute, ALTiN Coated
General Purpose	ZA304	6	4 Flute Standard Length - Square End, ALTiN Coated
General Purpose	ZR304	7	4 Flute Standard Length - Corner Radius, ALTiN Coated
General Purpose	ZB304	9	4 Flute Standard Length - Ball End, ALTiN Coated

Note: For different lengths see these series in S-Stub, L-Long Length, X-Extra Long Length and LS-Long Shank.

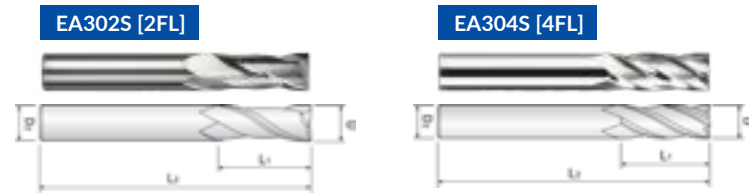
Hardened Tool Steels

Catalogue	Series Number	Page	Series Description
2016 Inch & Metric	DA, ZA & ZR	172 - 192	ZAMUS CLASSIC - 2,4 & 6 Flutes
2016 Inch & Metric	DA,DB,ZE, ZS & ZR	28 - 89	ZAMUS STAR - 2,3 & 4 Flutes, ALTiN+HH Coated
General Purpose	ZA304	6	4 Flute Standard Length - Square End, ALTiN Coated
General Purpose	ZR304	7	4 Flute Standard Length - Corner Radius, ALTiN Coated
General Purpose	ZB304	9	4 Flute Standard Length - Ball End, ALTiN Coated

Note: For different lengths see these series in S-Stub, L-Long Length, X-Extra Long Length and LS-Long Shank.

Stub | Square End

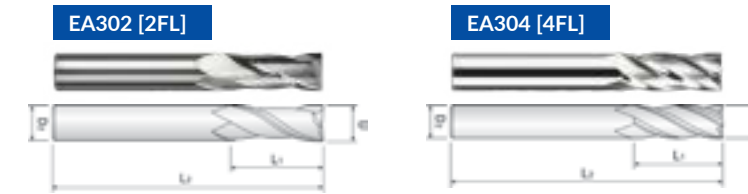
- Center Cutting - Micro Grain Carbide End Mill
- More Rigidity - Shorter Flute Length
- Slotting & Milling



2 FL. SERIES #	4 FL. SERIES #	D			L ₂ Overall Length INCH	L ₁ Flute Length INCH	D ₂ Shank Diameter INCH	LIST PRICE
		DECIMAL INCH	FRACTION INCH	METRIC MM				
	EA304004S	0.0625	1/16	1.588	1 1/2	1/8	1/8	\$4.95
	EA304006S	0.0938	3/32	2.383	1 1/2	3/16	1/8	\$4.95
EA302008S	EA304008S	0.1250	1/8	3.175	1 1/2	1/4	1/8	\$4.61
	EA304010S	0.1562	5/32	3.967	2	5/16	3/16	\$7.17
EA302012S	EA304012S	0.1875	3/16	4.763	2	3/8	3/16	\$6.78
	EA304014S	0.2188	7/32	5.558	2 1/2	5/8	1/4	\$8.71
EA302016S	EA304016S	0.2500	1/4	6.350	2 1/2	1/2	1/4	\$8.59
EA302020S	EA304020S	0.3125	5/16	7.938	2 1/2	1/2	5/16	\$8.59
EA302024S	EA304024S	0.3750	3/8	9.525	2 1/2	9/16	3/8	\$13.32
	EA304028S	0.4375	7/16	11.113	2 1/2	9/16	7/16	\$20.11
EA302032S	EA304032S	0.5000	1/2	12.700	3	5/8	1/2	\$23.88

Standard | Square End

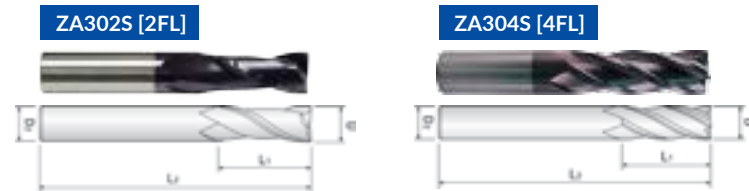
- Center Cutting - Micro Grain Carbide End Mill
- Slotting & Milling



2 FL. SERIES #	4 FL. SERIES #	D			L ₂ Overall Length INCH	L ₁ Flute Length INCH	D ₂ Shank Diameter INCH	LIST PRICE
		DECIMAL INCH	FRACTION INCH	METRIC MM				
EA302001	EA304001	0.0156	1/64	0.397	1 1/2	1/32	1/8	\$9.37
EA302002	EA304002	0.0312	1/32	0.792	1 1/2	5/64	1/8	\$5.81
EA302003	EA304003	0.0469	3/64	1.191	1 1/2	7/64	1/8	\$5.81
EA302004	EA304004	0.0625	1/16	1.588	1 1/2	3/16	1/8	\$4.37
EA302005	EA304005	0.0781	5/64	1.984	1 1/2	1/4	1/8	\$4.37
EA302006	EA304006	0.0938	3/32	2.383	1 1/2	5/16	1/8	\$4.37
EA302007	EA304007	0.1094	7/64	2.779	1 1/2	3/8	1/8	\$4.95
EA302008	EA304008	0.1250	1/8	3.175	1 1/2	1/2	1/8	\$4.61
EA302009	EA304009	0.1406	9/64	3.571	2	1/2	3/16	\$6.33
EA302010	EA304010	0.1562	5/32	3.967	2	9/16	3/16	\$6.33
EA302011	EA304011	0.1719	11/64	4.366	2	9/16	3/16	\$6.33
EA302012	EA304012	0.1875	3/16	4.763	2	5/8	3/16	\$6.38
EA302013	EA304013	0.2031	13/64	5.159	2 1/2	5/8	1/4	\$9.02
EA302014	EA304014	0.2188	7/32	5.558	2 1/2	5/8	1/4	\$9.62
EA302015	EA304015	0.2344	15/64	5.954	2 1/2	3/4	1/4	\$9.62
EA302016	EA304016	0.2500	1/4	6.350	2 1/2	3/4	1/4	\$8.03
EA302018	EA304018	0.2656	9/32	7.142	2 1/2	3/4	5/16	\$12.39
EA302020	EA304020	0.3125	5/16	7.938	2 1/2	13/16	5/16	\$11.18
EA302022	EA304022	0.3438	11/32	8.733	2 1/2	7/8	3/8	\$14.62
EA302024	EA304024	0.3750	3/8	9.525	2 1/2	1	3/8	\$13.64
EA302026	EA304026	0.4062	13/32	10.317	3	1	7/16	\$21.06
EA302028	EA304028	0.4375	7/16	11.113	3	1	7/16	\$19.05
EA302030	EA304030	0.4688	15/32	11.908	3	1	1/2	\$25.28
EA302032	EA304032	0.5000	1/2	12.700	3	1	1/2	\$23.28
EA302036	EA304036	0.5625	9/16	14.288	3 1/2	1 1/8	9/16	\$35.65
EA302040	EA304040	0.6250	5/8	15.875	3 1/2	1 1/4	5/8	\$43.28
EA302044	EA304044	0.6875	11/16	17.463	4	1 3/8	3/4	\$69.21
EA302048	EA304048	0.7500	3/4	19.050	4	1 1/2	3/4	\$66.03
EA302056	EA304056	0.8750	7/8	22.225	4	1 1/2	7/8	\$95.32
EA302064	EA304064	1.0000	1	25.400	4	1 1/2	1	\$107.50

Stub | Square End | ALTiN Coating

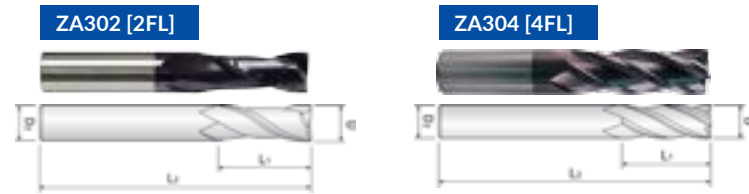
- Center Cutting - Micro Grain Carbide End Mill
- More Rigidity - Shorter Flute Length
- Enhanced Tool Life
- Slotting & Milling



