

ALUFLASH™

SLOTING | RAMPING | HELICAL
INTERPOLATION | SIDE MILLING
DYNAMIC MILLING | PLUNGING

2021 INCH



HANITA



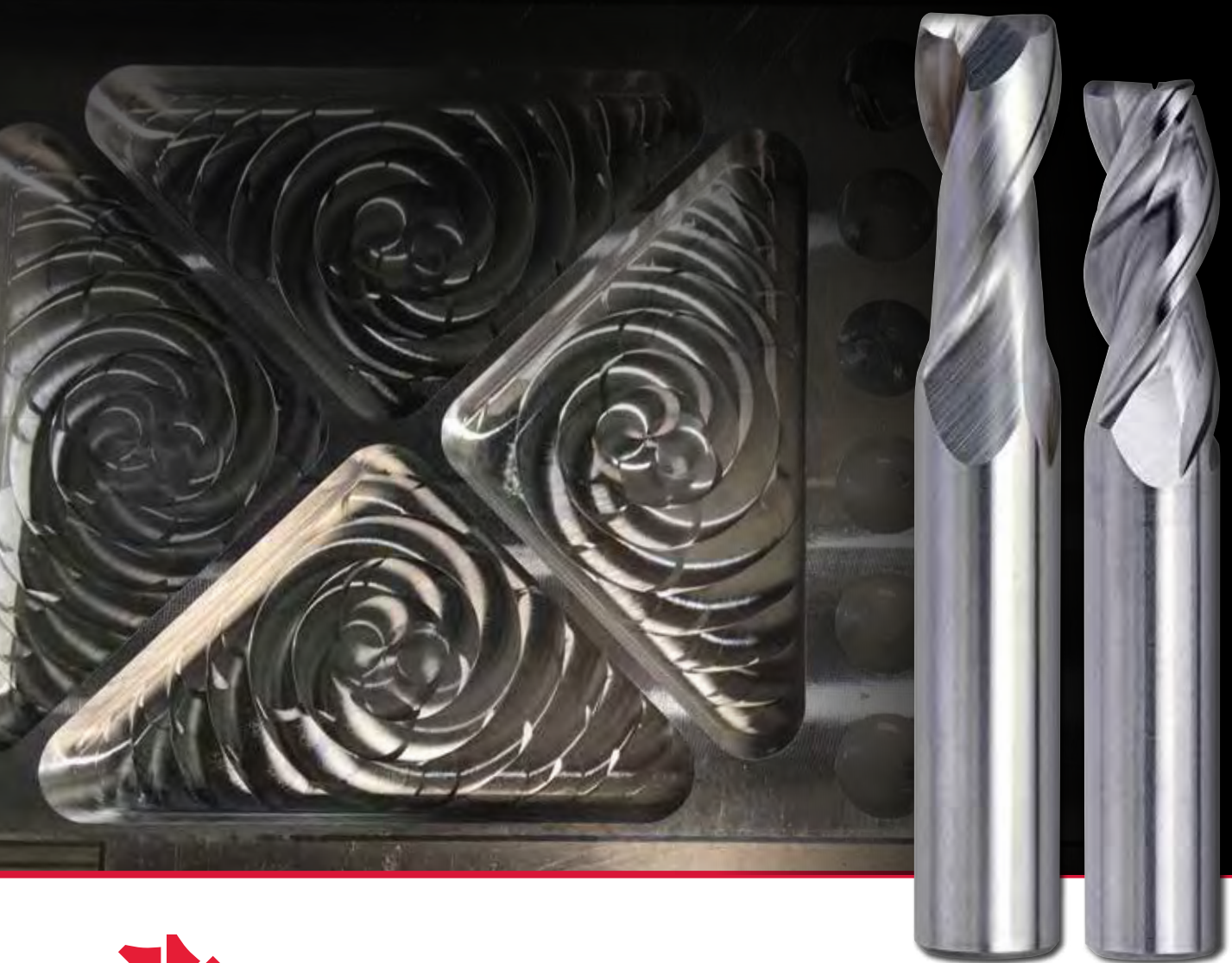
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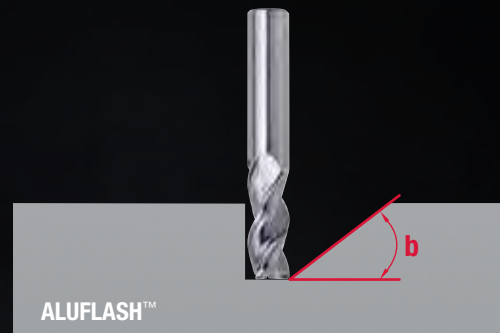
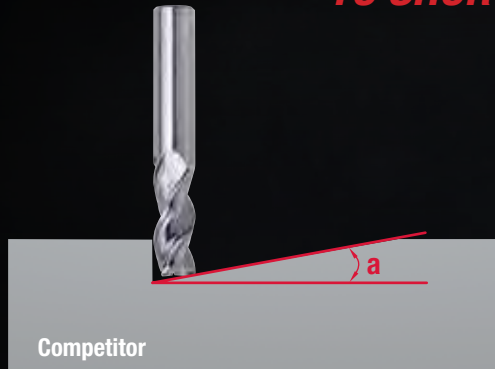
SAFE | ADVANCED | ACCELERATED

***EXPERIENCE ALUFLASH, A VIBRATION-FREE
TOOL FOR ALUMINUM MACHINING CAPABLE OF
ACHIEVING ADVANCED MILLING APPLICATIONS
AT ACCELERATED RPMs.***



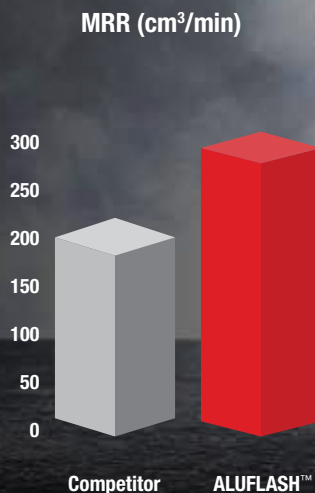
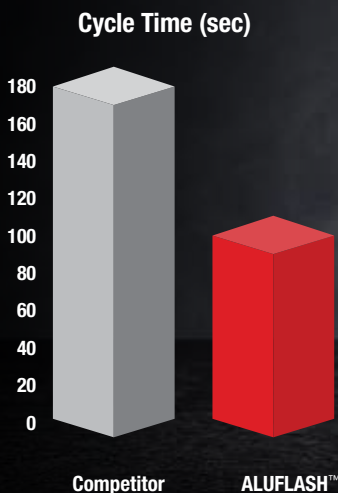
SAFE | ADVANCED | ACCELERATED

**RUN STEEPER RAMPING ANGLES
TO SHORTEN CYCLE TIME**



In this application, ALUFLASH™ was used to machine closed pockets.

In this application, the ALUFLASH™ dove to the bottom of the pocket faster than any other conventional tool, reducing the cycle time while keeping the same Vc and fz. Additionally, its great chip evacuation capability enabled the tool to take a larger radial DOC, dramatically increasing the MRR.



	Competitor	HANITA™
End Mill		ALUFLASH
Diameter	12mm (.472")	12mm (.472")
# flute	3	3
Grade		UNCOATED
Vc	650m/min (1950 sfm)	650m/min (1950 sfm)
rpm	17242 rev/min	17242 rev/min
fz	0,12mm/z (.0047 ipt)	0,12mm/z (.0047 ipt)
Vf	6207mm/min (244 ipm)	6207mm/min (244 ipm)
ap	24mm (.944")	24mm (.944")
ae	6mm (.236")	8mm (.314")
Ramping Angle	5°	30°

ALUFLASH™

*High-Performance Solid End Milling
for Aluminum*

Materials

N

Applications



Slotting



Side Milling/
Shoulder Milling



Ramping



Helical
Interpolation



Plunge Milling



Trochoidal Milling

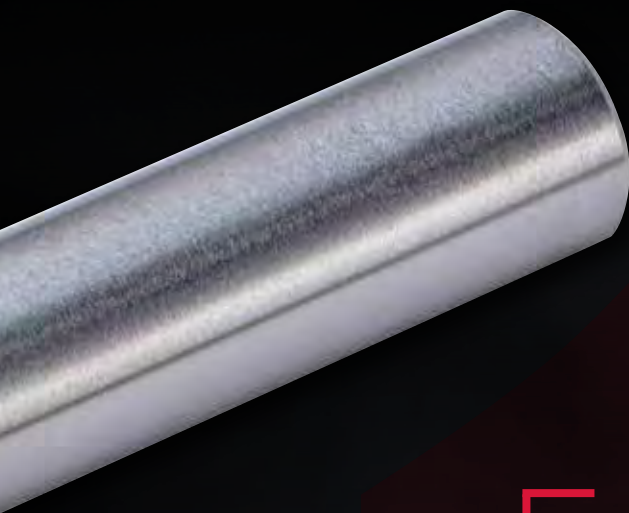


Drilling

UNCOATED

2- and 3-flute solid carbide end mill.
Diameter Range: 1mm–20mm (1/8-1")





Built-in features to enable accelerated aluminum machining.

Balanced by design
to guarantee limited vibration and a low spindle load at very high RPMs.

"W" flute shape
for improved chip formation and evacuation, increasing process security.

Parabolic core
for increased tool stability and reduced deflection and risk of breakage.

Double/Triple rake gashing
for improved chip evacuation and higher ramping capabilities and Z-axis machining.



SOLID END MILLING



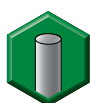
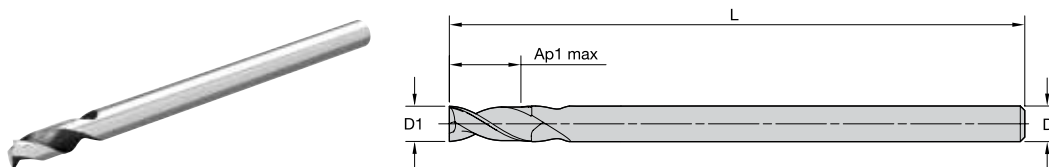
ALUFLASH • CATALOG NUMBERING SYSTEM

Each character in our catalog number signifies a specific trait of that product.
Use the following key columns and corresponding images to easily identify which attributes apply.

3AN9M12006RJT

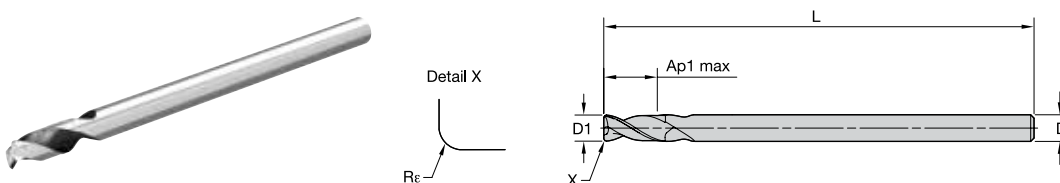
3A	N	9	M	120	0	6	R	J	T
Platform	Neck and Cutting Length	Shape/ Application	UOM	Cutting Diameter	Overall Length	Shank Size	Corner Style	Corner Size	Shank Style
2A = ALUFLASH 2 Flutes 3A = ALUFLASH 3 Flutes	0 = No Neck and Regular Cutting Length (approx 2 x D) 1 = No Neck - Long Cutting Length (approx 3 x D) 2 = No Neck - Longer Cutting Length (approx 5 x D) 3 = No Neck - Extended Cutting Length (approx 7 x D) N = Regular Neck approx 3 x D - Regular Cutting Length (approx 2 x D) L = Long Neck approx 4 x D - Regular Cutting Length (approx 2 x D) F = Extended Neck approx 5 x D - Regular Cutting Length (approx 2 x D) P = Neck - Longer Cutting Length (approx 3 x D) R = Neck - Extended Cutting Length (approx 5 x D)	9 = Specific for ISO N	M = Metric E = Inch	010 = 1.00mm 015 = 1.50mm 020 = 2.00mm 025 = 2.50mm 030 = 3.00mm (1/8") 035 = 3.50mm 040 = 4.00mm 045 = 4.50mm 050 = 5.00mm (3/16") 060 = 6.00mm 070 = 7.00mm (1/4") 080 = 8.00mm (5/16") 090 = 9.00mm 100 = 10.00mm (3/8") 110 = 7/16" 120 = 12mm 130 = 1/2" 160 = 16.00mm (5/8") 180 = 18.00mm 190 = 3/4" 200 = 20.00mm 250 = 25.00mm (1")	0 = Regular 1 = Extended 2 = Long 3 = Extra Long 4 = Stub	0 = 3.00mm (1/8") 1 = 4.00mm (3/16") 2 = 5.00mm 3 = 6.00mm (1/4") 4 = 8.00mm (5/16") 5 = 10.00mm (3/8") 6 = 12.00mm (1/2") 7 = 14.00mm 8 = 16.00mm (5/8") 9 = 20.00mm (3/4") A = 25.00mm (1")	S = Sharp R = Radius C = Chamfer G = Chamfer End Mill F = Concave Radius	Z = Sharp A = 0.20mm (.015") Y = 0.25mm (.017") E = 0.50mm (.030") G = 0.75mm (.060") J = 1.00mm (.090") H = 1.50mm (.010") K = 2.00mm (.120") M = 2.50mm (.160") P = 3.00mm (.190") Q = 4.00mm (.250") R = 5.00mm (.375") D = 6.00mm (.450") X = Special	T = Cylindrical

