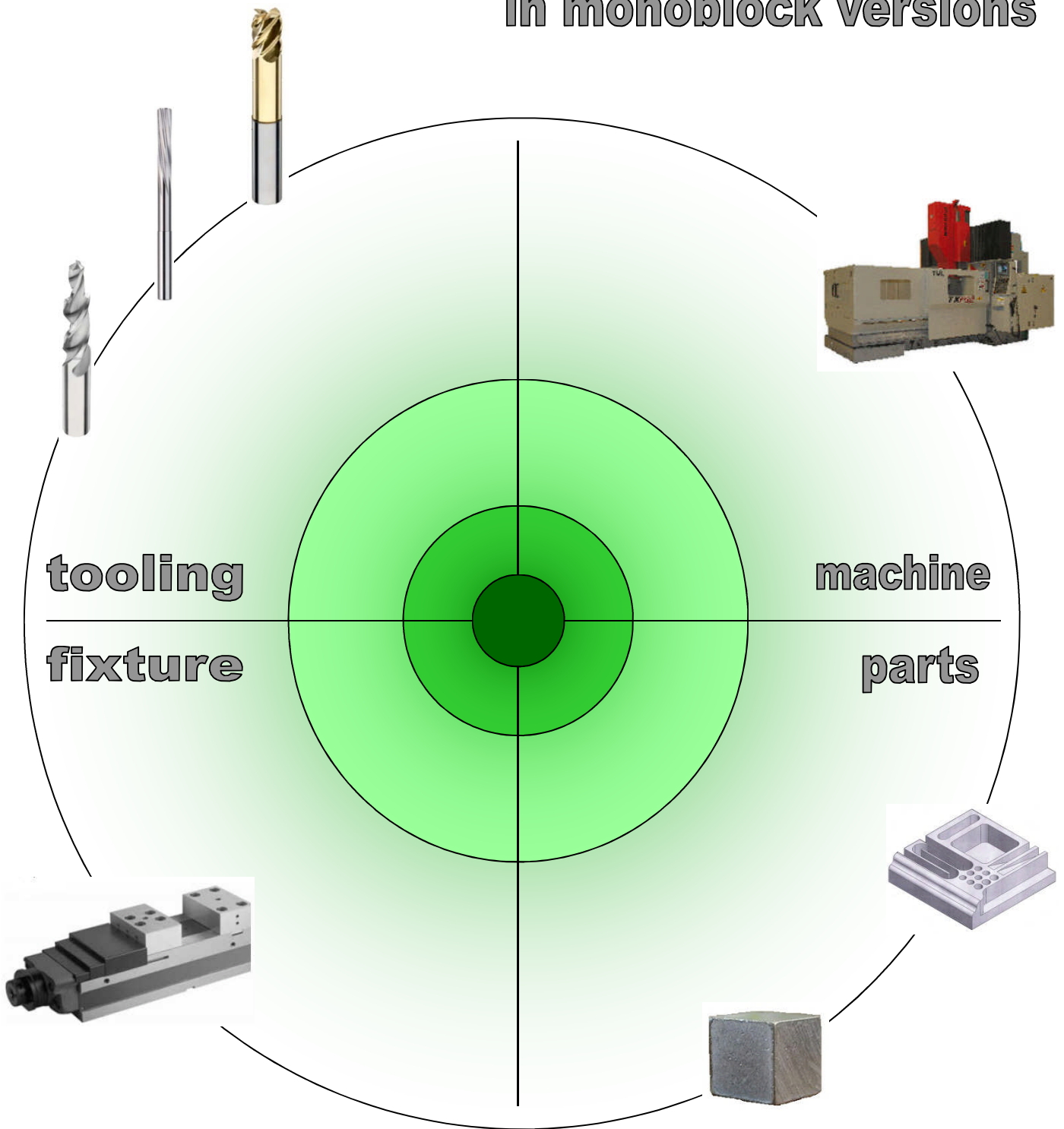
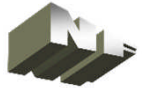


Rotative tooling in monoblock versions



NF Edition part 1 UK 2012

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• **Workpiece materials**

• **Application area tooling types**

• **Solid carbide drilling tools**

• **Solid carbide reaming tools**

• **Solid carbide milling tools**

square - and ballnose applications

edge land, radius and drill point applications

• **Technics**

formulas and calculations for:

drilling

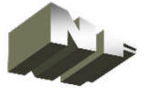
boring

reaming

milling



Workpiece materials



1 Aluminium wrought alloys Rm < 250 N/mm²

Workpiece material number	DIN description
3.0255	Al99.5
3.0280	Al99.8
3.0515	GAl995
3.3292	GDAIMg9
3.3315	AlMg1
3.3535	AlMg3
3.3547	AlMg4, 5Mn
3.3555	AlMg5

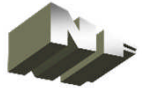
2 Aluminium wrought alloys Rm < 400 N/mm²

Workpiece material number	DIN description
3.0615	AlMgSiPb
3.1325	AlCuMg1
3.1355	AlCuMg2
3.1371	GAlCu4TiMg
3.1645	AlCuMgPb
3.1655	AlCuBiPb
3.1754	GAlCu5Ni1,5
3.2315	AlMgSi1
3.3206	AlMgSi0,5
3.3542	GAlMg3
3.3445	AlZnMgCu0,5

3 Aluminium casting alloys; low abrasive Si < 12% and Rm < 300N/mm²

Workpiece material number	DIN description
3.1841	GAlCu4Ti
3.2131	GAlSi5Cu1
3.2151	GAlSi6Cu4
3.2161	GAlSi8Cu3
3.2163	GDAISi9Cu3
3.2211	GAlSi11
3.2341	GAlSi5Mg
3.2373	GAlSi9Mg
3.2381	GAlSi10Mg

Workpiece materials



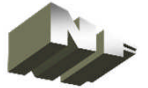
3 Aluminium casting alloys; low abrasive Si < 12% and Rm < 300N/mm²

Workpiece material number	DIN description
3.2382	GDAISi10Mg
3.2383	GAISi10MgCu
3.2581	GAISi12
3.2582	GDAISi12
3.2583	GAISi12Cu
3.2585	SAISi12
3.2982	GDAISi12Cu
3.3241	GAIMg3Si
3.3261	GAIMg5Si
3.3561	GAIMg5
3.5101	GMgZn4SE1Zr1
3.5102	GMgZn5Th2Zr1
3.5103	MgSE3Zn2Zr1
3.5105	GMgTh3Zn2Zr1
3.5106	GMgAg3SE2Zr1
3.5200	GMGAl8Zn1
3.5470	GDMgAl4Si1
3.5612	GDMgAl6Zn1
3.5662	GDMgAl6
3.5812	GMgAl8Zn1
3.5912	GMgAl9Zn1
2.1871	GAICu4TiMg
3.2371	GAISi7Mg

4 Aluminium casting alloys; high abrasive Si > 12% < 18% and Rm < 550N/mm²

Workpiece material number	DIN description
	GAISi17Cu4
	GAISi21CuNiMg

Workpiece materials



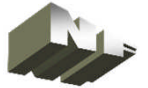
5 Copper free machining alloys; Pb > 1%

Workpiece material number	DIN description
2.0290	GCuZn33Pb
2.0330	CuZn36Pb1,5
2.0331	CuZn36Pb1,5
2.0340	GCuZn37Pb
2.0401	CuZn39Pb3
2.0402	CuZn39Pb2
2.1061	GCuSn12Pb
2.1090	GCuSn7ZnPb
2.1096	GCuSN5ZnPb
2.1098	GCuSn2ZnPb
2.1176	GCuPb10Sn
2.1182	GCuPb15Sn

6 Brass, copper alloys

Workpiece material number	DIN description
2.0220	CuZn5
2.0240	CuZn15
2.0265	CuZn30
2.0321	CuZn37
2.0380	CuZn39Pb2
2.0492	GCuZn15Si4
2.0510	CuZn37Al1
2.0550	CuZn40Al2
2.0561	CuZn40Al1
2.0590	GCuZn40Fe
2.0591	GKCuZn38Al
2.0592	GCuZn35Al1
2.0592	GKCuZn37Al1
2.0595	GCuZn34Al2
2.0596	GCuZn25Al5
2.1188	GCuPb20Sn
2.1292	GCuCrF35
2.1293	CuCrZr

Workpiece materials



7 Copper, copper without lead and electrolytic copper

Workpiece material number	DIN description
2.0040	OFCu
2.0060	ECu57
2.0065	ECu58
2.0070	SECu
2.0082	GCuL45
2.0085	GCuL50
2.0241	CuZn40MnPb
2.0460	CuZn20Al2
2.0872	CuNi10Fe1Mn
2.0882	CuNi30Mn1Fe
2.0936	CuAl10Fe3Mn2
2.0940	GCuAl10Fe
2.0966	CuAl10Ni5Fe4
2.0975	GCuAl10Ni
2.1050	GCuSn10
2.1052	GCuSn12
2.1060	GCuSn12Ni
2.1086	GCuSn10Zn
2.1093	GCuSn6ZnNi

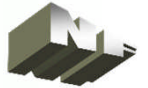
8 Duro - and thermoplastics

Workpiece material number	DIN description
PC	Makralon, Nuclon and Plastocarbon
Pe	Baylon, Dekalen, Lupolen and Hostalen
PF	Alberit, Bakelit, Bulitol, Durax, Harex and Resinol
PFTE	Hostaflon
PP	Vestolen PP, Synalen PP, Novolen and Hostalen PP
PS	Hostyron, Lorkalen, Polystyrol and Styropor
PVC	Coroplast, Hostalit, Mipolam, Opalon, Solves and Vinoflex

9 Fibrous reinforced plastics

Workpiece material number	DIN description
AFK	Keflar, Twaron
BFK/CFK/GFK/MFK en SFK	

Application area tool types



1 Aluminium wrought alloys $R_m < 250 \text{ N/mm}^2$

Drilling with solid carbide

812...	814...	818...	833...
835...	840...	851...	870...
881...	924...	950...	

Drilling with inserts

6010...	6015...	6020...	
---------	---------	---------	--

Boring with inserts

TVA...	2TP...	1THF...	1TAF...
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Reaming with solid carbide

R2...	R2 2S...	R3...	990...
991...			

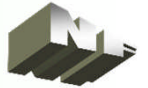
Milling with solid carbide

241...	310...	311...	312...
313...	512...	514...	700...
722...	770...	800...	870...
890...	1100...	1101...	1102...

Milling with inserts

1010...	1012...	1014...	1016...
1018...	1030...	1035...	1040...
1045...	1055...	1060...	1064...
1070...	1072...	1075...	1095...
1105...	1110...	1122...	1132...
2060...	2110...	2112...	2114...
2116...	2118...	2130...	2132...
2134...	2136...	2138...	3012...
3016...			

Application area tool types



2 Aluminium wrought alloys Rm < 400 N/mm²

Drilling with solid carbide

812...	814...	818...	833...
835...	840...	851...	870...
881...	924...	950...	

Drilling with inserts

6010...	6015...	6020...	
---------	---------	---------	--

Boring with inserts

TVA...	2TP...	1THF...	1TAF...
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Reaming with solid carbide

R2...	R3...	R2 2S...	990...
991...			

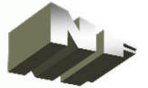
Milling with solid carbide

241...	310...	311...	312...
313...	354...	355...	356...
362...	363...	512...	514...
515...	516...	517...	518...
522...	524...	643...	700...
722...	770...	800...	870...
890...	1100...	1101...	1102...

Milling with inserts

1010...	1012...	1014...	1016...
1018...	1030...	1035...	1040...
1045...	1055...	1060...	1060...
1064...	1070...	1072...	1075...
1095...	1105...	1110...	1122...
1132...	2060...	2110...	2112...
2114...	2116...	2118...	2130...
2132...	2134...	2136...	2138...
3012/3016...	5010W/5040W...	5015T/5026T...	5045/5090...

Application area tool types



3 Aluminium casting alloys; low abrasive Si < 12% and Rm < 300 N/mm²

Drilling with solid carbide

812...	814...	818...	820...
832...	833...	834...	835...
851...	818...	924...	950...
960...	1025...		

Drilling with inserts

6010...	6015...	6020...	6025...
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Boring with inserts

TVA...	2TP...	1THF...	1TAF...
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Reaming with solid carbide

R2...	R2 2S...	R3...	990...
991...	992...	993...	

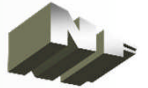
Milling with solid carbide

241...	310...	311...	312...
313...	354...	354...	356...
358...	359...	362...	363...
512...	514...	515...	516...
517...	518...	522...	524...
643...	700...	722...	770...
800...	870...	890...	1100...
1101...	1102...		

Milling with inserts

1010...	1012...	1014...	1016...
1018...	1030...	1035...	1040...
1045...	1055...	1060...	1064...
1070...	1072...	1075...	1095...
1105...	1110...	1122...	1132...
2060...	2110/2138...	3012/3016...	5010/5040...
5015T/5026T...	5045/5090...		

Application area tool types



4 Aluminium casting alloys; high abrasive Si > 12% < 18% and Rm < 550 N/mm²

Drilling with solid carbide

812...	814...	818...	820...
832...	833...	834...	835...
851...	881...	924...	950...
960...	1025...		

Drilling with inserts

6010...	6015...	6020...	6025...
---------	---------	---------	---------

Boring with inserts

TVA...	2TP...	1THF...	1TAF...
--------	--------	---------	---------

Reaming with solid carbide

R2...	R2 2S...	R3...	990...
991...	992...	993...	

Milling with solid carbide

241...	310...	311...	312...
313...	354...	354...	356...
358...	359...	362...	363...
512...	514...	515...	516...
517...	518...	522...	524...
643...	700...	722...	770...
800...	870...	890...	1100...
1101...	1102...		

Milling with inserts

1010...	1012...	1014...	1016...
1018...	1030...	1035...	1040...
1045...	1055...	1060...	1064...
1070...	1072...	1075...	1095...
1105...	1110...	1122...	1132...
2060...	2110/2138...	3012/3016...	5010/5040...
5015T/5026T...	5045/5090...		

Application area tool types



5 Copper free machining alloys; Pb > 1%

Drilling with solid carbide

812...	814...	818...	833...
835...	840...	851...	870...
881...	924...	950...	

Drilling with inserts

6010...	6015...	6020...	
---------	---------	---------	--

Boring with inserts

TVA...	2TP...	1THF...	1TAF...
--------	--------	---------	---------

Reaming with solid carbide

R2...	R2 2S...	R3...	990...
991...			

Milling with solid carbide

241...	310...	311...	312...
313...	512...	514...	700...
722...	770...	800...	870...
890...	1100...	1101...	1102...

Milling with inserts

1030...	1035...	1040...	1045...
1055...	1060...	1064...	1070...
1072...	1075...	1095...	1105...
1110...	2110...	2112...	2114...
2116...	2118...	2130...	2132...
2134...	2136...	2138...	3012...
3016...			

Application area tool types



6 Brass and copper

Drilling with solid carbide

812...	814...	818...	820...
833...	834...	835...	840...
851...	881...	924...	950...
960...	970...	1025...	

Drilling with inserts

6010...	6015...	6020...	6025...
---------	---------	---------	---------

Boring with inserts

TVA...	2TP...	1THF...	1TAF...
--------	--------	---------	---------

Reaming with solid carbide

R2...	R2 2S...	R3...	990...
991...	992...	993...	

Milling with solid carbide

241...	310...	311...	312...
313...	354...	355...	356...
358...	359...	362...	363...
512...	514...	515...	516...
517...	522...	524...	643...
700...	722...	770...	800...
870...	890...	1100...	1101...
1102...			

Milling with inserts

1010...	1012...	1014...	1016...
1018...	1030...	1035...	1040...
1045...	1055...	1060...	1064...
1070...	1072...	1075...	1095...
1105...	1110...	1122...	1132...
2060...	2110/2138...	3012/3016...	5010/5040...
5015T/5026T...	5045/5090...		

Application area tool types



7 Copper, copper without lead and electrolytic copper

Drilling with solid carbide

812...	814...	833...	835...
840...	851...	870...	881...
924...	950...		

Drilling with inserts

6010...	6015...	6020...	
---------	---------	---------	--

Boring with inserts

TVA...	2TP...	1THF...	1TAF...
--------	--------	---------	---------

Reaming with solid carbide

R2...	R2 2S...	R3...	990...
991...			

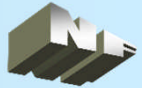
Milling with solid carbide

241...	310...	311...	312...
313...	354...	355...	356...
358...	359...	362...	363...
512...	514...	515...	516...
517...	522...	524...	643...
700...	722...	770...	800...
870...	890...	1100...	1101...
1102...			

Milling with inserts

1030...	1035...	1040...	1045...
1055...	1060...	1064...	1070...
1072...	1075...	1095...	1122...
1132...	2110...	2112...	2114...
2116...	2118...	2130...	2132...
2134...	2136...	2138...	3012...
3016...			

Application area tool types



8 Duro - and thermoplastics

Drilling with solid carbide

812...	814...	832...	833...
834...	835...	840...	851...
870...	881...	924...	

Drilling with inserts

6010...	6015...	6020...	
---------	---------	---------	--

Boring with inserts

TVA...	2TP...	1THF...	1TAF...
--------	--------	---------	---------

Reaming with solid carbide

R2...	R2 2S...	R3...	990...
991...	992...	993...	

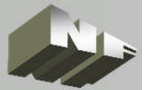
Milling with solid carbide

241...	310...	311...	312...
313...	354...	355...	356...
358...	359...	362...	363...
512...	514...	515...	516...
517...	522...	524...	643...
700...	722...	770...	800...
870...	890...	1100...	1101...
1102...			

Milling with inserts

1030...	1035...	1040...	1045...
1055...	1060...	1064...	1070...
1072...	1075...	1095...	1105...
1110...	1122...	1132...	2110...
2112...	2114...	2116...	2118...
2130...	2132...	2134...	2136...
2138...	3012...	3016...	5010/5040...

Application area tool types



9 Fabrous reinforced plastics

Drilling with solid carbide

812...	832...	833...	834...
835...	840...	851...	870...
881...			

Drilling with inserts

...

Boring with inserts

TVA...	2TP...	1THF...	1TAF...
--------	--------	---------	---------

Reaming with solid carbide

...

Milling with solid carbide

241...	310...	311...	312...
313...	354...	355...	356...
358...	359...	362...	363...
512...	514...	515...	516...
517...	522...	524...	643...
700...	722...	770...	800...
870...	890...	1100...	1101...
1102...			

Milling with inserts

1030...	1035...	1040...	1045...
1055...	1060...	1064...	1070...
1072...	1075...	1095...	1105...
1110...	2110...	2112...	2114...
2116...	2118...	2130...	2132...
2134...	2136...	2138...	



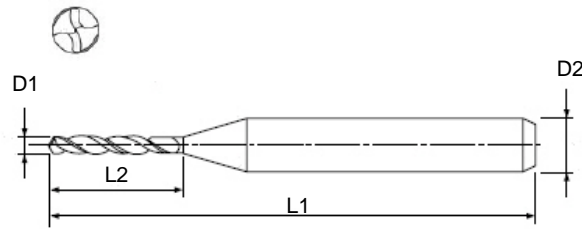
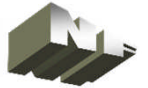
• Drilling operations

SC tool types; universal

Ø 0.80 - 3.00	4 x D	840...	not coated / TiAIN
0.80 - 3.00	7 x D	870...	not coated / TiAIN
1.00 - 2.90	3 x D	833...	not coated / TiAIN
1.00 - 2.90	5 x D	851...	not coated / TiAIN
1.00 - 2.90	8 x D	881...	not coated / TiAIN
1.00 - 2.90	12 x D	812...	not coated / TiAIN
0.61 - 12.50	2.5 x D	832...	not coated / TiAIN
1.00 - 8.50	4 x D	834...K	not coated / TiAIN
1.00 - 8.50	6 x D	834...L	not coated / TiAIN
0.70 - 8.50	7 x D	835...	not coated / TiAIN
1.0 - 20.0	5 x D	814...	TiAIN
1.0 - 20.0	8 x D	818...	TiAIN
1.0 - 16.0	12 x D	820...	TiAIN
1.0 - 16.0	15 x D	1025...	TiAIN
M3 - M10	hole	950...	not coated
M3 - M16	hole	960...	TiAIN
3 - 20	142° point	924...	TiAIN



• 840 Series



840 Series

Ø 0.80 - 3.00 mm for **4 x D** drilling depth

2 cutting edges

140° attack angle; self centering

30° helix angle

DIN 6535 HA shank [h6]

not coated - and TiAIN coating

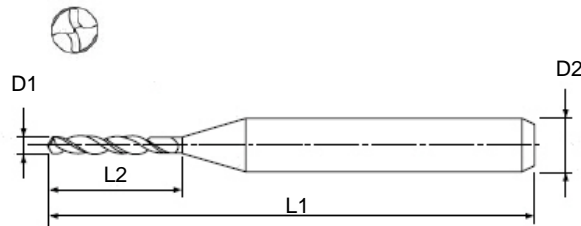
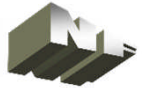


Article number not coated
840 080
840 085
840 090
840 095
840 100
840 105
840 110
840 115
840 120
840 125
840 130
840 135
840 140
840 145
840 150
840 155
840 160
840 165
840 170
840 175
840 180
840 185
840 190
840 195
840 200
840 205
840 210
840 215
840 220
840 225
840 230
840 235
840 240

Article number TiAIN coated
840 080 TiAIN
840 085 TiAIN
840 090 TiAIN
840 095 TiAIN
840 100 TiAIN
840 105 TiAIN
840 110 TiAIN
840 115 TiAIN
840 120 TiAIN
840 125 TiAIN
840 130 TiAIN
840 135 TiAIN
840 140 TiAIN
840 145 TiAIN
840 150 TiAIN
840 155 TiAIN
840 160 TiAIN
840 165 TiAIN
840 170 TiAIN
840 175 TiAIN
840 180 TiAIN
840 185 TiAIN
840 190 TiAIN
840 195 TiAIN
840 200 TiAIN
840 205 TiAIN
840 210 TiAIN
840 215 TiAIN
840 220 TiAIN
840 225 TiAIN
840 230 TiAIN
840 235 TiAIN
840 240 TiAIN

D1	L2	D2	L1
0.80	5.20	3.00	44
0.85	5.20	3.00	44
0.90	5.80	3.00	44
0.95	5.80	3.00	44
1.10	6.40	3.00	44
1.05	6.40	3.00	44
1.10	7.00	3.00	44
1.15	7.00	3.00	44
1.20	7.60	3.00	45
1.25	7.60	3.00	45
1.30	8.20	3.00	45
1.35	8.20	3.00	45
1.40	8.80	3.00	46
1.45	8.80	3.00	46
1.50	9.40	3.00	46
1.55	9.40	3.00	46
1.60	10.0	3.00	47
1.65	10.0	3.00	47
1.70	10.6	3.00	47
1.75	10.6	3.00	47
1.80	11.2	3.00	48
1.85	11.2	3.00	48
1.90	11.8	3.00	48
1.95	11.8	3.00	48
2.00	12.4	3.00	55
2.05	12.4	3.00	55
2.10	13.0	3.00	55
2.15	13.0	3.00	55
2.20	13.6	3.00	56
2.25	13.6	3.00	56
2.30	14.2	3.00	56
2.35	14.2	3.00	56
2.40	14.6	3.00	57

• 840 Series



840 Series

Ø 0.80 - 3.00 mm for **4 x D** drilling depth

2 cutting edges

140° attack angle; self centering

30° helix angle

DIN 6535 HA shank [h6]

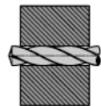
not coated - and TiAlN coating



Article number not coated
840 245
840 250
840 255
840 260
840 265
840 270
840 275
840 280
840 285
840 290
840 295
840 300

Article number TiAlN coated
840 245 TiAlN
840 250 TiAlN
840 255 TiAlN
840 260 TiAlN
840 265 TiAlN
840 270 TiAlN
840 275 TiAlN
840 280 TiAlN
840 285 TiAlN
840 290 TiAlN
840 295 TiAlN
840 300 TiAlN