2 FL. SERIES #	4 FL. SERIES #	D			L ₂ Overall Length INCH	L ₁ Flute Length INCH	D ₂ Shank Diameter INCH	LIST PRICE
		DECIMAL INCH	FRACTION INCH	METRIC MM				
	ZA304004S	0.0625	1/16	1.588	1 1/2	1/8	1/8	\$6.55
	ZA304006S	0.0938	3/32	2.383	1 1/2	3/16	1/8	\$6.55
ZA302008S	ZA304008S	0.1250	1/8	3.175	1 1/2	1/4	1/8	\$6.21
	ZA304010S	0.1562	5/32	3.967	2	5/16	3/16	\$8.77
ZA302012S	ZA304012S	0.1875	3/16	4.763	2	3/8	3/16	\$8.38
	ZA304014S	0.2188	7/32	5.558	2 1/2	5/8	1/4	\$11.13
ZA302016S	ZA304016S	0.2500	1/4	6.350	2 1/2	1/2	1/4	\$11.15
ZA302020S	ZA304020S	0.3125	5/16	7.938	2 1/2	1/2	5/16	\$15.32
ZA302024S	ZA304024S	0.3750	3/8	9.525	2 1/2	9/16	3/8	\$17.79
	ZA304028S	0.4375	7/16	11.113	2 1/2	9/16	7/16	\$25.70
ZA302032S	ZA304032S	0.5000	1/2	12.700	3	5/8	1/2	\$29.47

Standard | Square End | ALTiN Coating

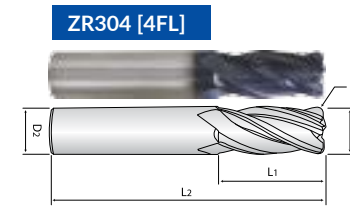
- Center Cutting - Micro Grain Carbide End Mill
- Enhanced Tool Life
- Slotting & Milling



2 FL. SERIES #	4 FL. SERIES #	D			L ₂ Overall Length INCH	L ₁ Flute Length INCH	D ₂ Shank Diameter INCH	LIST PRICE
		DECIMAL INCH	FRACTION INCH	METRIC MM				
ZA302001	ZA304001	0.0156	1/64	0.397	1 1/2	1/32	1/8	\$10.87
ZA302002	ZA304002	0.0312	1/32	0.792	1 1/2	5/64	1/8	\$6.97
ZA302003	ZA304003	0.0469	3/64	1.191	1 1/2	7/64	1/8	\$6.97
ZA302004	ZA304004	0.0625	1/16	1.588	1 1/2	3/16	1/8	\$6.16
ZA302005	ZA304005	0.0781	5/64	1.984	1 1/2	1/4	1/8	\$6.16
ZA302006	ZA304006	0.0938	3/32	2.383	1 1/2	5/16	1/8	\$6.16
ZA302007	ZA304007	0.1094	7/64	2.779	1 1/2	3/8	1/8	\$6.16
ZA302008	ZA304008	0.1250	1/8	3.175	1 1/2	1/2	1/8	\$5.48
ZA302009	ZA304009	0.1406	9/64	3.571	2	1/2	3/16	\$8.26
ZA302010	ZA304010	0.1562	5/32	3.967	2	9/16	3/16	\$8.26
ZA302011	ZA304011	0.1719	11/64	4.366	2	9/16	3/16	\$8.26
ZA302012	ZA304012	0.1875	3/16	4.763	2	5/8	3/16	\$7.88
ZA302013	ZA304013	0.2031	13/64	5.159	2 1/2	5/8	1/4	\$11.90
ZA302014	ZA304014	0.2188	7/32	5.558	2 1/2	5/8	1/4	\$11.90
ZA302015	ZA304015	0.2344	15/64	5.954	2 1/2	3/4	1/4	\$11.90
ZA302016	ZA304016	0.2500	1/4	6.350	2 1/2	3/4	1/4	\$10.17
ZA302018	ZA304018	0.2656	9/32	7.142	2 1/2	3/4	5/16	\$17.42
ZA302020	ZA304020	0.3125	5/16	7.938	2 1/2	13/16	5/16	\$16.13
ZA302022	ZA304022	0.3438	11/32	8.733	2 1/2	7/8	3/8	\$19.79
ZA302024	ZA304024	0.3750	3/8	9.525	2 1/2	1	3/8	\$18.75
ZA302026	ZA304026	0.4062	13/32	10.317	3	1	7/16	\$27.73
ZA302028	ZA304028	0.4375	7/16	11.113	3	1	7/16	\$25.58
ZA302030	ZA304030	0.4688	15/32	11.908	3	1	1/2	\$32.22
ZA302032	ZA304032	0.5000	1/2	12.700	3	1	1/2	\$24.45
ZA302036	ZA304036	0.5625	9/16	14.288	3 1/2	1 1/8	9/16	\$46.51
ZA302040	ZA304040	0.6250	5/8	15.875	3 1/2	1 1/4	5/8	\$54.65
ZA302044	ZA304044	0.6875	11/16	17.463	4	1 3/8	3/4	\$83.93
ZA302048	ZA304048	0.7500	3/4	19.050	4	1 1/2	3/4	\$80.86
ZA302056	ZA304056	0.8750	7/8	22.225	4	1 1/2	7/8	\$111.77
ZA302064	ZA304064	1.0000	1	25.400	4	1 1/2	1	\$129.24

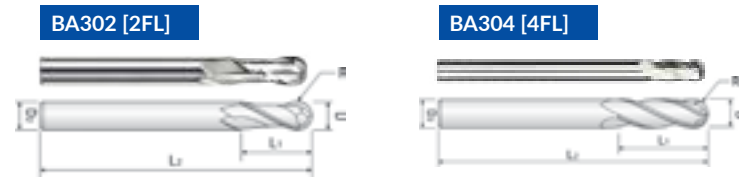
Standard | Corner Radius | ALTiN Coating

- Center Cutting - Micro Grain Carbide End Mill
- Enhanced Tool Life
- Stronger Tool Corners

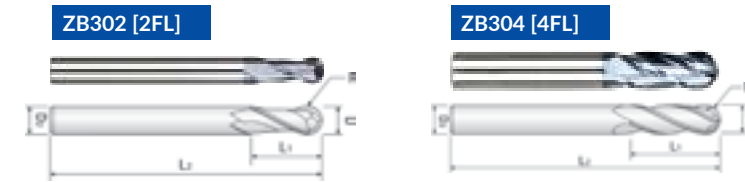


4 FL. SERIES #	D			L ₂ Overall Length INCH	L ₁ Flute Length INCH	R Corner Radius INCH	D ₂ Shank Diameter INCH	LIST PRICE
	DECIMAL INCH	FRACTION INCH	METRIC MM					
ZR304A008010	0.1250	1/8	3.175	1 1/2	1/2	0.010	1/8	\$6.97
ZR304A008020	0.1250	1/8	3.175	1 1/2	1/2	0.020	1/8	\$6.97
ZR304A012010	0.1875	3/16	4.763	2	5/8	0.010	3/16	\$10.19
ZR304A012020	0.1875	3/16	4.763	2	5/8	0.020	3/16	\$10.19
ZR304A012030	0.1875	3/16	4.763	2	5/8	0.030	3/16	\$10.19
ZR304A016010	0.2500	1/4	6.350	2 1/2	3/4	0.010	1/4	\$11.50
ZR304A016020	0.2500	1/4	6.350	2 1/2	3/4	0.020	1/4	\$11.50
ZR304A016030	0.2500	1/4	6.350	2 1/2	3/4	0.030	1/4	\$11.50
ZR304A016045	0.2500	1/4	6.350	2 1/2	3/4	0.045	1/4	\$11.50
ZR304A020020	0.3125	5/16	7.938	2 1/2	13/16	0.020	5/16	\$17.38
ZR304A020030	0.3125	5/16	7.938	2 1/2	13/16	0.030	5/16	\$17.38
ZR304A020045	0.3125	5/16	7.938	2 1/2	13/16	0.045	5/16	\$17.38
ZR304A024010	0.3750	3/8	9.525	2 1/2	1	0.010	3/8	\$20.45
ZR304A024020	0.3750	3/8	9.525	2 1/2	1	0.020	3/8	\$20.45
ZR304A024030	0.3750	3/8	9.525	2 1/2	1	0.030	3/8	\$20.45
ZR304A024045	0.3750	3/8	9.525	2 1/2	1	0.045	3/8	\$20.45
ZR304A032010	0.5000	1/2	12.700	3	1	0.010	1/2	\$26.85
ZR304A032015	0.5000	1/2	12.700	3	1	0.015	1/2	\$26.85
ZR304A032020	0.5000	1/2	12.700	3	1	0.020	1/2	\$26.85
ZR304A032030	0.5000	1/2	12.700	3	1	0.030	1/2	\$26.85
ZR304A032060	0.5000	1/2	12.700	3	1	0.060	1/2	\$26.85
ZR304A040030	0.6250	5/8	15.875	3 1/2	1 1/4	0.030	5/8	\$58.61
ZR304A040060	0.6250	5/8	15.875	3 1/2	1 1/4	0.060	5/8	\$58.61
ZR304A040090	0.6250	5/8	15.875	3 1/2	1 1/4	0.090	5/8	\$58.61
ZR304A048030	0.7500	3/4	19.050	4	1 1/2	0.030	3/4	\$87.66
ZR304A048060	0.7500	3/4	19.050	4	1 1/2	0.060	3/4	\$87.66
ZR304A048090	0.7500	3/4	19.050	4	1 1/2	0.090	3/4	\$87.66
ZR304A064030	1.0000	1	25.400	4	1 1/2	0.030	1	\$136.59
ZR304A064060	1.0000	1	25.400	4	1 1/2	0.060	1	\$136.59