ALUFLASH SERIES 2A09 • SQUARE END • 2 FLUTE • REGULAR LENGTH • CYLINDRICAL SHANK • INCH



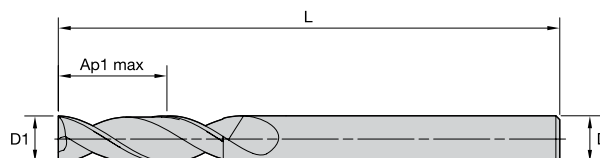
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6853394 2A09E03000SZT	1/8	1/8	1/4	2	2
6853396 2A09E05001SZT	3/16	3/16	5/16	2	2
6853398 2A09E07003SZT	1/4	1/4	3/8	2	2
6853421 2A09E08004SZT	5/16	5/16	5/8	2 1/2	2
6853423 2A09E10005SZT	3/8	3/8	1	3	2
6853426 2A09E13006SZT	1/2	1/2	1 1/4	3 1/2	2
6853431 2A09E19009SZT	3/4	3/4	1 5/8	4 1/4	2
6853435 2A09E2500ASZT	1	1	2 1/2	5 1/2	2

ALUFLASH SERIES 2A09 • RADIUS • 2 FLUTE • REGULAR LENGTH • CYLINDRICAL SHANK • INCH



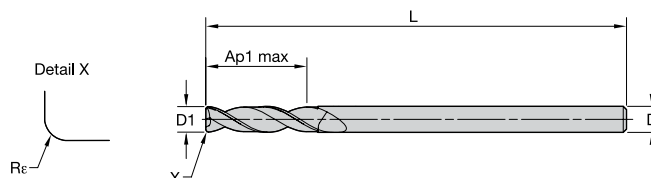
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6853395 2A09E03000RAT	1/8	1/8	1/4	2	.015	2
6853397 2A09E05001RAT	3/16	3/16	5/16	2	.015	2
6853399 2A09E07003RAT	1/4	1/4	3/8	2	.015	2
6853400 2A09E07003RET	1/4	1/4	3/8	2	.030	2
6853422 2A09E08004RAT	5/16	5/16	5/8	2 1/2	.015	2
6853424 2A09E10005RAT	3/8	3/8	1	3	.015	2
6853425 2A09E10005RET	3/8	3/8	1	3	.030	2
6853427 2A09E13006RAT	1/2	1/2	1 1/4	3 1/2	.015	2
6853428 2A09E13006RET	1/2	1/2	1 1/4	3 1/2	.030	2
6853429 2A09E13006RGT	1/2	1/2	1 1/4	3 1/2	.060	2
6853430 2A09E13006RKT	1/2	1/2	1 1/4	3 1/2	.120	2
6853432 2A09E19009RET	3/4	3/4	1 5/8	4 1/4	.030	2
6853433 2A09E19009RGT	3/4	3/4	1 5/8	4 1/4	.060	2
6853434 2A09E19009RKT	3/4	3/4	1 5/8	4 1/4	.120	2
6853436 2A09E2500ARET	1	1	2 1/2	5 1/2	.030	2
6853437 2A09E2500ARGT	1	1	2 1/2	5 1/2	.060	2
6853438 2A09E2500ARKT	1	1	2 1/2	5 1/2	.120	2

ALUFLASH SERIES 2A19 • SQUARE END • 2 FLUTE • LONG LENGTH • CYLINDRICAL SHANK • INCH



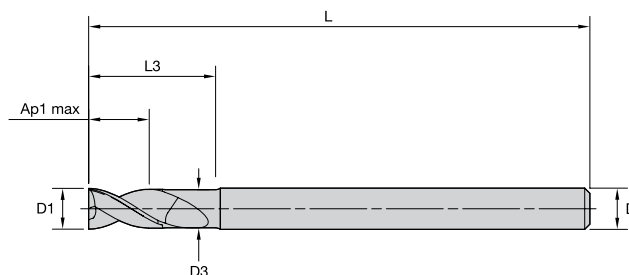
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6853379 2A19E03010SZT	1/8	1/8	1/2	2	2
6853381 2A19E05011SZT	3/16	3/16	5/8	2	2
6853383 2A19E07013SZT	1/4	1/4	3/4	2 1/2	2
6853386 2A19E08014SZT	5/16	5/16	1 1/4	3	2
6853388 2A19E10015SZT	3/8	3/8	1 1/2	4	2
6853391 2A19E13016SZT	1/2	1/2	2	4	2

ALUFLASH SERIES 2A19 • RADIUS • 2 FLUTE • LONG LENGTH • CYLINDRICAL SHANK • INCH



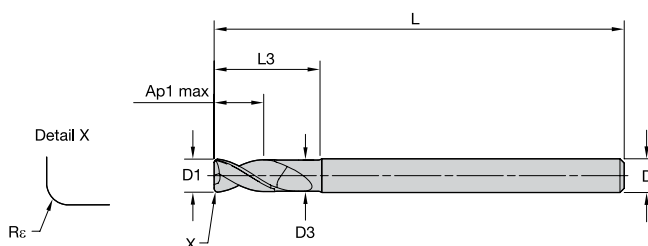
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6853380 2A19E03010RAT	1/8	1/8	1/2	2	.015	2
6853382 2A19E05011RAT	3/16	3/16	5/8	2	.015	2
6853384 2A19E07013RAT	1/4	1/4	3/4	2 1/2	.015	2
6853385 2A19E07013RET	1/4	1/4	3/4	2 1/2	.030	2
6853387 2A19E08014RAT	5/16	5/16	1 1/4	3	.015	2
6853389 2A19E10015RAT	3/8	3/8	1 1/2	4	.015	2
6853390 2A19E10015RET	3/8	3/8	1 1/2	4	.030	2
6853392 2A19E13016RAT	1/2	1/2	2	4	.015	2
6853393 2A19E13016RET	1/2	1/2	2	4	.030	2

ALUFLASH SERIES 2AN9 • SQUARE END • 2 FLUTE • REGULAR LENGTH • REGULAR NECK • CYLINDRICAL SHANK • INCH



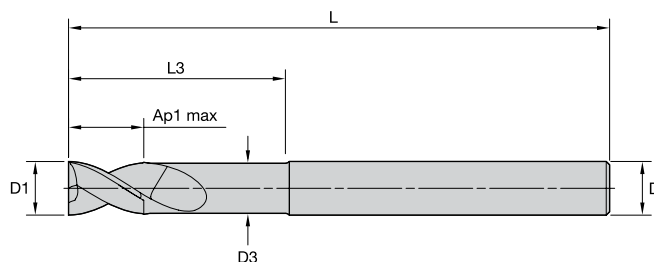
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6859874 2AN9E03000SZT	1/8	1/8	.118	3/16	1 1/2	3/8	2
6859876 2AN9E05001SZT	3/16	3/16	.176	1/4	2 1/4	9/16	2
6859878 2AN9E07003SZT	1/4	1/4	.235	5/16	2 1/2	3/4	2
6859883 2AN9E08004SZT	5/16	5/16	.294	3/8	2 1/2	1	2
6859886 2AN9E10005SZT	3/8	3/8	.353	1/2	3	1 1/4	2
6859889 2AN9E13006SZT	1/2	1/2	.470	5/8	3 1/2	1 1/2	2
6859892 2AN9E16008SZT	5/8	5/8	.588	3/4	4	2	2
6859895 2AN9E19009SZT	3/4	3/4	.705	1	5	2 1/4	2
6859898 2AN9E2500ASZT	1	1	.940	1 1/4	5 1/2	2 1/2	2

ALUFLASH SERIES 2AN9 • RADIUS • 2 FLUTE • REGULAR LENGTH • REGULAR NECK • CYLINDRICAL SHANK • INCH



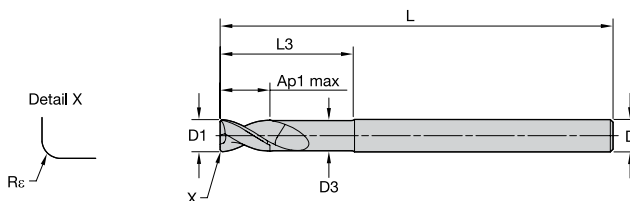
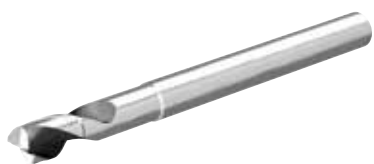
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6859877 2AN9E05001RAT	3/16	3/16	.176	1/4	2 1/4	9/16	.015	2
6859881 2AN9E07003RET	1/4	1/4	.235	5/16	2 1/2	3/4	.030	2
6859882 2AN9E07003RGT	1/4	1/4	.235	5/16	2 1/2	3/4	.060	2
6859884 2AN9E08004RET	5/16	5/16	.294	3/8	2 1/2	1	.030	2
6859885 2AN9E08004RGT	5/16	5/16	.294	3/8	2 1/2	1	.060	2
6859887 2AN9E10005RET	3/8	3/8	.353	1/2	3	1 1/4	.030	2
6859888 2AN9E10005RGT	3/8	3/8	.353	1/2	3	1 1/4	.060	2
6859890 2AN9E13006RET	1/2	1/2	.470	5/8	3 1/2	1 1/2	.030	2
6859891 2AN9E13006RGT	1/2	1/2	.470	5/8	3 1/2	1 1/2	.060	2
6859893 2AN9E16008RET	5/8	5/8	.588	3/4	4	2	.030	2
6859894 2AN9E16008RGT	5/8	5/8	.588	3/4	4	2	.060	2
6859896 2AN9E19009RET	3/4	3/4	.705	1	5	2 1/4	.030	2
6859897 2AN9E19009RGT	3/4	3/4	.705	1	5	2 1/4	.060	2
6859899 2AN9E2500ARET	1	1	.940	1 1/4	5 1/2	2 1/2	.030	2
6859900 2AN9E2500ARGT	1	1	.940	1 1/4	5 1/2	2 1/2	.060	2

ALUFLASH SERIES 2AL9 • SQUARE END • 2 FLUTE • REGULAR LENGTH • MEDIUM NECK • CYLINDRICAL SHANK • INCH



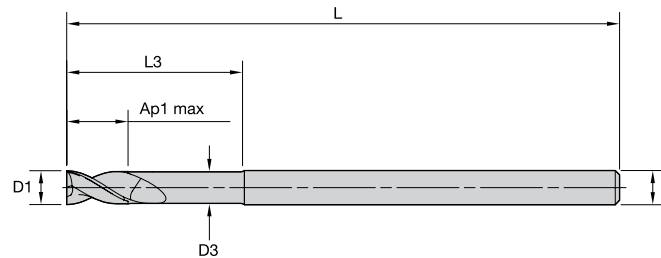
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order #	catalog #	D1	D	D3	Ap1 max	L	L3	Z U
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6859651	2AL9E08014SZT	5/16	5/16	.294	3/8	3	1 1/4	2
6859654	2AL9E10015SZT	3/8	3/8	.353	1/2	3	1 1/2	2
6859657	2AL9E13016SZT	1/2	1/2	.470	5/8	4	2	2
6859660	2AL9E16018SZT	5/8	5/8	.588	3/4	5	2 1/2	2
6859673	2AL9E19019SZT	3/4	3/4	.705	1	5	3	2
6859676	2AL9E2501ASZT	1	1	.940	1 1/4	5 1/2	3	2