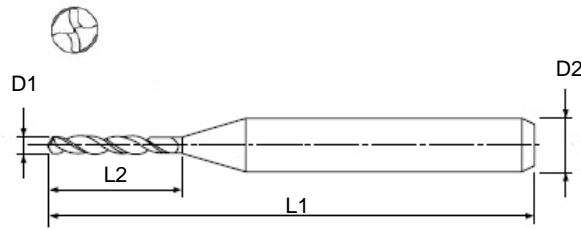
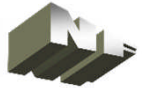
D1	L2	D2	L1
2.45	14.6	3.00	57
2.50	15.2	3.00	57
2.55	15.2	3.00	57
2.60	15.8	3.00	58
2.65	15.8	3.00	58
2.70	16.4	3.00	58
2.75	16.4	3.00	58
2.80	17.0	3.00	60
2.85	17.0	3.00	60
2.90	17.6	3.00	60
2.95	17.6	3.00	60
3.00	18.0	3.00	60



Machining example

Workpiece:	flange	6
Material:	brass CuZn15	
Operation:	hole Ø 2.5 mm; drilling depth 6.0 mm	
Machining center:	horizontal	
Adapter:	SK40 MAS-BT/JIS to ER20 collet	
Coolant:	8% emulsion	
Tool:	840 250 TiAlN	
Cutting speed Vc / revs. n:	Vc = 70.0 m/min / n = 8917 r.p.m.	
Feed rate fn and Vf:	fn = 0.1 mm and Vf = 892 mm/min	

• 870 Series



870 Series

Ø 0.80 - 3.00 mm for **7 x D** drilling depth

2 cutting edges

140° attack angle; self centering

30° helix angle

DIN 6535 HA shank [h6]

not coated - and TiAIN coated

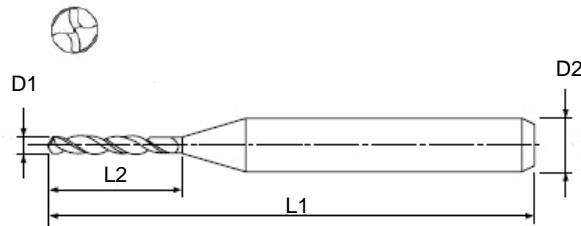
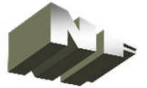


Article number not coated
870 080
870 085
870 090
870 095
870 100
870 105
870 110
870 115
870 120
870 125
870 130
870 135
870 140
870 145
870 150
870 155
870 160
870 165
870 170
870 175
870 180
870 185
870 190
870 195
870 200
870 205
870 210
870 215
870 220
870 225
870 230
870 235
870 240

Article number TiAIN coated
870 080 TiAIN
870 085 TiAIN
870 090 TiAIN
870 095 TiAIN
870 100 TiAIN
870 105 TiAIN
870 110 TiAIN
870 115 TiAIN
870 120 TiAIN
870 125 TiAIN
870 130 TiAIN
870 135 TiAIN
870 140 TiAIN
870 145 TiAIN
870 150 TiAIN
870 155 TiAIN
870 160 TiAIN
870 165 TiAIN
870 170 TiAIN
870 175 TiAIN
870 180 TiAIN
870 185 TiAIN
870 190 TiAIN
870 195 TiAIN
870 200 TiAIN
870 205 TiAIN
870 210 TiAIN
870 215 TiAIN
870 220 TiAIN
870 225 TiAIN
870 230 TiAIN
870 235 TiAIN
870 240 TiAIN

D1	L2	D2	L1
0.80	6.8	3.00	45
0.85	6.8	3.00	45
0.90	7.6	3.00	45
0.95	7.6	3.00	45
1.10	8.4	3.00	46
1.05	8.4	3.00	46
1.10	9.2	3.00	46
1.15	9.2	3.00	46
1.20	11.3	3.00	49
1.25	11.3	3.00	49
1.30	12.2	3.00	49
1.35	12.2	3.00	49
1.40	13.1	3.00	50.5
1.45	13.1	3.00	50.5
1.50	13.5	3.00	50.5
1.55	13.5	3.00	50.5
1.60	14.9	3.00	52
1.65	14.9	3.00	52
1.70	15.8	3.00	52
1.75	15.8	3.00	52
1.80	16.7	3.00	53.5
1.85	16.7	3.00	53.5
1.90	17.6	3.00	53.5
1.95	17.6	3.00	53.5
2.00	18.5	3.00	61.5
2.05	18.5	3.00	61.5
2.10	19.4	3.00	61.5
2.15	19.4	3.00	61.5
2.20	20.3	3.00	63
2.25	20.3	3.00	63
2.30	21.2	3.00	63
2.35	21.2	3.00	63
2.40	22.1	3.00	64.5

• 870 Series



870 Series

Ø 0.80 - 3.00 mm for **7 x D** drilling depth

2 cutting edges

140° attack angle; self centering

30° helix angle

DIN 6535 HA shank [h6]

not coated - and TiAlN coating



Article number not coated
870 245
870 250
870 255
870 260
870 265
870 270
870 275
870 280
870 285
870 290
870 295
870 300

Article number TiAlN coated
870 245 TiAlN
870 250 TiAlN
870 255 TiAlN
870 260 TiAlN
870 265 TiAlN
870 270 TiAlN
870 275 TiAlN
870 280 TiAlN
870 285 TiAlN
870 290 TiAlN
870 295 TiAlN
870 300 TiAlN

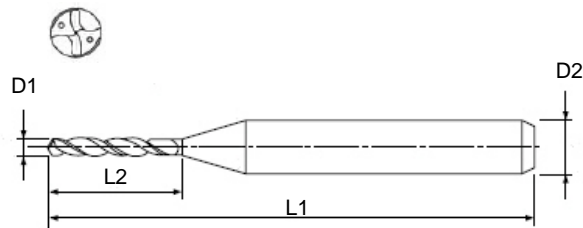
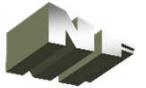
D1	L2	D2	L1
2.45	22.1	3.00	64.5
2.50	23.0	3.00	64.5
2.55	23.0	3.00	64.5
2.60	23.9	3.00	66
2.65	23.9	3.00	66
2.70	24.8	3.00	66
2.75	24.8	3.00	66
2.80	25.7	3.00	67.5
2.85	25.7	3.00	67.5
2.90	26.9	3.00	67.5
2.95	26.9	3.00	67.5
3.00	27.2	3.00	67.5



Machining example

Workpiece:	hydraulic controlblock	2
Material:	AlMgSi1	
Operation:	hole Ø 2.8 mm; drilling depth 14.0 mm	
Method:	pre centering with 142° drill point and in steps towards total drilling depth [1xD]	
Machining:	horizontal	
Adapter:	SK40 MAS-BT/JIS to hydraulic chuck	
Coolant:	8% emulsion	
Tool:	870 280	
Cutting speed Vc / revs. n:	Vc = 85.0 m/min / n = 9670 r.p.m.	
Feed rate fn and Vf:	fn = 0.045 mm and Vf = 435 mm/min	

• 833 Series




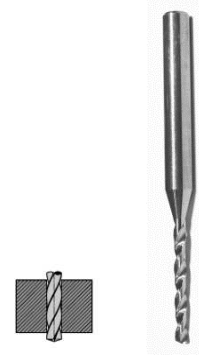
833 Series [central coolant channels]
 Ø 1.00 - 2.90 mm for **3 x D** drilling depth
 2 cutting edges
 140° attack angle; self centering
 30° helix angle
 DIN 6535 HA shank [h6]
 not coated - and TiAIN coating



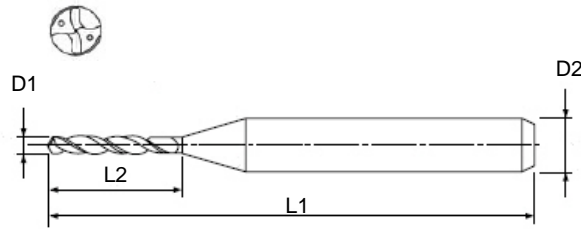
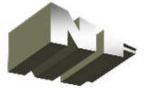
Article number not coated	Article number TiAIN coated	D1 [+0.004]	L2	D2	L1
833 0100	833 0100 TiAIN	1.00	6	3.00	55
833 0110	833 0110 TiAIN	1.10	9	3.00	55
833 0120	833 0120 TiAIN	1.20	9	3.00	55
833 0125	833 0125 TiAIN	1.25	9	3.00	55
833 0130	833 0130 TiAIN	1.30	9	3.00	55
833 0135	833 0135 TiAIN	1.35	9	3.00	55
833 0140	833 0140 TiAIN	1.40	9	3.00	55
833 0145	833 0145 TiAIN	1.45	9	3.00	55
833 0150	833 0150 TiAIN	1.50	9	3.00	68
833 0160	833 0160 TiAIN	1.60	12	3.00	68
833 0170	833 0170 TiAIN	1.70	12	3.00	68
833 0180	833 0180 TiAIN	1.80	12	3.00	68
833 0190	833 0190 TiAIN	1.90	12	3.00	68
833 0200	833 0200 TiAIN	2.00	12	3.00	74
833 0210	833 0210 TiAIN	2.10	15	3.00	74
833 0220	833 0220 TiAIN	2.20	15	3.00	74
833 0230	833 0230 TiAIN	2.30	15	3.00	74
833 0240	833 0240 TiAIN	2.40	15	3.00	74
833 0250	833 0250 TiAIN	2.50	15	3.00	81
833 0260	833 0260 TiAIN	2.60	16	3.00	81
833 0270	833 0270 TiAIN	2.70	16	3.00	81
833 0280	833 0280 TiAIN	2.80	16	3.00	81
833 0290	833 0290 TiAIN	2.90	16	3.00	81

Machining example

Workpiece: rotor cap 
 Material: G AISi5Cu1
 Operation: hole Ø 2.0 mm; drilling depth 5.0 mm
 Machining center: vertical
 Adapter: HSK 63 A to shrink fit chuck
 Coolant: 8% emulsion; 20 bar pressure
 Tool: 833 0200 TiAIN
 Cutting speed Vc / revs. n: Vc = 62.8 m/min / n = 10000 r.p.m.
 Feed rate fn and Vf: fn = 0.07 mm and Vf = 700 mm/min



• 851 Series




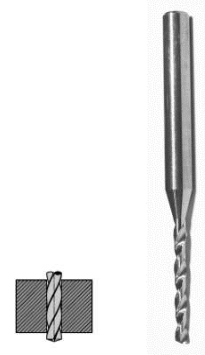
851 Series [central coolant channels]
 Ø 1.00 - 2.90 mm for **5 x D** drilling depth
 2 cutting edges
 140° attack angle; self centering
 30° helix angle
 DIN 6535 HA shank [h6]
 not coated - and TiAIN coated



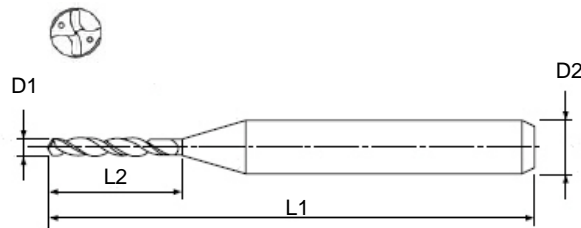
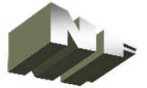
Article number not coated	Article number TiAIN coated	D1 [+0.004]	L2	D2	L1
851 0100	851 0100 TiAIN	1.00	8	3.00	55
851 0110	851 0110 TiAIN	1.10	9	3.00	55
851 0120	851 0120 TiAIN	1.20	9	3.00	55
851 0125	851 0125 TiAIN	1.25	9	3.00	55
851 0130	851 0130 TiAIN	1.30	9	3.00	55
851 0135	851 0135 TiAIN	1.35	9	3.00	55
851 0140	851 0140 TiAIN	1.40	9	3.00	55
851 0145	851 0145 TiAIN	1.45	9	3.00	55
851 0150	851 0150 TiAIN	1.50	9	3.00	68
851 0160	851 0160 TiAIN	1.60	12	3.00	68
851 0170	851 0170 TiAIN	1.70	12	3.00	68
851 0180	851 0180 TiAIN	1.80	12	3.00	68
851 0190	851 0190 TiAIN	1.90	12	3.00	68
851 0200	851 0200 TiAIN	2.00	12	3.00	74
851 0210	851 0210 TiAIN	2.10	15	3.00	74
851 0220	851 0220 TiAIN	2.20	15	3.00	74
851 0230	851 0230 TiAIN	2.30	15	3.00	74
851 0240	851 0240 TiAIN	2.40	15	3.00	74
851 0250	851 0250 TiAIN	2.50	15	3.00	81
851 0260	851 0260 TiAIN	2.60	16	3.00	81
851 0270	851 0270 TiAIN	2.70	16	3.00	81
851 0280	851 0280 TiAIN	2.80	16	3.00	81
851 0290	851 0290 TiAIN	2.90	16	3.00	81

Machining example

Workpiece: cover plate 
 Material: G AISi11
 Operation: hole Ø 2.6 mm; drilling depth 11.0 mm
 Machining center: vertical
 Adapter: HSK 63 A to hydraulic chuck
 Coolant: 8% emulsion; 20 bar pressure
 Tool: 851 0260 TiAIN
 Cutting speed Vc / revs. n: Vc = 65.3 m/min / n = 8000 r.p.m.
 Feed rate fn and Vf: fn = 0.08 mm and Vf = 640 mm/min



• 881 Series



881 Series [central coolant channels]
 Ø 1.00 - 2.90 mm for **8 x D** drilling depth
 2 cutting edges
 140° attack angle; self centering
 30° helix angle
 DIN 6535 HA shank [h6]
 not coated - and TiAlN coated

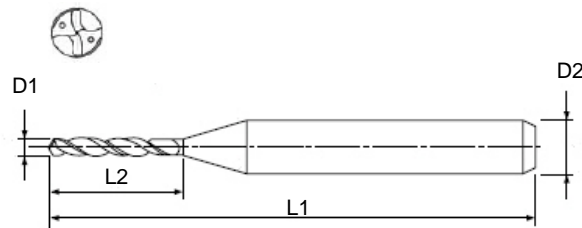
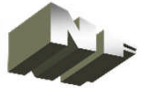
1	2	3	5	4	6	7	8	9	D1	L2	D2	L1	
Article number not coated				Article number TiAlN gecoat					[+0.004]				
881 0100				881 0100 TiAlN					1.00	11	3.00	55	
881 0110				881 0110 TiAlN					1.10	17	3.00	55	
881 0120				881 0120 TiAlN					1.20	17	3.00	55	
881 0125				881 0125 TiAlN					1.25	17	3.00	55	
881 0130				881 0130 TiAlN					1.30	17	3.00	55	
881 0135				881 0135 TiAlN					1.35	17	3.00	55	
881 0140				881 0140 TiAlN					1.40	17	3.00	55	
881 0145				881 0145 TiAlN					1.45	17	3.00	55	
881 0150				881 0150 TiAlN					1.50	17	3.00	68	
881 0160				881 0160 TiAlN					1.60	22	3.00	68	
881 0170				881 0170 TiAlN					1.70	22	3.00	68	
881 0180				881 0180 TiAlN					1.80	22	3.00	68	
881 0190				881 0190 TiAlN					1.90	22	3.00	68	
881 0200				881 0200 TiAlN					2.00	22	3.00	74	
881 0210				881 0210 TiAlN					2.10	28	3.00	74	
881 0220				881 0220 TiAlN					2.20	28	3.00	74	
881 0230				881 0230 TiAlN					2.30	28	3.00	74	
881 0240				881 0240 TiAlN					2.40	28	3.00	74	
881 0250				881 0250 TiAlN					2.50	28	3.00	81	
881 0260				881 0260 TiAlN					2.60	32	3.00	81	
881 0270				881 0270 TiAlN					2.70	32	3.00	81	
881 0280				881 0280 TiAlN					2.80	32	3.00	81	
881 0290				881 0290 TiAlN					2.90	32	3.00	81	

Machining example

Workpiece: housing 3
 Material: G AlMg5Si
 Operation: hole Ø 1.5 mm; drilling depth 11.0 mm; pre centering with 142° drill point
 Machining center: horizontal
 Adapter: HSK 63 A to shrink fit chuck
 Coolant: 8% emulsion; 40 bar pressure
 Tool: 881 0150
 Cutting speed Vc / revs. n: Vc = 56.5 m/min / n = 12000 r.p.m.
 Feed rate fn and Vf: fn = 0.055 mm and Vf = 660 mm/min



• 812 Series



812 Series [central coolant channels]
 Ø 1.00 - 2.90 mm for **12 x D** drilling depth
 2 cutting edges
 140° attack angle; self centering
 30° helix angle
 DIN 6535 HA shank [h6]
 not coated - and TiAlN coated

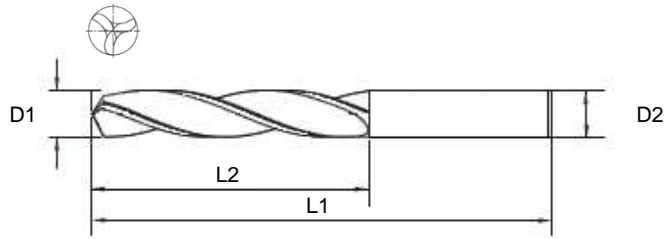
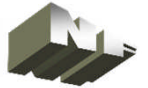
1	2	3	5	4	6	7	8	9	D1	L2	D2	L1	
Article number not coated				Article number TiAlN coated					[+0.004]				
812 1100				812 1100 TiAlN					1.00	15	3.00	55	
812 1110				812 1110 TiAlN					1.10	23	3.00	55	
812 1120				812 1120 TiAlN					1.20	23	3.00	55	
812 1125				812 1125 TiAlN					1.25	23	3.00	55	
812 1130				812 1130 TiAlN					1.30	23	3.00	55	
812 1135				812 1135 TiAlN					1.35	23	3.00	55	
812 1140				812 1140 TiAlN					1.40	23	3.00	55	
812 1145				812 1145 TiAlN					1.45	23	3.00	55	
812 1150				812 1150 TiAlN					1.50	23	3.00	68	
812 1160				812 1160 TiAlN					1.60	30	3.00	68	
812 1170				812 1170 TiAlN					1.70	30	3.00	68	
812 1180				812 1180 TiAlN					1.80	30	3.00	68	
812 1190				812 1190 TiAlN					1.90	30	3.00	68	
812 1200				812 1200 TiAlN					2.00	30	3.00	74	
812 1210				812 1210 TiAlN					2.10	38	3.00	74	
812 1220				812 1220 TiAlN					2.20	38	3.00	74	
812 1230				812 1230 TiAlN					2.30	38	3.00	74	
812 1240				812 1240 TiAlN					2.40	38	3.00	74	
812 1250				812 1250 TiAlN					2.50	38	3.00	81	
812 1260				812 1260 TiAlN					2.60	44	3.00	81	
812 1270				812 1270 TiAlN					2.70	44	3.00	81	
812 1280				812 1280 TiAlN					2.80	44	3.00	81	
812 1290				812 1290 TiAlN					2.90	44	3.00	81	

Machining example

Material: G AISi17Cu4 4
 Operation: hole Ø 2.5 mm; drilling depth 22.0 mm
 Machining center: horizontal
 Adapter: HSK 63 A to shrink fit chuck
 Coolant: 8% emulsion 50 bar pressure
 Tool: **pre drilling 3 x D depth** 840 250 TiAlN
drilling to depth 812 250 TiAlN

Tool: 840 250 TiAlN **[3 x D version]**
 Revs. n: n = 10190 r.p.m. Vc = 80 m/min
 Feed rate Vf: Vf = 560 mm/min fz = 0.055 mm
 Tool: 812 250 TiAlN **[12 x D version]**
 Enter and leave [2xD] in the hole with 5% of the max. revs.
 Revs. n: n = 10190 r.p.m. Vc = 80 m/min
 Feed rate Vf: Vf = 356 mm/min fz = 0.035 mm

• 832 Series



832 Series extra short version
 Ø 0.60 - 12.50 mm for **3 x D** drilling depth
 3 cutting edges
 120° attack angle; self centering
 30° helix angle
 cylindrical shank [h6]
 not coated - and TiAlN coated

3

Article number not coated
832 0060
832 0061-0067
832 0068-0075
832 0076-0085
832 0086-0095
832 0096-0106
832 0107-0118
832 0119-0132
832 0133-0150
832 0151-0170
832 0171-0190
832 0191-0212
832 0213-0236
832 0237-0265
832 0266-0300
832 0301-0335
832 0336-0375
832 0376-0425
832 0426-0475
832 0476-0530
832 0531-0600
832 0601-0670
832 0671-0750
832 0751-0800
832 0810-0850
832 0860-0950
832 0960-1000

4

6

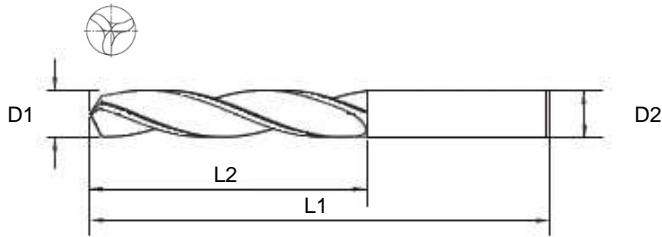
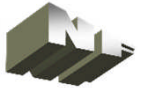
8

9

Article number TiAlN coated
832 0060 TiAlN
832 0061-0067 TiAlN
832 0068-0075 TiAlN
832 0076-0085 TiAlN
832 0086-0095 TiAlN
832 0096-0106 TiAlN
832 0107-0118 TiAlN
832 0119-0132 TiAlN
832 0133-0150 TiAlN
832 0151-0170 TiAlN
832 0171-0190 TiAlN
832 0191-0121 TiAlN
832 0213-0236 TiAlN
832 0237-0265 TiAlN
832 0266-0300 TiAlN
832 0301-0335 TiAlN
832 0336-0375 TiAlN
832 0376-0425 TiAlN
832 0426-0475 TiAlN
832 0476-0530 TiAlN
832 0531-0600 TiAlN
832 0601-0670 TiAlN
832 0671-0750 TiAlN
832 0750-0800 TiAlN
832 0810-0850 TiAlN
832 0860-0950 TiAlN
832 0960-1000 TiAlN

D1	L2	D2	L1
0.60	3.5	0.60	21
0.61-0.67	4	0.61-0.67	22
0.68-0.75	4.5	0.68-0.75	23
0.76-0.85	5	0.76-0.85	24
0.86-0.95	5.5	0.86-0.95	25
0.96-1.06	6	0.96-1.06	26
1.07-1.18	7	1.07-1.18	28
1.19-1.32	8	1.19-1.32	30
1.33-1.50	9	1.33-1.50	32
1.51-1.70	10	1.51-1.70	34
1.71-1.90	11	1.71-1.90	36
1.91-2.12	12	1.91-2.12	38
2.13-2.36	13	2.12-2.36	40
2.37-2.65	14	2.37-2.65	43
2.66-3.00	16	2.66-3.00	46
3.01-3.35	18	3.01-3.35	49
3.36-3.75	20	3.36-3.75	52
3.76-4.25	22	3.76-4.25	55
4.25-4.75	24	4.25-4.75	58
4.76-5.30	26	4.76-5.30	62
5.31-6.00	28	5.31-6.00	66
6.01-6.70	31	6.01-6.70	70
6.71-7.50	34	6.71-7.50	74
7.51-8.00	37	7.51-8.00	79
8.10-8.50	37	8.10-8.50	79
8.60-9.50	40	8.60-9.50	84
9.60-10.00	43	9.60-10.00	89

• 832 Series



832 Series extra short version
 \varnothing 0.60 - 12.50 mm for **3 x D** drilling depth
 3 cutting edges
 120° attack angle; self centering
 30° helix angle
 cylindrical shank [h6]
 not coated - and TiAlN coated

3

Article number not coated

832 1010-1050
 832 1060-1150
 832 1160-1200
 832 1210-1250

4

6

8

9

Article number TiAlN coated

832 1010-1050 TiAlN
 832 1060-1150 TiAlN
 832 1160-1200 TiAlN
 832 1210-1250 TiAlN

D1

L2

D2

L1

10.10-10.50
 10.60-11.50
 11.60-12.00
 12.10-12.50

43
 47
 51
 51

10.10-10.50
 10.60-11.50
 11.60-12.00
 12.10-12.50

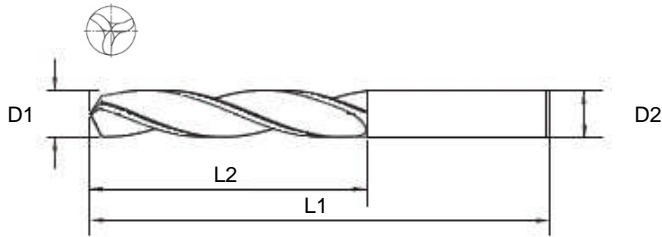
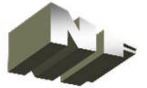
89
 95
 102
 102