- Center Cutting - Micro Grain Carbide End Mill
- Slotting & Milling



2 FL. SERIES #	4 FL. SERIES #	D			L ₂ Overall Length INCH	L ₁ Flute Length INCH	D ₂ Shank Diameter INCH	LIST PRICE
		DECIMAL INCH	FRACTION INCH	METRIC MM				
BA302001	BA304001	0.0156	1/64	0.397	1 1/2	1/32	1/8	\$12.84
BA302002	BA304002	0.0312	1/32	0.792	1 1/2	5/64	1/8	\$7.46
BA302003	BA304003	0.0469	3/64	1.191	1 1/2	7/64	1/8	\$7.18
BA302004	BA304004	0.0625	1/16	1.588	1 1/2	3/16	1/8	\$6.08
BA302005	BA304005	0.0781	5/64	1.984	1 1/2	1/4	1/8	\$6.08
BA302006	BA304006	0.0938	3/32	2.383	1 1/2	5/16	1/8	\$6.08
BA302007	BA304007	0.1094	7/64	2.779	1 1/2	3/8	1/8	\$6.08
BA302008	BA304008	0.1250	1/8	3.175	1 1/2	1/2	1/8	\$5.85
BA302009	BA304009	0.1406	9/64	3.571	2	1/2	3/16	\$8.58
BA302010	BA304010	0.1562	5/32	3.967	2	9/16	3/16	\$8.58
BA302011	BA304011	0.1719	11/64	4.366	2	9/16	3/16	\$8.58
BA302012	BA304012	0.1875	3/16	4.763	2	5/8	3/16	\$7.95
BA302013	BA304013	0.2031	13/64	5.159	2 1/2	5/8	1/4	\$11.98
BA302014	BA304014	0.2188	7/32	5.558	2 1/2	5/8	1/4	\$11.98
BA302015	BA304015	0.2344	15/64	5.954	2 1/2	3/4	1/4	\$11.98
BA302016	BA304016	0.2500	1/4	6.350	2 1/2	3/4	1/4	\$11.25
BA302018	BA304018	0.2656	9/32	7.142	2 1/2	3/4	5/16	\$16.69
BA302020	BA304020	0.3125	5/16	7.938	2 1/2	13/16	5/16	\$15.32
BA302022	BA304022	0.3438	11/32	8.733	2 1/2	7/8	3/8	\$20.26
BA302024	BA304024	0.3750	3/8	9.525	2 1/2	1	3/8	\$20.61
BA302026	BA304026	0.4062	13/32	10.317	3	1	7/16	\$27.11
BA302028	BA304028	0.4375	7/16	11.113	3	1	7/16	\$25.73
BA302030	BA304030	0.4688	15/32	11.908	3	1	1/2	\$32.56
BA302032	BA304032	0.5000	1/2	12.700	3	1	1/2	\$30.54
BA302036	BA304036	0.5625	9/16	14.288	3 1/2	1 1/8	9/16	\$46.28
BA302040	BA304040	0.6250	5/8	15.875	3 1/2	1 1/4	5/8	\$55.02
BA302044	BA304044	0.6875	11/16	17.463	4	1 3/8	3/4	\$89.86
BA302048	BA304048	0.7500	3/4	19.050	4	1 1/2	3/4	\$83.18
BA302056	BA304056	0.8750	7/8	22.225	4	1 1/2	7/8	\$124.16
BA302064	BA304064	1.0000	1	25.400	4	1 1/2	1	\$132.68



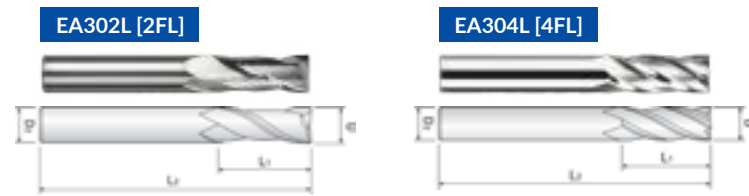
- Center Cutting - Micro Grain Carbide End Mill
- Enhanced Tool Life
- Slotting & Milling



2 FL. SERIES #	4 FL. SERIES #	D			L ₂ Overall Length INCH	L ₁ Flute Length INCH	D ₂ Shank Diameter INCH	LIST PRICE
		DECIMAL INCH	FRACTION INCH	METRIC MM				
ZB302001	ZB304001	0.0156	1/64	0.397	1 1/2	1/32	1/8	\$14.09
ZB302002	ZB304002	0.0312	1/32	0.792	1 1/2	5/64	1/8	\$8.84
ZB302003	ZB304003	0.0469	3/64	1.191	1 1/2	7/64	1/8	\$8.58
ZB302004	ZB304004	0.0625	1/16	1.588	1 1/2	3/16	1/8	\$7.50
ZB302005	ZB304005	0.0781	5/64	1.984	1 1/2	1/4	1/8	\$7.50
ZB302006	ZB304006	0.0938	3/32	2.383	1 1/2	5/16	1/8	\$7.50
ZB302007	ZB304007	0.1094	7/64	2.779	1 1/2	3/8	1/8	\$7.50
ZB302008	ZB304008	0.1250	1/8	3.175	1 1/2	1/2	1/8	\$7.28
ZB302009	ZB304009	0.1406	9/64	3.571	2	1/2	3/16	\$9.94
ZB302010	ZB304010	0.1562	5/32	3.967	2	9/16	3/16	\$9.94
ZB302011	ZB304011	0.1719	11/64	4.366	2	9/16	3/16	\$9.94
ZB302012	ZB304012	0.1875	3/16	4.763	2	5/8	3/16	\$9.32
ZB302013	ZB304013	0.2031	13/64	5.159	2 1/2	5/8	1/4	\$14.06
ZB302014	ZB304014	0.2188	7/32	5.558	2 1/2	5/8	1/4	\$14.06
ZB302015	ZB304015	0.2344	15/64	5.954	2 1/2	3/4	1/4	\$14.06
ZB302016	ZB304016	0.2500	1/4	6.350	2 1/2	3/4	1/4	\$13.35
ZB302018	ZB304018	0.2656	9/32	7.142	2 1/2	3/4	5/16	\$16.29
ZB302020	ZB304020	0.3125	5/16	7.938	2 1/2	13/16	5/16	\$19.33
ZB302022	ZB304022	0.3438	11/32	8.733	2 1/2	7/8	3/8	\$24.14
ZB302024	ZB304024	0.3750	3/8	9.525	2 1/2	1	3/8	\$24.49
ZB302026	ZB304026	0.4062	13/32	10.317	3	1	7/16	\$31.93
ZB302028	ZB304028	0.4375	7/16	11.113	3	1	7/16	\$30.58
ZB302030	ZB304030	0.4688	15/32	11.908	3	1	1/2	\$37.25
ZB302032	ZB304032	0.5000	1/2	12.700	3	1	1/2	\$37.33
ZB302036	ZB304036	0.5625	9/16	14.288	3 1/2	1 1/8	9/16	\$48.79
ZB302040	ZB304040	0.6250	5/8	15.875	3 1/2	1 1/4	5/8	\$67.80
ZB302044	ZB304044	0.6875	11/16	17.463	4	1 3/8	3/4	\$106.51
ZB302048	ZB304048	0.7500	3/4	19.050	4	1 1/2	3/4	\$99.43
ZB302056	ZB304056	0.8750	7/8	22.225	4	1 1/2	7/8	\$145.36
ZB302064	ZB304064	1.0000	1	25.400	4	1 1/2	1	\$156.88

Long | Square End

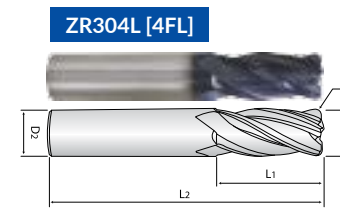
- Center Cutting - Micro Grain Carbide End Mill
- Longer Reach vs. Standard Length
- Slotting & Milling