ALUFLASH SERIES 2AL9 • RADIUS • 2 FLUTE • REGULAR LENGTH • MEDIUM NECK • CYLINDRICAL SHANK • INCH



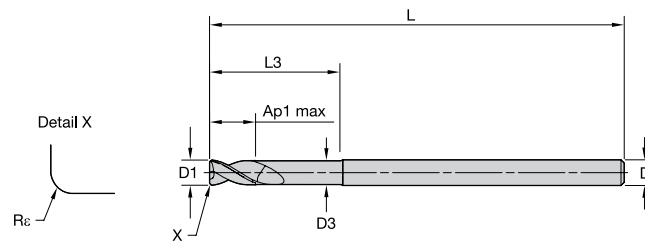
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order #	catalog #	D1	D	D3	Ap1 max	L	L3	Re Z U
6859606	2AL9E05011RAT	3/16	3/16	.176	1/4	2 1/4	3/4	.015 2
6859608	2AL9E07013RET	1/4	1/4	.235	5/16	2 1/2	1	.030 2
6859610	2AL9E07013RGT	1/4	1/4	.235	5/16	2 1/2	1	.060 2
6859652	2AL9E08014RET	5/16	5/16	.294	3/8	3	1 1/4	.030 2
6859653	2AL9E08014RGT	5/16	5/16	.294	3/8	3	1 1/4	.060 2
6859655	2AL9E10015RET	3/8	3/8	.353	1/2	3	1 1/2	.030 2
6859656	2AL9E10015RGT	3/8	3/8	.353	1/2	3	1 1/2	.060 2
6859658	2AL9E13016RET	1/2	1/2	.470	5/8	4	2	.030 2
6859659	2AL9E13016RGT	1/2	1/2	.470	5/8	4	2	.060 2
6859671	2AL9E16018RET	5/8	5/8	.588	3/4	5	2 1/2	.030 2
6859672	2AL9E16018RGT	5/8	5/8	.588	3/4	5	2 1/2	.060 2
6859674	2AL9E19019RET	3/4	3/4	.705	1	5	3	.030 2
6859675	2AL9E19019RGT	3/4	3/4	.705	1	5	3	.060 2
6859677	2AL9E2501ARET	1	1	.940	1 1/4	5 1/2	3	.030 2
6859678	2AL9E2501ARGT	1	1	.940	1 1/4	5 1/2	3	.060 2

ALUFLASH SERIES 2AF9 • SQUARE END • 2 FLUTE • REGULAR LENGTH • LONG NECK • CYLINDRICAL SHANK • INCH



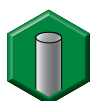
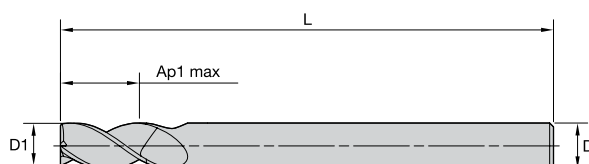
grade UNCOATED order # catalog #	D1	D	D3	length of cut Ap1 max	length L	L3	Z U
6859680 2AF9E03020SZT	1/8	1/8	.118	3/16	2	5/8	2
6859682 2AF9E05021SZT	3/16	3/16	.176	1/4	2 1/4	1	2
6859684 2AF9E07023SZT	1/4	1/4	.235	5/16	3	1 1/4	2
6859687 2AF9E08024SZT	5/16	5/16	.294	3/8	3	1 1/2	2
6859690 2AF9E10025SZT	3/8	3/8	.353	1/2	3 1/2	2	2
6859693 2AF9E13026SZT	1/2	1/2	.470	5/8	4 1/2	2 1/2	2
6859696 2AF9E16028SZT	5/8	5/8	.588	3/4	5	3 1/4	2
6859699 2AF9E19029SZT	3/4	3/4	.705	1	5 1/2	3 1/2	2
6859702 2AF9E2502ASZT	1	1	.940	1 1/4	6 1/2	3 3/4	2

ALUFLASH SERIES 2AF9 • RADIUS • 2 FLUTE • REGULAR LENGTH • LONG NECK • CYLINDRICAL SHANK • INCH

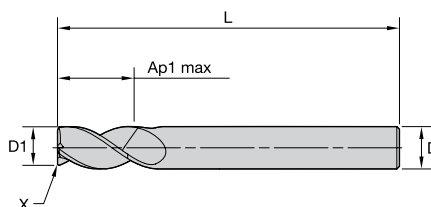
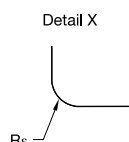


grade UNCOATED order # catalog #	D1	D	D3	length of cut Ap1 max	length L	L3	Rr	Z U
6859681 2AF9E03020RAT	1/8	1/8	.118	3/16	2	5/8	.015	2
6859683 2AF9E05021RAT	3/16	3/16	.176	1/4	2 1/4	1	.015	2
6859685 2AF9E07023RET	1/4	1/4	.235	5/16	3	1 1/4	.030	2
6859686 2AF9E07023RGT	1/4	1/4	.235	5/16	3	1 1/4	.060	2
6859688 2AF9E08024RET	5/16	5/16	.294	3/8	3	1 1/2	.030	2
6859689 2AF9E08024RGT	5/16	5/16	.294	3/8	3	1 1/2	.060	2
6859691 2AF9E10025RET	3/8	3/8	.353	1/2	3 1/2	2	.030	2
6859692 2AF9E10025RGT	3/8	3/8	.353	1/2	3 1/2	2	.060	2
6859694 2AF9E13026RET	1/2	1/2	.470	5/8	4 1/2	2 1/2	.030	2
6859695 2AF9E13026RGT	1/2	1/2	.470	5/8	4 1/2	2 1/2	.060	2
6859697 2AF9E16028RET	5/8	5/8	.588	3/4	5	3 1/4	.030	2
6859698 2AF9E16028RGT	5/8	5/8	.588	3/4	5	3 1/4	.060	2
6859700 2AF9E19029RET	3/4	3/4	.705	1	5 1/2	3 1/2	.030	2
6859701 2AF9E19029RGT	3/4	3/4	.705	1	5 1/2	3 1/2	.060	2
6859703 2AF9E2502ARET	1	1	.940	1 1/4	6 1/2	3 3/4	.030	2
6859704 2AF9E2502ARGT	1	1	.940	1 1/4	6 1/2	3 3/4	.060	2

ALUFLASH SERIES 3A09 • SQUARE END • 3 FLUTE • REGULAR LENGTH • CYLINDRICAL SHANK • INCH

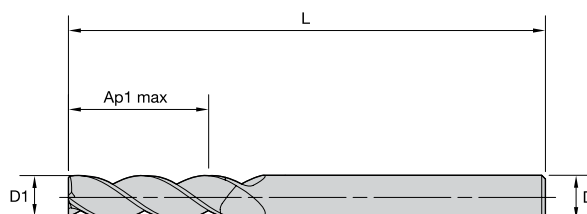


grade	UNCOATED					
order #	catalog #	D1	D	length of cut Ap1 max	length L	Z U
6853347	3A09E05001SZT	3/16	3/16	5/16	2	3
6853349	3A09E07003SZT	1/4	1/4	3/8	2	3
6853352	3A09E08004SZT	5/16	5/16	5/8	2 1/2	3
6853354	3A09E10005SZT	3/8	3/8	1	3	3
6853358	3A09E13006SZT	1/2	1/2	1 1/4	3 1/2	3
6853363	3A09E16008SZT	5/8	5/8	1 1/2	3 1/2	3
6853366	3A09E19009SZT	3/4	3/4	1 5/8	4	3
6853371	3A09E2500ASZT	1	1	2 1/2	5 1/2	3

**ALUFLASH SERIES 3A09 • RADIUS • 3 FLUTE •
REGULAR LENGTH • CYLINDRICAL SHANK • INCH**


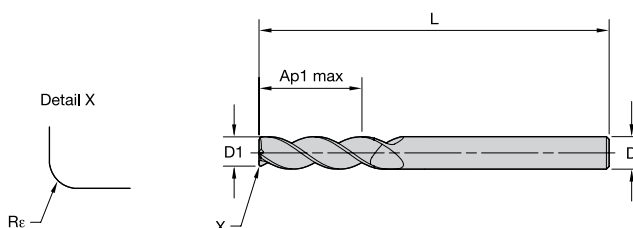
grade UNCOATED order # catalog #	D1	D	length of cut Ap1 max	length L	Re	Z U
6853348 3A09E05001RAT	3/16	3/16	5/16	2	.015	3
6853350 3A09E07003RAT	1/4	1/4	3/8	2	.015	3
6853351 3A09E07003RET	1/4	1/4	3/8	2	.030	3
6853353 3A09E08004RAT	5/16	5/16	5/8	2 1/2	.015	3
6853355 3A09E10005RAT	3/8	3/8	1	3	.015	3
6853356 3A09E10005RET	3/8	3/8	1	3	.030	3
6853357 3A09E10005RGT	3/8	3/8	1	3	.060	3
6853359 3A09E13006RAT	1/2	1/2	1 1/4	3 1/2	.015	3
6853360 3A09E13006RET	1/2	1/2	1 1/4	3 1/2	.030	3
6853361 3A09E13006RGT	1/2	1/2	1 1/4	3 1/2	.060	3
6853362 3A09E13006RKT	1/2	1/2	1 1/4	3 1/2	.120	3
6853364 3A09E16008RGT	5/8	5/8	1 1/2	3 1/2	.060	3
6853365 3A09E16008RKT	5/8	5/8	1 1/2	3 1/2	.120	3
6853367 3A09E19009RET	3/4	3/4	1 5/8	4	.030	3
6853368 3A09E19009RGT	3/4	3/4	1 5/8	4	.060	3
6853369 3A09E19009RKT	3/4	3/4	1 5/8	4	.120	3
6853370 3A09E19009RPT	3/4	3/4	1 5/8	4	.190	3
6853372 3A09E2500ARET	1	1	2 1/2	5 1/2	.030	3
6853373 3A09E2500ARGT	1	1	2 1/2	5 1/2	.060	3
6853374 3A09E2500ARJT	1	1	2 1/2	5 1/2	.090	3
6853375 3A09E2500ARKT	1	1	2 1/2	5 1/2	.120	3
6853376 3A09E2500ARPT	1	1	2 1/2	5 1/2	.190	3
6853377 3A09E2500ARQT	1	1	2 1/2	5 1/2	.250	3

ALUFLASH SERIES 3A19 • SQUARE END • 3 FLUTE • MEDIUM LENGTH • CYLINDRICAL SHANK • INCH

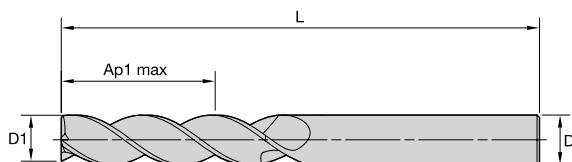


grade UNCOATED order # catalog #	D1	D	length of cut Ap1 max	length L	Z U
6853307 3A19E05011SZT	3/16	3/16	5/8	2	3
6853309 3A19E07013SZT	1/4	1/4	3/4	2 1/2	3
6853323 3A19E10015SZT	3/8	3/8	1 1/2	4	3
6853327 3A19E13016SZT	1/2	1/2	2	4	3
6853331 3A19E16018SZT	5/8	5/8	2	5	3
6853335 3A19E19019SZT	3/4	3/4	2 1/2	5	3
6853339 3A19E2501ASZT	1	1	3 1/4	6 1/2	3

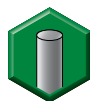
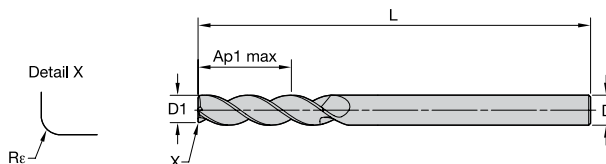
ALUFLASH SERIES 3A19 • RADIUS • 3 FLUTE • MEDIUM LENGTH • CYLINDRICAL SHANK • INCH



grade UNCOATED order # catalog #	D1	D	length of cut Ap1 max	length L	Re	Z U
6853308 3A19E05011RAT	3/16	3/16	5/8	2	.015	3
6853310 3A19E07013RAT	1/4	1/4	3/4	2 1/2	.015	3
6853321 3A19E07013RET	1/4	1/4	3/4	2 1/2	.030	3
6853322 3A19E07013RGT	1/4	1/4	3/4	2 1/2	.060	3
6853324 3A19E10015RAT	3/8	3/8	1 1/2	4	.015	3
6853325 3A19E10015RET	3/8	3/8	1 1/2	4	.030	3
6853326 3A19E10015RGT	3/8	3/8	1 1/2	4	.060	3
6853328 3A19E13016RET	1/2	1/2	2	4	.030	3
6853329 3A19E13016RGT	1/2	1/2	2	4	.060	3
6853330 3A19E13016RKT	1/2	1/2	2	4	.120	3
6853332 3A19E16018RET	5/8	5/8	2	5	.030	3
6853333 3A19E16018RGT	5/8	5/8	2	5	.060	3
6853334 3A19E16018RKT	5/8	5/8	2	5	.120	3
6853336 3A19E19019RET	3/4	3/4	2 1/2	5	.030	3
6853337 3A19E19019RGT	3/4	3/4	2 1/2	5	.060	3
6853338 3A19E19019RKT	3/4	3/4	2 1/2	5	.120	3
6853340 3A19E2501ARET	1	1	3 1/4	6 1/2	.030	3
6853341 3A19E2501ARGT	1	1	3 1/4	6 1/2	.060	3
6853342 3A19E2501ARJT	1	1	3 1/4	6 1/2	.090	3
6853343 3A19E2501ARKT	1	1	3 1/4	6 1/2	.120	3
6853344 3A19E2501ARPT	1	1	3 1/4	6 1/2	.190	3
6853345 3A19E2501ARQT	1	1	3 1/4	6 1/2	.250	3