Machining example

Workpiece: engine block 4
 Material: G AlSi17Cu4
 Operation: hole \varnothing 8.5 mm; drilling depth 28.0 mm
 Machining center: horizontal
 Adapter: HSK 63 A to hydraulic chuck
 Coolant: 8% emulsion 40 bar pressure
 Tool: 832 0850 TiAlN
 Cutting speed V_c / Revs. n : $V_c = 80$ m/min / $n = 2996$ r.p.m.
 Feed rate f_n and V_f : $f_n = 0.26$ [$z = 3$] and $V_f = 778$ mm/min

• 834K Series



834 Series short version
 Ø 1.00 - 8.50 mm for **3 x D** drilling depth
 3 cutting edges
 140° attack angle; self centering
 30° helix angle
 cylindrical shank [h6]
 not coated - and TiAlN coated

3

Article number not coated

834 0100K
 834 0110K
 834 0120-0130K
 834 0140-0150K
 834 0160-0170K
 834 0180-0190K
 834 0200-0210K
 834 0220-0230K
 834 0240-0260K
 834 0270-0300K
 834 0310-0330K
 834 0340-0370K
 834 0380-0420K
 834 0430-0470K
 834 0480-0530K
 834 0540-0600K
 834 0610-0670K
 834 0680-0750K
 834 0760-0800K
 834 0810-0850K

4

6

8

9

Article number TiAlN coated

834 0100K TiAlN
 834 0110K TiAlN
 834 0120-0130K TiAlN
 834 0140-0150K TiAlN
 834 0160-0170K TiAlN
 834 0180-0190K TiAlN
 834 0200-0210K TiAlN
 834 0220-0230K TiAlN
 834 0240-0260K TiAlN
 834 0270-0300K TiAlN
 834 0310-0330K TiAlN
 834 0340-0370K TiAlN
 834 0380-0420K TiAlN
 834 0430-0470K TiAlN
 834 0480-0530K TiAlN
 834 0540-0600K TiAlN
 834 0610-0670K TiAlN
 834 0680-0750K TiAlN
 834 0760-0800K TiAlN
 834 0810-0850K TiAlN

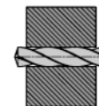
D1	L2	D2	L1
1.00	8	1.00	30
1.10	8	1.10	30
1.20-1.30	10	1.20-1.30	30
1.40-1.50	10	1.40-1.50	30
1.60-1.70	12	1.60-1.70	38
1.80-1.90	12	1.80-1.90	38
2.00-2.10	12	2.00-2.10	38
2.20-2.30	13	2.20-2.30	38
2.40-2.60	14	2.40-2.60	44
2.70-3.00	16	2.70-3.00	44
3.10-3.30	18	3.10-3.30	50
3.40-3.70	20	3.40-3.70	50
3.80-4.20	22	3.80-4.20	54
4.30-4.70	24	4.30-4.70	61
4.80-5.30	26	4.80-5.30	61
5.40-6.00	28	5.40-6.00	66
6.10-6.70	31	6.10-6.70	72
6.80-7.50	34	6.80-7.50	72
7.60-8.00	37	7.60-8.00	83
8.10-8.50	37	8.10-8.50	83



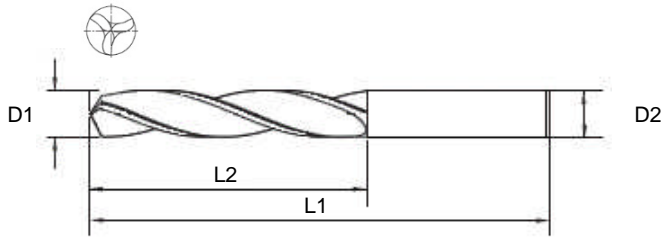
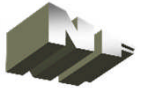
Machining example

Workpiece: cylinder head
 Material: G AlSi21CuNiMg
 Operation: hole Ø 6.3 mm; drilling depth 22.0 mm
 Machining center: horizontal
 Adapter: HSK 63 A to hydraulic chuck
 Coolant: 8% emulsion 40 bar pressure
 Tool: 834 0630K TiAlN
 Cutting speed Vc / Revs. n: Vc = 70 m/min / n = 3538 r.p.m.
 Feed rate fn and Vf: fn = 0.22 [z = 3] and Vf = 778 mm/min

4



• 834L Series



834 Series long version
 Ø 1.00 - 8.50 mm for **8 x D** drilling depth
 3 cutting edges
 140° attack angle; self centering
 30° helix angle
 cylindrical shank [h6]
 not coated - and TiAlN coated

3

Article number not coated

834 0100L
 834 0110L
 834 0120-0130L
 834 0140-0150L
 834 0160-0170L
 834 0180-0190L
 834 0200-0210L
 834 0220-0230L
 834 0240-0260L
 834 0270-0300L
 834 0310-0330L
 834 0340-0370L
 834 0380-0420L
 834 0430-0470L
 834 0480-0530L
 834 0540-0600L
 834 0610-0670L
 834 0680-0750L
 834 0760-0800L
 834 0810-0850L

4

6

8

9

Article number TiAlN coated

834 0100L TiAlN
 834 0110L TiAlN
 834 0120-0130L TiAlN
 834 0140-0150L TiAlN
 834 0160-0170L TiAlN
 834 0180-0190L TiAlN
 834 0200-0210L TiAlN
 834 0220-0230L TiAlN
 834 0240-0260L TiAlN
 834 0270-0300L TiAlN
 834 0310-0330L TiAlN
 834 0340-0370L TiAlN
 834 0380-0420L TiAlN
 834 0430-0470L TiAlN
 834 0480-0530L TiAlN
 834 0540-0600L TiAlN
 834 0610-0670L TiAlN
 834 0680-0750L TiAlN
 834 0760-0800L TiAlN
 834 0810-0850L TiAlN

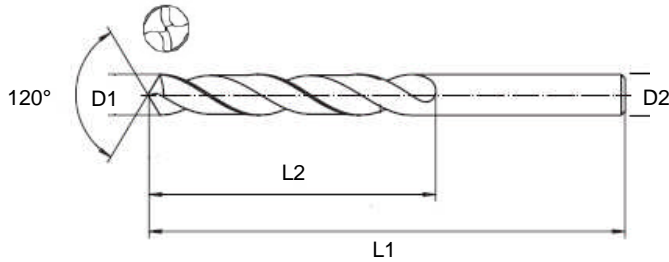
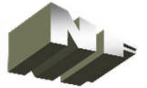
D1	L2	D2	L1
1.00	12	1.00	33
1.10	14	1.10	38
1.20-1.30	16	1.20-1.30	38
1.40-1.50	18	1.40-1.50	38
1.60-1.70	20	1.60-1.70	44
1.80-1.90	22	1.80-1.90	44
2.00-2.10	24	2.00-2.10	50
2.20-2.30	27	2.20-2.30	54
2.40-2.60	30	2.40-2.60	61
2.70-3.00	33	2.70-3.00	61
3.10-3.30	35	3.10-3.30	66
3.40-3.70	39	3.40-3.70	72
3.80-4.20	43	3.80-4.20	72
4.30-4.70	47	4.30-4.70	83
4.80-5.30	52	4.80-5.30	83
5.40-6.00	57	5.40-6.00	92
6.10-6.70	63	6.10-6.70	104
6.80-7.50	69	6.80-7.50	109
7.60-8.00	75	7.60-8.00	117
8.10-8.50	75	8.10-8.50	117



Maching example

Workpiece:	hub bearing cap	6
Material:	G CuZn37Al1	
Operation:	pre drilling with 142° drill point hole Ø 5.0 mm; drill depth 30.0 mm in steps from 3 x D to 1 x D	
Machining center:	horizontal	
Adapter:	HSK 63 A to shrink fit chuck	
Coolant:	8% emulsion 40 bar pressure	
Tool:	834 0500L TiAlN	
Cutting speed Vc / Revs. n:	Vc = 90 m/min / n = 5732 r.p.m.	
Feed rate fn and Vf:	fn = 0.18 [z = 3] and Vf = 1032 mm/min	

• 835 Series



835 Series long version

Ø 0.70 - 8.50 mm for **8 x D** drilling depth

2 cutting edges

120° attack angle

24° helix angle

cylindrical shank [h6]

not coated - and TiAlN coated



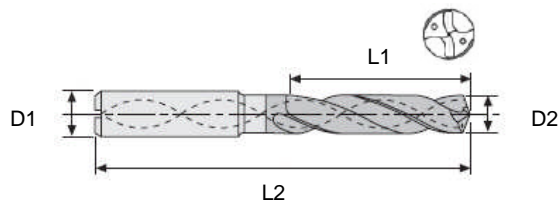
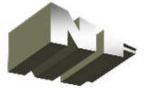
Article number not coated	Article number TiAlN coated	D1	L2	D2	L1
835 0070-0075	835 0070-0075 TiAlN	0.70-0.75	9	0.70-0.75	28
835 0076-0085	835 0076-0085 TiAlN	0.76-0.85	10	0.76-0.85	30
835 0086-0095	835 0086-0095 TiAlN	0.86-0.95	11	0.86-0.95	32
835 0096-0106	835 0096-0106 TiAlN	0.96-1.06	12	0.96-1.06	34
835 0107-0119	835 0107-0119 TiAlN	1.07-1.19	14	1.07-1.19	36
835 0120-0132	835 0120-0132 TiAlN	1.20-1.32	16	1.20-1.32	38
835 0133-0150	835 0133-0150 TiAlN	1.33-1.50	18	1.33-1.50	40
835 0151-0174	835 0151-0174 TiAlN	1.51-1.74	20	1.51-1.74	43
835 0175-0190	835 0175-0190 TiAlN	1.75-1.90	22	1.75-1.90	46
835 0191-0214	835 0191-0214 TiAlN	1.91-2.14	24	1.91-2.14	49
835 0215-0239	835 0215-0239 TiAlN	2.15-2.39	27	2.15-2.39	53
835 0240-0269	835 0240-0269 TiAlN	2.40-2.69	30	2.40-2.69	57
835 0270-0304	835 0270-0304 TiAlN	2.70-3.04	33	2.70-3.04	61
835 0305-0339	835 0305-0339 TiAlN	3.05-3.39	36	3.05-3.40	65
835 0340-0379	835 0340-0379 TiAlN	3.40-3.79	39	3.41-3.79	70
835 0380-0424	835 0380-0424 TiAlN	3.80-4.24	43	3.80-4.24	75
835 0425-0479	835 0425-0479 TiAlN	4.25-4.79	47	4.25-4.79	80
835 0480-0539	835 0480-0539 TiAlN	4.80-5.39	52	4.80-5.39	86
835 0540-0609	835 0540-0609 TiAlN	5.40-6.09	57	5.40-6.09	93
835 0610-0679	835 0610-0679 TiAlN	6.10-6.79	63	6.10-6.79	101
835 0680-0759	835 0680-0759 TiAlN	6.80-7.59	69	6.80-7.59	109
835 0760-0809	835 0760-0809 TiAlN	7.60-8.09	75	7.60-8.09	117
835 0810-0850	835 0810-0850 TiAlN	8.10-8.50	75	8.10-8.50	117

Maching=ing center

Material:	CuNi30Mn1Fe
Operation:	pre drilling with 142° drill point hole Ø 6.8 mm; drill depth 36.0 mm in steps from 1.5 x D to 0.5 x D
Machining center:	vertical
Adapter:	SK40 MAS BT/JIS A to hydraulic chuck
Coolant:	8% emulsion 20 bar presure
Tool:	835 0680
Cutting speed Vc / Revs. n:	Vc = 120 m/min / n = 5620 r.p.m.
Feed rate fn and Vf:	fn = 0.14 and Vf = 787 mm/min



• 814 Series

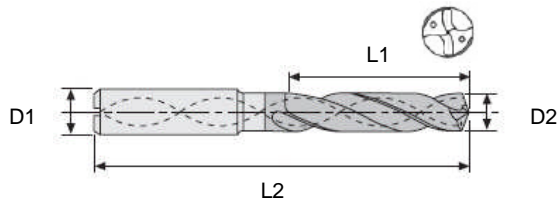
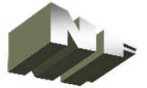


814 Series long version
 Ø 1.0 - 20.0 mm for **5 x D** drilling depth
 2 cutting edges
 140° attack angle
 30° helix angle
 DIN 6535 HA shank [h6]
 TiAlN coated

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

Article number TiAlN coated	D1	D2	L1	L2	Article number TiAlN coated	D1	D2	L1	L2
814 010 00	1.0	3.0	55	10	814 041 00	4.1	6.0	74	36
814 011 00	1.1	3.0	55	12	814 042 00	4.2	6.0	74	36
814 012 00	1.2	3.0	55	12	814 043 00	4.3	6.0	74	36
814 013 00	1.3	3.0	55	12	814 044 00	4.4	6.0	74	36
814 014 00	1.4	3.0	55	12	814 045 00	4.5	6.0	74	36
814 015 00	1.5	3.0	55	12	814 046 00	4.6	6.0	74	36
814 016 00	1.6	3.0	55	16	814 047 00	4.7	6.0	74	36
814 017 00	1.7	3.0	55	16	814 048 00	4.8	6.0	82	44
814 018 00	1.8	3.0	55	16	814 049 00	4.9	6.0	82	44
814 019 00	1.9	3.0	55	16	814 050 00	5.0	6.0	82	44
814 020 00	2.0	3.0	57	16	814 051 00	5.1	6.0	82	44
814 021 00	2.1	3.0	57	21	814 052 00	5.2	6.0	82	44
814 022 00	2.2	3.0	57	21	814 053 00	5.3	6.0	82	44
814 023 00	2.3	3.0	57	21	814 054 00	5.4	6.0	82	44
814 024 00	2.4	3.0	57	21	814 055 00	5.5	6.0	82	44
814 025 00	2.5	3.0	57	21	814 056 00	5.6	6.0	82	44
814 026 00	2.6	3.0	57	21	814 057 00	5.7	6.0	82	44
814 027 00	2.7	3.0	57	21	814 058 00	5.8	6.0	82	44
814 028 00	2.8	3.0	57	21	814 059 00	5.9	6.0	82	44
814 029 00	2.9	3.0	57	21	814 060 00	6.0	6.0	82	44
814 030 00	3.0	6.0	66	28	814 061 00	6.1	8.0	91	53
814 031 00	3.1	6.0	66	28	814 062 00	6.2	8.0	91	53
814 032 00	3.2	6.0	66	28	814 063 00	6.3	8.0	91	53
814 033 00	3.3	6.0	66	28	814 064 00	6.4	8.0	91	53
814 034 00	3.4	6.0	66	28	814 065 00	6.5	8.0	91	53
814 035 00	3.5	6.0	66	28	814 066 00	6.6	8.0	91	53
814 036 00	3.6	6.0	66	28	814 067 00	6.7	8.0	91	53
814 037 00	3.7	6.0	66	28	814 068 00	6.8	8.0	91	53
814 038 00	3.8	6.0	74	36	814 069 00	6.9	8.0	91	53
814 039 00	3.9	6.0	74	36	814 070 00	7.0	8.0	91	53
814 040 00	4.0	6.0	74	36	814 071 00	7.1	8.0	91	53

• 814 Series

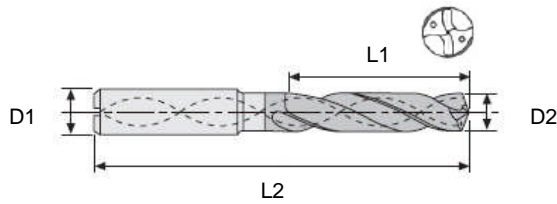
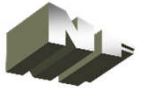


814 Series long version
 Ø 1.0 - 20.0 mm for **5 x D** drilling depth
 2 cutting edges
 140° attack angle
 30° helix angle
 DIN 6535 HA shank [h6]
 TiAlN coated



Article number TiAlN coated	D1	D2	L1	L2	Article number TiAlN coated	D1	D2	L1	L2
814 072 00	7.2	8.0	91	53	814 103 00	10.3	12.0	118	71
814 073 00	7.3	8.0	91	53	814 104 00	10.4	12.0	118	71
814 074 00	7.4	8.0	91	53	814 105 00	10.5	12.0	118	71
814 075 00	7.5	8.0	91	53	814 106 00	10.6	12.0	118	71
814 076 00	7.6	8.0	91	53	814 107 00	10.7	12.0	118	71
814 077 00	7.7	8.0	91	53	814 108 00	10.8	12.0	118	71
814 078 00	7.8	8.0	91	53	814 109 00	10.9	12.0	118	71
814 079 00	7.9	8.0	91	53	814 110 00	11.0	12.0	118	71
814 080 00	8.0	8.0	91	53	814 111 00	11.1	12.0	118	71
814 081 00	8.1	3.0	103	61	814 112 00	11.2	12.0	118	71
814 082 00	8.2	10.0	103	61	814 113 00	11.3	12.0	118	71
814 083 00	8.3	10.0	103	61	814 114 00	11.4	12.0	118	71
814 084 00	8.4	10.0	103	61	814 115 00	11.5	12.0	118	71
814 085 00	8.5	10.0	103	61	814 116 00	11.6	12.0	118	71
814 086 00	8.6	10.0	103	61	814 117 00	11.7	12.0	118	71
814 087 00	8.7	10.0	103	61	814 118 00	11.8	12.0	118	71
814 088 00	8.8	10.0	103	61	814 119 00	11.9	12.0	118	71
814 089 00	8.9	10.0	103	61	814 120 00	12.0	12.0	118	71
814 090 00	9.0	10.0	103	61	814 122 00	12.2	14.0	124	77
814 091 00	9.1	10.0	103	61	814 123 00	12.3	14.0	124	77
814 092 00	9.2	10.0	103	61	814 125 00	12.5	14.0	124	77
814 093 00	9.3	10.0	103	61	814 128 00	12.8	14.0	124	77
814 094 00	9.4	10.0	103	61	814 130 00	13.0	14.0	124	77
814 095 00	9.5	10.0	103	61	814 135 00	13.5	14.0	124	77
814 096 00	9.6	10.0	103	61	814 138 00	13.8	14.0	124	77
814 097 00	9.7	10.0	103	61	814 140 00	14.0	14.0	124	77
814 098 00	9.8	10.0	103	61	814 145 00	14.5	16.0	133	83
814 099 00	9.9	10.0	103	61	814 148 00	14.8	16.0	133	83
814 100 00	10.0	10.0	103	61	814 150 00	15.0	16.0	133	83
814 101 00	10.1	12.0	118	71	814 155 00	15.5	16.0	133	83
814 102 00	10.2	12.0	118	71	814 158 00	15.8	16.0	133	83

• 814 Series



814 Series long version
 \varnothing 1.0 - 20.0 mm for **5 x D** drilling depth
 2 cutting edges
 140° attack angle
 30° helix angle
 DIN 6535 HA shank [h6]
 TiAlN coated



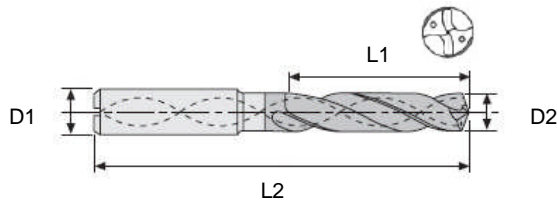
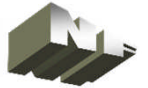
Article number TiAlN coated	D1	D2	L1	L2
814 160 00	16.0	16.0	133	83
814 165 00	16.5	18.0	143	93
814 168 00	16.8	18.0	143	93
814 170 00	17.0	18.0	143	93
814 175 00	17.5	18.0	143	93
814 178 00	17.8	18.0	143	93
814 180 00	18.0	18.0	143	93
814 185 00	18.5	20.0	153	101
814 190 00	19.0	20.0	153	101
814 195 00	19.5	20.0	153	101
814 200 00	20.0	20.0	153	101



Machining example

Workpiece:	flange
Material:	G AISi7Mg 3
Operation:	hole \varnothing 14.0 mm; drilling depth 38.0 mm
Machining center:	vertical
Adapter:	SK40 MAS-BT/JIS hydraulic chuck
Coolant:	8% emulsion
Tool:	814.140.00
Cutting speed V_c / Revs. n:	$V_c = 200.0$ m/min / $n = 4950$ r.p.m.
Feed rate f_n and V_f :	$f_n = 0.4$ mm and $V_f = 1980$ mm/min

• 818 Series



818 Series long version
 Ø 1.0 - 20.0 mm for **8 x D** drill depth
 2 cutting edges
 140° attack angle
 30° helix angle
 DIN 6535 HA shank [h6]
 TiAlN coated



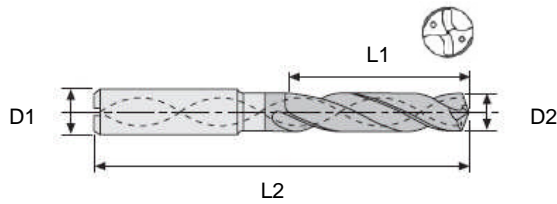
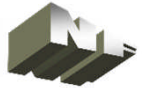
Article number TiAlN coated
818 010 00
818 011 00
818 012 00
818 013 00
818 014 00
818 015 00
818 016 00
818 017 00
818 018 00
818 019 00
818 020 00
818 021 00
818 022 00
818 023 00
818 024 00
818 025 00
818 026 00
818 027 00
818 028 00
818 029 00
818 030 00
818 031 00
818 032 00
818 033 00
818 034 00
818 035 00
818 036 00
818 037 00
818 038 00
818 039 00
818 040 00

D1	D2	L1	L2
1.0	3.0	55	11
1.1	3.0	55	17
1.2	3.0	55	17
1.3	3.0	55	17
1.4	3.0	55	17
1.5	3.0	55	17
1.6	3.0	65	22
1.7	3.0	65	22
1.8	3.0	65	22
1.9	3.0	65	22
2.0	3.0	65	22
2.1	3.0	74	28
2.2	3.0	74	28
2.3	3.0	74	28
2.4	3.0	74	28
2.5	3.0	74	28
2.6	3.0	81	23
2.7	3.0	81	23
2.8	3.0	81	23
2.9	3.0	81	23
3.0	6.0	81	28
3.1	6.0	81	34
3.2	6.0	81	34
3.3	6.0	81	34
3.4	6.0	81	34
3.5	6.0	81	34
3.6	6.0	81	34
3.7	6.0	81	34
3.8	6.0	81	43
3.9	6.0	81	43
4.0	6.0	81	43

Article number TiAlN coated
818 041 00
818 042 00
818 043 00
818 044 00
818 045 00
818 046 00
818 047 00
818 048 00
818 049 00
818 050 00
818 051 00
818 052 00
818 053 00
818 054 00
818 055 00
818 056 00
818 057 00
818 058 00
818 059 00
818 060 00
818 061 00
818 062 00
818 063 00
818 064 00
818 065 00
818 066 00
818 067 00
818 068 00
818 069 00
818 070 00
818 071 00

D1	D2	L1	L2
4.1	6.0	81	43
4.2	6.0	81	43
4.3	6.0	81	43
4.4	6.0	81	43
4.5	6.0	81	43
4.6	6.0	81	43
4.7	6.0	95	57
4.8	6.0	95	57
4.9	6.0	95	57
5.0	6.0	95	57
5.1	6.0	95	57
5.2	6.0	95	57
5.3	6.0	95	57
5.4	6.0	95	57
5.5	6.0	95	57
5.6	6.0	95	57
5.7	6.0	95	57
5.8	6.0	95	57
5.9	6.0	95	57
6.0	6.0	114	76
6.1	8.0	114	76
6.2	8.0	114	76
6.3	8.0	114	76
6.4	8.0	114	76
6.5	8.0	114	76
6.6	8.0	114	76
6.7	8.0	114	76
6.8	8.0	114	76
6.9	8.0	114	76
7.0	8.0	114	76
7.1	8.0	114	76

• 818 Series



818 Series long series
 Ø 1.0 - 12.0 mm for 8 x D drill depth
 2 cutting edges
 140° attack angle
 30° helix angle
 DIN 6535 HA shank [h6]
 TiAlN coated