2 FL. SERIES #	4 FL. SERIES #	D			L ₂ Overall Length INCH	L ₁ Flute Length INCH	D ₂ Shank Diameter INCH	LIST PRICE
		DECIMAL INCH	FRACTION INCH	METRIC MM				
EA302008L	EA304008L	0.1250	1/8	3.175	2 1/4	3/4	1/8	\$7.67
EA302012L	EA304012L	0.1875	3/16	4.763	2 1/4	3/4	3/16	\$8.97
EA302016L	EA304016L	0.2500	1/4	6.350	3	1 1/8	1/4	\$12.60
EA302020L	EA304020L	0.3125	5/16	7.938	3	1 1/8	5/16	\$16.80
EA302024L	EA304024L	0.3750	3/8	9.525	3 1/2	1 1/8	3/8	\$19.63
EA302028L	EA304028L	0.4375	7/16	11.113	4	1 1/2	7/16	\$33.87
EA302032L	EA304032L	0.5000	1/2	12.700	4	1 1/2	1/2	\$39.10
EA302040L	EA304040L	0.6250	5/8	15.875	5	2 1/4	5/8	\$81.30
EA302048L	EA304048L	0.7500	3/4	19.050	5	2 1/4	3/4	\$105.54
EA302064L	EA304064L	1.0000	1	25.400	5	2 1/4	1	\$172.51

Long | Corner Radius | ALTiN Coating

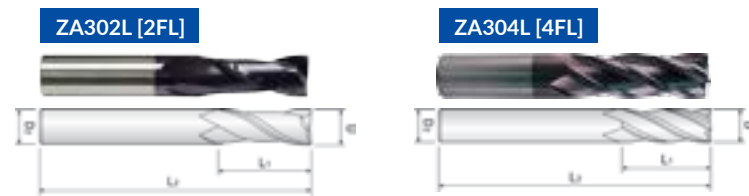
- Center Cutting - Micro Grain Carbide End Mill
- Longer Reach vs. Standard Length
- Enhanced Tool Life
- Stronger Tool Corners



4 FL. SERIES #	D			L ₂ Overall Length INCH	L ₁ Flute Length INCH	R Corner Radius INCH	D ₂ Shank Diameter INCH	LIST PRICE
	DECIMAL INCH	FRACTION INCH	METRIC MM					
ZR304A012010L	0.1875	3/16	4.763	3	1 1/8	0.010	3/16	\$12.86
ZR304A012020L	0.1875	3/16	4.763	3	1 1/8	0.020	3/16	\$12.86
ZR304A012030L	0.1875	3/16	4.763	3	1 1/8	0.030	3/16	\$12.86
ZR304A016010L	0.2500	1/4	6.350	3	1 1/8	0.010	1/4	\$18.35
ZR304A016020L	0.2500	1/4	6.350	3	1 1/8	0.020	1/4	\$18.35
ZR304A016030L	0.2500	1/4	6.350	3	1 1/8	0.030	1/4	\$18.35
ZR304A016045L	0.2500	1/4	6.350	3	1 1/8	0.045	1/4	\$18.35
ZR304A020020L	0.3125	5/16	7.938	3	1 1/8	0.020	5/16	\$24.59
ZR304A020030L	0.3125	5/16	7.938	3	1 1/8	0.030	5/16	\$24.59
ZR304A020045L	0.3125	5/16	7.938	3	1 1/8	0.045	5/16	\$24.59
ZR304A024010L	0.3750	3/8	9.525	3 1/2	1 1/8	0.010	3/8	\$28.44
ZR304A024020L	0.3750	3/8	9.525	3 1/2	1 1/8	0.020	3/8	\$28.44
ZR304A024030L	0.3750	3/8	9.525	3 1/2	1 1/8	0.030	3/8	\$28.44
ZR304A024045L	0.3750	3/8	9.525	3 1/2	1 1/8	0.045	3/8	\$28.44
ZR304A032010L	0.5000	1/2	12.700	4	1 1/2	0.010	1/2	\$49.89
ZR304A032015L	0.5000	1/2	12.700	4	1 1/2	0.015	1/2	\$49.89
ZR304A032020L	0.5000	1/2	12.700	4	1 1/2	0.020	1/2	\$49.89
ZR304A032030L	0.5000	1/2	12.700	4	1 1/2	0.030	1/2	\$49.89
ZR304A032060L	0.5000	1/2	12.700	4	1 1/2	0.060	1/2	\$49.89
ZR304A040030L	0.6250	5/8	15.875	5	2 1/4	0.030	5/8	\$97.70
ZR304A040060L	0.6250	5/8	15.875	5	2 1/4	0.060	5/8	\$97.70
ZR304A040090L	0.6250	5/8	15.875	5	2 1/4	0.090	5/8	\$97.70
ZR304A048030L	0.7500	3/4	19.050	5	2 1/4	0.030	3/4	\$123.32
ZR304A048060L	0.7500	3/4	19.050	5	2 1/4	0.060	3/4	\$123.32
ZR304A048090L	0.7500	3/4	19.050	5	2 1/4	0.090	3/4	\$123.32
ZR304A064030L	1.0000	1	25.400	5	2 1/4	0.030	1	\$189.25
ZR304A064060L	1.0000	1	25.400	5	2 1/4	0.060	1	\$189.25

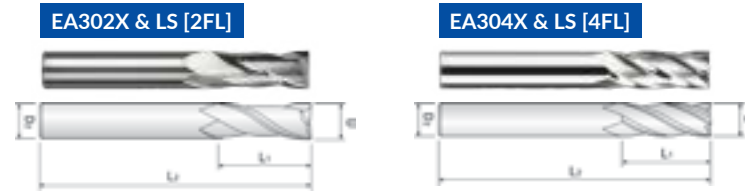
Long | Square End | ALTiN Coating

- Center Cutting - Micro Grain Carbide End Mill
- Longer Reach vs. Standard Length
- Enhanced Tool Life
- Slotting & Milling



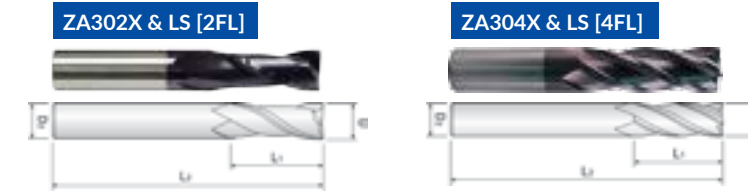
2 FL. SERIES #	4 FL. SERIES #	D			L ₂ Overall Length INCH	L ₁ Flute Length INCH	D ₂ Shank Diameter INCH	LIST PRICE
		DECIMAL INCH	FRACTION INCH	METRIC MM				
ZA302008L	ZA304008L	0.1250	1/8	3.175	2 1/4	3/4	1/8	\$8.98
ZA302012L	ZA304012L	0.1875	3/16	4.763	2 1/4	3/4	3/16	\$11.18
ZA302016L	ZA304016L	0.2500	1/4	6.350	3	1 1/8	1/4	\$15.95
ZA302020L	ZA304020L	0.3125	5/16	7.938	3	1 1/8	5/16	\$21.38
ZA302024L	ZA304024L	0.3750	3/8	9.525	3 1/2	1 1/8	3/8	\$24.73
ZA302028L	ZA304028L	0.4375	7/16	11.113	4	1 1/2	7/16	\$37.22
ZA302032L	ZA304032L	0.5000	1/2	12.700	4	1 1/2	1/2	\$49.89
ZA302040L	ZA304040L	0.6250	5/8	15.875	5	2 1/4	5/8	\$96.28
ZA302048L	ZA304048L	0.7500	3/4	19.050	5	2 1/4	3/4	\$121.53
ZA302064L	ZA304064L	1.0000	1	25.400	5	2 1/4	1	\$186.51

- Center Cutting - Micro Grain Carbide End Mill
- Extra Long Overall Length
- Slotting & Milling



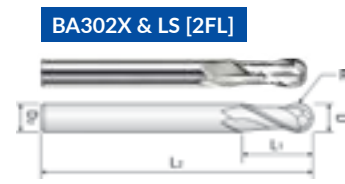
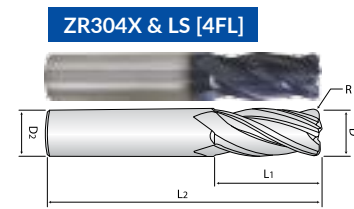
2 FL. SERIES #	4 FL. SERIES #	D			L ₂ Overall Length INCH	L ₁ Flute Length INCH	D ₂ Shank Diameter INCH	LIST PRICE
		DECIMAL INCH	FRACTION INCH	METRIC MM				
EA302008X	EA304008X	0.1250	1/8	3.175	3	1	1/8	\$8.95
EA302012X	EA304012X	0.1875	3/16	4.763	3	1 1/8	3/16	\$11.50
EA302012LS	EA304012LS	0.1875	3/16	4.763	4	1 1/2	3/16	\$15.69
EA302016X	EA304016X	0.2500	1/4	6.350	4	1 1/2	1/4	\$18.25
EA302016LS	EA304016LS	0.2500	1/4	6.350	6	1 1/2	1/4	\$29.77
EA302020X	EA304020X	0.3125	5/16	7.938	4	1 5/8	5/16	\$22.03
EA302024X	EA304024X	0.3750	3/8	9.525	4	1 3/4	3/8	\$28.17
EA302024LS	EA304024LS	0.3750	3/8	9.525	6	2	3/8	\$41.88
EA302028X	EA304028X	0.4375	7/16	11.113	6	2	7/16	\$51.64
EA302032X	EA304032X	0.5000	1/2	12.700	6	2	1/2	\$61.26
EA302032LS	EA304032LS	0.5000	1/2	12.700	6	3	1/2	\$63.98
EA302040X	EA304040X	0.6250	5/8	15.875	6	3	5/8	\$105.56
EA302048X	EA304048X	0.7500	3/4	19.050	6	3	3/4	\$131.37
EA302064X	EA304064X	1.0000	1	25.400	6	3	1	\$215.92