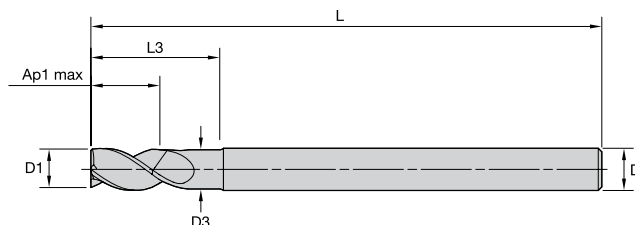
**ALUFLASH SERIES 3A29 • SQUARE END • 3 FLUTE •
LONG LENGTH • CYLINDRICAL SHANK • INCH**


grade UNCOATED order # catalog #	D1	D	length of cut Ap1 max	length L	Z U
6853216 3A29E07023SZT	1/4	1/4	1	3 1/4	3
6853220 3A29E08024SZT	5/16	5/16	1 1/4	3	3
6853282 3A29E10025SZT	3/8	3/8	1 3/4	4	3
6853285 3A29E13026SZT	1/2	1/2	2 1/4	4 1/2	3
6853289 3A29E19029SZT	3/4	3/4	3	5 1/2	3
6853303 3A29E2502ASZT	1	1	4	7	3

**ALUFLASH SERIES 3A29 • RADIUS • 3 FLUTE •
LONG LENGTH • CYLINDRICAL SHANK • INCH**


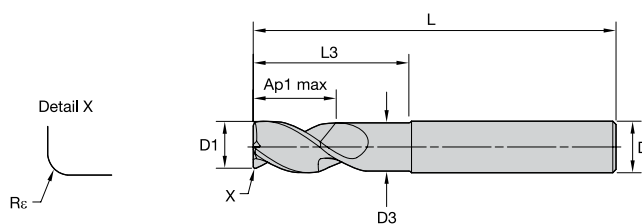
grade UNCOATED order # catalog #	D1	D	length of cut Ap1 max	length L	Rr	Z U
6853217 3A29E07023RAT	1/4	1/4	1	3 1/4	.015	3
6853218 3A29E07023RET	1/4	1/4	1	3 1/4	.030	3
6853219 3A29E07023RGT	1/4	1/4	1	3 1/4	.060	3
6853281 3A29E08024RAT	5/16	5/16	1 1/4	3	.015	3
6853283 3A29E10025RET	3/8	3/8	1 3/4	4	.030	3
6853284 3A29E10025RGT	3/8	3/8	1 3/4	4	.060	3
6853286 3A29E13026RET	1/2	1/2	2 1/4	4 1/2	.030	3
6853287 3A29E13026RGT	1/2	1/2	2 1/4	4 1/2	.060	3
6853288 3A29E13026RKT	1/2	1/2	2 1/4	4 1/2	.120	3
6853290 3A29E19029RET	3/4	3/4	3	5 1/2	.030	3
6853301 3A29E19029RGT	3/4	3/4	3	5 1/2	.060	3
6853302 3A29E19029RKT	3/4	3/4	3	5 1/2	.120	3
6853304 3A29E2502ARET	1	1	4	7	.030	3
6853305 3A29E2502ARGT	1	1	4	7	.060	3
6853306 3A29E2502ARKT	1	1	4	7	.120	3

ALUFLASH SERIES 3AN9 • SQUARE END • 3 FLUTE • REGULAR LENGTH • REGULAR NECK • CYLINDRICAL SHANK • INCH



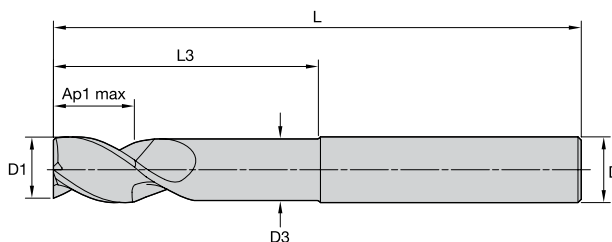
grade UNCOATED order # catalog #	D1	D	D3	length of cut Ap1 max	length L	L3	Z U
6859706 3AN9E05001SZT	3/16	3/16	.176	1/4	2 1/4	9/16	3
6859708 3AN9E07003SZT	1/4	1/4	.235	5/16	2 1/2	3/4	3
6859711 3AN9E08004SZT	5/16	5/16	.294	3/8	2 1/2	1	3
6859715 3AN9E10005SZT	3/8	3/8	.353	1/2	3	1 1/4	3
6859718 3AN9E13006SZT	1/2	1/2	.470	5/8	3 1/2	1 1/2	3
6859721 3AN9E16008SZT	5/8	5/8	.588	3/4	4	2	3
6859724 3AN9E19009SZT	3/4	3/4	.705	1	5	2 1/4	3
6859727 3AN9E2500ASZT	1	1	.940	1 1/4	5 1/2	2 1/2	3

ALUFLASH SERIES 3AN9 • RADIUS • 3 FLUTE • REGULAR LENGTH • REGULAR NECK • CYLINDRICAL SHANK • INCH



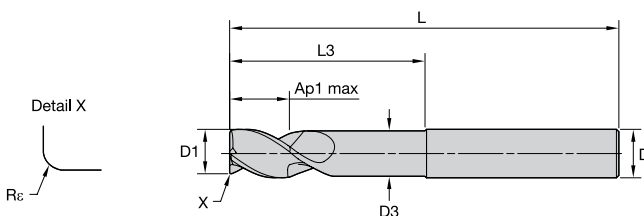
grade UNCOATED order # catalog #	D1	D	D3	length of cut Ap1 max	length L	L3	Rε	Z U
6859707 3AN9E05001RAT	3/16	3/16	.176	1/4	2 1/4	9/16	.015	3
6859709 3AN9E07003RET	1/4	1/4	.235	5/16	2 1/2	3/4	.030	3
6859710 3AN9E07003RGT	1/4	1/4	.235	5/16	2 1/2	3/4	.060	3
6859712 3AN9E08004RET	5/16	5/16	.294	3/8	2 1/2	1	.030	3
6859714 3AN9E08004RGT	5/16	5/16	.294	3/8	2 1/2	1	.060	3
6859716 3AN9E10005RET	3/8	3/8	.353	1/2	3	1 1/4	.030	3
6859717 3AN9E10005RGT	3/8	3/8	.353	1/2	3	1 1/4	.060	3
6859719 3AN9E13006RET	1/2	1/2	.470	5/8	3 1/2	1 1/2	.030	3
6859720 3AN9E13006RGT	1/2	1/2	.470	5/8	3 1/2	1 1/2	.060	3
6859722 3AN9E16008RET	5/8	5/8	.588	3/4	4	2	.030	3
6859723 3AN9E16008RGT	5/8	5/8	.588	3/4	4	2	.060	3
6859725 3AN9E19009RET	3/4	3/4	.705	1	5	2 1/4	.030	3
6859726 3AN9E19009RGT	3/4	3/4	.705	1	5	2 1/4	.060	3
6859728 3AN9E2500ARET	1	1	.940	1 1/4	5 1/2	2 1/2	.030	3
6859729 3AN9E2500ARGT	1	1	.940	1 1/4	5 1/2	2 1/2	.060	3

ALUFLASH SERIES 3AL9 • SQUARE END • 3 FLUTE • REGULAR LENGTH • MEDIUM NECK • CYLINDRICAL SHANK • INCH



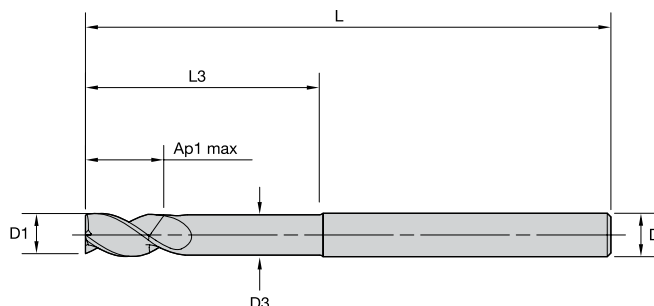
grade UNCOATED order # catalog #	D1	D	D3	length of cut Ap1 max	length L	L3	Z U
6859740 3AL9E05011SZT	3/16	3/16	.176	1/4	2 1/4	3/4	3
6859783 3AL9E07013SZT	1/4	1/4	.235	5/16	2 1/2	1	3
6859786 3AL9E08014SZT	5/16	5/16	.294	3/8	3	1 1/4	3
6859789 3AL9E10015SZT	3/8	3/8	.353	1/2	3	1 1/2	3
6859802 3AL9E13016SZT	1/2	1/2	.470	5/8	4	2	3
6859805 3AL9E16018SZT	5/8	5/8	.588	3/4	5	2 1/2	3
6859808 3AL9E19019SZT	3/4	3/4	.705	1	5	3	3
6859811 3AL9E2501ASZT	1	1	.940	1 1/4	5 1/2	3	3

ALUFLASH SERIES 3AL9 • RADIUS END • 3 FLUTE • REGULAR LENGTH • MEDIUM NECK • CYLINDRICAL SHANK • INCH



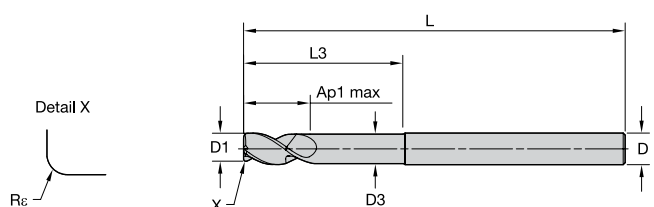
grade UNCOATED order # catalog #	D1	D	D3	length of cut Ap1 max	length L	L3	Rε	Z U
6859781 3AL9E05011RAT	3/16	3/16	.176	1/4	2 1/4	3/4	.015	3
6859784 3AL9E07013RET	1/4	1/4	.235	5/16	2 1/2	1	.030	3
6859785 3AL9E07013RGT	1/4	1/4	.235	5/16	2 1/2	1	.060	3
6859787 3AL9E08014RET	5/16	5/16	.294	3/8	3	1 1/4	.030	3
6859788 3AL9E08014RGT	5/16	5/16	.294	3/8	3	1 1/4	.060	3
6859790 3AL9E10015RET	3/8	3/8	.353	1/2	3	1 1/2	.030	3
6859801 3AL9E10015RGT	3/8	3/8	.353	1/2	3	1 1/2	.060	3
6859803 3AL9E13016RET	1/2	1/2	.470	5/8	4	2	.030	3
6859804 3AL9E13016RGT	1/2	1/2	.470	5/8	4	2	.060	3
6859806 3AL9E16018RET	5/8	5/8	.588	3/4	5	2 1/2	.030	3
6859807 3AL9E16018RGT	5/8	5/8	.588	3/4	5	2 1/2	.060	3
6859809 3AL9E19019RET	3/4	3/4	.705	1	5	3	.030	3
6859810 3AL9E19019RGT	3/4	3/4	.705	1	5	3	.060	3
6859812 3AL9E2501ARET	1	1	.940	1 1/4	5 1/2	3	.030	3
6859813 3AL9E2501ARGT	1	1	.940	1 1/4	5 1/2	3	.060	3