Article number TiAlN coated	D1	D2	L1	L2
818 072 00	7.2	8.0	114	76
818 073 00	7.3	8.0	114	76
818 074 00	7.4	8.0	114	76
818 075 00	7.5	8.0	114	76
818 076 00	7.6	8.0	114	76
818 077 00	7.7	8.0	114	76
818 078 00	7.8	8.0	114	76
818 079 00	7.9	8.0	114	76
818 080 00	8.0	8.0	114	76
818 081 00	8.1	10.0	142	95
818 082 00	8.2	10.0	142	95
818 083 00	8.3	10.0	142	95
818 084 00	8.4	10.0	142	95
818 085 00	8.5	10.0	142	95
818 086 00	8.6	10.0	142	95
818 087 00	8.7	10.0	142	95
818 088 00	8.8	10.0	142	95
818 089 00	8.9	10.0	142	95
818 090 00	9.0	10.0	142	95
818 091 00	9.1	10.0	142	95
818 092 00	9.2	10.0	142	95
818 093 00	9.3	10.0	142	95
818 094 00	9.4	10.0	142	95
818 095 00	9.5	10.0	142	95
818 096 00	9.6	10.0	142	95
818 097 00	9.7	10.0	142	95
818 098 00	9.8	10.0	142	95
818 099 00	9.9	10.0	142	95
818 100 00	10.0	10.0	142	95
818 101 00	10.1	12.0	162	114
818 102 00	10.2	12.0	162	114

Article number TiAlN coated	D1	D2	L1	L2
818 103 00	10.3	12.0	162	114
818 104 00	10.4	12.0	162	114
818 105 00	10.5	12.0	162	114
818 106 00	10.6	12.0	162	114
818 107 00	10.7	12.0	162	114
818 108 00	10.8	12.0	162	114
818 109 00	10.9	12.0	162	114
818 110 00	11.0	12.0	162	114
818 111 00	11.1	12.0	162	114
818 112 00	11.2	12.0	162	114
818 113 00	11.3	12.0	162	114
818 114 00	11.4	12.0	162	114
818 115 00	11.5	12.0	162	114
818 116 00	11.6	12.0	162	114
818 117 00	11.7	12.0	162	114
818 118 00	11.8	12.0	162	114
818 119 00	11.9	12.0	162	114
818 120 00	12.0	12.0	162	114



Machining example

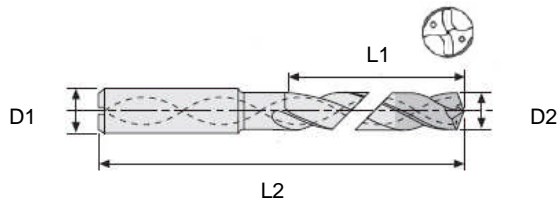
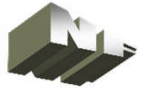
Workpiece:
 Material:
 Operation 1:
 Operation 2:
 Machining center:
 Adapter:
 Coolant:
 Cutting speed Vc / Revs. n bij 1:
 Cutting speed Vc / Revs. n bij 2:
 Feed rate fn and Vf on 1:
 Feed rate fn and Vf on 2:

hydraulic control block
 G AISi9Mg
 center drilling Ø 8 mm with 924.080.00
 drilling tp depth Ø 8 x 52 with 818.080.00
 horizontal
 HSK 63 A to hydraulic chuck
 8% emulsion; 40 bar presure
 Vc = 160 m/min / n = 6370 r.p.m.
 Vc = 100.0 m/min / n = 3980 r.p.m.
 fn = 0.14 mm en Vf = 892 mm/min
 fn = 0.11 mm en Vf = 438 mm/min





• 820 Series



820 Series long version
 Ø 1.0 - 16.0 mm for 12 x D drilling depth
 2 cutting edges
 140° attack angle
 30° helix angle
 DIN 6535 HA shank [h6]
 TiAlN coated



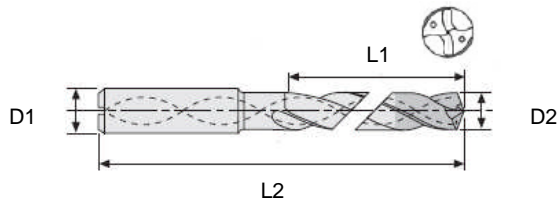
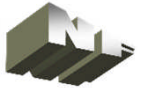
Article number TiAlN coated
820 010 00
820 011 00
820 012 00
820 013 00
820 014 00
820 015 00
820 016 00
820 017 00
820 018 00
820 019 00
820 020 00
820 021 00
820 022 00
820 023 00
820 024 00
820 025 00
820 026 00
820 027 00
820 028 00
820 029 00
820 030 00
820 033 00
820 035 00
820 038 00
820 040 00
820 042 00
820 045 00
820 048 00
820 050 00
820 055 00
820 058 00

D1	D2	L1	L2
1.0	3.0	55	15
1.1	3.0	55	23
1.2	3.0	55	23
1.3	3.0	55	23
1.4	3.0	55	23
1.5	3.0	55	23
1.6	3.0	65	30
1.7	3.0	65	30
1.8	3.0	65	30
1.9	3.0	65	30
2.0	3.0	65	30
2.1	3.0	74	38
2.2	3.0	74	38
2.3	3.0	74	38
2.4	3.0	74	38
2.5	3.0	74	38
2.6	3.0	81	44
2.7	3.0	81	44
2.8	3.0	81	44
2.9	3.0	81	44
3.0	6.0	92	54
3.3	6.0	92	54
3.5	6.0	92	54
3.8	6.0	102	64
4.0	6.0	102	64
4.2	6.0	102	64
4.5	6.0	102	64
4.8	6.0	116	78
5.0	6.0	116	78
5.5	6.0	116	78
5.8	6.0	116	78

Article number TiAlN coated
820 060 00
820 065 00
820 068 00
820 070 00
820 075 00
820 078 00
820 080 00
820 085 00
820 088 00
820 090 00
820 095 00
820 098 00
820 100 00
820 102 00
820 105 00
820 108 00
820 110 00
820 115 00
820 118 00
820 120 00
820 125 00
820 128 00
820 130 00
820 135 00
820 140 00
820 145 00
820 150 00
820 155 00
820 160 00

D1	D2	L1	L2
6.0	6.0	116	78
6.5	8.0	146	108
6.8	8.0	146	108
7.0	8.0	146	108
7.5	8.0	146	108
7.8	8.0	146	108
8.0	8.0	146	108
8.5	10.0	162	120
8.8	10.0	162	120
9.0	10.0	162	120
9.5	10.0	162	120
9.8	10.0	162	120
10.0	10.0	162	120
10.2	12.0	204	156
10.5	12.0	204	156
10.8	12.0	204	156
11.0	12.0	204	156
11.5	12.0	204	156
11.8	12.0	204	156
12.0	12.0	204	156
12.5	14.0	230	182
12.8	14.0	230	182
13.0	14.0	230	182
13.5	14.0	230	182
14.0	14.0	230	182
14.5	16.0	260	208
15.0	16.0	260	208
15.5	16.0	260	208
16.0	16.0	260	208

• 820 Series



820 Series long version
 \varnothing 1.0 - 16.0 mm for **12 x D** drilling depth
 2 cutting edges
 140° attack angle
 30° helix angle
 DIN 6535 HA shank [h6]
 TiAlN coated

Machining example

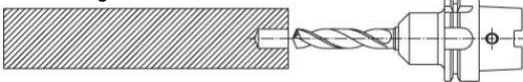
Workpiece:	hydraulic valva housing	4
Material:	aluminium alloyed casting G-AlSi12Cu / 3.2583	
Operation 1:	pre drilling \varnothing 12 x 40 mm with 814.120.00	
Operation 2:	drilling to depth \varnothing 12 x 125 with 820.120.00	
Machining center:	horizontal	
Adapter:	HSK 100 A to hydraulic chuck	
Coolant:	8% emulsion; 50 bar pressure	
Cutting speed Vc / Revs. n on 1:	Vc = 120 m/min / n = 3185 r.p.m.	
Feed rate fn and Vf bij 1:	fn = 0.26 mm and Vf = 828 mm/min	

Positioning for operation 2 plus retracting from the hole after operation 2:

Toolchange:	slow mode
Spindel revs.:	400 r.p.m.
Entering the hole:	Vf = 800 mm/min to 0,5 mm from bottom pre-drilled hole
Initiate recommended cutting values:	drilling to depth [125 mm]
Retracting from the hole:	with recommended cutting values to depth of the pre-drilled hole
Leaving the workpiece:	change to spindelrevs. 400 r.p.m. and feed rate Vf = 800 mm/min
Tool:	slow mode

Cutting speed Vc / Revs. n on 2:	Vc = 65 m/min / n = 1725 r.p.m.
Feed rate fn and Vf on 2:	fn = 0.2 mm en Vf = 345 mm/min

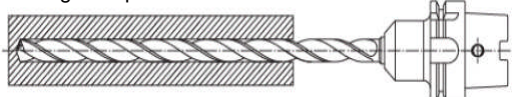
Pre-drilling



Positioning for deep-drilling



Drilling to depth

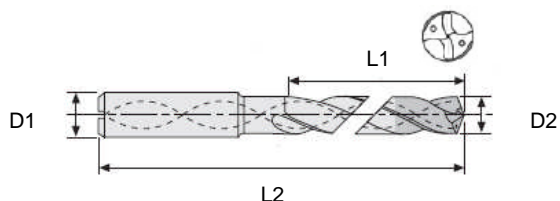


Retract from the workpiece





• 1025 Series

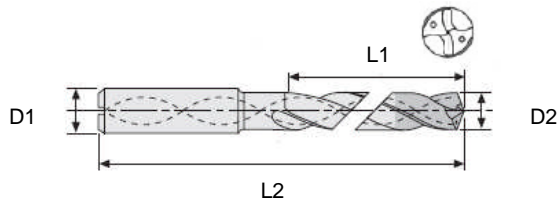
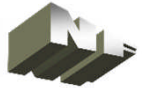


820 Series long version
 Ø 1.0 - 16.0 mm for **15 x D** drilling depth
 2 cutting edges
 140° attack angle
 30° helix angle
 DIN 6535 HA shank [h6]
 TiAlN coated



Article number TiAlN coated	D1	D2	L1	L2	Article number TiAlN coated	D1	D2	L1	L2
1025 010 00	1.0	3.0	60	20	1025 041 00	4.1	6.0	115	78
1025 011 00	1.1	3.0	60	22	1025 042 00	4.2	6.0	115	78
1025 012 00	1.2	3.0	60	24	1025 043 00	4.3	6.0	115	78
1025 013 00	1.3	3.0	60	25	1025 044 00	4.4	6.0	115	78
1025 014 00	1.4	3.0	60	27	1025 045 00	4.5	6.0	115	78
1025 015 00	1.5	3.0	60	27	1025 046 00	4.6	6.0	125	84
1025 016 00	1.6	3.0	65	32	1025 047 00	4.7	6.0	125	84
1025 017 00	1.7	3.0	65	32	1025 048 00	4.8	6.0	125	84
1025 018 00	1.8	3.0	65	35	1025 049 00	4.9	6.0	125	84
1025 019 00	1.9	3.0	65	35	1025 050 00	5.0	6.0	125	84
1025 020 00	2.0	3.0	65	35	1025 051 00	5.1	6.0	130	92
1025 021 00	2.1	3.0	75	40	1025 052 00	5.2	6.0	130	92
1025 022 00	2.2	3.0	75	40	1025 053 00	5.3	6.0	130	92
1025 023 00	2.3	3.0	75	40	1025 054 00	5.4	6.0	130	92
1025 024 00	2.4	3.0	75	45	1025 055 00	5.5	6.0	130	92
1025 025 00	2.5	3.0	75	45	1025 056 00	5.6	6.0	140	100
1025 026 00	2.6	3.0	80	48	1025 057 00	5.7	6.0	140	100
1025 027 00	2.7	3.0	80	48	1025 058 00	5.8	6.0	140	100
1025 028 00	2.8	3.0	80	50	1025 059 00	5.9	6.0	140	100
1025 029 00	2.9	3.0	80	50	1025 060 00	6.0	6.0	140	100
1025 030 00	3.0	3.0	100	60	1025 061 00	6.1	8.0	145	108
1025 031 00	3.1	6.0	100	60	1025 062 00	6.2	8.0	145	108
1025 032 00	3.2	6.0	100	60	1025 063 00	6.3	8.0	145	108
1025 033 00	3.3	6.0	100	60	1025 064 00	6.4	8.0	145	108
1025 034 00	3.4	6.0	100	60	1025 065 00	6.5	8.0	145	108
1025 035 00	3.5	6.0	100	60	1025 066 00	6.6	8.0	170	130
1025 036 00	3.6	6.0	108	68	1025 067 00	6.7	8.0	170	130
1025 037 00	3.7	6.0	108	68	1025 068 00	6.8	8.0	170	130
1025 038 00	3.8	6.0	108	68	1025 069 00	6.9	8.0	170	130
1025 039 00	3.9	6.0	108	68	1025 070 00	7.0	8.0	170	130
1025 040 00	4.0	6.0	108	68	1025 075 00	7.5	8.0	170	130

• 1025 Series



1025 Series long version

Ø 1.0 - 16.0 mm for **15 x D** drilling depth

2 cutting edges

140° attack angle

30° helix angle

DIN 6535 HA shank [h6]

TiAlN coated

3

4

6

Article number TiAlN coated
1025 078 00
1025 080 00
1025 085 00
1025 088 00
1025 090 00
1025 095 00
1025 098 00
1025 100 00
1025 102 00
1025 105 00
1025 108 00
1025 110 00

D1	D2	L1	L2
7.8	8.0	170	130
8.0	8.0	170	130
8.5	10.0	208	163
8.8	10.0	208	163
9.0	10.0	208	163
9.5	10.0	208	163
9.8	10.0	208	163
10.0	10.0	208	163
10.2	12.0	245	195
10.5	12.0	245	195
10.8	12.0	245	195
11.0	12.0	245	195

Article number TiAlN coated
1025 112 00
1025 115 00
1025 118 00
1025 120 00
1025 125 00
1025 130 00
1025 138 00
1025 140 00
1025 148 00
1025 150 00
1025 158 00
1025 160 00

D1	D2	L1	L2
11.2	12.0	245	195
11.5	12.0	245	195
11.8	12.0	245	195
12.0	12.0	245	195
12.5	14.0	280	230
13.0	14.0	280	230
13.8	14.0	280	230
14.0	14.0	280	230
14.8	16.0	310	260
15.0	16.0	310	260
15.8	16.0	310	260
16.0	16.0	310	260

Maching example

Workpiece:	engine block	4
Material:	G-AlSi12Cu / 3.2583	
Operation 1:	pre-drilling Ø 8 x 30 mm with 814.080.00	
Operation 2:	drilling to depth Ø 8 x 110 with 1025.080.00	
Machining center:	horizontal	
Adapter:	HSK 100 A to hydraulic chuck	
Coolant:	8% emulsion; 50 bar pressure	
Cutting speed Vc / Revs. n on 1:	Vc = 120 m/min / n = 4777 r.p.m.	
Feed rate fn and Vf on 1:	fn = 0.2 and Vf = 955 mm/min	

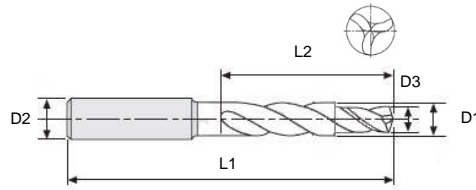
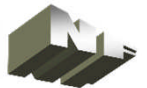


Positioning for operation 2 plus retracting from hole after operation 2:

Tool change:	slow mode
Spindelrevs.:	300 r.p.m.
Entering the hole:	Vf = 800 mm/min untill 0,5 mm from bottom pre-drilled hole
Initiate recommended cutting values:	drilling to depth [125 mm]
Retract from hole:	with recommended cutting values up till position [diepte] van het voorgeboorde gat
Leaving the workpiece:	back to spindelrevs. 300 r.p.m. and feed rate Vf = 800 mm/min slow mode
Tool change:	
Cutting speed Vc / Revs. n bij 2:	Vc = 50 m/min / n = 1990 r.p.m.
Feed rate fn and Vf on 2:	fn = 0.17 and Vf = 338 mm/min



• 950 Series



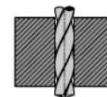
950 Series
 M3.0 - 10.0 mm
 3 cutting edges
 135° attack angle
 30° helix angle
 cylindrical shank [h6]
 version; not coated



Article number not coated	D1	D2	D3 x length	L1	L2	M
950 030 09	6.0	6.0	2.5 x 9.0	66	28	M3
950 040 09	8.0	8.0	3.3 x 10.0	80	37	M4
950 050 09	10.0	10.0	4.2 x 13.0	89	43	M5
950 060 09	11.0	11.0	5.0 x 15.0	95	47	M6
950 080 09	15.0	15.0	6.8 x 19.0	110	56	M8
950 100 09	18.0	18.0	8.5 x 23.0	123	62	M10

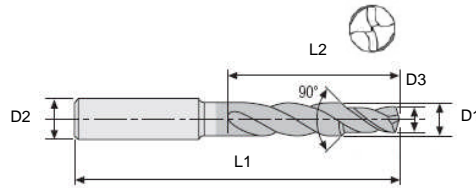
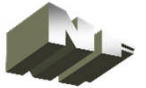
Machining example

Workpiece: flange 3
 Material: G AISi11
 Operation: hole \varnothing 18.0 x \varnothing 8.5 mm [M10]
 Machining center: vertical
 Adapter: SK40 DIN 69871 A to collet ER32
 Coolant: 8% emulsion
 Tool: 950.100.09
 Cutting speed V_c / Revs. n: $V_c = 100.0$ m/min / $n = 1770$ r.p.m.
 Feed rate f_n and V_f : $f_n = 0.24$ mm en $V_f = 425$ mm/min





• 960 Series



960 Series
 M3.0 - 16.0 mm
 2 cutting edges
 140° attack angle
 30° helix angle
 DIN 6535 HA shank [h6]
 version; TiAlN coated

3

4

6

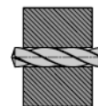
Article number
 TiAlN coated

Article number	D1	D2	D3 x length	L1	L2	M
960 030 00	3.4	6.0	2.5 x 8.8	66	20	M3
960 040 00	4.5	6.0	3.3 x 11.4	66	24	M4
960 050 00	5.5	6.0	4.2 x 13.6	66	28	M5
960 060 00	6.6	8.0	5.0 x 16.5	79	34	M6
960 080 00	9.0	10.0	6.8 x 21.0	89	47	M8
960 100 00	11.0	12.0	8.5 x 25.5	102	55	M10
960 120 00	14.0	14.0	10.2 x 30.0	107	60	M12
960 140 00	16.0	16.0	12.0 x 34.5	115	65	M14
960 160 00	18.0	18.0	14.0 x 38.5	123	73	M16

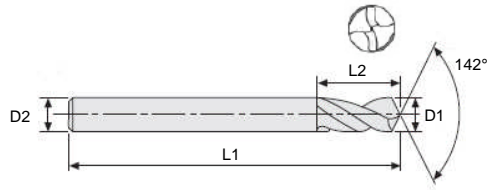
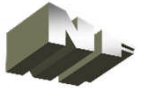
Machining example

Workpiece: spacer
 Material: G CuZn25Al5
 Operation: hole for M16
 Machining center: horizontal
 Adapter: SK50 DIN 69871 A to hydraulic chuck
 Coolant: 8% emulsion
 Tool: 960.160.00
 Cutting speed Vc / Revs. n: Vc = 120.0 m/min / n = 2730 r.p.m.
 Feed rate fn and Vf: fn = 0.30 mm and Vf = 819 mm/min

6



• 924 Series



924 Series

Ø 3.0 - 20.0 mm

2 cutting edges

142° attack angle

30° helix angle

cylindrical shank [h6]

version; not coated - and TiAlN coated

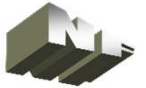


Article number not coated
924 030 09
924 040 09
924 050 09
924 060 09
924 080 09
924 100 09
924 120 09
924 160 09
924 200 09

Article number TiAlN coated
924 030 00
924 040 00
924 050 00
924 060 00
924 080 00
924 100 00
924 120 00
924 160 00
924 200 00

D1	D2	L1	L2
3.0	3.0	38	8
4.0	4.0	50	10
5.0	5.0	50	13
6.0	6.0	57	13
8.0	8.0	63	19
10.0	10.0	66	20
12.0	12.0	73	22
16.0	16.0	82	24
20.0	20.0	92	30





1

Vc = 30 - 300 m/min [micro drills]

fn for D < 0.5	fn for D < 1.0	fn for D < 1.5	fn for D < 2.0	fn for D < 2.5	fn for D < 3.0
0.005	0.01	0.015	0.02	0.03	0.04
0.04	0.05	0.06	0.07	0.08	0.10

Vc = 200 - 450 m/min [standard drills]

fn for D < 1.0	fn for D < 3.0	fn for D < 6.0	fn for D < 10.0	fn for D < 16.0	fn for D < 20.0
0.02	0.04	0.06	0.14	0.26	0.30
0.10	0.12	0.22	0.32	0.40	0.50

2

Vc = 20 - 250 m/min [micro drills]

fn for D < 0.5	fn for D < 1.0	fn for D < 1.5	fn for D < 2.0	fn for D < 2.5	fn for D < 3.0
0.005	0.01	0.015	0.02	0.03	0.04
0.04	0.05	0.06	0.07	0.08	0.10

Vc = 200 - 450 m/min [standard drills]

fn for D < 1.0	fn for D < 3.0	fn for D < 6.0	fn for D < 10.0	fn for D < 16.0	fn for D < 20.0
0.02	0.04	0.06	0.14	0.26	0.30
0.10	0.12	0.22	0.32	0.40	0.50

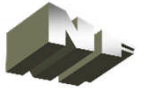
3

Vc = 20 - 200 m/min [micro drills]

fn for D < 0.5	fn for D < 1.0	fn for D < 1.5	fn for D < 2.0	fn for D < 2.5	fn for D < 3.0
0.005	0.01	0.015	0.02	0.03	0.04
0.04	0.05	0.06	0.07	0.08	0.10

Vc = 160 - 350 m/min [standard drills]

fn for D < 1.0	fn for D < 3.0	fn for D < 6.0	fn for D < 10.0	fn for D < 16.0	fn for D < 20.0
0.03	0.05	0.08	0.16	0.26	0.30
0.12	0.14	0.26	0.34	0.40	0.50



4

Vc = 15 - 100 m/min [micro drills]

fn for D < 0.5 0.005 0.04	fn for D < 1.0 0.01 0.05	fn for D < 1.5 0.015 0.06	fn for D < 2.0 0.02 0.07	fn for D < 2.5 0.03 0.08	fn for D < 3.0 0.04 0.10
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Vc = 70 - 140 m/min [standard drills]

fn for D < 1.0 0.04 0.12	fn for D < 3.0 0.06 0.14	fn for D < 6.0 0.10 0.26	fn for D < 10.0 0.16 0.34	fn for D < 16.0 0.26 0.40	fn for D < 20.0 0.30 0.50
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5

Vc = 20 - 100 m/min [micro drills]

fn for D < 0.5 0.005 0.04	fn for D < 1.0 0.01 0.05	fn for D < 1.5 0.015 0.06	fn for D < 2.0 0.02 0.07	fn for D < 2.5 0.03 0.08	fn voor D < 3.0 0.04 0.10
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Vc = 80 - 160 m/min [standard drills]

fn for D < 1.0 0.04 0.12	fn for D < 3.0 0.06 0.14	fn for D < 6.0 0.08 0.26	fn for D < 10.0 0.18 0.32	fn for D < 16.0 0.26 0.40	fn for D < 20.0 0.30 0.50
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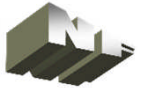
6

Vc = 30 - 120 m/min [micro drills]

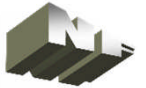
fn for D < 0.5 0.005 0.04	fn for D < 1.0 0.01 0.05	fn for D < 1.5 0.015 0.06	fn for D < 2.0 0.02 0.07	fn for D < 2.5 0.03 0.08	fn for D < 3.0 0.04 0.10
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Vc = 100 - 200 m/min [standard drills]

fn for D < 1.0 0.03 0.10	fn for D < 3.0 0.05 0.12	fn for D < 6.0 0.06 0.22	fn for D < 10.0 0.14 0.32	fn for D < 16.0 0.26 0.40	fn for D < 20.0 0.30 0.50
-----------------------------------	-----------------------------------	-----------------------------------	------------------------------------	------------------------------------	------------------------------------