- Center Cutting - Micro Grain Carbide End Mill
- Extra Long Overall Length
- Enhanced Tool Life
- Slotting & Milling

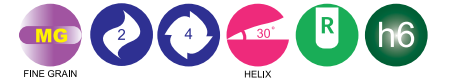


2 FL. SERIES #	4 FL. SERIES #	D			L ₂ Overall Length INCH	L ₁ Flute Length INCH	D ₂ Shank Diameter INCH	LIST PRICE
		DECIMAL INCH	FRACTION INCH	METRIC MM				
ZA302008X	ZA304008X	0.1250	1/8	3.175	3	1	1/8	\$10.79
ZA302012X	ZA304012X	0.1875	3/16	4.763	3	1 1/8	3/16	\$13.86
ZA302012LS	ZA304012LS	0.1875	3/16	4.763	4	1 1/2	3/16	\$19.10
ZA302016X	ZA304016X	0.2500	1/4	6.350	4	1 1/2	1/4	\$24.26
ZA302016LS	ZA304016LS	0.2500	1/4	6.350	6	1 1/2	1/4	\$38.77
ZA302020X	ZA304020X	0.3125	5/16	7.938	4	1 5/8	5/16	\$29.50
ZA302024X	ZA304024X	0.3750	3/8	9.525	4	1 3/4	3/8	\$34.64
ZA302024LS	ZA304024LS	0.3750	3/8	9.525	6	2	3/8	\$53.11
ZA302028X	ZA304028X	0.4375	7/16	11.113	6	2	7/16	\$64.21
ZA302032X	ZA304032X	0.5000	1/2	12.700	6	2	1/2	\$69.72
ZA302032LS	ZA304032LS	0.5000	1/2	12.700	6	3	1/2	\$72.30
ZA302040X	ZA304040X	0.6250	5/8	15.875	6	3	5/8	\$121.67
ZA302048X	ZA304048X	0.7500	3/4	19.050	6	3	3/4	\$150.31
ZA302064X	ZA304064X	1.0000	1	25.400	6	3	1	\$237.78

- Center Cutting - Micro Grain Carbide End Mill
- Extra Long Overall Length
- Enhanced Tool Life
- Stronger Tool Corners



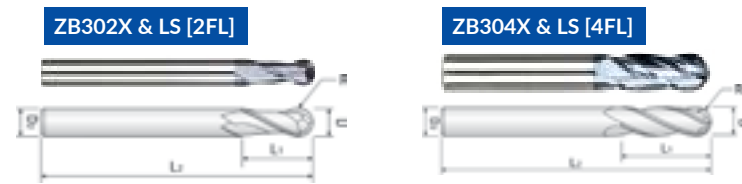
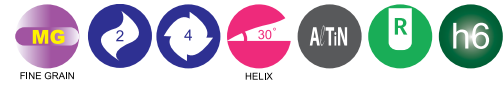
- Center Cutting - Micro Grain Carbide End Mill
- Extra Long Overall Length
- Slotting & Milling



4 FL. SERIES #	D			L ₂ Overall Length INCH	L ₁ Flute Length INCH	R Corner Radius INCH	D ₂ Shank Diameter INCH	LIST PRICE
	DECIMAL INCH	FRACTION INCH	METRIC MM					
ZR304A016010X	0.2500	1/4	6.350	4	1 1/2	0.010	1/4	\$25.02
ZR304A016020X	0.2500	1/4	6.350	4	1 1/2	0.020	1/4	\$25.02
ZR304A016030X	0.2500	1/4	6.350	4	1 1/2	0.030	1/4	\$25.02
ZR304A016045X	0.2500	1/4	6.350	4	1 1/2	0.045	1/4	\$25.02
ZR304A016010LS	0.2500	1/4	6.350	6	1 1/2	0.010	1/4	\$42.65
ZR304A016020LS	0.2500	1/4	6.350	6	1 1/2	0.020	1/4	\$42.65
ZR304A016030LS	0.2500	1/4	6.350	6	1 1/2	0.030	1/4	\$42.65
ZR304A016045LS	0.2500	1/4	6.350	6	1 1/2	0.045	1/4	\$42.65
ZR304A020020X	0.3125	5/16	7.938	4	1 5/8	0.020	5/16	\$30.42
ZR304A020030X	0.3125	5/16	7.938	4	1 5/8	0.030	5/16	\$30.42
ZR304A020045X	0.3125	5/16	7.938	4	1 5/8	0.045	5/16	\$30.42
ZR304A024010X	0.3750	3/8	9.525	4	1 3/4	0.010	3/8	\$35.72
ZR304A024020X	0.3750	3/8	9.525	4	1 3/4	0.020	3/8	\$35.72
ZR304A024030X	0.3750	3/8	9.525	4	1 3/4	0.030	3/8	\$35.72
ZR304A024045X	0.3750	3/8	9.525	4	1 3/4	0.045	3/8	\$35.72
ZR304A024010LS	0.3750	3/8	9.525	6	2	0.010	3/8	\$58.42
ZR304A024020LS	0.3750	3/8	9.525	6	2	0.020	3/8	\$58.42
ZR304A024030LS	0.3750	3/8	9.525	6	2	0.030	3/8	\$58.42
ZR304A024045LS	0.3750	3/8	9.525	6	2	0.045	3/8	\$58.42
ZR304A032010X	0.5000	1/2	12.700	6	2	0.010	1/2	\$67.67
ZR304A032015X	0.5000	1/2	12.700	6	2	0.015	1/2	\$67.67
ZR304A032020X	0.5000	1/2	12.700	6	2	0.020	1/2	\$67.67
ZR304A032030X	0.5000	1/2	12.700	6	2	0.030	1/2	\$67.67
ZR304A032060X	0.5000	1/2	12.700	6	2	0.060	1/2	\$67.67
ZR304A032010LS	0.5000	1/2	12.700	6	3	0.010	1/2	\$71.76
ZR304A032015LS	0.5000	1/2	12.700	6	3	0.015	1/2	\$71.76
ZR304A032020LS	0.5000	1/2	12.700	6	3	0.020	1/2	\$71.76
ZR304A032030LS	0.5000	1/2	12.700	6	3	0.030	1/2	\$71.76
ZR304A032060LS	0.5000	1/2	12.700	6	3	0.060	1/2	\$71.76
ZR304A040030X	0.6250	5/8	15.875	6	3	0.030	5/8	\$118.09
ZR304A040060X	0.6250	5/8	15.875	6	3	0.060	5/8	\$118.09
ZR304A040090X	0.6250	5/8	15.875	6	3	0.090	5/8	\$118.09
ZR304A048030X	0.7500	3/4	19.050	6	3	0.030	3/4	\$145.89
ZR304A048060X	0.7500	3/4	19.050	6	3	0.060	3/4	\$145.89
ZR304A048090X	0.7500	3/4	19.050	6	3	0.090	3/4	\$145.89
ZR304A064030X	1.0000	1	25.400	6	3	0.030	1	\$230.78
ZR304A064060X	1.0000	1	25.400	6	3	0.060	1	\$230.78

2 FL. SERIES #	4 FL. SERIES #	D			L ₂ Overall Length INCH	L ₁ Flute Length INCH	D ₂ Shank Diameter INCH	LIST PRICE
		DECIMAL INCH	FRACTION INCH	METRIC MM				
BA302008X	BA304008X	0.1250	1/8	3.175	3	1	1/8	\$10.87
BA302012X	BA304012X	0.1875	3/16	4.763	3	1 1/8	3/16	\$14.19
BA302012LS	BA304012LS	0.1875	3/16	4.763	4	1 1/2	3/16	\$33.60
BA302016X	BA304016X	0.2500	1/4	6.350	4	1 1/2	1/4	\$20.92
BA302016LS	BA304016LS	0.2500	1/4	6.350	6	1 1/2	1/4	\$35.38
BA302020X	BA304020X	0.3125	5/16	7.938	4	1 5/8	5/16	\$24.72
BA302024X	BA304024X	0.3750	3/8	9.525	4	1 3/4	3/8	\$30.09
BA302024LS	BA304024LS	0.3750	3/8	9.525	6	2	3/8	\$51.96
BA302028X	BA304028X	0.4375	7/16	11.113	6	2	7/16	\$54.97
BA302032X	BA304032X	0.5000	1/2	12.700	6	2	1/2	\$64.19
BA302032LS	BA304032LS	0.5000	1/2	12.700	6	3	1/2	\$67.28
BA302040X	BA304040X	0.6250	5/8	15.875	6	3	5/8	\$113.49
BA302048X	BA304048X	0.7500	3/4	19.050	6	3	3/4	\$141.26
BA302064X	BA304064X	1.0000	1	25.400	6	3	1	\$226.82