ALUFLASH SERIES 3AF9 • SQUARE END • 3 FLUTE • REGULAR LENGTH • LONG NECK • CYLINDRICAL SHANK • INCH

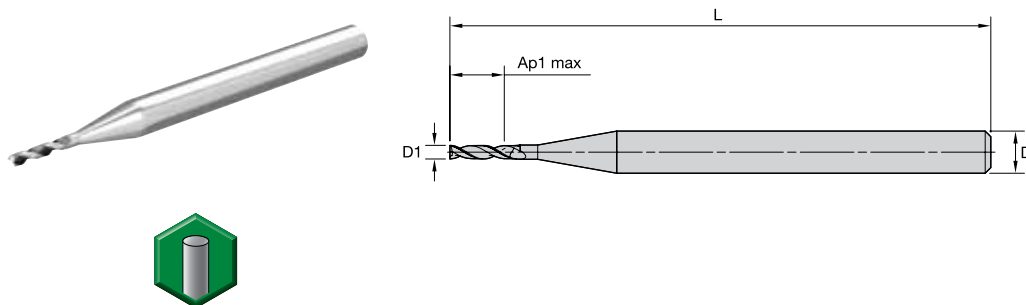


grade	UNCOATED				length of cut	length		
order #	catalog #	D1	D	D3	Ap1 max	L	L3	Z U
6859818	3AF9E05021SZT	3/16	3/16	.176	1/4	2 1/4	1	3
6859820	3AF9E07023SZT	1/4	1/4	.235	5/16	3	1 1/4	3
6859843	3AF9E08024SZT	5/16	5/16	.294	3/8	3	1 1/2	3
6859846	3AF9E10025SZT	3/8	3/8	.353	1/2	3 1/2	2	3
6859849	3AF9E13026SZT	1/2	1/2	.470	5/8	4 1/2	2 1/2	3
6859862	3AF9E16028SZT	5/8	5/8	.588	3/4	5	3 1/4	3
6859866	3AF9E19029SZT	3/4	3/4	.705	1	5 1/2	3 1/2	3
6859869	3AF9E2502ASZT	1	1	.940	1 1/4	6 1/2	3 3/4	3

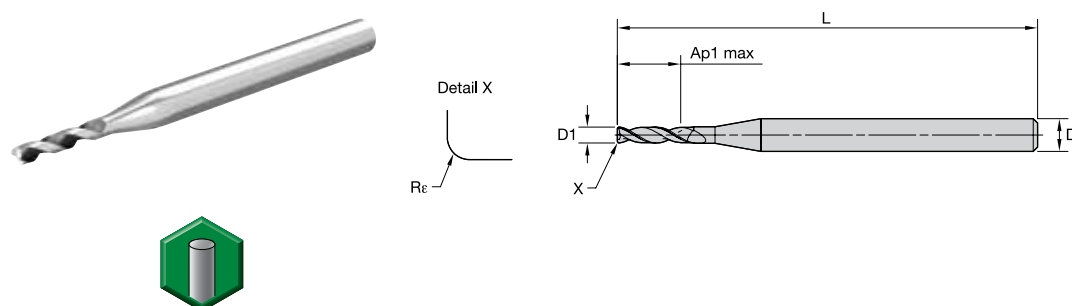
ALUFLASH SERIES 3AF9 • RADIUS • 3 FLUTE • REGULAR LENGTH • LONG NECK • CYLINDRICAL SHANK • INCH



grade	UNCOATED				length of cut	length		
order #	catalog #	D1	D	D3	Ap1 max	L	L3	Rc
6859819	3AF9E05021RAT	3/16	3/16	.176	1/4	2 1/4	1	.015
6859841	3AF9E07023RET	1/4	1/4	.235	5/16	3	1 1/4	.030
6859842	3AF9E07023RGT	1/4	1/4	.235	5/16	3	1 1/4	.060
6859844	3AF9E08024RET	5/16	5/16	.294	3/8	3	1 1/2	.030
6859845	3AF9E08024RGT	5/16	5/16	.294	3/8	3	1 1/2	.060
6859847	3AF9E10025RET	3/8	3/8	.353	1/2	3 1/2	2	.030
6859848	3AF9E10025RGT	3/8	3/8	.353	1/2	3 1/2	2	.060
6859850	3AF9E13026RET	1/2	1/2	.470	5/8	4 1/2	2 1/2	.030
6859861	3AF9E13026RGT	1/2	1/2	.470	5/8	4 1/2	2 1/2	.060
6859864	3AF9E16028RET	5/8	5/8	.588	3/4	5	3 1/4	.030
6859865	3AF9E16028RGT	5/8	5/8	.588	3/4	5	3 1/4	.060
6859867	3AF9E19029RET	3/4	3/4	.705	1	5 1/2	3 1/2	.030
6859868	3AF9E19029RGT	3/4	3/4	.705	1	5 1/2	3 1/2	.060
6859870	3AF9E2502ARET	1	1	.940	1 1/4	6 1/2	3 3/4	.030
6859871	3AF9E2502ARGT	1	1	.940	1 1/4	6 1/2	3 3/4	.060

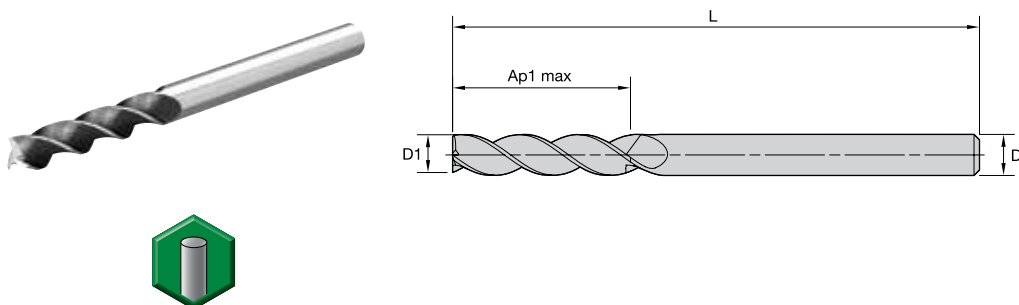
**ALUFLASH SERIES 2A09 • SQUARE END • 2 FLUTE •
REGULAR LENGTH • CYLINDRICAL SHANK • METRIC**


grade UNCOATED order # catalog #	D1	D	length of cut Ap1 max	length L	Z U
6853514 2A09M01000SZT	1,0	3	4,00	38	2
6853515 2A09M01500SZT	1,5	3	6,00	38	2
6853517 2A09M02000SZT	2,0	3	8,00	38	2
6853519 2A09M02500SZT	2,5	3	9,00	38	2
6853542 2A09M04001SZT	4,0	4	12,00	50	2
6853544 2A09M05002SZT	5,0	5	14,00	50	2
6853547 2A09M06003SZT	6,0	6	16,00	50	2
6853549 2A09M08004SZT	8,0	8	20,00	63	2
6853552 2A09M12006SZT	12,0	12	25,00	76	2
6853554 2A09M16008SZT	16,0	16	32,00	89	2
6853556 2A09M20009SZT	20,0	20	40,00	104	2

**ALUFLASH SERIES 2A09 • RADIUS • 2 FLUTE •
REGULAR LENGTH • CYLINDRICAL SHANK • METRIC**


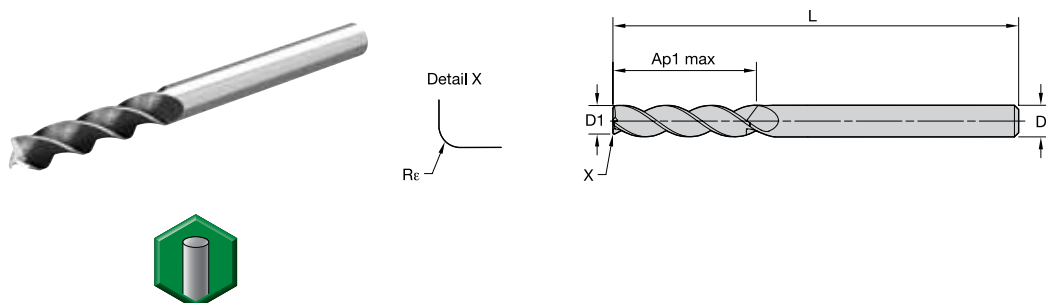
grade UNCOATED order # catalog #	D1	D	length of cut Ap1 max	length L	Re	Z U
6853516 2A09M01500RAT	1,5	3	6,00	38	0,20	2
6853518 2A09M02000RAT	2,0	3	8,00	38	0,20	2
6853520 2A09M02500RAT	2,5	3	9,00	38	0,20	2
6853541 2A09M03000RAT	3,0	3	12,00	38	0,20	2
6853543 2A09M04001RAT	4,0	4	12,00	50	0,20	2
6853546 2A09M05002RAT	5,0	5	14,00	50	0,20	2
6853548 2A09M06003RET	6,0	6	16,00	50	0,50	2
6853550 2A09M08004RET	8,0	8	20,00	63	0,50	2
6853551 2A09M10005RJT	10,0	10	22,00	76	1,00	2
6853553 2A09M12006RJT	12,0	12	25,00	76	1,00	2
6853555 2A09M16008RJT	16,0	16	32,00	89	1,00	2
6853557 2A09M20009RJT	20,0	20	40,00	104	1,00	2

ALUFLASH SERIES 3A09 • SQUARE END • 3 FLUTE • REGULAR LENGTH • CYLINDRICAL SHANK • METRIC



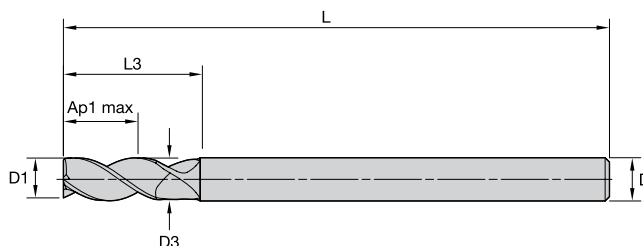
grade UNCOATED order # catalog #	D1	D	length of cut Ap1 max	length L	Z U
6853511 3A09M03000SZT	3,0	3	12,00	38	3

ALUFLASH SERIES 3A09 • RADIUS • 3 FLUTE • REGULAR LENGTH • CYLINDRICAL SHANK • METRIC



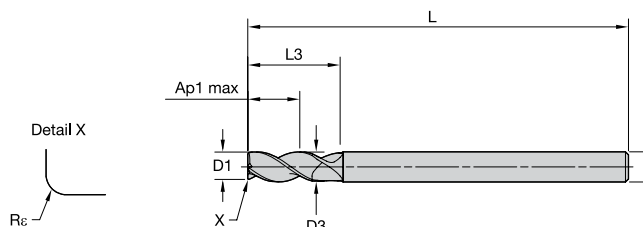
grade UNCOATED order # catalog #	D1	D	length of cut Ap1 max	length L	Re	Z U
6853512 3A09M03000RAT	3,0	3	12,00	38	0,20	3
6853513 3A09M04001RET	4,0	4	12,00	63	0,50	3

**ALUFLASH SERIES 3AN9 • SQUARE END • 3 FLUTE •
REGULAR LENGTH • REGULAR NECK • CYLINDRICAL SHANK • METRIC**



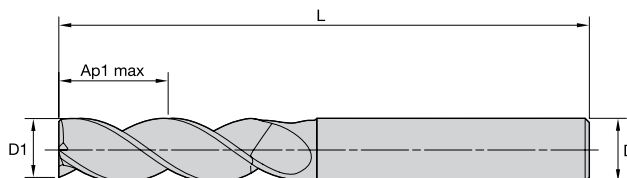
grade UNCOATED order # catalog #	D1	D	D3	length of cut Ap1 max	length L	L3	Z U
6853460 3AN9M04001SZT	4,0	4	3,76	8,00	50	12,00	3
6853462 3AN9M05002SZT	5,0	5	4,70	10,00	63	15,00	3
6853465 3AN9M06003SZT	6,0	6	5,64	13,00	63	18,00	3
6853469 3AN9M08004SZT	8,0	8	7,52	18,00	76	24,00	3
6853474 3AN9M10005SZT	10,0	10	9,40	22,00	76	30,00	3
6853479 3AN9M12006SZT	12,0	12	11,28	25,00	76	36,00	3
6853486 3AN9M16008SZT	16,0	16	15,04	32,00	89	48,00	3
6853494 3AN9M20009SZT	20,0	20	18,80	40,00	115	60,00	3