7	Vc = 15 - 90 m/min [micro drills]					
	fn for D < 0.5 0.005 0.04	fn for D < 1.0 0.01 0.05	fn for D < 1.5 0.015 0.06	fn for D < 2.0 0.02 0.07	fn for D < 2.5 0.03 0.08	fn for D < 3.0 0.04 0.10
	Vc = 70 - 140 m/min [standard drills]					
	fn for D < 1.0 0.03 0.10	fn for D < 3.0 0.04 0.12	fn for D < 6.0 0.06 0.22	fn for D < 10.0 0.14 0.28	fn for D < 16.0 0.26 0.35	fn for D < 20.0 0.30 0.40
8	Vc = 10 - 80 m/min [micro drills]					
	fn for D < 0.5 0.005 0.04	fn for D < 1.0 0.01 0.05	fn for D < 1.5 0.015 0.06	fn for D < 2.0 0.02 0.07	fn for D < 2.5 0.03 0.08	fn for D < 3.0 0.04 0.10
	Vc = 70 - 120 m/min [standard drills]					
	fn for D < 1.0 0.03 0.10	fn for D < 3.0 0.04 0.12	fn for D < 6.0 0.06 0.22	fn for D < 10.0 0.12 0.32	fn for D < 16.0 0.22 0.38	fn for D < 20.0 0.30 0.45
9	Vc = 10 - 60 m/min [micro drills]					
	fn for D < 0.5 0.005 0.04	fn for D < 1.0 0.01 0.05	fn for D < 1.5 0.015 0.06	fn for D < 2.0 0.02 0.07	fn for D < 2.5 0.03 0.08	fn for D < 3.0 0.04 0.10
	Vc = 50 - 80 m/min [standard drills]					
	fn for D < 1.0 0.02 0.10	fn for D < 3.0 0.03 0.12	fn for D < 6.0 0.05 0.18	fn for D < 10.0 0.08 0.26	fn for D < 16.0 0.14 0.32	fn for D < 20.0 0.28 0.38



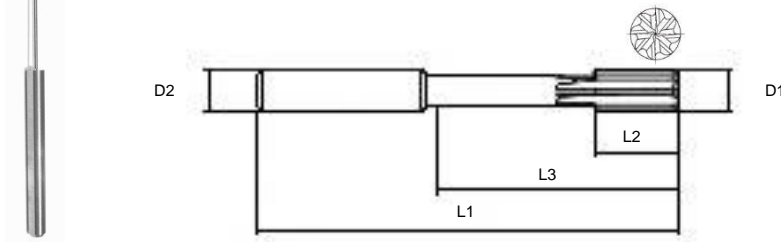
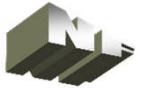
• Reaming operations

Solid carbide tool types; universal

Ø 0.900 - 12.150	+/- 0.002	R2...	not coated
0.900 - 12.150	+/- 0.002	R3...	not coated
3.00 - 8.00	e8	R2 2S...	not coated
0.48 - 14.00	+ 0.005	990...	not coated
1.00 - 16.00	h7	991...	not coated
4.80 - 12.70	h7	992...	TiAlN coated
4.16 - 12.70	h7	993...	TiAlN coated



• R2 Series



R2 Series

Ø 0.900 - 12.150 mm [+/-0.002]

3 - 6 cutting edges

45° T land

straight chipflutes

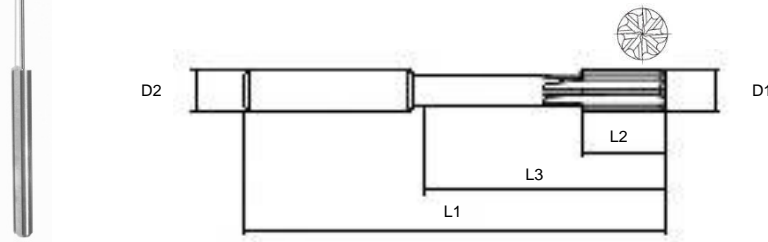
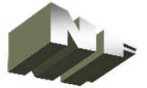
cylindrical shank [h6]

version; not coated



Article number	D1 +/-0.002	D2	L1	L2	L3	Number of teeth z
R2 0900 6 - 1069 6	0.900 - 1.069	3	48	6	20	3
R2 1070 6 - 1569 6	1.070 - 1.569	3	48	6	20	3
R2 1570 6 - 2069 6	1.570 - 2.069	3	48	6	20	3
R2 2070 6 - 2569 6	2.070 - 2.569	3	48	6	20	3
R2 2570 6 - 3069 6	2.570 - 3.069	3	48	6	20	4
R2 3070 6 - 3569 6	3.070 - 3.569	4	54	8	26	4
R2 3570 6 - 4069 6	3.570 - 4.069	4	54	8	26	4
R2 4070 12 - 4569 12	4.070 - 4.569	6	74	12	38	6
R2 4570 12 - 5069 12	4.570 - 5.069	6	74	12	38	6
R2 5070 12 - 6150 12	5.070 - 6.150	6	74	12	38	6
R2 6160 12 - 6790 12	6.160 - 6.790	8	91	12	55	6
R2 6800 12 - 7150 12	6.800 - 7.150	8	91	16	55	6
R2 7160 12 - 8150 12	7.150 - 8.150	8	91	16	55	6
R2 8160 12 - 8690 12	8.160 - 8.690	10	103	16	63	6
R2 8700 20 - 10150 20	8.700 - 10.150	10	103	20	63	6
R2 10160 20 - 10590 20	10.160 - 10.590	12	118	20	73	6
R2 10600 24 - 12150 24	10.600 - 12.150	12	118	24	73	6

• R3 IK Series



R3 Series [central coolant channels]

Ø 0.900 - 12.150 mm [+/-0.002]

3 - 6 cutting edges

45° T land

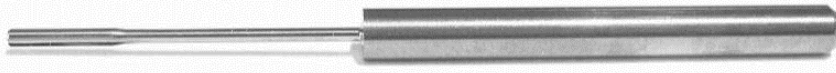
straight chipflutes

cylindrical shank [h6]

version; not coated



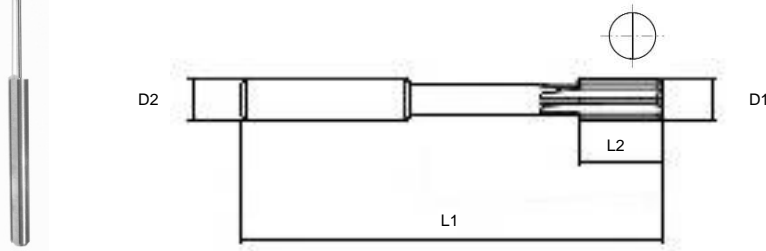
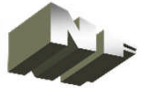
Article number	D1 +/-0.002	D2	L1	L2	L3	Number of teeth z
R3 0900 6 - 1069 6	0.900 - 1.069	3	48	6	20	3
R3 1070 6 - 1569 6	1.070 - 1.569	3	48	6	20	3
R3 1570 6 - 2069 6	1.570 - 2.069	3	48	6	20	3
R3 2070 6 - 2569 6	2.070 - 2.569	3	48	6	20	3
R3 2570 6 - 3069 6	2.570 - 3.069	3	48	6	20	4
R3 3070 6 - 3569 6	3.070 - 3.569	4	54	8	26	4
R3 3570 6 - 4069 6	3.570 - 4.069	4	54	8	26	4
R3 4070 12 - 4569 12	4.070 - 4.569	6	74	12	38	6
R3 4570 12 - 5069 12	4.570 - 5.069	6	74	12	38	6
R3 5070 12 - 6150 12	5.070 - 6.150	6	74	12	38	6
R3 6160 12 - 6790 12	6.160 - 6.790	8	91	12	55	6
R3 6800 12 - 7150 12	6.800 - 7.150	8	91	16	55	6
R3 7160 12 - 8150 12	7.150 - 8.150	8	91	16	55	6
R3 8160 12 - 8690 12	8.160 - 8.690	10	103	16	63	6
R3 8700 20 - 10150 20	8.700 - 10.150	10	103	20	63	6
R3 10160 20 - 10590 20	10.160 - 10.590	12	118	20	73	6
R3 10600 24 - 12150 24	10.600 - 12.150	12	118	24	73	6



Machining example

Workpiece:	fixture	1
Material:	AlMg1	
Operation:	pin hole K6	
Machining center:	horizontal	
Adapter:	SK40 MAS-BT/JIS to ER20 collet	
Coolant:	8% emulsion	
Tool:	R3 2500 6	
Cutting speed Vc / Revs. n:	Vc = 80.0 m/min / n = 10190 r.p.m.	
Feed rate fn and Vf:	fn = 0.2 mm and Vf = 2038 mm/min	

• R2 2S Series

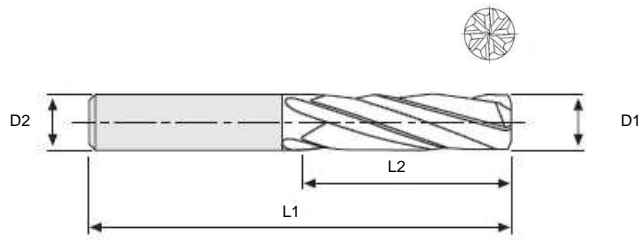
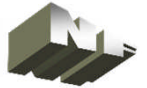


R2 2S Series
 Ø 3.00 - 8.00 mm [h7]
 2 cutting edges
 45° T land
 Straight chipflutes
 DIN 6535 HA shank [h6]
 version; not coated



Article number	D1 H7	D2	L1	L2	Number of teeth z
R2 2S 0300 18	3.00	6	82	18	2
R2 2S 0330 20	3.30	6	82	20	2
R2 2S 0350 21	3.50	6	82	21	2
R2 2S 0400 24	4.00	6	82	24	2
R2 2S 0420 26	4.20	6	82	26	2
R2 2S 0450 27	4.50	6	82	27	2
R2 2S 0500 30	5.00	6	82	30	2
R2 2S 0550 33	5.50	6	94	33	2
R2 2S 0600 36	6.00	6	94	36	2
R2 2S 0650 39	6.50	8	102	39	2
R2 2S 0680 41	6.80	8	102	41	2
R2 2S 0700 42	7.00	8	102	42	2
R2 2S 0750 45	7.50	8	108	45	2
R2 2S 0800 48	8.00	8	108	48	2
R2 2S 0300 36	3.00	6	82	36	2
R2 2S 0330 40	3.30	6	82	40	2
R2 2S 0350 42	3.50	6	82	42	2
R2 2S 0400 48	4.00	6	82	48	2
R2 2S 0420 51	4.20	6	82	51	2
R2 2S 0450 54	4.50	6	82	54	2
R2 2S 0500 60	5.00	6	82	60	2
R2 2S 0550 66	5.50	6	94	66	2
R2 2S 0600 72	6.00	6	94	72	2
R2 2S 0650 78	6.50	8	102	78	2
R2 2S 0680 82	6.80	8	102	82	2
R2 2S 0700 84	7.00	8	102	84	2
R2 2S 0750 90	7.50	8	108	90	2
R2 2S 0800 96	8.00	8	108	96	2

• 990 Series



990 Series form B

Ø 0.48 - 14.00 mm [0 / +0.005]

4 - 6 cutting edges

45° T land

Chipflutes with helix angle

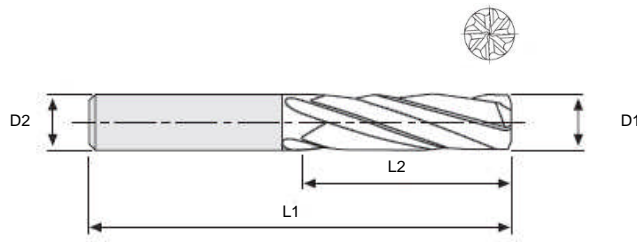
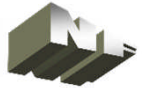
cilindrical shank [h6]

version; not coated



Article number	D1	D2	L1	L2
	0 / +0.005			
990 048 053 09	0.48 – 0.53	1.5	35	5
990 054 059 09	0.54 – 0.59	1.5	35	5
990 060 069 09	0.60 – 0.69	1.5	35	6
990 070 079 09	0.70 – 0.79	1.5	35	6
990 080 090 09	0.80 – 0.90	1.5	35	6
990 091 100 09	0.91 – 1.00	1.5	35	8
990 101 120 09	1.01 – 1.20	1.5	35	10
990 121 150 09	1.21 – 1.50	1.5	40	14
990 151 200 09	1.51 – 2.00	2.0	45	16
990 201 240 09	2.01 – 2.40	2.0	50	18
990 241 270 09	2.41 – 2.70	2.0-2.5	55	20
990 271 270 09	2.71 – 3.10	2.5-3.0	60	20
990 311 370 09	3.11 – 3.70	3.0-3.5	60	22
990 371 410 09	3.71 – 4.10	3.5-4.0	65	24
990 411 460 09	4.11 – 4.60	4.0-4.5	65	24
990 491 520 09	4.61 – 4.90	4.5-5.0	65	26
990 521 570 09	4.91 – 5.20	5.0	75	28
990 571 620 09	5.21 – 5.70	5.0	75	28
990 621 660 09	5.71 – 6.20	5.0-6.0	75	28
990 661 690 09	6.21 – 6.60	6.0	80	30
990 691 720 09	6.61 – 7.20	7.0	80	30
990 721 770 09	7.21 – 7.70	7.0	90	35
990 771 820 09	7.71 – 8.20	7.0-8.0	90	35
990 821 870 09	8.21 – 8.70	8.0	95	35
990 871 890 09	8.71 – 8.90	8.0-9.0	195	35
990 891 920 09	8.91 – 9.20	9.0	100	35
990 921 970 09	9.21 – 9.70	9.0	100	35
990 971 1020 09	9.71 – 10.20	9.0-10.0	100	35
990 1021 1070 09	10.21 – 10.70	10.0	100	35
990 1071 1090 09	10.71 – 10.90	10.0-11.0	100	35
990 1091 1120 09	10.91 – 11.20	11.0	100	35
990 1121 1170 09	11.21 – 11.70	11.0	100	35
990 1171 1210 09	11.71 – 12.10	11.0-12.0	100	35
990 1211 1260 09	12.11 – 12.60	12.0	100	35
990 1261 1310 09	12.61 – 13.10	12.0-13.0	100	35
990 1311 1400 09	13.11 – 14.00	13.0-14.0	100	35

• 991 Series



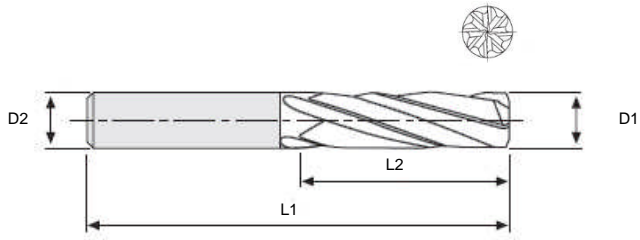
991 Series form B
 Ø 1.00 - 16.00 mm [h7]
 4 - 6 cutting edges
 45° T land
 Chipflutes with helix angle
 cylindrical shank [h6]
 version; not coated



Article number	D1 H7	D2 h6	L1	L2
991 010 09	1.00	1.00	40	5
991 011 09	1.10	1.10	40	7
991 012 09	1.20	1.20	40	7
991 013 09	1.30	1.30	40	7
991 014 09	1.40	1.40	40	8
991 015 09	1.50	1.50	40	8
991 016 09	1.60	1.60	43	9
991 017 09	1.70	1.70	46	10
991 018 09	1.80	1.80	46	10
991 019 09	1.90	1.90	46	10
991 020 09	2.00	2.00	49	11
991 021 09	2.10	2.10	49	11
991 022 09	2.20	2.20	53	12
991 023 09	2.30	2.30	53	12
991 024 09	2.40	2.40	54	14
991 025 09	2.50	2.50	57	14
991 026 09	2.60	2.60	57	14
991 027 09	2.70	2.70	61	15
991 028 09	2.80	2.80	61	15
991 029 09	2.90	2.90	61	15
991 030 09	3.00	3.00	61	15
991 031 09	3.10	3.10	65	16
991 032 09	3.20	3.20	65	16
991 033 09	3.30	3.30	65	16
991 034 09	3.40	3.40	70	18
991 035 09	3.50	3.50	70	18
991 036 09	3.60	3.60	70	18
991 037 09	3.70	3.70	70	18
991 038 09	3.80	3.80	75	19
991 039 09	3.90	3.90	75	19
991 040 09	4.00	4.00	75	19
991 041 09	4.10	4.10	75	19
991 042 09	4.20	4.20	75	19
991 043 09	4.30	4.30	80	21
991 044 09	4.40	4.40	80	21
991 045 09	4.50	4.50	80	21
991 046 09	4.60	4.60	80	21
991 047 09	4.70	4.70	80	21
991 048 09	4.80	4.80	86	23

Article number	D1 H7	D2 h6	L1	L2
991 049 09	4.90	4.90	86	23
991 050 09	5.00	5.00	86	23
991 051 09	5.10	5.10	86	23
991 052 09	5.20	5.20	86	23
991 053 09	5.30	5.30	86	23
991 054 09	5.40	5.40	93	26
991 055 09	5.50	5.50	93	26
991 056 09	5.60	5.60	93	26
991 057 09	5.70	5.70	93	26
991 058 09	5.80	5.80	93	26
991 059 09	5.90	5.90	93	26
991 060 09	6.00	6.00	93	26
991 065 09	6.50	6.50	101	28
991 070 09	7.00	7.00	109	31
991 075 09	7.50	7.50	109	31
991 080 09	8.00	8.00	117	33
991 081 09	8.10	8.10	117	33
991 082 09	8.20	8.20	117	33
991 085 09	8.50	8.50	117	33
991 090 09	9.00	9.00	125	36
991 095 09	9.50	9.50	125	36
991 100 09	10.00	10.00	133	38
991 102 09	10.20	10.20	133	38
991 105 09	10.50	10.50	133	38
991 110 09	11.00	11.00	142	41
991 115 09	11.50	11.50	142	41
991 120 09	12.00	12.00	151	44
991 125 09	12.50	12.50	151	44
991 130 09	13.00	13.00	151	44
991 140 09	14.00	14.00	160	47
991 150 09	15.00	15.00	162	47
991 160 09	16.00	16.00	162	47

• 992 IK Series



992 Series form B
 Ø 4.80 - 12.70 mm [h7]
 4 - 6 cutting edges
 45° T land
 Chipflutes with helix angle
 DIN 6535 HA shank [h6]
 version; TiAlN coated

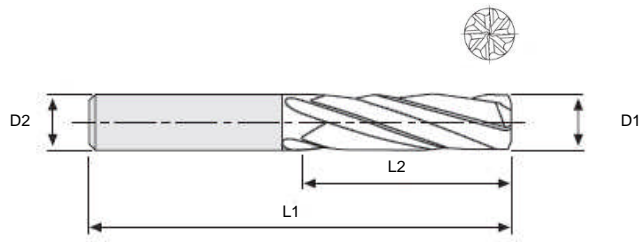
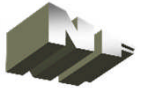


Article number	D1 H7	D2 h6	L1	L2
992 480 515 00	4.80 – 5.15	6	74	12
992 516 579 00	5.16 – 5.79	6	74	12
992 580 615 00	5.80 – 6.15	6	74	12
992 616 679 00	6.16 – 6.79	8	91	16
992 680 715 00	6.80 – 7.15	8	91	16
992 716 769 00	7.16 – 7.69	8	91	16
992 770 815 00	7.70 – 8.15	8	91	16
992 816 869 00	8.16 – 8.69	10	103	20
992 870 915 00	8.70 – 9.15	10	103	20
992 916 959 00	9.16 – 9.59	10	103	20
992 960 1015 00	9.60 – 10.15	10	103	20
992 1016 1059 00	10.16 – 10.59	10	103	20
992 1060 1115 00	10.60 – 11.15	12	118	24
992 1116 1159 00	11.16 – 11.59	12	118	24
992 1160 1215 00	11.60 – 12.15	12	118	24
992 1216 1270 00	12.16 – 12.70	14	132	28

Machining example

Workpiece:	guide ring	6
Material:	CuZn39Pb2	
Operation:	paspen boring 10H7	
Machining center:	horizontal	
Adapter:	HSK 63 A to shrink fit chuck Ø 10 mm	
Coolant:	8% emulsion	
Tool:	992 1000 00	
Cutting speed Vc / Revs. n:	Vc = 80.0 m/min / n = 2548 r.p.m.	
Feed rate fn and Vf:	fn = 0.84 mm and Vf = 2140 mm/min	

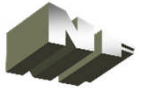
• 993 Series



993 Series form B
 Ø 4.16 - 12.70 mm [h7]
 4 - 6 cutting edges
 45° T land
 Straight chipflutes
 DIN 6535 HA shank [h6]
 version; TiAlN coated



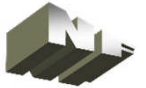
Article number	D1 H7	D2 h6	L1	L2
993 416 479 00	4.16 – 4.79	6	74	10
993 480 515 00	4.80 – 5.15	6	74	12
993 516 579 00	5.16 – 5.79	6	74	12
993 580 615 00	5.80 – 6.15	6	74	12
993 616 679 00	6.16 – 6.79	8	91	16
993 680 715 00	6.80 – 7.15	8	91	16
993 716 769 00	7.16 – 7.69	8	91	16
993 770 815 00	7.70 – 8.15	8	91	16
993 816 869 00	8.16 – 9.69	10	103	20
993 870 915 00	8.70 – 9.15	10	103	20
993 916 959 00	9.16 – 9.59	10	103	20
993 960 1015 00	9.60 – 10.15	10	103	20
993 1016 1059 00	10.16 – 10.59	10	118	20
993 1060 1115 00	10.60 – 11.15	12	118	24
993 1116 1159 00	11.16 – 11.59	12	118	24
993 1160 1215 00	11.60 – 12.15	12	118	24
993 1216 1270 00	12.16 – 12.70	14	132	28



1	Vc = 65 - 75 m/min [micro reamers: R2 / R3 / 990 / 991]					
	fn for D < 1.0 0.12 0.16	fn for D < 1.5 0.14 0.18	fn for D < 2.0 0.16 0.20	fn for D < 2.5 0.18 0.22	fn for D < 3.0 0.20 0.24	
	Vc = 65 - 75 m/min [standard reamers: R2 / R3 / 990 / 991] [R2 2S fn x 0.3]					
	fn for D < 4.0 0.22 0.28	fn for D < 6.0 0.26 0.32	fn for D < 8.0 0.30 0.38	fn for D < 10.0 0.32 0.40	fn for D < 12.0 0.34 0.42	fn for D < 16.0 0.36 0.45
2	Vc = 65 - 75 m/min [micro reamers: R2 / R3 / 990 / 991]					fn as 1
	Vc = 65 - 75 m/min [standard reamers: R2 / R3 / 990 / 991] [R2 2S fn x 0.3]					
3	Vc = 55 - 65 m/min [micro reamers: R2 / R3 / 990 / 991]					fn as 1
	Vc = 55 - 65 m/min [standard reamers: R2 / R3 / 990 / 991] [R2 2S fn x 0.3]					
	Vc = 75 - 85 m/min [standard reamers: 992 / 993] [TiAlN]					
4	Vc = 35 - 45 m/min [micro reamers: R2 / R3 / 990 / 991]					fn as 1
	Vc = 35 - 45 m/min [standard reamers: R2 / R3 / 990 / 991] [R2 2S fn x 0.3]					
	Vc = 55 - 65 m/min [standard reamers: 992 / 993] [TiAlN]					
5	Vc = 65 - 75 m/min [micro reamers: R2 / R3 / 990 / 991]					fn as 1
	Vc = 65 - 75 m/min [standard reamers: R2 / R3 / 990 / 991] [R2 2S fn x 0.3]					
6	Vc = 55 - 65 m/min [micro reamers: R2 / R3 / 990 / 991]					fn as 1
	Vc = 55 - 65 m/min [standard reamers: R2 / R3 / 990 / 991] [R2 2S fn x 0.3]					
	Vc = 75 - 85 m/min [standard reamers: 992 / 993] [TiAlN]					

Vc / fn

• Initial cutting values solid carbide reamers



7

Vc = 55 - 65 m/min [micro reamers: R2 / R3 / 990 / 991]

fn as 1

Vc = 55 - 65 m/min [standard reamers: R2 / R3 / 990 / 991] [R2 2S fn x 0.3]

8

Vc = 55 - 65 m/min [micro reamers: R2 / R3 / 990 / 991]

fn as 1

Vc = 55 - 65 m/min [standard reamers: R2 / R3 / 990 / 991] [R2 2S fn x 0.3]