- Center Cutting - Micro Grain Carbide End Mill
- Extra Long Overall Length
- Enhanced Tool Life
- Slotting & Milling



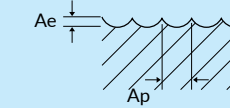
2 FL. SERIES #	4 FL. SERIES #	D			L ₂ Overall Length INCH	L ₁ Flute Length INCH	D ₂ Shank Diameter INCH	LIST PRICE
		DECIMAL INCH	FRACTION INCH	METRIC MM				
ZB302008X	ZB304008X	0.1250	1/8	3.175	3	1	1/8	\$13.38
ZB302012X	ZB304012X	0.1875	3/16	4.763	3	1 1/8	3/16	\$17.58
ZB302012LS	ZB304012LS	0.1875	3/16	4.763	4	1 1/2	3/16	\$29.66
ZB302016X	ZB304016X	0.2500	1/4	6.350	4	1 1/2	1/4	\$27.33
ZB302016LS	ZB304016LS	0.2500	1/4	6.350	6	1 1/2	1/4	\$45.20
ZB302020X	ZB304020X	0.3125	5/16	7.938	4	1 5/8	5/16	\$33.50
ZB302024X	ZB304024X	0.3750	3/8	9.525	4	1 3/4	3/8	\$42.25
ZB302024LS	ZB304024LS	0.3750	3/8	9.525	6	2	3/8	\$64.86
ZB302028X	ZB304028X	0.4375	7/16	11.113	6	2	7/16	\$80.68
ZB302032X	ZB304032X	0.5000	1/2	12.700	6	2	1/2	\$85.85
ZB302032LS	ZB304032LS	0.5000	1/2	12.700	6	3	1/2	\$90.62
ZB302040X	ZB304040X	0.6250	5/8	15.875	6	3	5/8	\$134.20
ZB302048X	ZB304048X	0.7500	3/4	19.050	6	3	3/4	\$155.26
ZB302064X	ZB304064X	1.0000	1	25.400	6	3	1	\$273.00

▪ ZB302 Series | General Speed Cutting

Material	Non-Alloyed Steels Alloy Steels · Cast Iron		Alloy Steels Heat Resistant Steels		Hardened Steels	
	~ HRc30		HRc30 ~ HRc40		HRc45 ~ HRc65	
Strength	~ 1000N/mm ²		1000 ~ 1250N/mm ²		1500N/mm ²	
Diameter (INCH)	RPM	FEED	RPM	FEED	RPM	FEED
R1/64 X 1/32	15760	9.80	12720	7.80	5800	3.80
R1/32 X 1/16	15760	13.80	12140	1.60	5320	4.70
R3/64 X 3/32	14400	29.50	10700	19.30	4680	5.90
R1/16 X 1/8	13100	26.70	10000	18.10	4520	5.90
R3/32 X 3/16	9140	32.30	7300	22.80	3680	7.10
R1/8 X 1/4	7780	33.00	6300	24.80	3160	7.50
R5/32 X 5/16	5260	37.50	4420	26.00	2100	7.50
R3/16 X 3/8	4620	40.10	3780	28.00	1780	7.50
R1/4 X 1/2	3780	35.40	2940	26.00	1360	7.50
R5/16 X 5/8	2740	36.20	2320	26.00	1160	7.50
R3/8 X 3/4	2100	33.00	1900	25.00	840	7.50

RPM = rev. / min.
FEED = inch / min.

Ae: D1/32~D1/4=.008 inch
D5/16~D3/4=.012 inch
Ap: 0.2 X D



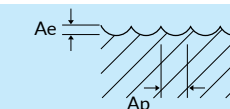
Ae: D1/32~D1/4=.008 inch
D5/16~D3/4=.012 inch
Ap: 0.1 X D

▪ ZB302 Series | High Speed Cutting

Material	Non-Alloyed Steels Alloy Steels · Cast Iron		Hardened Steels	
	~ HRc45		~ HRc65	
Strength	~ 1500N/mm ²		1500N/mm ²	
Diameter (INCH)	RPM	FEED	RPM	FEED
R1/64 X 1/32	25000	25.60	25000	15.70
R1/32 X 1/16	23000	27.50	23000	16.90
R3/64 X 3/32	21000	34.60	19000	19.30
R1/16 X 1/8	21000	39.40	17000	20.50
R3/32 X 3/16	21000	70.90	12000	23.60
R1/8 X 1/4	21000	90.90	10500	24.80
R5/32 X 5/16	15760	111.80	7880	29.10
R3/16 X 3/8	13660	120.00	6300	33.00
R1/4 X 1/2	10500	103.50	5260	33.00
R5/16 X 5/8	8200	103.50	3780	28.00
R3/8 X 3/4	6300	99.00	2940	20.80

RPM = rev. / min.
FEED = inch / min.

Ae: D1/32~D1/4=.008 inch
D5/16~D3/4=.012 inch
Ap: 0.05 X D



■ ZB304 Series | General Speed Cutting

Material	Carbon Steels · Alloy Steels · Cast Iron		Alloy Steels · Tool Steels		Hardened Steels	
Hardness	~ HRc30		HRc30 ~ HRc40		HRc55 ~ HRc65	
Strength	~ 1000N/mm ²		1000 ~ 1250N/mm ²		1500N/mm ²	
Diameter (INCH)	RPM	FEED	RPM	FEED	RPM	FEED
R1/16 X 1/8	13100	40.10	10000	27.00	4520	8.85
R3/32 X 3/16	9140	48.50	7300	34.00	3680	10.50
R1/8 X 1/4	7780	49.50	6300	37.00	3160	11.25
R5/32 X 5/16	5260	56.00	4420	39.00	2100	11.25
R3/16 X 3/8	4620	60.00	3780	42.00	1780	11.25
R1/4 X 1/2	3780	53.00	2940	39.00	1360	11.25
R5/16 X 5/8	2740	54.50	2320	38.50	1160	11.25

RPM = rev. / min.
FEED = inch / min.

Ae: D1/8~D1/4=.008 inch
D5/16~D5/8=.012 inch
Ap: 0.02 X D



Ae: D1/8~D1/4=.008 inch
D5/16~D5/8=.012 inch
Ap: 0.1 X D

■ ZA302 Series

Material	Carbon Steels · Alloy Steels · Cast Iron		Alloy Steels · Tool Steels		StainlessSteels		Hardened Steels		Hardened Steels	
Hardness	~ HRc30		HRc30 ~ HRc45				HRc45 ~ HRc55		HRc55 ~ HRc65	
Strength	~ 1000N/mm ²		1000 ~ 1500N/mm ²				1500 ~ 2000N/mm ²		2000N/mm ²	
Diameter (INCH)	RPM	FEED	RPM	FEED	RPM	FEED	RPM	FEED	RPM	FEED
1/16	11560	7.50	7560	4.70	6300	3.55	5040	1.40		
1/8	8920	8.25	5560	5.50	4620	4.70	3360	1.55	1900	1.55
3/16	6300	12.60	3780	7.50	3160	6.30	2320	1.95	1260	1.55
1/4	5560	13.80	3360	8.65	2840	7.10	2000	2.15	1100	1.55
5/16	4200	14.95	2520	7.85	2100	7.10	1680	2.95	840	1.55
3/8	3260	13.00	2000	6.30	1680	6.30	1360	2.35	680	1.40
1/2	2740	11.00	1680	5.10	1360	5.10	1160	2.15	560	1.40
5/8	2200	8.65	1360	4.30	1060	4.30	900	1.55	440	0.80
3/4	1680	6.70	1060	3.15	840	3.15	680	1.20	320	0.80
1	1360	5.10	840	2.75	680	2.35	540	0.80	260	0.60

RPM = rev. / min.
FEED = inch / min.