ALUFLASH SERIES 3AN9 • RADIUS • 3 FLUTE • REGULAR LENGTH • REGULAR NECK • CYLINDRICAL SHANK • METRIC



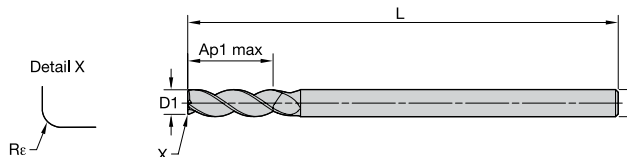
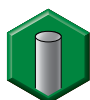
grade	UNCOATED				length of cut	length			
order #	catalog #	D1	D	D3	Ap1 max	L	L3	Rε	Z U
6853461	3AN9M04001RAT	4,0	4	3,76	8,00	50	12,00	0,20	3
6853463	3AN9M05002RAT	5,0	5	4,70	10,00	63	15,00	0,20	3
6853464	3AN9M05002RET	5,0	5	4,70	10,00	63	15,00	0,50	3
6853466	3AN9M06003RAT	6,0	6	5,64	13,00	63	18,00	0,20	3
6853467	3AN9M06003RET	6,0	6	5,64	13,00	63	18,00	0,50	3
6853468	3AN9M06003RJT	6,0	6	5,64	13,00	63	18,00	1,00	3
6853470	3AN9M08004RAT	8,0	8	7,52	18,00	76	24,00	0,20	3
6853471	3AN9M08004RET	8,0	8	7,52	18,00	76	24,00	0,50	3
6853473	3AN9M08004RHT	8,0	8	7,52	18,00	76	24,00	1,50	3
6853472	3AN9M08004RJT	8,0	8	7,52	18,00	76	24,00	1,00	3
6853475	3AN9M10005RAT	10,0	10	9,40	22,00	76	30,00	0,20	3
6853476	3AN9M10005RET	10,0	10	9,40	22,00	76	30,00	0,50	3
6853478	3AN9M10005RHT	10,0	10	9,40	22,00	76	30,00	1,50	3
6853477	3AN9M10005RJT	10,0	10	9,40	22,00	76	30,00	1,00	3
6853480	3AN9M12006RAT	12,0	12	11,28	25,00	76	36,00	0,20	3
6853481	3AN9M12006RET	12,0	12	11,28	25,00	76	36,00	0,50	3
6853483	3AN9M12006RHT	12,0	12	11,28	25,00	76	36,00	1,50	3
6853482	3AN9M12006RJT	12,0	12	11,28	25,00	76	36,00	1,00	3
6853484	3AN9M12006RKT	12,0	12	11,28	25,00	76	36,00	2,00	3
6853485	3AN9M12006RPT	12,0	12	11,28	25,00	76	36,00	3,00	3
6853487	3AN9M16008RAT	16,0	16	15,04	32,00	89	48,00	0,20	3
6853488	3AN9M16008RET	16,0	16	15,04	32,00	89	48,00	0,50	3
6853490	3AN9M16008RHT	16,0	16	15,04	32,00	89	48,00	1,50	3
6853489	3AN9M16008RJT	16,0	16	15,04	32,00	89	48,00	1,00	3
6853491	3AN9M16008RMT	16,0	16	15,04	32,00	89	48,00	2,50	3
6853492	3AN9M16008RPT	16,0	16	15,04	32,00	89	48,00	3,00	3
6853493	3AN9M16008RQT	16,0	16	15,04	32,00	89	48,00	4,00	3
6853495	3AN9M20009RAT	20,0	20	18,80	40,00	115	60,00	0,20	3
6853496	3AN9M20009RHT	20,0	20	18,80	40,00	115	60,00	1,50	3
6853497	3AN9M20009RKT	20,0	20	18,80	40,00	115	60,00	2,00	3
6853498	3AN9M20009RPT	20,0	20	18,80	40,00	115	60,00	3,00	3
6853499	3AN9M20009RQT	20,0	20	18,80	40,00	115	60,00	4,00	3
6853500	3AN9M20009RRT	20,0	20	18,80	40,00	115	60,00	5,00	3

ALUFLASH SERIES 3AP9 • SQUARE END • 3 FLUTE • LONG LENGTH • REGULAR NECK • CYLINDRICAL SHANK • METRIC



grade UNCOATED	order #	catalog #	D1	D	D3	length of cut Ap1 max	length L	L3	Z U
	6853448	3AP9M12016SZT	12,0	12	11,28	36,00	100	48,00	3

ALUFLASH SERIES 3AP9 • RADIUS • 3 FLUTE • LONG LENGTH • REGULAR NECK • CYLINDRICAL SHANK • METRIC



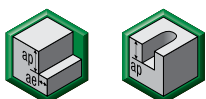
grade UNCOATED	order #	catalog #	D1	D	D3	length of cut Ap1 max	length L	L3	Rε	Z U
	6853439	3AP9M04011RAT	4,0	4	3,76	12,00	63	16,00	0,20	3
	6853440	3AP9M05002RAT	5,0	5	4,70	15,00	63	20,00	0,20	3
	6853441	3AP9M06013RET	6,0	6	5,64	18,00	76	24,00	0,50	3
	6853442	3AP9M06013RJT	6,0	6	5,64	18,00	76	24,00	1,00	3
	6853443	3AP9M08014RET	8,0	8	7,52	24,00	76	32,00	0,50	3
	6853444	3AP9M08014RJT	8,0	8	7,52	24,00	76	32,00	1,00	3
	6853445	3AP9M10015RET	10,0	10	9,40	30,00	89	40,00	0,50	3
	6853446	3AP9M10015RHT	10,0	10	9,40	30,00	89	40,00	1,50	3
	6853447	3AP9M10015RKT	10,0	10	9,40	30,00	89	40,00	2,00	3
	6853449	3AP9M12016RET	12,0	12	11,28	36,00	100	48,00	0,50	3
	6853450	3AP9M12016RHT	12,0	12	11,28	36,00	100	48,00	1,50	3
	6853451	3AP9M12016RPT	12,0	12	11,28	36,00	100	48,00	3,00	3
	6853452	3AP9M16018RET	16,0	16	15,04	48,00	110	64,00	0,50	3
	6853453	3AP9M16018RHT	16,0	16	15,04	48,00	110	64,00	1,50	3
	6853454	3AP9M16018RPT	16,0	16	15,04	48,00	110	64,00	3,00	3
	6853455	3AP9M20019RET	20,0	20	18,80	60,00	150	80,00	0,50	3
	6853456	3AP9M20019RHT	20,0	20	18,80	60,00	150	80,00	1,50	3
	6853457	3AP9M20019RKT	20,0	20	18,80	60,00	150	80,00	2,00	3
	6853458	3AP9M20019RPT	20,0	20	18,80	60,00	150	80,00	3,00	3
	6853459	3AP9M20019RQT	20,0	20	18,80	60,00	150	80,00	4,00	3

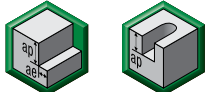
ALUFLASH • SIDE MILLING AND SLOTTING • APPLICATION DATA • INCH

Material Group																				
	Side Milling (A) and Slotting (B)			UNCOATED			Recommended feed per tooth (Fz = IPT) for side milling (A). For slotting (B), reduce Fz by 20%.													
	A		B	Cutting Speed — Vc SFM				D1 — Diameter												
	ap	ae	ap	min	Start	max	Fraction	1/8	5/32	3/16	1/4	5/16	3/8	1/2	9/16	5/8	23/32	3/4	1	
	1	Ap1 max	0.5 x D1	1 x D1	1500	1800	6000	IPT	.0009	.0017	.0022	.0026	.0035	.0043	.0052	.0060	.0069	.0078	.0087	.0108

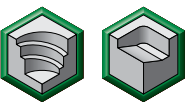
Material Group																				
	Side Milling (A) and Slotting (B)			UNCOATED			Recommended feed per tooth (Fz = IPT) for side milling (A). For slotting (B), reduce Fz by 20%.													
	A		B	Cutting Speed — Vc SFM				D1 — Diameter												
	ap	ae	ap	min	Start	max	Fraction	1/8	5/32	3/16	1/4	5/16	3/8	1/2	9/16	5/8	23/32	3/4	1	
	1	Ap1 max	0.5 x D1	1 x D	1500	1800	4500	IPT	.0008	.0016	.0019	.0023	.0031	.0039	.0047	.0054	.0062	.0070	.0078	.0097

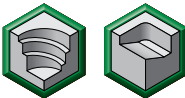
ALUFLASH • SIDE MILLING AND SLOTTING • APPLICATION DATA • METRIC

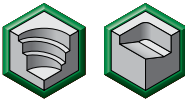
Material Group																							
	Side Milling (A) and Slotting (B)			UNCOATED			Recommended feed per tooth (fz = mm/z) for side milling (A). For slotting (B), reduce fz by 20%.																
	A		B	Cutting Speed — Vc m/min				D1 — Diameter															
	ap	ae	ap	min	Start	max	mm	2.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0				
N	1	Ap1 max	0,5 x D1	1 x D	500	600	2000	fz	0.022	0.044	0.055	0.066	0.088	0.110	0.132	0.153	0.176	0.198	0.220	0.275			
	2	Ap1 max	0,5 x D1	1 x D	500	600	1500	fz	0.020	0.040	0.048	0.059	0.079	0.099	0.119	0.138	0.158	0.178	0.198	0.247			
	3	Ap1 max	0,5 x D1	1 x D	500	600	1500	fz	0.015	0.031	0.038	0.046	0.062	0.077	0.092	0.107	0.123	0.138	0.154	0.192			
	4	Ap1 max	0,5 x D1	1 x D	400	450	750	fz	0.015	0.031	0.038	0.046	0.062	0.077	0.092	0.107	0.123	0.138	0.154	0.192			
	5	Ap1 max	0,5 x D1	1 x D	250	400	1000	fz	0.020	0.040	0.050	0.059	0.079	0.099	0.119	0.138	0.158	0.178	0.198	0.247			

Material Group																						
	Side Milling (A) and Slotting (B)			UNCOATED			Recommended feed per tooth (fz = mm/z) for side milling (A). For slotting (B), reduce fz by 20%.															
	A		B	Cutting Speed — Vc m/min				D1 — Diameter														
	ap	ae	ap	min	Start	max	mm	2.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0			
N	1	Ap1 max	0,5 x D1	1 x D	500	600	2000	fz	0.022	0.044	0.055	0.066	0.088	0.110	0.132	0.153	0.176	0.198	0.220	0.275		
	2	Ap1 max	0,5 x D1	1 x D	500	600	1500	fz	0.020	0.040	0.048	0.059	0.079	0.099	0.119	0.138	0.158	0.178	0.198	0.247		
	3	Ap1 max	0,5 x D1	1 x D	500	600	1500	fz	0.015	0.031	0.038	0.046	0.062	0.077	0.092	0.107	0.123	0.138	0.154	0.192		
	4	Ap1 max	0,5 x D1	1 x D	400	450	750	fz	0.015	0.031	0.038	0.046	0.062	0.077	0.092	0.107	0.123	0.138	0.154	0.192		
	5	Ap1 max	0,5 x D1	1 x D	250	400	1000	fz	0.020	0.040	0.050	0.059	0.079	0.099	0.119	0.138	0.158	0.178	0.198	0.247		

ALUFLASH • RAMPING 2FL • APPLICATION DATA • INCH

Material Group		Max Depth	Helical Interpolation / Ramping																														
			0° - 15°																														
			UNCOATED			Recommended feed per tooth (fz = IPT) for Helical Interpolation and Ramping																											
			Cutting Speed – Vc SFM			Diameter – D1 [Ømin–Ømax]																											
						Fraction	1/8	5/32	3/16	1/4	5/16	3/8	1/2	9/16	5/8	23/32	3/4	1															
						Decimals	.180-	.180-	.216-	.288-	.359-	.431-	.575-	.633-	.719-	.814-	.863-	1.150-															
							.180	.297	.356	.475	.594	.713	.950	1.047	1.188	1.346	1.425	1.900															
N	1	1.25 x D1	1500	1800	6000	IPT	.0009	.0017	.0022	.0026	.0035	.0043	.0052	.0060	.0069	.0078	.0087	.0108															
	2	1.25 x D1	1500	1800	4500	IPT	.0008	.0016	.0019	.0023	.0031	.0039	.0047	.0054	.0062	.0070	.0078	.0097															
	3	1.25 x D1	1500	1800	4500	IPT	.0006	.0012	.0015	.0018	.0024	.0030	.0036	.0042	.0048	.0054	.0061	.0076															
	4	1.25 x D1	1200	1350	2250	IPT	.0006	.0012	.0015	.0018	.0024	.0030	.0036	.0042	.0048	.0054	.0061	.0076															
	5	1.25 x D1	750	1200	3000	IPT	.0008	.0016	.0020	.0023	.0031	.0039	.0047	.0054	.0062	.0070	.0078	.0097															