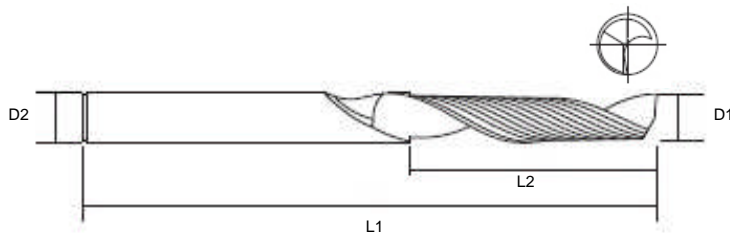
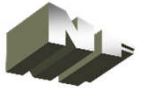
• Milling operations

Solid carbide tool types; aluminium

Ø 0.10	- 12.00	h6 / z = 1	241...	not coated
1.50	- 12.00	e8 / z = 1	310...	not coated / CrN
1.50	- 12.00	e8 / z = 1	311...	not coated / CrN
1.50	- 12.00	e8 / z = 1	312...	not coated / CrN
1.50	- 12.00	e8 / z = 1	313...	not coated / CrN
3.0	- 20.0	h10 / z = 2	512...	not coated / CrN
6.0	- 25.0	h10 / z = 3	514...	not coated / CrN
6.0	- 25.0	h10 / z = 2	517...	ZrN
4.0	- 25.0	h10 / z = 2,3, 4	516...	ZrN
3.0	- 25.0	h10 / z = 3	354...	ZrN
5.0	- 25.0	h10 / z = 3	355...	ZrN
3.0	- 25.0	h10 / z = 3, 4	522...	ZrN
3.0	- 25.0	h10 / z = 4	524...	ZrN
6.0	- 25.0	h10 / z = 3	362...	ZrN
3.0	- 25.0	h10 / z = 4	518...	ZrN
6.0	- 25.0	h10 / z = 3	363...	ZrN
6.0	- 25.0	h10 / z = 3	515...	ZrN
6.0	- 25.0	h10 / z = 6	356...	ZrN
1.0	- 20.0	h10 / z = 2	643...	ZrN
0.5	- 25.0	h10 / z = 2	358...	DLC [diamond coating]
1.0	- 25.0	h10 / z = 3	359...	DLC [diamond coating]



• 241 Series short



241 Series

Ø 0.10 - 12.0 mm [h6]

1 cutting edge

30° helix angle

DIN 6535 HA shank [h6]

version; not coated

1

2

3

4

5

6

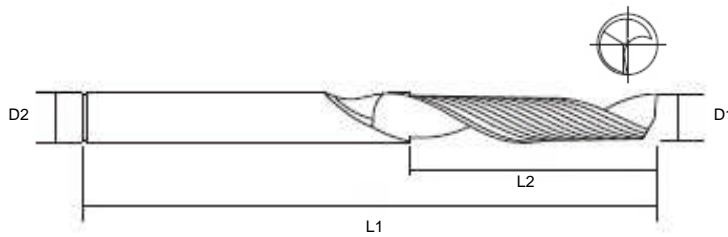
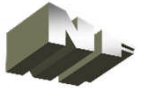
7

8

9

Article number	D1 [h6]	D2 [h6]	L2	L1
241 001	0.10	3.00	0.3	38
241 002	0.20	3.00	0.6	38
241 003	0.30	3.00	1.0	38
241 004	0.40	3.00	1.0	38
241 005	0.50	3.00	1.5	38
241 006	0.60	3.00	3.0	38
241 007	0.70	3.00	4.0	38
241 008	0.80	3.00	5.0	38
241 009	0.90	3.00	5.0	38
241 010	1.00	3.00	5.0	38
241 011	1.10	3.00	5.0	38
241 012	1.20	3.00	5.0	38
241 013	1.30	3.00	5.0	38
241 014	1.40	3.00	5.0	38
241 015	1.50	3.00	5.0	38
241 016	1.60	3.00	6.0	38
241 017	1.70	3.00	7.0	38
241 018	1.80	3.00	7.0	38
241 019	1.90	3.00	7.0	38
241 020	2.00	3.00	10.0	38
241 022	2.20	3.00	10.0	38
241 024	2.40	3.00	10.0	38
241 025	2.50	3.00	10.0	38
241 026	2.60	3.00	10.0	38
241 028	2.80	3.00	10.0	38
241 030	3.00	3.00	10.0	38
241 040	4.00	6.00	11.0	54
241 050	5.00	6.00	13.0	54
241 060	7.00	6.00	13.0	54
241 080	8.00	8.00	19.0	58
241 100	10.00	10.00	22.0	66
241 120	12.00	12.00	26.0	73

• 310 Series long

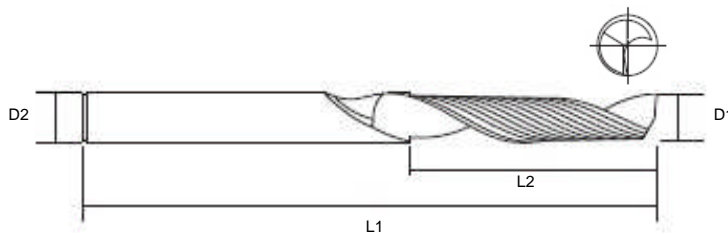


310 RS Series
 Ø 1.5 - 12.0 mm [e8]
 1 cutting edge
 30° helix angle
 cylindrical shank [h6]
 version; coated and not coated



Article number	Artikelnummer	D1	L2	D2	L1
Not coated	CrN	[e8]		[h6]	
310 010 15	310 035 15	1.5	6	3	50
310 010 20	310 035 20	2.0	8	3	50
310 010 30	310 035 30	3.0	12	3	50
310 010 40	310 035 40	4.0	15	4	60
310 010 50	310 035 50	5.0	17	5	60
310 010 60	310 035 60	6.0	20	6	65
310 010 80	310 035 80	8.0	22	8	65
310 010 100	310 035 100	10.0	25	10	70
310 010 120	310 035 120	12.0	30	12	80

• 311 Series long

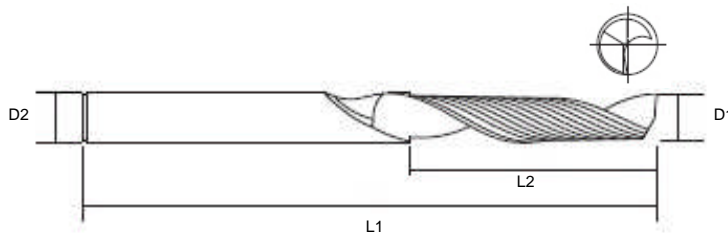
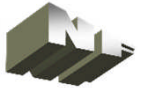


311 Series
 Ø 1.5 - 12.0 mm [e8]
 1 cutting edge
 30° helix angle
 cylindrical shank [h6]
 version; coated and not coated, polished



Article number	Article number	D1	L2	D2	L1
Not coated	CrN	[e8]		[h6]	
311 010 15	311 035 15	1.5	6	3	50
311 010 20	311 035 20	2.0	8	3	50
311 010 30	311 035 30	3.0	12	3	50
311 010 40	311 035 40	4.0	15	4	60
311 010 50	311 035 50	5.0	17	5	60
311 010 60	311 035 60	6.0	20	6	65
311 010 80	311 035 80	8.0	22	8	65
311 010 100	311 035 100	10.0	25	10	70
311 010 120	311 035 120	12.0	30	12	80

• 312 Series long



312 Series

Ø 1.5 - 12.0 mm [e8]

1 cutting edge with radius

30° helix angle

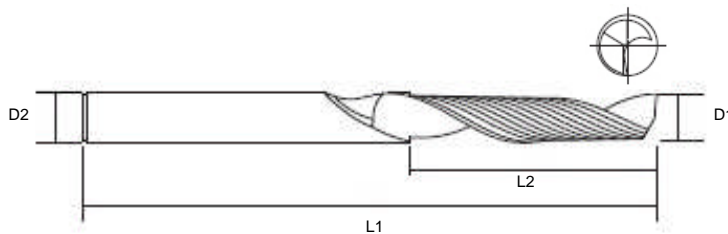
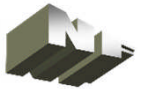
cylindrical shank [h6]

version; coated and not coated, polished



Article number Not coated	Article number CrN	D1 [e8]	L2	D2 [h6]	L1	radius
312 010 15	312 035 15	1.5	6	3	50	0.75
312 010 20	312 035 20	2.0	8	3	50	1.0
312 010 30	312 035 30	3.0	12	3	50	1.5
312 010 40	312 035 40	4.0	15	4	60	2.0
312 010 50	312 035 50	5.0	17	5	60	2.5
312 010 60	312 035 60	6.0	20	6	65	3.0
312 010 80	312 035 80	8.0	22	8	65	4.0
312 010 100	312 035 100	10.0	25	10	70	5.0
312 010 120	312 035 120	12.0	30	12	80	6.0

• 313 Series long



313 Series

Ø 1.5 - 12.0 mm [e8]

1 cutting edge

30° helix angle [left]

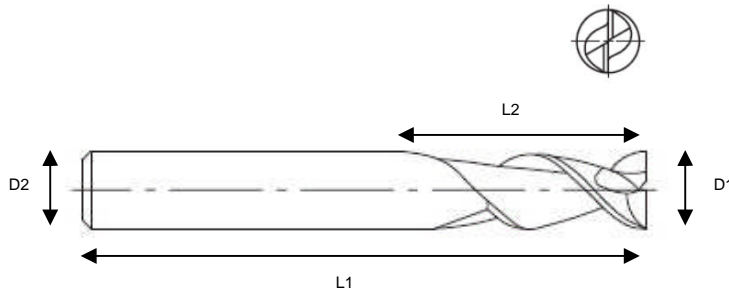
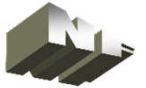
cylindrical shank [h6]

version; coated and not coated, polished



Article number Not coated	Article number CrN	D1 [e8]	L2	D2 [h6]	L1
313 010 15	313 010 15	1.5	6	3	50
313 010 20	313 010 20	2.0	8	3	50
313 010 30	313 010 30	3.0	12	3	50
313 010 40	313 010 40	4.0	15	4	60
313 010 50	313 010 50	5.0	17	5	60
313 010 60	313 010 60	6.0	20	6	65
313 010 80	313 010 80	8.0	22	8	65
313 010 100	313 010 100	10.0	25	10	70
313 010 120	313 010 120	12.0	30	12	80

• 512 Series DIN 6527 long

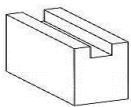


512 Series
 Ø 3.0 - 20.0 mm [h10]
 2 cutting edges
 55° helix angle
 DIN 6535 HA and HB shank [h6]
 version; not coated



Article number DIN 6535 HA	Article number DIN 6535 HB	D1	D2	L1	L2
512 010 30	512 035 30	3.0	6	57	8
512 010 40	512 035 40	4.0	6	57	11
512 010 50	512 035 50	5.0	6	57	13
512 010 60	512 035 60	6.0	6	57	13
512 010 80	512 035 80	8.0	8	63	19
512 010 100	512 035 100	10.0	10	72	22
512 010 120	512 035 120	12.0	12	83	26
512 010 140	512 035 140	14.0	14	83	26
512 010 160	512 035 160	16.0	16	92	32
512 010 180	512 035 180	18.0	18	92	32
512 010 200	512 035 200	20.0	20	104	38

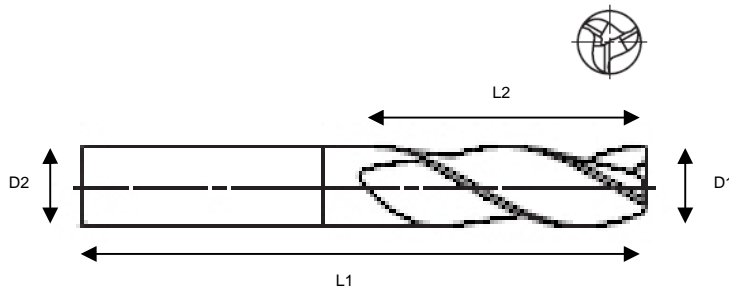
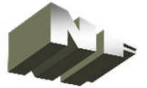
Order example: 512 010 180 HB [with Weldon flat]
 512 035 80 HA [cylindrical shank]



Machining example

Material: AlMg1 1
 Operation: full slot 20 mm
 Machining center: horizontal
 Adapter: HSK 63 A to shrink fit chuck Ø 20 mm
 Coolant: 8% emulsion
 Tool: 512 010 20
 D.O.C. / Ap: 24 mm
 W.O.C. / Ae: 20 mm
 Cutting speed Vc / Revs. n: Vc = 750.0 m/min / n = 11943 r.p.m.
 Feed rate fn and Vf: fz = 0.11 mm and Vf = 2627 mm/min

• 514 Series extra long



514 Series

Ø 6.0 - 25.0 mm [h10]

3 cutting edges

45° helix angle

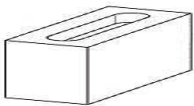
DIN 6535 HA and HB shank [h6]

version; not coated



Article number DIN 6535 HA	Article number DIN 6535 HB	D1	D2	L1	L2
514 010 60	514 035 60	6.0	6	60	16
514 010 80	514 035 80	8.0	8	78	25
514 010 100	514 035 100	10.0	10	78	28
514 010 120	514 035 120	12.0	12	89	32
514 010 140	514 035 140	14.0	14	89	32
514 010 160	514 035 160	16.0	16	96	36
514 010 200	514 035 200	20.0	20	111	45
514 010 250	514 035 250	25.0	25	126	50

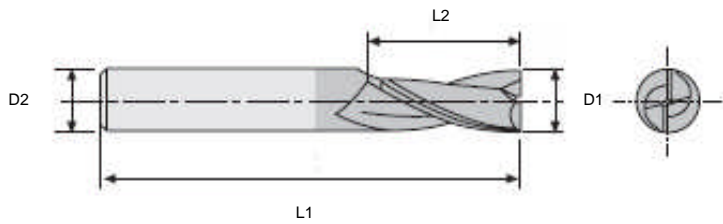
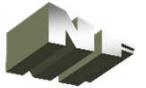
Order example: 514 010 250 HB [with Weldon flat]
514 035 80 HA [cilindrical shank]



Machining example

Material:	G AISi11 3
Operation:	3D pocket milling
Machining center:	vertical
Adapter:	HSK 63 A to hydraulic chuck Ø 8 mm
Coolant:	8% emulsion
Tool:	514 035 08
D.O.C. max / Apmax:	2.0 mm
W.O.C. var. / Aevar:	2.0 tot 8.0 mm
Snijsnelheid Vc / Toerental n:	Vc = 200.0 m/min / n = 7962 r.p.m.
Feed rate fn and Vf:	fz = 0.11 mm and Vf = 2627 mm/min

• 517 Series DIN 6527 long

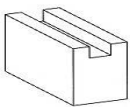


517 Series
 Ø 6.0 - 25.0 mm [h10]
 2 cutting edges
 40° helix angle
 DIN 6535 HB shank [h6]
 version; ZrN coated



Article number ZrN	D1	D2	L1	L2
517 030 60	6.0	6	57	13
517 030 80	8.0	8	63	19
517 030 100	10.0	10	72	22
517 030 120	12.0	12	83	26
517 030 160	16.0	16	92	32
517 030 200	20.0	20	104	42
517 030 250	25.0	25	110	42

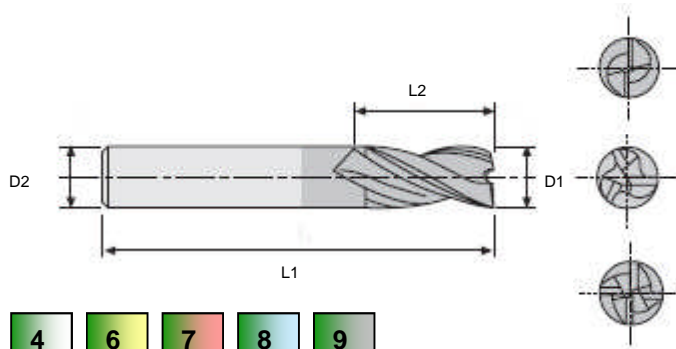
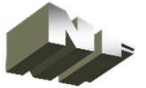
Order example: 517 030 60 HB [with Weldon flat]



Machining example

Material: G D Alsi10Mg 3
 Operation: full slot 25 mm
 Machining center: horizontal
 Adapter: HSK 100 A to Weldon shank Ø 25 mm
 Coolant: 8% emulsion
 Tool: 517 030 250
 D.O.C. / Ap: 32 mm
 W.O.C. / Ae: 25 mm
 Cutting speed Vc / Revs. n: Vc = 200.0 m/min / n = 2548 r.p.m.
 Feed rate fn and Vf: fz = 0.12 mm and Vf = 612 mm/min

• 516 Series DIN 6527 long



516 Series

Ø 4.0 - 25.0 mm [h10]

2, 3 and 4 cutting edges

20° helix angle

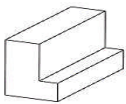
DIN 6535 HB shank [h6]

version; ZrN coated



Article number ZrN	D1	D2	L1	L2	z
516 030 40	4.0	4	54	13	2
516 030 50	5.0	5	54	15	2
516 030 60	6.0	6	64	16	2
516 030 80	8.0	8	70	22	2
516 030 100	10.0	10	72	25	2
516 030 120	12.0	12	83	28	3
516 030 140	14.0	14	83	30	3
516 030 160	16.0	16	92	36	3
516 030 180	18.0	18	92	36	3
516 030 200	20.0	20	104	41	4
516 030 250	25.0	25	110	43	4

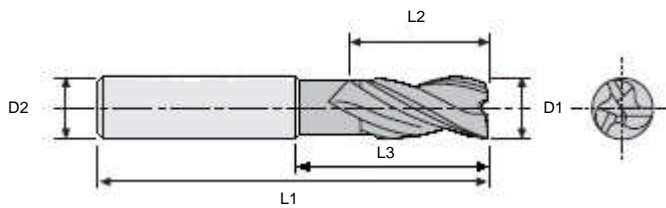
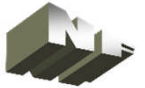
Order example: 516 030 140 HB [with Weldon flat]



Machining example

Material:	G AlSi6Cu4	3
Operation:	side milling	
Machining center:	vertical	
Adapter:	SK40 MAS BT/JIS to Weldon shank Ø 16 mm	
Coolant:	8% emulsion	
Tool:	516 030 160	
D.O.C. / Ap:	32 mm	
W.O.C / Ae:	2 mm	
Cutting speed Vc / Revs. n:	Vc = 260.0 m/min / n = 5175 r.p.m.	
Feed rate fn and Vf:	fz = 0.15 mm and Vf = 3105 mm/min	

• 354 Series DIN 6527 long and extra long



354 Series

Ø 3.0 - 25.0 mm [h10] with neck

3 cutting edges with chamfer

45° helix angle

DIN 6535 HA and HB shank [h6]

version; ZrN coated



Article number ZrN	D1	D2	L1	L2	L3
354 030 30	3.0	6	57	8	12
354 030 40	4.0	6	57	11	18
354 030 50	5.0	6	57	13	18
354 030 60 57	6.0	6	57	13	18
354 030 60 80	6.0	6	80	13	42
354 030 80 63	8.0	8	63	21	25
354 030 80 100	8.0	8	100	21	62
354 030 100 72	10.0	10	72	22	30
354 030 100 100	10.0	10	100	22	58
354 030 120 83	12.0	12	83	26	36
354 030 120 120	12.0	12	120	26	73
354 030 160 92	16.0	16	92	36	42
354 030 160 150	16.0	16	150	36	100
354 030 180 92	18.0	18	92	36	42
354 030 180 150	18.0	18	150	36	100
354 030 200 104	20.0	20	104	41	52
354 030 200 150	20.0	20	150	41	98
354 030 250	25.0	25	125	50	65

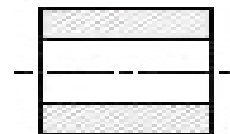
Order example: 354 030 200 150 HB [with Weldon flat]

354 030 100 100 HA [cilindrical shank]

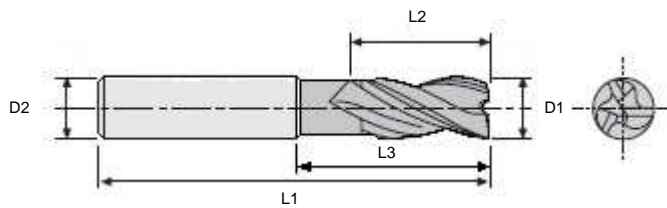
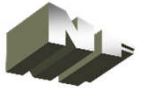
Machining example

2

Material: AlCuMgPb
 Operation: helicoil milling; hole Ø 36.0 x 80 mm
 Machining center: horizontal
 Adapter: HSK 63 A to hydraulic chuck Ø 20 mm
 Coolant: 8% emulsion
 Tool: 354 030 200 150 HA
 D.O.C. max / A_{pmax}: 1 mm
 W.O.C var / A_{evar}: 18 tot 20 mm
 Cutting speed V_c / Revs. n: V_c = 300.0 m/min / n = 4777 r.p.m.
 Feed rate f_n and V_f: f_z = 0.08 mm and V_f = 1147 mm/min



• 355 Series DIN 6527 long



355 Series

Ø 5.0 - 25.0 mm [h10] with neck

3 cutting edges with radius

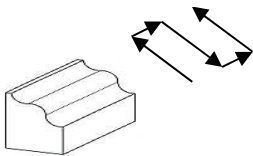
45° helix angle

DIN 6535 HA and HB shank [h6]
version; ZrN coated



Article number ZrN	D1	D2	L1	L2	L3	r
355 030 50 R 0.5	5.0	6	57	13	18	0.5
355 030 50 R 1.0	5.0	6	57	13	18	1.0
355 030 60 R 0.5	6.0	6	57	13	18	0.5
355 030 60 R 1.0	6.0	6	57	13	18	1.0
355 030 80 R 0.5	8.0	8	63	21	25	0.5
355 030 80 R 1.0	8.0	8	63	21	25	1.0
355 030 100 R 0.5	10.0	10	72	22	30	0.5
355 030 100 R 1.0	10.0	10	72	22	30	1.0
355 030 120 R 0.5	12.0	12	83	26	36	0.5
355 030 120 R 1.0	12.0	12	83	26	36	1.0
355 030 160 R 2.0	16.0	16	92	36	42	2.0
355 030 160 R 4.0	16.0	16	92	36	42	4.0
355 030 200 R 4.0	20.0	20	104	41	52	4.0
355 030 250 R 5.0	25.0	25	125	50	65	5.0

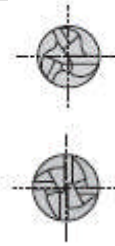
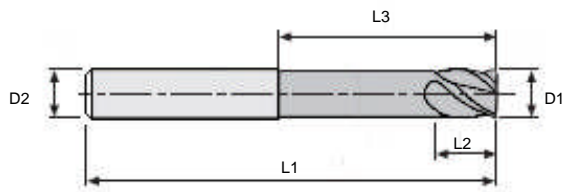
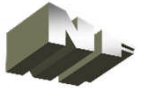
Order example: 355 030 200 R 4.0 HB [with Weldon flat]
355 030 100 R 0.5 HA [cilindrical shank]



Machining example

Material:	AlCuBiPb 2
Operation:	contour milling
Machining center:	vertical
Adapter:	SK40 MAS BT/JIS to shrink fit krimp chuck Ø 20 mm
Coolant:	8% emulsion
Tool:	355 030 200 R 4.0 HA
D.O.C max / A _p max:	0.1 - 0.5 mm
W.O.C / A _e :	0.8 mm
Cutting speed V _c / Revs. n:	V _c = 500.0 m/min / n = 7962 r.p.m.
Feed rate f _n and V _f :	f _z = 0.2 mm and V _f = 4777 mm/min

• 522 Series extra long



522 Series

Ø 3.0 - 25.0 mm [h10] with neck

3 and 4 cutting edges

40° helix angle

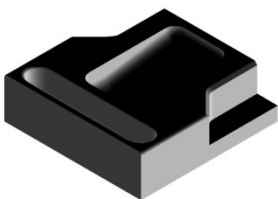
DIN 6535 HA shank [h6]

version; ZrN coated



Article number ZrN	D1	D2	L1	L2	L3	z
522 030 30	3.0	3	70	8	20	3
522 030 40	4.0	4	70	11	25	3
522 030 50	5.0	5	70	13	30	3
522 030 60	6.0	6	70	13	30	3
522 030 80	8.0	8	80	20	35	3
522 030 100	10.0	10	90	22	45	3
522 030 120	12.0	12	100	26	55	4
522 030 160	16.0	16	115	36	65	4
522 030 200	20.0	20	125	41	75	4
522 030 250	25.0	25	150	52	95	4