(Up to $\phi 1/8:0.2D$)




■ ZB304 Series | High Speed Cutting

Material	Carbon Steels · Alloy Steels · Cast Iron		Alloy Steels · Tool Steels	
Hardness	~ HRc45		HRc45 ~ HRc65	
Strength	~ 1500N/mm ²		~ 1500N/mm ²	
Diameter (INCH)	RPM	FEED	RPM	FEED
R1/16 X 1/8	21000	59.00	17000	30.50
R3/32 X 3/16	21000	106.25	12000	35.50
R1/8 X 1/4	21000	136.50	10500	37.00
R5/32 X 5/16	15760	167.50	7800	43.50
R3/16 X 3/8	13660	180.00	6300	49.50
R1/4 X 1/2	10500	155.50	5260	49.50
R5/16 X 5/8	8200	155.50	3780	42.00

RPM = rev. / min.
FEED = inch / min.

Ae: D1/8~D1/4=.008 inch
D5/16~D5/8=.012 inch
Ap: 0.05 X D



■ ZA304 Series

Material	Carbon Steels · Alloy Steels · Cast Iron		Alloy Steels · Tool Steels		StainlessSteels		Hardened Steels		Hardened Steels	
Hardness	~ HRc30		HRc30 ~ HRc45				HRc45 ~ HRc55		HRc55 ~ HRc65	
Strength	~ 1000N/mm ²		1000 ~ 1500N/mm ²				1500 ~ 2000N/mm ²		2000N/mm ²	
Diameter (INCH)	RPM	FEED	RPM	FEED	RPM	FEED	RPM	FEED	RPM	FEED
1/16	11560	11.00	7560	6.70	6300	5.50	5040	1.95		
1/8	8920	12.60	5560	7.85	4620	6.70	3360	2.35	1900	2.35
3/16	6300	23.60	3780	14.15	3160	11.80	2320	2.75	1260	2.35
1/4	5560	26.00	3360	16.15	2840	13.00	2000	3.15	1100	2.35
5/16	4200	27.95	2520	14.95	2100	13.80	1680	4.30	840	2.35
3/8	3260	24.00	2000	11.80	1680	11.80	1360	3.55	680	1.95
1/2	2740	20.50	1680	9.85	1360	9.45	1160	3.15	560	1.95
5/8	2200	16.15	1360	7.85	1060	7.85	900	2.35	440	1.20
3/4	1680	12.60	1060	6.30	840	5.90	680	1.55	320	1.20
1	1360	9.85	840	5.10	680	4.70	540	1.20	260	0.80

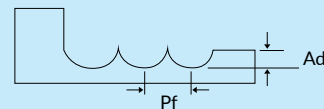
RPM = rev. / min.
FEED = inch / min.




■ BA302, BA304 Series

Material	Cast Iron		Mild Steels Carbon Steels		Alloys Steels, Tool Steels, Ti Steels (Annealed)		Hardened Steels, Prehardened Steels, Ti, Alloys (Solution Treated & Aged)		Hardened Steels, Prehardened Steels, Stainless Steels, Inconel, Ni Bases Alloys		Aluminium Alloys	
			Up to 750N/mm		Up to 30 HRc		30 to 38 HRc		38 to 45 HRc			
Hardness												
Strength												
Diameter (INCH)	RPM	FEED	RPM	FEED	RPM	FEED	RPM	FEED	RPM	FEED	RPM	FEED
1/32	19,600	4.8	19,600	4.5	14,680	2.5	12,200	1.2	9,780	0.9	50,000	6.8
3/64	14,140	5.2	14,140	4.8	10,305	3.0	8,620	1.5	6,885	1.0	35,535	8.0
1/16	11,115	5.8	11,115	5.1	8,045	3.4	6,720	1.7	5,360	1.2	29,585	9.8
5/64	8,090	6.3	8,090	5.4	5,780	3.7	4,810	1.8	3,840	1.4	23,630	11.7
3/32	6,970	6.5	6,970	5.7	4,965	3.9	4,140	1.9	3,290	1.4	20,420	11.8
7/64	5,920	6.7	5,920	6.0	4,205	4.1	3,520	1.9	2,795	1.4	17,325	11.8
1/8	5,090	7.2	5,090	6.1	3,610	4.3	3,030	1.9	2,400	1.4	14,945	11.8
9/64	4,545	7.9	4,545	6.2	3,225	4.3	2,690	1.9	2,140	1.4	13,470	11.8
5/32	4,000	8.6	4,000	6.3	2,850	4.3	2,360	1.9	1,875	1.4	11,990	11.8
11/64	3,670	9.2	3,670	6.6	2,620	4.3	2,160	1.9	1,725	1.4	11,020	12.7
3/16	3,360	9.6	3,360	6.9	2,405	4.4	1,970	1.9	1,580	1.4	10,090	13.6
13/64	3,090	10.1	3,090	7.1	2,205	4.4	1,810	1.9	1,455	1.4	9,275	14.2
7/32	2,870	10.4	2,870	7.1	2,045	4.3	1,690	1.9	1,360	1.4	8,630	14.2
1/4	2,520	11.3	2,520	6.9	1,775	4.2	1,490	1.9	1,205	1.4	7,570	14.6
9/32	2,260	12.5	2,260	6.4	1,580	4.1	1,350	1.9	1,080	1.4	6,785	15.5
5/16	1,995	13.6	1,995	5.9	1,390	4.0	1,200	1.9	960	1.4	6,000	16.4
11/32	1,820	13.7	1,820	5.8	1,290	4.0	1,100	1.9	880	1.4	5,495	16.5
3/8	1,655	13.7	1,655	5.7	1,200	4.0	1,005	1.9	800	1.4	5,020	16.5
13/32	1,515	13.7	1,515	5.6	1,110	3.9	920	1.9	735	1.4	4,610	16.9
7/16	1,420	13.7	1,420	5.4	1,030	3.7	855	1.9	690	1.4	4,300	17.8
1/2	1,250	13.7	1,250	5.2	900	3.5	750	1.9	600	1.4	3,750	18.9
9/16	1,120	13.9	1,120	5.2	795	3.5	660	1.9	530	1.4	3,290	18.5
5/8	1,005	13.9	1,005	5.2	720	3.5	590	1.9	470	1.4	2,960	16.7
11/16	915	13.9	915	5.2	650	3.5	540	1.9	430	1.4	2,715	16.5
3/4	820	12.9	820	5.2	580	3.5	485	1.9	380	1.4	2,415	16.5
7/8	710	11.2	710	5.2	510	3.5	425	1.8	335	1.4	2,100	16.5
1	630	9.8	630	5.1	440	3.5	370	1.6	300	1.4	1,830	16.3

RPM = rev. / min.
FEED = inch / min.



	Ad	pf
D < 1/8	0.1D	0.2D
1/8 ≤ D	0.3D	0.7D

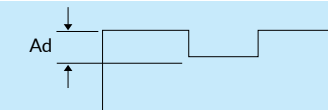
Note

- for 2Flute
 - Reduce Speeds & Feeds 25% for 2FL. Ball nose Long length
 - Reduce Speeds & Feeds 50% for 2FL. Ball nose Extra Long length
- for 4Flute
 - Increase Speeds & Feeds 40% for 4FL. Ball nose Standard & Stub length
 - Reduce Speeds 25% & Increase Feeds 10% for 4FL. Ball nose Long length