Material Group	Max Depth	Helical Interpolation / Ramping																																
		15° - 30°			UNCOATED			Recommended feed per tooth (fz = IPT) for Helical Interpolation and Ramping																										
		Cutting Speed – Vc SFM			Diameter – D1 [Ømin–Ømax]																													
		min	Start	max	Fraction	1/8	5/32	3/16	1/4	5/16	3/8	1/2	9/16	5/8	23/32	3/4	1																	
					Decimals	.180-	.180-	.216-	.288-	.359-	.431-	.575-	.633-	.719-	.814-	.863-	1.150-																	
N	1	1.25 x D1	1500	1800	4800	IPT	.0006	.0013	.0016	.0019	.0026	.0032	.0039	.0045	.0052	.0058	.0065	.0081																
	2	1.25 x D1	1500	1800	3600	IPT	.0006	.0012	.0014	.0018	.0023	.0029	.0035	.0041	.0047	.0053	.0058	.0073																
	3	1.25 x D1	1500	1800	3600	IPT	.0005	.0009	.0011	.0014	.0018	.0023	.0027	.0032	.0036	.0041	.0045	.0057																
	4	1.25 x D1	1200	1350	1800	IPT	.0005	.0009	.0011	.0014	.0018	.0023	.0027	.0032	.0036	.0041	.0045	.0057																
	5	1.25 x D1	750	1200	2400	IPT	.0006	.0012	.0015	.0018	.0023	.0029	.0035	.0041	.0047	.0053	.0058	.0073																

Material Group	Max Depth	Helical Interpolation / Ramping																														
		30° - 45°			UNCOATED														Recommended feed per tooth (fz = IPT) for Helical Interpolation and Ramping													
		Cutting Speed – Vc SFM			Diameter – D1 [Ømin–Ømax]																											
		min	Start	max	Fraction	1/8	5/32	3/16	1/4	5/16	3/8	1/2	9/16	5/8	23/32	3/4	1	Decimals	.180-	.180-	.297	.356	.475	.594	.713	.950	1.047	1.188	1.346	1.425	1.900	
1	1.25 x D1	1260	1500	2400	IPT	.0005	.0010	.0013	.0016	.0021	.0026	.0031	.0036	.0042	.0047	.0052	.0065															
N	2	1.25 x D1	1260	1500	2400	IPT	.0005	.0009	.0011	.0014	.0019	.0023	.0028	.0033	.0037	.0042	.0047	.0058														
	3	1.25 x D1	1260	1500	2400	IPT	.0004	.0007	.0009	.0011	.0015	.0018	.0022	.0025	.0029	.0033	.0036	.0045														
	4	1.25 x D1	1020	1140	1350	IPT	.0004	.0007	.0009	.0011	.0015	.0018	.0022	.0025	.0029	.0033	.0036	.0045														
	5	1.25 x D1	630	1020	1800	IPT	.0005	.0009	.0012	.0014	.0019	.0023	.0028	.0033	.0037	.0042	.0047	.0058														

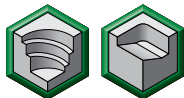
ALUFLASH • RAMPING 2FL • APPLICATION DATA • METRIC

Material Group	Max Depth	Helical Interpolation / Ramping 0° - 15°			  													
		UNCOATED			Recommended feed per tooth (fz = mm/z) for Helical Interpolation and Ramping													
		Cutting Speed — Vc m/min			Diameter – D1 [Ømin–Ømax]													
		min	Start	max	mm	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0	
				mm	2.5-4.8	4.6-7.6	5.8-9.5	6.9-11.4	9.2-15.2	11.5-19.0	13.8-22.8	16.1-26.6	18.4-30.4	20.7-34.2	23.0-38.0	28.8-47.5		
N	1	1,25 x D1	500	600	2000	fz	0.022	0.044	0.055	0.066	0.088	0.110	0.132	0.153	0.176	0.198	0.220	0.275
	2	1,25 x D1	500	600	1500	fz	0.020	0.040	0.048	0.059	0.079	0.099	0.119	0.138	0.158	0.178	0.198	0.247
	3	1,25 x D1	500	600	1500	fz	0.015	0.031	0.038	0.046	0.062	0.077	0.092	0.107	0.123	0.138	0.154	0.192
	4	1,25 x D1	400	450	750	fz	0.015	0.031	0.038	0.046	0.062	0.077	0.092	0.107	0.123	0.138	0.154	0.192
	5	1,25 x D1	250	400	1000	fz	0.020	0.040	0.050	0.059	0.079	0.099	0.119	0.138	0.158	0.178	0.198	0.247

Material Group	Max Depth	Helical Interpolation / Ramping 15° - 30°																
		UNCOATED			Recommended feed per tooth (fz = mm/z) for Helical Interpolation and Ramping													
		Cutting Speed — Vc m/min			Diameter – D1 [Ømin–Ømax]													
		min	Start	max	mm	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0	
				mm	2.5-4.8	4.6-7.6	5.8-9.5	6.9-11.4	9.2-15.2	11.5-19.0	13.8-22.8	16.1-26.6	18.4-30.4	20.7-34.2	23.0-38.0	28.8-47.5		
N	1	1,25 x D1	500	600	1600	fz	0.017	0.033	0.041	0.050	0.066	0.082	0.099	0.115	0.132	0.148	0.165	0.206
	2	1,25 x D1	500	600	1200	fz	0.015	0.030	0.036	0.045	0.059	0.074	0.089	0.104	0.119	0.134	0.148	0.185
	3	1,25 x D1	500	600	1200	fz	0.012	0.023	0.029	0.035	0.046	0.058	0.069	0.080	0.092	0.104	0.115	0.144
	4	1,25 x D1	400	450	600	fz	0.012	0.023	0.029	0.035	0.046	0.058	0.069	0.080	0.092	0.104	0.115	0.144
	5	1,25 x D1	250	400	800	fz	0.015	0.030	0.038	0.045	0.059	0.074	0.089	0.104	0.119	0.134	0.148	0.185

Material Group		Helical Interpolation / Ramping 30° - 45°			 														
					UNCOATED			Recommended feed per tooth (fz = mm/z) for Helical Interpolation and Ramping											
					Cutting Speed — Vc m/min			Diameter – D1 [Ømin–Ømax]											
Max Depth		min	Start	max	mm	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0		
					mm	2.5-4.8	4.6-7.6	5.8-9.5	6.9-11.4	9.2-15.2	11.5-19.0	13.8-22.8	16.1-26.6	18.4-30.4	20.7-34.2	23.0-38.0	28.8-47.5		
N	1	1,25 x D1	420	500	800	fz	0.013	0.026	0.033	0.040	0.053	0.066	0.079	0.092	0.106	0.119	0.132	0.165	
	2	1,25 x D1	420	500	800	fz	0.012	0.024	0.029	0.036	0.048	0.059	0.071	0.083	0.095	0.107	0.119	0.148	
	3	1,25 x D1	420	500	800	fz	0.009	0.018	0.023	0.028	0.037	0.046	0.055	0.064	0.074	0.083	0.092	0.115	
	4	1,25 x D1	340	380	450	fz	0.009	0.018	0.023	0.028	0.037	0.046	0.055	0.064	0.074	0.083	0.092	0.115	
	5	1,25 x D1	210	340	600	fz	0.012	0.024	0.030	0.036	0.048	0.059	0.071	0.083	0.095	0.107	0.119	0.148	

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Material Group		Helical Interpolation / Ramping 0° - 15°															
		UNCOATED		Recommended feed per tooth (fz = IPT) for Helical Interpolation and Ramping – fz x 1													
Cutting Speed – Vc m/min		Diameter – D1 [Ømin–Ømax]															
Max Depth		min	Start	max	Fraction	1/8	5/32	3/16	1/4	5/16	3/8	1/2	9/16	5/8	23/32	3/4	1
					Decimals	.180-.180	.180-.297	.216-.356	.288-.475	.359-.594	.431-.713	.575-.950	.633-1.047	.719-1.188	.814-1.346	.863-1.425	1.150-1.900
N	1	1.25 x D1	1500	1800	6000	IPT	.0009	.0017	.0022	.0026	.0035	.0043	.0052	.0060	.0069	.0078	.0108
	2	1.25 x D1	1500	1800	4500	IPT	.0008	.0016	.0019	.0023	.0031	.0039	.0047	.0054	.0062	.0070	.0097
	3	1.25 x D1	1500	1800	4500	IPT	.0006	.0012	.0015	.0018	.0024	.0030	.0036	.0042	.0048	.0054	.0076
	4	1.25 x D1	1200	1350	2250	IPT	.0006	.0012	.0015	.0018	.0024	.0030	.0036	.0042	.0048	.0054	.0076
	5	1.25 x D1	750	1200	3000	IPT	.0008	.0016	.0020	.0023	.0031	.0039	.0047	.0054	.0062	.0070	.0097

Material Group	Helical Interpolation / Ramping 15° - 30°																
				UNCOATED													
				Recommended feed per tooth (fz = IPT) for Helical Interpolation and Ramping – fz x 1													
	Cutting Speed — Vc m/min			Diameter – D1 [Ømin–Ømax]													
Max Depth	min	Start	max	Fraction	1/8	5/32	3/16	1/4	5/16	3/8	1/2	9/16	5/8	23/32	3/4	1	
				Decimals	.180-.180	.180-.297	.216-.356	.288-.475	.359-.594	.431-.713	.575-.950	.633-1.047	.719-1.188	.814-1.346	.863-1.425	1.150-1.900	
N	1	1.25 x D1	1500	1800	4800	IPT	.0006	.0013	.0016	.0019	.0026	.0032	.0039	.0045	.0052	.0058	.0081
	2	1.25 x D1	1500	1800	3600	IPT	.0006	.0012	.0014	.0018	.0023	.0029	.0035	.0041	.0047	.0053	.0073
	3	1.25 x D1	1500	1800	3600	IPT	.0005	.0009	.0011	.0014	.0018	.0023	.0027	.0032	.0036	.0041	.0057
	4	1.25 x D1	1200	1350	1800	IPT	.0005	.0009	.0011	.0014	.0018	.0023	.0027	.0032	.0036	.0041	.0057
	5	1.25 x D1	750	1200	2400	IPT	.0006	.0012	.0015	.0018	.0023	.0029	.0035	.0041	.0047	.0053	.0058

Material Group	Max Depth	Helical Interpolation / Ramping																												
		30° - 45°			UNCOATED					Recommended feed per tooth (fz = IPT) for Helical Interpolation and Ramping – fz x 1																				
		Cutting Speed – Vc m/min			Diameter – D1 [Ømin–Ømax]																									
		min	Start	max	Fraction	1/8	5/32	3/16	1/4	5/16	3/8	1/2	9/16	5/8	23/32	3/4	1													
					Decimals	.180-.180	.180-.297	.216-.356	.288-.475	.359-.594	.431-.713	.575-.950	.633-1.047	.719-1.188	.814-1.346	.863-1.425	1.150-1.900													
N	1	1.25 x D1	1260	1500	2400	IPT	.0005	.0010	.0013	.0016	.0021	.0026	.0031	.0036	.0042	.0047	.0065													
	2	1.25 x D1	1260	1500	2400	IPT	.0005	.0009	.0011	.0014	.0019	.0023	.0028	.0033	.0037	.0042	.0058													
	3	1.25 x D1	1260	1500	2400	IPT	.0004	.0007	.0009	.0011	.0015	.0018	.0022	.0025	.0029	.0033	.0045													
	4	1.25 x D1	1020	1140	1350	IPT	.0004	.0007	.0009	.0011	.0015	.0018	.0022	.0025	.0029	.0033	.0045													
	5	1.25 x D1	630	1020	1800	IPT	.0005	.0009	.0012	.0014	.0019	.0023	.0028	.0033	.0037	.0042	.0058													

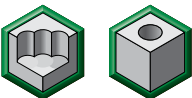
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Material Group		Helical Interpolation / Ramping 0° - 15°																	
		UNCOATED			Recommended feed per tooth (fz = mm/z) for Helical Interpolation and Ramping – fz x 1														
		Cutting Speed – Vc m/min			Diameter – D1 [Ømin-Ømax]														
		Max Depth	min	Start	max	mm	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0	
				mm	2.5-4.8	4.6-7.6	5.8-9.5	6.9-11.4	9.2-15.2	11.5-19.0	13.8-22.8	16.1-26.6	18.4-30.4	20.7-34.2	23.0-38.0	28.8-47.5			
N	1	1,25 x D1	500	600	2000	fz	0.022	0.044	0.055	0.066	0.088	0.110	0.132	0.153	0.176	0.198	0.220	0.275	
	2	1,25 x D1	500	600	1500	fz	0.020	0.040	0.048	0.059	0.079	0.099	0.119	0.138	0.158	0.178	0.198	0.247	
	3	1,25 x D1	500	600	1500	fz	0.015	0.031	0.038	0.046	0.062	0.077	0.092	0.107	0.123	0.138	0.154	0.192	
	4	1,25 x D1	400	450	750	fz	0.015	0.031	0.038	0.046	0.062	0.077	0.092	0.107	0.123	0.138	0.154	0.192	
	5	1,25 x D1	250	400	1000	fz	0.020	0.040	0.050	0.059	0.079	0.099	0.119	0.138	0.158	0.178	0.198	0.247	