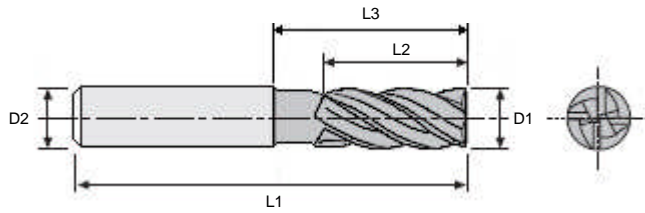
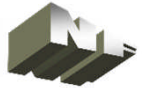
Order example: 522 030 100 HA [cilindrical shank]



Machining example

Material:	G AlMg3 2
Operation:	full slot milling 24 x 100 x 32
Machining center:	vertical
Adapter:	SK50 DIN 69871 A to hydraulical chuck Ø 20 mm
Coolant:	8% emulsion
Tool:	522 030 200
D.O.C. max / A _p max:	1.5 mm
W.O.C. var / A _e var:	2.0 - 20.0 mm
Cutting speed V _c / Revs. n:	V _c = 350.0 m/min / n = 5573 r.p.m.
Feed rate f _n and V _f :	f _z = 0.12 mm and V _f = 2675 mm/min

• 524 Series extra long



524 Series

Ø 3.0 - 25.0 mm [h10] with neck

4 cutting edges with chamfer

45° helix angle

DIN 6535 HA and HB shank [h6]
version; ZrN coated

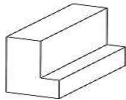


Article number ZrN	D1	D2	L1	L2	L3
524 030 30	3.0	3	57	8	12
524 030 40	4.0	4	57	11	18
524 030 50	5.0	5	57	13	18
524 030 60 57	6.0	6	57	13	18
524 030 60 80	6.0	6	80	13	42
524 030 80 63	8.0	8	63	21	25
524 030 80 100	8.0	8	100	22	62
524 030 100 72	10.0	10	72	22	30
524 030 100 100	10.0	10	100	22	58
524 030 120 83	12.0	12	83	26	36
524 030 120 120	12.0	12	120	26	73
524 030 160 92	16.0	16	92	36	42
524 030 160 150	16.0	16	150	36	100
524 030 180 92	18.0	18	92	36	42
524 030 180 150	18.0	18	150	36	100
524 030 200 104	20.0	20	104	41	52
524 030 200 150	20.0	20	150	41	98
524 030 250	25.0	25	125	50	65

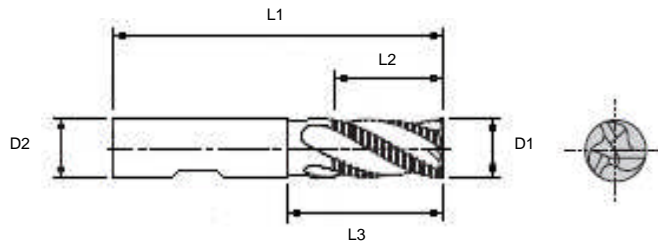
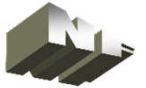
Order example: 524 030 100 72 HA [cilindrical shank]

524 030 160 92 HB [with weldon flat]

Machining example

Material:	G DAISI9Cu3	3	
Operation:	side milling		
Machining center:	vertical		
Adapter:	SK40 DIN 69871 A to Weldon shank Ø 12 mm		
Coolant:	8% emulsion		
Tool:	524 030 120 83 HB		
D.O.C. / Ap:	22 mm		
W.O.C. / Ae:	2.5 mm		
Cutting speed Vc / Revs. n:	Vc = 220.0 m/min / n = 5838 r.p.m.		
Feed rate fn and Vf:	fz = 0.14 mm and Vf = 3269 mm/min		

• 362 Series extra long



362 Series

Ø 6.0 - 25.0 mm [h10] with neck

3 cutting edges with radius

30° helix angle

DIN 6535 HA and HB shank [h6]
version; ZrN coated

2

3

4

6

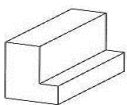
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Article number ZrN	D1	D2	L1	L2	L3	r
362 030 60	6.0	6	70	13	18	0.4
362 030 80	8.0	8	80	21	25	0.4
362 030 100	10.0	10	80	22	30	0.4
362 030 120	12.0	12	90	26	36	0.4
362 030 160	16.0	16	100	36	42	0.4
362 030 200	20.0	20	120	41	52	0.4
362 030 250	25.0	25	150	50	75	0.5

Order example: 362 030 080 HA [cilindrical shank]
362 030 120 HB [with weldon flat]



Machining example

Material: G AlSi17Cu4 4

Operation: side milling

Machining center: horizontal

Adapter: HSK 63 A to Weldon shank Ø 16 mm

Coolant: 8% emulsion

Tool: 362 030 160 HB

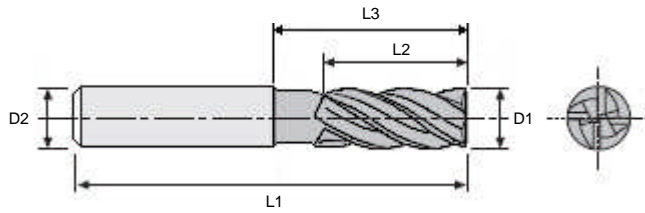
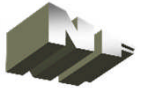
D.O.C. / Ap: 32 mm

W.O.C. Ae: 4.0 mm

Cutting speed Vc / Revs. n: Vc = 100.0 m/min / n = 1990 r.p.m.

Feed rate fn and Vf: fz = 0.2 mm and Vf = 1194 mm/min

• 518 Series DIN 6527 long



518 Series

Ø 3.0 - 25.0 mm [h10] with neck

4 cutting edges with chamfer

35° and 38° helix angle

DIN 6535 HA and HB shank [h6]

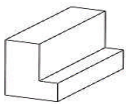
version; ZrN coated



Article number ZrN	D1	D2	L1	L2	L3
518 030 30	3.0	6	57	11	18
518 030 40	4.0	6	57	12	21
518 030 50	5.0	6	57	15	21
518 030 60	6.0	6	57	15	21
518 030 80	8.0	8	63	21	28
518 030 100	10.0	10	72	22	32
518 030 120	12.0	12	83	28	38
518 030 140	14.0	14	83	30	42
518 030 160	16.0	16	92	35	45
518 030 200	20.0	20	104	41	55
518 030 250	25.0	25	110	51	65

Order example: 518 030 100 HA [cilindrical shank]

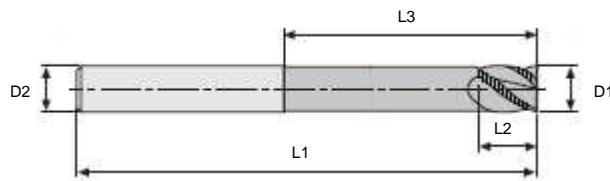
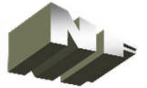
518 030 160 HB [with weldon flat]



Machining example

Material:	G CuZn25Al5	6
Operation:	side milling	
Machining center:	vertical	
Adapter:	HSK 63 A to shrink fit chuck Ø 10 mm	
Coolant:	8% emulsion	
Tool:	518 030 100 HA	
D.O.C. / Ap:	18 mm	
W.O.C. / Ae:	1.0 mm	
Cutting speed Vc / Revs. n:	Vc = 160.0 m/min / n = 5095 r.p.m.	
Feed rate fn and Vf:	fz = 0.08 mm and Vf = 1630 mm/min	

• 363 Series extra long



363 Series

Ø 6.0 - 25.0 mm [h10] with neck

3 cutting edges

55° helix angle

DIN 6535 HA shank [h6]

version; ZrN coated

2

3

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6

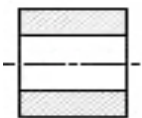
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Article number ZrN	D1	D2	L1	L2	L3
363 030 60	6.0	6	63	10	24
363 030 80	8.0	8	72	12	29
363 030 100	10.0	10	83	14	35
363 030 120	12.0	12	100	16	50
363 030 160	16.0	16	115	20	63
363 030 200	20.0	20	125	20	70
363 030 250	25.0	25	135	25	75

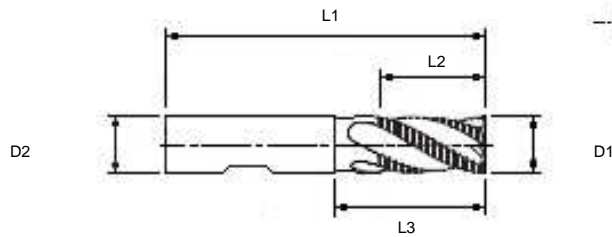
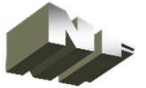
Order example: 363 030 120 HA [cilindrical shank DIN 6535 HA]
363 030 160 HB [cilindrical shank DIN 6535 HB]



Machining example

Material:	G AlSi17Cu4	4
Operation:	helicoil milling; hole Ø39.6 x 60 mm [casting hole Ø 32 x 60 mm]	
Machining center:	horizontal	
Adapter:	HSK 100 A shrink fit chuck Ø 25 mm	
Coolant:	8% emulsion; 40 bar coolant pressure	
Tool:	363 030 250 HA	
D.O.C. / Ap:	1.0 mm [per pitch]	
W.O.C. / Ae:	4.0 mm	
Cutting speed Vc / Revs. n:	Vc = 90.0 m/min / n = 1128 r.p.m.	
Feed rate fn and Vf:	fz = 0.2 mm and Vf = 677 mm/min	

• 515 Series extra long



515 Series

Ø 6.0 - 25.0 mm [h10] with neck

3 cutting edges with chamfer

45° helix angle

DIN 6535 HA and HB shank [h6]

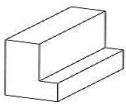
version; ZrN coated



Article number ZrN	D1	D2	L1	L2	L3
515 030 60	6.0	6	60	16	25
515 030 80	8.0	8	78	25	33
515 030 100	10.0	10	78	28	35
515 030 120	12.0	12	89	32	40
515 030 140	14.0	14	89	32	40
515 030 160	16.0	16	96	36	45
515 030 200	20.0	20	111	45	60
515 030 250	25.0	25	126	50	65

Order example: 515 030 080 HA [cilindrical shank]

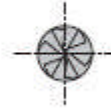
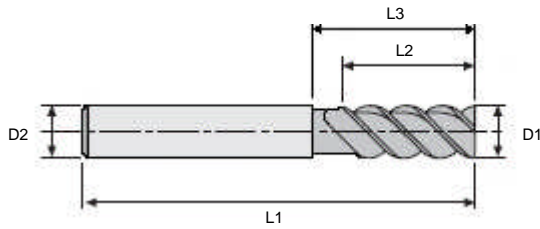
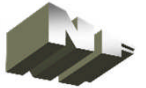
515 030 120 HB [Weldon flat]



Machining example

Material:	G CuSn12Ni 7
Operation:	side milling; roughing contour
Machining center:	vertical
Adapter:	SK 50 DIN 69871 A to Weldon shank Ø 20 mm
Coolant:	8% emulsion
Tool:	515 030 200 HA
D.O.C. / Ap:	40.0 mm
W.O.C. / Ae:	3.0 mm
Cutting speed Vc / Revs. n:	Vc = 140.0 m/min / n = 2230 r.p.m.
Feed rate fn and Vf:	fz = 0.18 mm and Vf = 1204 mm/min

• 356 Series long and extra long



356 Series

Ø 6.0 - 25.0 mm [h10] with neck

6 cutting edges

45° helix angle

DIN 6535 HA and HB shank [h6]
version; ZrN coated

2

3

4

6

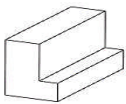
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Article number ZrN	D1	D2	L1	L2	L3
356 030 60 57	6.0	6	57	15	20
356 030 60 80	6.0	6	80	15	43
356 030 80 63	8.0	8	63	20	26
356 030 80 100	8.0	8	100	20	62
356 030 100 73	10.0	10	73	25	32
356 030 100 100	10.0	10	100	25	58
356 030 120 83	12.0	12	83	30	37
356 030 120 100	12.0	12	100	30	73
356 030 160 93	16.0	16	93	40	45
356 030 160 150	16.0	16	150	40	100
356 030 200 104	20.0	20	104	50	53
356 030 200 150	20.0	20	150	50	100
356 030 250	25.0	25	150	56	92

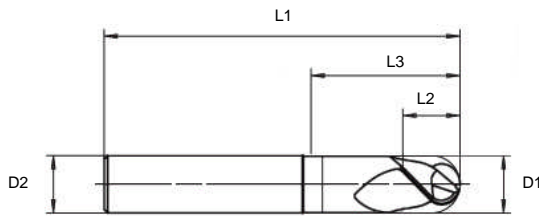
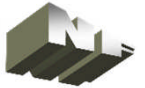
Order example: 356 030 080 63 HA [cilindrical shank]
356 030 120 100 HB [Weldon flat]



Machining example

Material:	G CuSn12Ni 7
Operation:	side milling; finishing contour
Machining center:	vertical
Adapter:	SK 50 DIN 69871 A to hydraulic chuck Ø 25 mm
Coolant:	8% emulsion
Tool:	356 030 250 HA
D.O.C. / Ap:	40.0 mm
W.O.C. / Ae:	0.5 mm
Cutting speed Vc / Revs. n:	Vc = 180.0 m/min / n = 2292 r.p.m.
Feed rate fn and Vf:	fz = 0.15 mm and Vf = 2063 mm/min

• 643 Series long



643 Series

Ø 1.0 - 20.0 mm [h10] with neck

2 cutting edges

40° helix angle

DIN 6535 HA shank [h6]

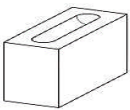
version; ZrN coated



Article number ZrN	D1	D2	L1	L2	L3
643 030 10	1.0	6	60	2	15
643 030 20	2.0	6	60	4	20
643 030 30	3.0	6	70	6	25
643 030 40	4.0	6	70	8	25
643 030 50	5.0	6	70	10	25
643 030 60	6.0	6	80	12	35
643 030 80	8.0	8	80	16	35
643 030 100	10.0	10	90	20	45
643 030 120	12.0	12	100	24	50
643 030 140	14.0	14	100	26	60
643 030 160	16.0	16	150	30	92
643 030 200	20.0	20	150	40	92

Order example: 643 030 140 HA [cilindric shank DIN 6535 HA]

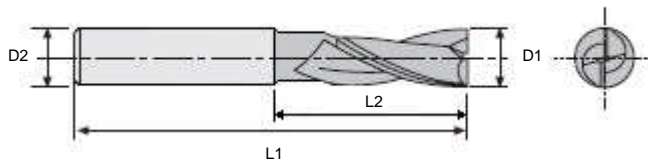
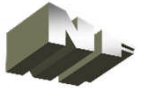
643 030 200 HB [cilindric shank DIN 6535 HB]



Machining example

Material:	G CuZn25Al5 6
Operation:	cavaty milling; roughing contour
Machining center:	vertical
Adapter:	SK 40 DIN 69871 A to hydraulic shank Ø 16 mm
Coolant:	8% emulsion
Tool:	643 030 160 HA
D.O.C. / Ap:	0 to 1.0 mm
Diameter max. in contact:	4 mm
Revs. n:	n = 11465 r.p.m. Vceff = 180.0 m/min
Feed rate fn and Vf:	fz = 0.18 mm and Vf = 4127 mm/min

• 358 Series long



358 Series

Ø 0.5 - 25.0 mm [h10] with neck

2 cutting edges

45° helix angle

DIN 6535 HA and HB shank [h6]
version; diamond coated

3

4

6

7

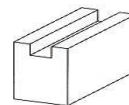
Article number DLC	D1	D2	L1	L2
358 030 05	0.5	4	50	1.5
358 030 06	0.6	4	50	1.5
358 030 08	0.8	4	50	2
358 030 10	1.0	6	50	3
358 030 12	1.2	6	50	4
358 030 15	1.5	6	50	4
358 030 18	1.8	6	50	5
358 030 20	2.0	6	50	6
358 030 30	3.0	6	50	8
358 030 40	4.0	6	50	10
358 030 50	5.0	6	50	13
358 030 60	6.0	6	50	15
358 030 80	8.0	8	60	20
358 030 100	10.0	10	75	25
358 030 120	12.0	12	75	30
358 030 160	16.0	16	100	42
358 030 200	20.0	20	100	52
358 030 250	25.0	25	125	62

Order example: 358 030 160 HB [cilindrical shank]

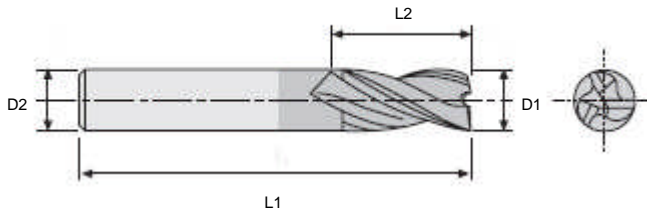
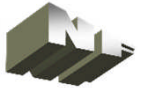
358 030 100 HA [Weldon flat]

Machining example

Material:	G AlSi17Cu4	4
Operation:	full slot milling	
Machining center:	horizontal	
Adapter:	HSK 100 A naar krimp opname Ø 10 mm	
Coolant:	8% emulsie	
Tool:	358 030 100 HA	
D.O.C. / Ap:	8 mm	
W.O.C. / Ae:	10 mm	
Cutting speed Vc / Revs. n:	Vc = 160.0 m/min / n = 5095 r.p.m.	
Feed rate fn and Vf:	fz = 0.07 mm and Vf = 713 mm/min	



• 359 Series long



359 Series

Ø 1.0 - 25.0 mm [h10] with neck

3 cutting edges

55° helix angle

DIN 6535 HA and HB shank [h6]
version; diamond coated

3

4

6

7

Article number DLC	D1	D2	L1	L2
359 030 10	1.0	6	50	3
359 030 12	1.2	6	50	4
359 030 15	1.5	6	50	4
359 030 18	1.8	6	50	5
359 030 20	2.0	6	50	6
359 030 30	3.0	6	50	8
359 030 40	4.0	6	50	10
359 030 50	5.0	6	50	13
359 030 60	6.0	6	50	15
359 030 80	8.0	8	60	20
359 030 100	10.0	10	75	25
359 030 120	12.0	12	75	30
359 030 160	16.0	16	100	42
359 030 200	20.0	20	100	52
359 030 250	25.0	25	125	62

Order example: 359 030 160 HA [cilindrical shank]

359 030 120 HB [Weldon flat]

Machining example

Material: G AlSi17Cu4 4

Operation: side milling

Machining center: horizontal

Adapter: HSK 100 A to shrink fit chuck Ø 12 mm

Coolant: 8% emulsion

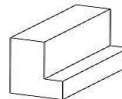
Tool: 359 030 120 HA

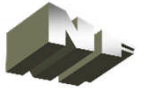
D.O.C. / Ap: 24 mm

W.O.C. / Ae: 1 mm

Cutting speed Vc / Revs. n: Vc = 160.0 m/min / n = 4246 r.p.m.

Feed rate fn and Vf: fz = 0.05 mm and Vf = 637 mm/min





1

Vc[blank] = 80 - 300 m/min for DIN 6527 short / factory norm short
Vc[ZrN/CrN] = 120 - 500 m/min “ “

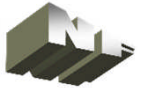
D 0.5 - 2 mm	D 2 - 6 mm	D 6 - 10 mm	D 10 - 16 mm	D 16 - 25 mm
fz : 0.01 - 0.018	fz : 0.02 - 0.08	fz : 0.06 - 0.14	fz : 0.08 - 0.18	fz : 0.10 - 0.28
Ap : 0.5 - 1.0 x D	Ap : 0.5 - 1.0 x D	Ap : 0.5 - 1.0 x D	Ap : 0.5 - 1.0 x D	Ap : 0.5 - 1.0 x D
Z = 2	Z = 2	Z = 2	Z = 2	Z = 2
Ae : 0.5 - 1.0 x D	Ae : 0.5 - 1.0 x D	Ae : 0.5 - 1.0 x D	Ae : 0.5 - 1.0 x D	Ae : 0.5 - 1.0 x D
Z = 3	Z = 3	Z = 3	Z = 3	Z = 3
Ae : 0.4 - 1.0 X D	Ae : 0.4 - 1.0 X D	Ae : 0.4 - 1.0 X D	Ae : 0.4 - 1.0 X D	Ae : 0.4 - 1.0 X D
Z ≥ 4	Z ≥ 4	Z ≥ 4	Z ≥ 4	Z ≥ 4
Ae : 0.1 - 0.25 x D	Ae : 0.1 - 0.25 x D	Ae : 0.1 - 0.25 x D	Ae : 0.1 - 0.25 x D	Ae : 0.1 - 0.25 x D

Vc[blank] = 60 - 260 m/min for DIN 6527 long / factory norm long
Vc[ZrN/CrN] = 100 - 400 m/min “ “

D 0.5 - 2 mm	D 2 - 6 mm	D 6 - 10 mm	D 10 - 16 mm	D 16 - 25 mm
fz : 0.01 - 0.018	fz : 0.02 - 0.06	fz : 0.05 - 0.12	fz : 0.06 - 0.16	fz : 0.08 - 0.25
Ap : 0.5 - 1.25 x D	Ap : 0.5 - 1.25 x D	Ap : 0.5 - 1.25 x D	Ap : 0.5 - 1.25 x D	Ap : 0.5 - 1.25 x D
Z = 2	Z = 2	Z = 2	Z = 2	Z = 2
Ae : 0.5 - 1.0 x D	Ae : 0.5 - 1.0 x D	Ae : 0.5 - 1.0 x D	Ae : 0.5 - 1.0 x D	Ae : 0.5 - 1.0 x D
Z = 3	Z = 3	Z = 3	Z = 3	Z = 3
Ae : 0.4 - 1.0 X D	Ae : 0.4 - 1.0 X D	Ae : 0.4 - 1.0 X D	Ae : 0.4 - 1.0 X D	Ae : 0.4 - 1.0 X D
Z ≥ 4	Z ≥ 4	Z ≥ 4	Z ≥ 4	Z ≥ 4
Ae : 0.05 - 0.2 x D	Ae : 0.05 - 0.2 x D	Ae : 0.05 - 0.2 x D	Ae : 0.05 - 0.2 x D	Ae : 0.05 - 0.2 x D

Vc[blank] = 60 - 220 m/min for factory norm long
Vc[ZrN/CrN] = 80 - 350 m/min “ “

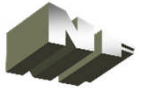
D 0.5 - 2 mm	D 2 - 6 mm	D 6 - 10 mm	D 10 - 16 mm	D 16 - 25 mm
fz : 0.01 - 0.018	fz : 0.02 - 0.06	fz : 0.04 - 0.10	fz : 0.05 - 0.14	fz : 0.06 - 0.20
Ap : 0.5 - 1.25 x D	Ap : 0.5 - 1.25 x D	Ap : 0.5 - 1.25 x D	Ap : 0.5 - 1.25 x D	Ap : 0.5 - 1.25 x D
Z = 2	Z = 2	Z = 2	Z = 2	Z = 2
Ae : 0.5 - 1.0 x D	Ae : 0.5 - 1.0 x D	Ae : 0.5 - 1.0 x D	Ae : 0.5 - 1.0 x D	Ae : 0.5 - 1.0 x D
Z = 3	Z = 3	Z = 3	Z = 3	Z = 3
Ae : 0.4 - 1.0 X D	Ae : 0.4 - 1.0 X D	Ae : 0.4 - 1.0 X D	Ae : 0.4 - 1.0 X D	Ae : 0.4 - 1.0 X D
Z ≥ 4	Z ≥ 4	Z ≥ 4	Z ≥ 4	Z ≥ 4
Ae : 0.05 - 0.2 x D	Ae : 0.05 - 0.2 x D	Ae : 0.05 - 0.2 x D	Ae : 0.05 - 0.2 x D	Ae : 0.05 - 0.2 x D