■ EA302 Series

Material	Cast Iron		Mild Steels Carbon Steels		Alloys Steels, Tool Steels, Ti Steels (Annealed)		Hardened Steels, Prehardened Steels, Ti, Alloys (Solution Treated & Aged)		Hardened Steels, Prehardened Steels, Stainless Steels, Inconel, Ni Bases Alloys		Aluminium Alloys	
			Up to 750N/mm		Up to 30 HRc		30 to 38 HRc		38 to 45 HRc			
Hardness												
Strength												
Diameter (INCH)	RPM	FEED	RPM	FEED	RPM	FEED	RPM	FEED	RPM	FEED	RPM	FEED
1/32	20,790	6.6	18,950	4.5	15,900	1.9	13,450	1.4	10,640	1.2	47,700	9.4
3/64	15,225	6.6	13,590	4.5	11,430	1.9	9,660	1.4	7,595	1.2	34,140	9.4
1/16	11,970	6.6	10,660	4.6	9,000	2.0	7,540	1.4	5,925	1.2	26,520	9.4
5/64	8,705	6.6	7,730	4.7	6,570	2.1	5,415	1.4	4,260	1.2	18,900	9.4
3/32	7,480	6.8	6,635	4.7	5,650	2.4	4,650	1.4	3,645	1.2	16,305	9.4
7/64	6,335	6.9	5,610	4.7	4,790	2.6	3,935	1.4	3,075	1.2	13,925	9.4
1/8	5,445	7.1	4,815	4.7	4,125	3.0	3,375	1.4	2,640	1.2	12,060	10.3
9/64	4,870	7.3	4,310	4.7	3,700	3.4	3,020	1.4	2,380	1.2	10,845	12.1
5/32	4,300	7.5	3,815	4.7	3,270	3.7	2,660	1.4	2,115	1.2	9,630	14.0
11/64	3,945	7.6	3,490	4.7	2,990	3.8	2,440	1.4	1,940	1.2	8,835	14.2
3/16	3,615	7.7	3,180	4.7	2,735	3.8	2,225	1.4	1,775	1.2	8,075	14.2
13/64	3,320	8.0	2,920	4.7	2,505	3.8	2,040	1.4	1,630	1.2	7,415	14.2
7/32	3,080	8.6	2,730	4.7	2,345	3.8	1,895	1.4	1,510	1.2	6,915	14.2
1/4	2,690	9.5	2,400	4.7	2,060	3.8	1,660	1.4	1,320	1.2	6,070	14.2
9/32	2,405	10.2	2,140	4.7	1,845	3.8	1,490	1.4	1,185	1.2	5,430	14.2
5/16	2,115	10.8	1,875	4.7	1,630	3.8	1,330	1.4	1,055	1.2	4,785	14.2
11/32	1,940	10.9	1,725	4.7	1,485	3.8	1,220	1.4	970	1.2	4,385	14.2
3/8	1,775	10.9	1,580	4.7	1,340	3.8	1,120	1.4	885	1.2	4,005	14.2
13/32	1,630	10.9	1,455	4.7	1,230	3.8	1,035	1.4	815	1.2	3,680	14.2
7/16	1,510	10.9	1,360	4.7	1,155	3.8	965	1.4	755	1.2	3,440	14.2
1/2	1,310	10.9	1,190	4.7	1,020	3.8	840	1.4	660	1.2	3,010	14.2
9/16	1,175	10.9	1,060	4.7	905	3.8	740	1.4	585	1.2	2,645	14.2
5/8	1,080	11.1	960	4.7	815	3.8	670	1.6	520	1.2	2,355	14.2
11/16	980	11.1	870	4.7	740	3.8	610	1.7	470	1.2	2,160	14.2
3/4	880	11.1	780	4.7	665	3.8	545	1.7	425	1.2	1,920	14.2
7/8	765	11.1	675	4.7	580	3.8	480	1.7	370	1.2	1,660	14.2
1	670	10.9	590	4.7	500	3.8	420	1.7	330	1.2	1,475	14.2

RPM = rev. / min.
FEED = inch / min.



	Ad
D < 1/8	0.3D
1/8 ≤ D	0.5D

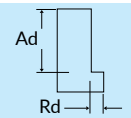
Note

- for 2Flute
 - Reduce Speeds & Feeds 25% for 2FL. Long length
 - Reduce Speeds & Feeds 50% for 2FL. Extra Long length
- for Side Milling
 - Increase Feeds 25% or More.

EA304 Series

Material	Cast Iron		Mild Steels Carbon Steels		Alloys Steels, Tool Steels, Ti Steels (Annealed)		Hardened Steels, Prehardened Steels, Ti, Alloys (Solution Treated & Aged)		Hardened Steels, Prehardened Steels, Stainless Steels, Inconel, Ni Bases Alloys		Aluminium Alloys	
			Up to 750N/mm		Up to 30 HRc		30 to 38 HRc		38 to 45 HRc			
Hardness												
Strength												
Diameter (INCH)	RPM	In/min	RPM	In/min	RPM	FEED	RPM	FEED	RPM	FEED	RPM	FEED
1/32	21,150	23.9	23,240	11.8	15,900	10.9	14,600	4.5	12,200	3.5	50,000	39.4
3/64	14,140	23.9	15,680	11.8	11,390	10.9	10,305	4.5	8,145	3.5	40,275	39.4
1/16	11,115	23.9	12,105	11.8	8,895	10.9	8,045	4.5	6,390	3.5	31,710	39.4
5/64	8,090	23.9	8,535	11.8	6,395	10.9	5,780	4.5	4,625	3.5	23,135	39.4
3/32	6,970	23.9	7,320	12.6	5,495	10.9	4,965	4.4	3,960	3.4	19,820	40.6
7/64	5,920	23.9	6,200	13.5	4,660	10.9	4,205	4.3	3,340	3.4	16,725	41.8
1/8	5,090	24.6	5,330	14.4	4,005	10.9	3,610	4.3	2,870	3.3	14,370	42.9
9/64	4,545	26.3	4,785	15.4	3,580	10.9	3,225	4.3	2,585	3.3	12,935	43.8
5/32	4,000	28.0	4,240	16.4	3,150	10.9	2,850	4.3	2,295	3.3	11,505	44.8
11/64	3,670	28.1	3,885	16.9	2,895	11.2	2,620	4.3	2,100	3.3	10,565	45.2
3/16	3,360	28.1	3,555	17.2	2,655	11.6	2,405	4.3	1,910	3.3	9,660	45.6
13/64	3,090	28.1	3,260	17.6	2,445	11.8	2,205	4.3	1,750	3.3	8,880	46.0
7/32	2,870	28.1	3,020	17.9	2,285	11.8	2,045	4.3	1,630	3.3	8,280	46.3
1/4	2,520	28.1	2,640	18.2	2,000	11.8	1,775	4.3	1,430	3.3	7,280	46.8
9/32	2,260	28.1	2,380	18.3	1,785	11.8	1,580	4.3	1,295	3.3	6,520	47.0
5/16	1,995	28.1	2,115	18.4	1,570	11.8	1,390	4.3	1,150	3.3	5,760	47.2
11/32	1,820	28.3	1,940	19.4	1,445	11.8	1,290	4.3	1,055	3.3	5,280	47.2
3/8	1,655	28.6	1,775	20.4	1,325	11.8	1,200	4.3	965	3.3	4,830	47.2
13/32	1,515	28.9	1,630	21.0	1,220	11.8	1,110	4.3	885	3.3	4,430	48.0
7/16	1,420	29.1	1,510	21.1	1,140	11.8	1,035	4.3	825	3.3	4,120	49.8
1/2	1,250	30.9	1,310	22.5	995	12.2	900	4.3	720	3.3	3,585	52.0
9/16	1,120	34.3	1,175	24.9	880	13.1	795	4.3	635	3.3	3,170	52.0
5/8	1,005	35.5	1,055	25.7	790	13.8	720	4.3	570	3.3	2,840	52.0
11/16	915	38.4	960	25.9	720	13.9	650	4.3	515	3.3	2,595	52.0
3/4	820	39.4	860	26.3	640	13.9	580	4.1	465	3.3	2,340	52.0
7/8	710	35.5	750	23.6	560	12.6	510	3.7	405	3.0	2,015	49.1
1	630	31.2	660	20.7	490	10.9	440	3.3	360	2.6	1,775	43.5

RPM = rev. / min.
FEED = inch / min.



Ad = 1.5D
Rd = 0.1D

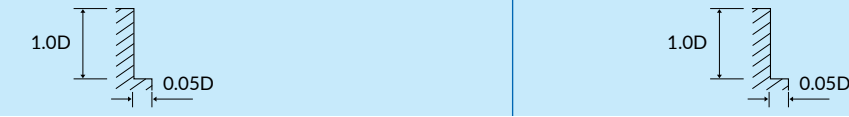
- Note**
- for 4Flute
 - Reduce Speeds & Feeds 25% for 4FL. Long length
 - Reduce Speeds & Feeds 50% for 4FL. Extra Long length
 - for Slot Milling
 - Reduce Feeds 20% to 50%



ZR304A Corner Radius Series

Material	Carbon Steels Alloy Steels · Cast Iron		Alloy Steels Tool Steels		Stainless Steels		Hardened Steels		Hardened Steels	
Hardness	~ HRc30		HRc30 ~ HRc45				HRc45 ~ HRc55		HRc55 ~ HRc65	
Strength	~ 1000N/mm ²		1000 ~ 1500N/mm ²				1500 ~ 2000N/mm ²		2000N/mm ²	
Diameter (INCH)	RPM	FEED	RPM	FEED	RPM	FEED	RPM	FEED	RPM	FEED
1/16	11560	11.00	7560	6.70	6300	5.50	5040	1.95		
1/8	8920	12.60	5560	7.85	4620	6.70	3360	2.35	1900	2.35
3/16	6300	23.60	3780	14.15	3160	11.80	2320	2.75	1260	2.35
1/4	5560	26.00	3360	16.15	2840	13.00	2000	3.15	1100	2.35
5/16	4200	27.95	2520	14.95	2100	13.80	1680	4.30	840	2.35
3/8	3260	24.00	2000	11.80	1680	11.80	1360	3.55	680	1.95
1/2	2740	20.50	1680	9.85	1360	9.45	1160	3.15	560	1.95
5/8	2200	16.15	1360	7.85	1060	7.85	900	2.35	440	1.20
3/4	1680	12.60	1060	6.30	840	5.90	680	1.55	320	1.20
1	1360	9.85	840	5.10	680	4.70	540	1.20	260	0.80

RPM = rev. / min.
FEED = inch / min.





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Radius**

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