Material Group	Helical Interpolation / Ramping 15° - 30°																	
				UNCOATED														
				Recommended feed per tooth (fz = mm/z) for Helical Interpolation and Ramping – fz x 1														
				Cutting Speed — Vc m/min														
	Max Depth	min	Start	max	mm	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0	
				mm	2.5-4.8	4.6-7.6	5.8-9.5	6.9-11.4	9.2-15.2	11.5-19.0	13.8-22.8	16.1-26.6	18.4-30.4	20.7-34.2	23.0-38.0	28.8-47.5		
N	1	1,25 x D1	500	600	1600	fz	0.017	0.033	0.041	0.050	0.066	0.082	0.099	0.115	0.132	0.148	0.165	0.206
	2	1,25 x D1	500	600	1200	fz	0.015	0.030	0.036	0.045	0.059	0.074	0.089	0.104	0.119	0.134	0.148	0.185
	3	1,25 x D1	500	600	1200	fz	0.012	0.023	0.029	0.035	0.046	0.058	0.069	0.080	0.092	0.104	0.115	0.144
	4	1,25 x D1	400	450	600	fz	0.012	0.023	0.029	0.035	0.046	0.058	0.069	0.080	0.092	0.104	0.115	0.144
	5	1,25 x D1	250	400	800	fz	0.015	0.030	0.038	0.045	0.059	0.074	0.089	0.104	0.119	0.134	0.148	0.185

Material Group		Helical Interpolation / Ramping																
		Max Depth	min	Start	max	UNCOATED					Recommended feed per tooth (fz = mm/z) for Helical Interpolation and Ramping – fz x 1							
Cutting Speed – Vc m/min						Diameter – D1 [Ømin–Ømax]												
mm	3.0					4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0		
mm	2.5-4.8					4.6-7.6	5.8-9.5	6.9-11.4	9.2-15.2	11.5-19.0	13.8-22.8	16.1-26.6	18.4-30.4	20.7-34.2	23.0-38.0	28.8-47.5		
N	1	1,25 x D1	420	500	800	fz	0.013	0.026	0.033	0.040	0.053	0.066	0.079	0.092	0.106	0.119	0.132	0.165
	2	1,25 x D1	420	500	800	fz	0.012	0.024	0.029	0.036	0.048	0.059	0.071	0.083	0.095	0.107	0.119	0.148
	3	1,25 x D1	420	500	800	fz	0.009	0.018	0.023	0.028	0.037	0.046	0.055	0.064	0.074	0.083	0.092	0.115
	4	1,25 x D1	340	380	450	fz	0.009	0.018	0.023	0.028	0.037	0.046	0.055	0.064	0.074	0.083	0.092	0.115
	5	1,25 x D1	210	340	600	fz	0.012	0.024	0.030	0.036	0.048	0.059	0.071	0.083	0.095	0.107	0.119	0.148

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Material Group																				
	Plunging/Drilling			UNCOATED			Recommended feed per revolution (fn =IPR) for Plunging 2 flute end mills													
				Cutting Speed – Vc SFM				D1 – Diameter												
	Max Depth	Applicable	Coolant	min	Start	max	Fraction	1/8	5/32	3/16	1/4	5/16	3/8	1/2	9/16	5/8	23/32	3/4	1	
N	1	1.5 x D	●	Required	360	780	1200	IPR	.0031	.0047	.0053	.0059	.0063	.0079	.0087	.0093	.0098	.0104	.0110	.0118
	2	1.5 x D	●	Required	360	750	840	IPR	.0031	.0047	.0053	.0059	.0063	.0079	.0087	.0093	.0098	.0104	.0110	.0118
	3	1.5 x D	●	Required	300	600	780	IPR	.0031	.0047	.0053	.0059	.0063	.0079	.0087	.0093	.0098	.0104	.0110	.0118
	4	1 x D	●	Required	180	450	780	IPR	.0024	.0031	.0039	.0047	.0055	.0063	.0079	.0083	.0087	.0093	.0098	.0110
	5	1.5 x D	●	Required	180	600	1200	IPR	.0031	.0047	.0053	.0059	.0063	.0079	.0087	.0093	.0098	.0104	.0110	.0118

Material Group	 																						
	Plunging/Drilling			UNCOATED			Recommended feed per revolution (fn =IPR) for Plunging 3 flute end mills																
				Cutting Speed – Vc SFM				D1 – Diameter															
		Max Depth	Applicable	Coolant	min	Start	max	Fraction	1/8	5/32	3/16	1/4	5/16	3/8	1/2	9/16	5/8	23/32	3/4	1			
N	1	1,5 x D	●	Required	360	780	1200	IPR	.0022	.0033	.0037	.0041	.0044	.0055	.0061	.0065	.0069	.0073	.0077	.0083			
	2	1,5 x D	●	Required	360	750	840	IPR	.0022	.0033	.0037	.0041	.0044	.0055	.0061	.0065	.0069	.0073	.0077	.0083			
	3	1,5 x D	●	Required	300	600	780	IPR	.0022	.0033	.0037	.0041	.0044	.0055	.0061	.0065	.0069	.0073	.0077	.0083			
	4	1 x D	●	Required	180	450	780	IPR	.0017	.0022	.0028	.0033	.0039	.0044	.0055	.0058	.0061	.0065	.0069	.0077			
	5	1,5 x D	●	Required	180	600	1200	IPR	.0022	.0033	.0037	.0041	.0044	.0055	.0061	.0065	.0069	.0073	.0077	.0083			

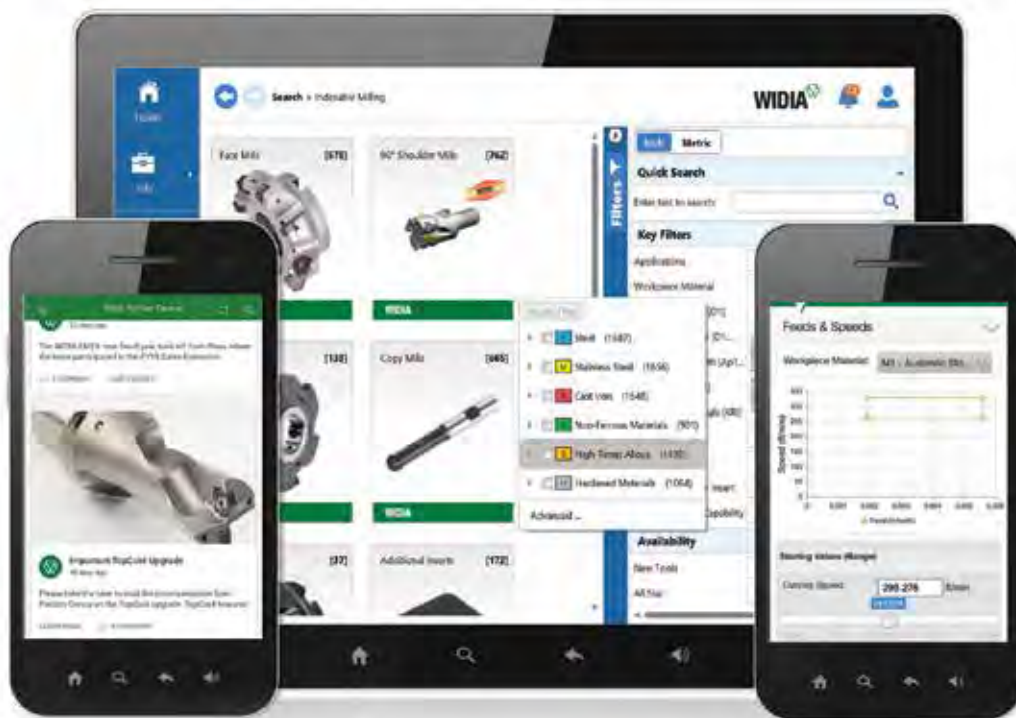
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Material Group	 																					
	Plunging/Drilling			UNCOATED			Recommended feed per revolution (fn =mm/rev) for Plunging 2 flute end mills															
				Cutting Speed – Vc m/min				D1 – Diameter														
		Max Depth	Applicable	Coolant	min	Start	max	mm	2.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0		
N	1	1,5 x D	●	Required	120	260	400	fn	0.080	0.120	0.135	0.150	0.160	0.200	0.220	0.235	0.250	0.265	0.280	0.300		
	2	1,5 x D	●	Required	120	250	280	fn	0.080	0.120	0.135	0.150	0.160	0.200	0.220	0.235	0.250	0.265	0.280	0.300		
	3	1,5 x D	●	Required	100	200	260	fn	0.080	0.120	0.135	0.150	0.160	0.200	0.220	0.235	0.250	0.265	0.280	0.300		
	4	1 x D	●	Required	60	150	260	fn	0.060	0.080	0.100	0.120	0.140	0.160	0.200	0.210	0.220	0.235	0.250	0.280		
	5	1.5 x D	●	Required	60	200	400	fn	0.080	0.120	0.135	0.150	0.160	0.200	0.220	0.235	0.250	0.265	0.280	0.300		

Material Group	 																			
	Plunging/Drilling			UNCOATED			Recommended feed per revolution (fn =mm/rev) for Plunging 3 flute end mills													
				Cutting Speed – Vc m/min				D1 – Diameter												
	Max Depth	Applicable	Coolant	min	Start	max	mm	2.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0	
N	1	1,5 x D	●	Required	120	260	400	fn	0.056	0.084	0.095	0.105	0.112	0.140	0.154	0.165	0.175	0.186	0.196	0.210
	2	1,5 x D	●	Required	120	250	280	fn	0.056	0.084	0.095	0.105	0.112	0.140	0.154	0.165	0.175	0.186	0.196	0.210
	3	1,5 x D	●	Required	100	200	260	fn	0.056	0.084	0.095	0.105	0.112	0.140	0.154	0.165	0.175	0.186	0.196	0.210
	4	1 x D	●	Required	60	150	260	fn	0.042	0.056	0.070	0.084	0.098	0.112	0.140	0.147	0.154	0.165	0.175	0.196
	5	1,5 x D	●	Required	60	200	400	fn	0.056	0.084	0.095	0.105	0.112	0.140	0.154	0.165	0.175	0.186	0.196	0.210

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METALCUTTING SAFETY

Projectile and Fragmentation Hazards

Modern metalcutting operations involve high spindle and cutter speeds and high temperatures and cutting forces. Hot metal chips may fly off the workpiece during metalcutting. Although cutting tools are designed and manufactured to withstand high cutting forces and temperatures, they can sometimes fragment, particularly if they are subjected to over-stress, severe impact, or other abuse.

To avoid injury:

- Always wear appropriate personal protective equipment, including safety goggles, when operating metalcutting machines or working nearby.
- Always make sure all machine guards are in place.

For more information, read the applicable Material Safety Data Sheet provided by WIDIA and consult General Industry Safety and Health Regulations, Part 1910, Title 29 of the Code of Federal Regulations.

These safety instructions are general guidelines. Many variables affect machining operations. It is impossible to cover every specific situation. The technical information included in this catalog and recommendations on machining practices may not apply to your particular operation.

For more information, consult the WIDIA Metalcutting Safety booklet, available free from WIDIA at +1 724 539 5747 or fax +1 724 539 5439. For specific product safety and environmental questions, contact our Corporate Environmental Health and Safety Office at +1 724 539 5066 or fax +1 724 539 5372.

Breathing and Skin Contact Hazards

Grinding carbide or other advanced cutting tool materials produces dust or mist containing metallic particles. Breathing this dust or mist — especially over an extended period — can cause temporary or permanent lung disease or make existing medical conditions worse. Contact with this dust or mist can irritate eyes, skin, and mucous membranes and may make existing skin conditions worse.

To avoid injury:

- Always wear breathing protection and safety goggles when grinding.
- Provide ventilation control and collect and properly dispose of dust, mist, or sludge from grinding.
- Avoid skin contact with dust or mist.

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