2	Vc[blank] = 80 - 300 m/min	for DIN 6527 short / factory norm short
	Vc[ZrN/CrN] = 120 - 500 m/min	“ “
	Ap / Ae and fz as under 1	
	Vc[blank] = 60 - 260 m/min	for DIN 6527 long / factory norm long
	Vc[ZrN/CrN] = 100 - 400 m/min	“ “
	Ap / Ae and fz as under 1	
	Vc[blank] = 60 - 220 m/min	for factory norm long
	Vc[ZrN/CrN] = 80 - 350 m/min	“ “
	Ap / Ae and fz as under 1	
3	Vc[blank] = 80 - 250 m/min	for DIN 6527 short / factory norm short
	Vc[ZrN/CrN] = 120 - 400 m/min	“ “
	Ap / Ae and fz as under 1	
	Vc[blank] = 60 - 200 m/min	for DIN 6527 long / factory norm long
	Vc[ZrN/CrN] = 100 - 350 m/min	“ “
	Ap / Ae and fz as under 1	
	Vc[blank] = 60 - 180 m/min	for factory norm long
	Vc[ZrN/CrN] = 80 - 300 m/min	“ “
	Vc[DLC] = 160 - 500 m/min	“ “
		Ap / Ae and fz as under 1
4	Vc[blank] = 60 - 90 m/min	for DIN 6527 short / factory norm short
	Vc[ZrN/CrN] = 80 - 120 m/min	“ “
	Ap / Ae and fz as under 1	
	Vc[blank] = 50 - 80 m/min	for DIN 6527 long / factory norm long
	Vc[ZrN/CrN] = 70 - 110 m/min	“ “
	Ap / Ae and fz as under 1	
	Vc[blank] = 50 - 70 m/min	for factory norm long
	Vc[ZrN/CrN] = 60 - 100 m/min	“ “
	Vc[DLC] = 120 - 340 m/min	“ “
		Ap / Ae and fz as under 1

$V_c / f_z / A_p / A_e$

• Initial cutting values solid carbide end mills



5

$V_c[\text{blank}] = 80 - 300 \text{ m/min}$ for DIN 6527 short / factory norm short
 $V_c[\text{ZrN/CrN}] = 120 - 500 \text{ m/min}$ “ “

$V_c[\text{blank}] = 60 - 260 \text{ m/min}$ for DIN 6527 long / factory norm long
 $V_c[\text{ZrN/CrN}] = 100 - 400 \text{ m/min}$ “ “

$V_c[\text{blank}] = 60 - 220 \text{ m/min}$ for factory norm long
 $V_c[\text{ZrN/CrN}] = 80 - 350 \text{ m/min}$ “ “

A_p / A_e and f_z as under 1

6

$V_c[\text{blank}] = 80 - 250 \text{ m/min}$ for DIN 6527 short / factory norm short
 $V_c[\text{ZrN/CrN}] = 120 - 400 \text{ m/min}$ “ “

$V_c[\text{blank}] = 60 - 200 \text{ m/min}$ for DIN 6527 long / factory norm long
 $V_c[\text{ZrN/CrN}] = 100 - 350 \text{ m/min}$ “ “

$V_c[\text{blank}] = 60 - 180 \text{ m/min}$ for factory norm long
 $V_c[\text{ZrN/CrN}] = 80 - 300 \text{ m/min}$ “ “
 $V_c[\text{DLC}] = 160 - 500 \text{ m/min}$ “ “

A_p / A_e and f_z as under 1

7

$V_c[\text{blank}] = 90 - 320 \text{ m/min}$ for DIN 6527 short / factory norm short
 $V_c[\text{ZrN/CrN}] = 140 - 500 \text{ m/min}$ “ “

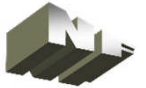
$V_c[\text{blank}] = 70 - 280 \text{ m/min}$ for DIN 6527 long / factory norm long
 $V_c[\text{ZrN/CrN}] = 110 - 400 \text{ m/min}$ “ “

$V_c[\text{blank}] = 70 - 220 \text{ m/min}$ for factory norm long
 $V_c[\text{ZrN/CrN}] = 90 - 350 \text{ m/min}$ “ “
 $V_c[\text{DLC}] = 160 - 550 \text{ m/min}$ “ “

A_p / A_e and f_z as under 1

$V_c/f_z/A_p/A_e$

• Initial cutting values solid carbide end mills



8

$V_c[\text{blank}] = 70 - 100 \text{ m/min}$ for DIN 6527 short / factory norm short
 $V_c[\text{ZrN/CrN}] = 90 - 130 \text{ m/min}$ “ “

$V_c[\text{blank}] = 60 - 90 \text{ m/min}$ for DIN 6527 long / factory norm long
 $V_c[\text{ZrN/CrN}] = 80 - 120 \text{ m/min}$ “ “

$V_c[\text{blank}] = 60 - 80 \text{ m/min}$ for factory norm long
 $V_c[\text{ZrN/CrN}] = 70 - 100 \text{ m/min}$ “ “

A_p / A_e and f_z as under 1

9

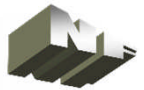
$V_c[\text{blank}] = 60 - 90 \text{ m/min}$ for DIN 6527 short / factory norm short
 $V_c[\text{ZrN/CrN}] = 80 - 120 \text{ m/min}$ “ “

$V_c[\text{blank}] = 50 - 80 \text{ m/min}$ for DIN 6527 long / factory norm long
 $V_c[\text{ZrN/CrN}] = 70 - 110 \text{ m/min}$ “ “

$V_c[\text{blank}] = 50 - 70 \text{ m/min}$ for factory norm long
 $V_c[\text{ZrN/CrN}] = 60 - 100 \text{ m/min}$ “ “

A_p / A_e and f_z as under 1





• Milling operations

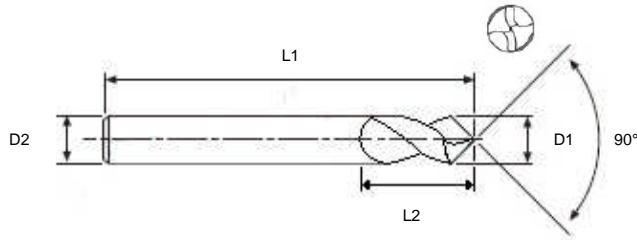
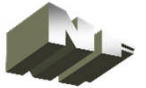
Solid carbide tool types; universal
factory versions

Ø 3	- 20	90° point angle	700...	not coated
3	- 20	120° point angle	722...	not coated
3	- 20	60° point angle	770...	not coated
1	- 20	90° chamfer angle	800...	not coated / TiAlN
4	- 20	60° chamfer angle	870...	not coated / TiAlN
7	- 10	r = 0.5 - 6.0	890...	not coated / TiAlN
2	- 16	2 sides 45° chamfer	1100...	TiAlN
8	- 10	2 sides radius r = 0.2 - 6.0	1101...	TiAlN
7	- 17	extra long / radius	1102...	TiAlN





• 700 Series 90° point angle



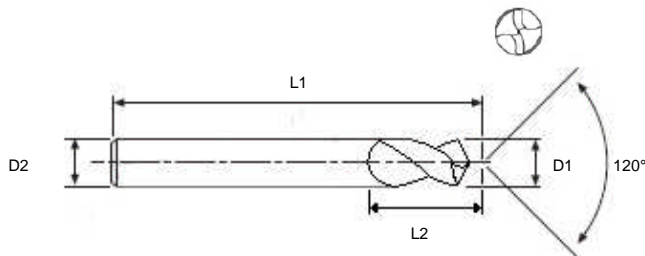
700 Series
 Ø 3.0 - 20.0 mm
 2 cutting edges
 30° helix angle
 cylindrical shank [h6]
 version; not coated



Article number	D1	D2	L1	L2
Not coated				
700 030 09	3.0	4	6	50
700 040 09	4.0	5	8	50
700 050 09	5.0	6	10	50
700 060 09	6.0	8	12	60
700 080 09	8.0	10	16	70
700 100 09	10.0	12	18	70
700 120 09	12.0	12	20	70
700 160 09	16.0	16	26	80
700 200 09	20.0	20	32	100



• 722 Series 120° point angle



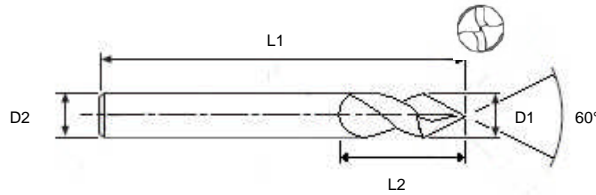
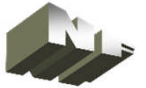
722 Series
 Ø 3.0 - 20.0 mm
 2 cutting edges
 30° helix angle
 cylindrical shank [h6]
 version; not coated



Article number	D1	D2	L1	L2
Not coated				
722 030 09	3.0	4	6	50
722 040 09	4.0	5	8	50
722 050 09	5.0	6	10	50
722 060 09	6.0	8	12	60
722 080 09	8.0	10	16	70
722 100 09	10.0	12	18	70
722 120 09	12.0	12	20	70
722 160 09	16.0	16	26	80
722 200 09	20.0	20	32	100



• 770 Series 60° point angle



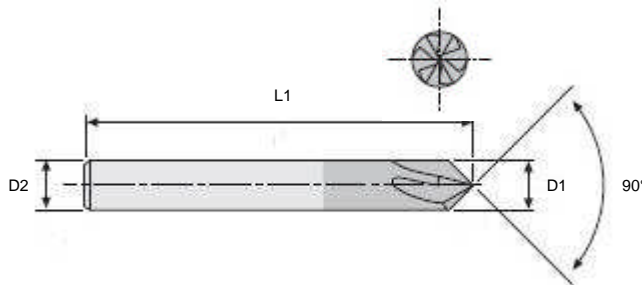
770 Series
 Ø 3.0 - 20.0 mm
 2 cutting edges
 30° helix angle
 cylindrical shank [h6]
 version; not coated



Article number	D1	D2	L1	L2
Not coated				
770 030 09	3.0	4	6	50
770 040 09	4.0	5	8	50
770 050 09	5.0	6	10	50
770 060 09	6.0	8	12	60
770 080 09	8.0	10	16	70
770 100 09	10.0	12	18	70
770 120 09	12.0	12	20	70
770 160 09	16.0	16	26	80
770 200 09	20.0	20	32	100



• 800 Series 90° chamfer angle

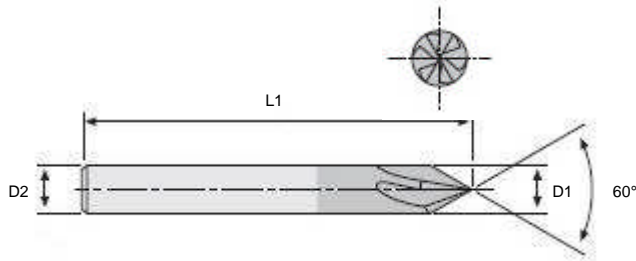
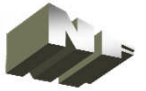


800 Series
 Ø 1.0 - 20.0 mm
 3 - 6 cutting edges
 0° helix angle
 cylindrical shank [h6]
 version; not coated and TiAlN coated



Article number	Article number	D1	D2	L1
Not coated				
800 010 09	800 010 00	1.0	3	38
800 020 09	800 020 00	2.0	3	38
800 030 09	800 030 00	3.0	3	38
800 040 09	800 040 00	4.0	4	54
800 060 09	800 060 00	6.0	6	57
800 080 09	800 080 00	8.0	8	63
800 100 09	800 100 00	10.0	10	72
800 120 09	800 120 00	12.0	12	83
800 160 09	800 160 00	16.0	16	92
800 200 09	800 200 00	20.0	20	104

• 870 Series 60° chamfer angle



870 Series

Ø 4.0 - 20.0 mm

4 - 6 cutting edges

0° helix angle

cylindrical shank [h6]

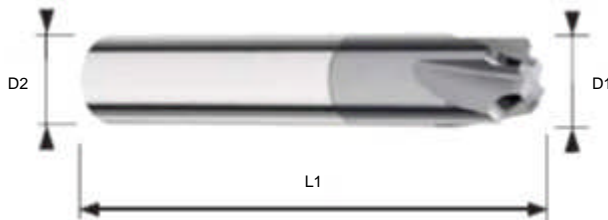
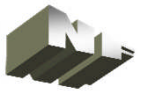
version; not coated and TiAIN coated



Article number	Article number	D1	D2	L1
Not coated	TiAIN			
870 040 09	870 040 00	4.0	4	54
870 060 09	870 060 00	6.0	6	57
870 080 09	870 080 00	8.0	8	63
870 100 09	870 100 00	10.0	10	72
870 120 09	870 120 00	12.0	12	83
870 160 09	870 160 00	16.0	16	92
870 200 09	870 200 00	20.0	20	104



• 890 Series concave radius on end mill



890 Series

radius 0.5 - 6.0 mm

4 cutting edges

0° helix angle

cylindrical shank [h6]

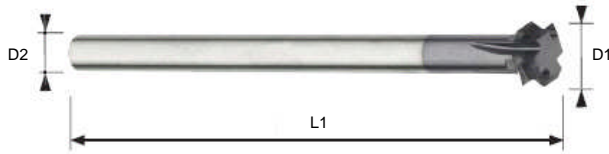
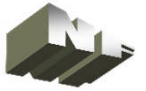
version; not coated and TiAIN coated



Article number	Article number	Radius	D1	D2	L1
Not coated	TiAIN				
890 005 09	890 005 00	0.5	7	8	70
890 010 09	890 010 00	1.0	6	8	70
890 015 09	890 015 00	1.5	7	10	75
890 020 09	890 020 00	2.0	6	10	75
890 025 09	890 025 00	2.5	7	12	75
890 030 09	890 030 00	3.0	6	12	75
890 035 09	890 035 00	3.5	9	16	80
890 040 09	890 040 00	4.0	8	16	80
890 045 09	890 045 00	4.5	7	16	80
890 050 09	890 050 00	5.0	10	20	80
890 060 09	890 060 00	6.0	8	20	80



• 1100 Series front - and back chamfer



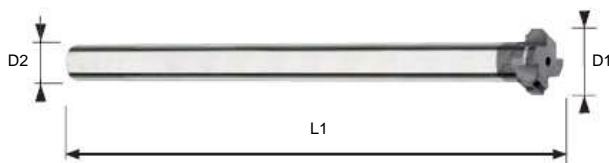
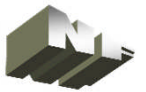
1100 Series
 Ø 2.0 - 16.0 mm
 3 and 4 cutting edges
 0° helix angle
 cylindrical shank [h6]
 version; TiAlN coated



Article number TiAlN	D1	D2	L1
1100 020 00	2.0	6	100
1100 030 00	3.0	6	100
1100 040 00	4.0	6	100
1100 060 00	6.0	6	100
1100 080 00	8.0	6	100
1100 100 00	10.0	6	100
1100 120 00	12.0	6	100
1100 160 00	16.0	10	100



• 1101 Series front - and back radius

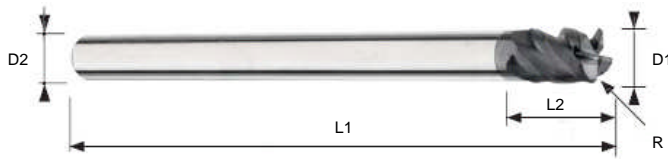
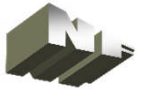


1101 Series
 Ø 0.5 - 6.0 mm
 4 cutting edges
 0° helix angle
 cylindrical shank [h6]
 version; TiAlN coated



Article number TiAlN	Radius	D1	D2	L1
1101 080 00	0.2	8	6	100
1101 081 00	0.3	8	6	100
1101 082 00	0.4	8	6	100
1101 083 00	0.5	8	6	100
1101 084 00	0.8	10	6	100
1101 085 00	1.0	10	6	100
1101 086 00	1.2	10	6	100
1101 087 00	1.5	10	6	100

• 1102 Series for high feed rates



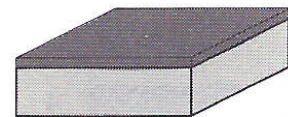
1102 Series
 Ø 7.0 - 17.0 mm
 4 cutting edges
 45° helix angle
 cylindrical shank [h6]
 version; TiAlN coated

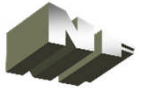


Article number TiAlN	D1	D2	L1	L2	Radius
1102 070 00	7.0	6	120	9	0.5
1102 090 00	9.0	8	135	12	1.0
1102 110 00	11.0	10	150	15	1.0
1102 130 00	13.0	12	160	18	1.0
1102 170 00	17.0	16	180	24	1.5

Machining example

Material:	G DAISi9Cu3	3
Operation:	face milling diameter 13 mm	
Machining center:	vertical	
Adapter:	HSK 63 A to shrink fit chuck Ø 12 mm	
Coolant:	8% emulsion	
Tool:	1102 130 00	
D.O.C / Ap:	0.4 mm	
W.O.C. / Ae:	10.0 mm	
Cutting speed Vc / Revs. n:	Vc = 180.0 m/min / n = 4410 r.p.m.	
Feed rate fn and Vf:	fz = 0.25 mm and Vf = 4410 mm/min	





1

Vc = 90 - 380 m/min [point end mills: 700 / 722 / 770] [blank]

fz for D 3 - 6	fz for D 6 - 8	fz for D 8 - 12	fz for D 12 - 16	fz for D 16 - 20
0.05 0.10	0.08 0.16	0.10 0.24	0.10 0.28	0.10 0.32

Vc = 90 - 380 m/min [chamfer end mills: 800 / 870 / 890 / 1100 / 1101] [blank]

fz for D 1 - 3	fz for D 3 - 6	fz for D 6 - 8	fz for D 8 - 12	fz for D 12 - 16	fz for D 16 - 20
0.06 0.12	0.10 0.20	0.10 0.30	0.10 0.40	0.12 0.60	0.15 0.90

Vc = 120 - 450 m/min [chamfer end mills: 800 / 870 / 890 / 1100 / 1101] [TiAlN]

fz for D 1 - 3	fz for D 3 - 6	fz for D 6 - 8	fz for D 8 - 12	fz for D 12 - 16	fz for D 16 - 20
0.06 0.12	0.10 0.20	0.10 0.30	0.10 0.40	0.12 0.60	0.15 0.90

Vc = 100 - 400 m/min [side end mills: 1102] [TiAlN]

fz for D = 7	fz for D = 9	fz for D = 11	fz for D = 13	fz for D = 17	Ap / Ae
0.04 0.06	0.06 0.08	0.08 0.10	0.08 0.12	0.10 0.14	Ap:0.3xD Ae:0.1xD

2

Vc = 80 - 350 m/min [point end mills: 700 / 722 / 770] [blank]

fz as 1

Vc = 80 - 350 m/min [chamfer end mills: 800 / 870 / 890 / 1100 / 1101] [blank]

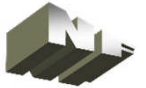
Vc = 110 - 400 m/min [chamfer end mills: 800 / 870 / 890 / 1100 / 1101] [TiAlN]

Vc = 90 - 370 m/min [side end mills: 1102] [TiAlN]

Ap/Ae/fz
as 1

Vc / fz

• Initial cutting values SC end mills factory versions



3	Vc = 80 - 300 m/min [point end mills: 700 / 722 / 770] [blank]	fz alls 1
	Vc = 80 - 300 m/min [chamfer end mills: 800 / 870 / 890 / 1100 / 1101] [blank]	
	Vc = 110 - 320 m/min [chamfer end mills: 800 / 870 / 890 / 1100 / 1101] [TiAlN]	
	Vc = 80 - 300 m/min [side end mills : 1102] [TiAlN]	Ap/Ae/fz as 1
4	Vc = 60 - 140 m/min [point end mills: 700 / 722 / 770] [blank]	fz as 1
	Vc = 60 - 140 m/min [chamfer end mills: 800 / 870 / 890 / 1100 / 1101] [blank]	
	Vc = 70 - 160 m/min [chamfer end mills: 800 / 870 / 890 / 1100 / 1101] [TiAlN]	
	Vc = 70 - 150 m/min [side end mills: 1102] [TiAlN]	Ap/Ae/fz as 1
5	Vc = 90 - 380 m/min [point end mills: 700 / 722 / 770] [blank]	fz as 1
	Vc = 90 - 380 m/min [chamfer end mills: 800 / 870 / 890 / 1100 / 1101] [blank]	
	Vc = 120 - 450 m/min [chamfer end mills: 800 / 870 / 890 / 1100 / 1101] [TiAlN]	
	Vc = 100 - 400 m/min [side end mills: 1102] [TiAlN]	Ap/Ae/fz as 1
6	Vc = 80 - 300 m/min [point end mills: 700 / 722 / 770] [blank]	fz as 1
	Vc = 80 - 300 m/min [chamfer end mills: 800 / 870 / 890 / 1100 / 1101] [blank]	
	Vc = 110 - 320 m/min [chamfer end mills: 800 / 870 / 890 / 1100 / 1101] [TiAlN]	
	Vc = 90 - 310 m/min [side end mills: 1102] [TiAlN]	Ap/Ae/fz as 1

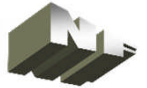
Vc / fz

• Initial cutting values SC end mills factory versions

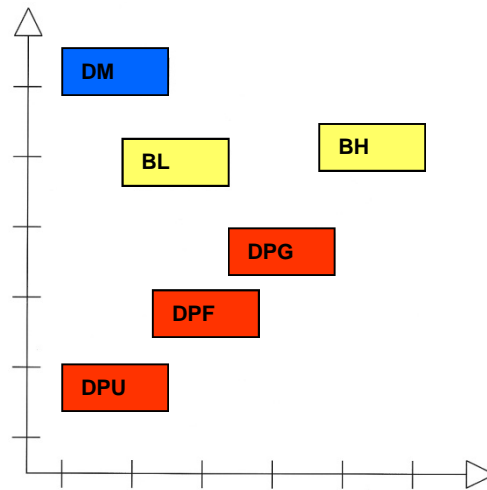


7	Vc = 90 - 380 m/min [point end mills: 700 / 722 / 770] [blank]	fz as 1
	Vc = 90 - 380 m/min [chamfer end mills: 800 / 870 / 890 / 1100 / 1101] [blank]	
	Vc = 120 - 450 m/min [chamfer end mills: 800 / 870 / 890 / 1100 / 1101] [TiAlN]	
	Vc = 100 - 400 m/min [side end mills: 1102] [TiAlN]	Ap/Ae/fz as 1
8	Vc = 60 - 140 m/min [point end mills: 700 / 722 / 770] [blank]	fz as 1
	Vc = 60 - 140 m/min [chamfer end mills: 800 / 870 / 890 / 1100 / 1101] [blank]	
	Vc = 70 - 160 m/min [chamfer end mills: 800 / 870 / 890 / 1100 / 1101] [TiAlN]	
	Vc = 70 - 150 m/min [side end mills: 1102] [TiAlN]	Ap/Ae/fz as 1
9	Vc = 60 - 90 m/min [point end mills: 700 / 722 / 770] [blank]	fz as 1
	Vc = 60 - 90 m/min [chamfer end mills: 800 / 870 / 890 / 1100 / 1101] [blank]	
	Vc = 80 - 120 m/min [chamfer end mills: 800 / 870 / 890 / 1100 / 1101] [TiAlN]	
	Vc = 80 - 110 m/min [side end mills: 1102] [TiAlN]	Ap/Ae/fz as 1



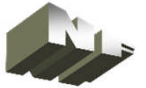


Wear resistance



Toughness

Grade	Description	Workpiece material and features
PCD-DPF	Polycrystalline diamond with carbide base, fine grain, sharp cutting edges and low cutting forces at tight tolerances. High wear resistance and toughness.	Finishing of all NF metal and NF workpiece materials with a small content on abrasive particles.
PCD-DPG	Polycrystalline diamond with carbide base, coarse grain, sharp cutting edges and low cutting forces at tight tolerances. High wear resistance and toughness.	Roughing, finishing and milling of all high abrasive NF metal and NF workpiece materials.
PCD-DPU	Polycrystalline diamond with carbide base, micro grain, sharp cutting edges and very low cutting forces at tight tolerances. Excellent wear resistance and toughness.	Fine finishing and milling of all NF metal and NF workpiece materials with a very small content on abrasive particles.
CBN-BHF -BHT	Solide polycrystalline CBN grade with high CBN content, middle grain size, high wear resistance, warm hardness, pressure resistance and toughness of all CBN grades for machining cast iron, hard castings, Ni-Hard and sintered steels. BHF = scharp cutting edge BHT = T land on cutting edge	Rough finishing from sintered steels, cast iron, hard castings, Ni-Hard and super alloys.
CBN-BLF -BLT	Solide polycrystalline CBN grade with low CBN content. Micro grain, very high wear resistance, pressure resistance and toughness. BLF = scharp cutting edge BLT = T land on cutting edge	Hard machining, dry and with coolant emulsion. High feed rates and small D.O.C. during smooth cutting and middle interrupted cut.
MCD-MD	Solide monocristalline diamond without structure. Absolute sharp cutting edges without cracks, therefore almost no cutting forces [burr free] and guaranteed tight tolerances. Absolute wear resistance and highest heat conduct, low toughness.	Ultra fine finishing of all NF metal and NF workpiece materials without abrasive particles.


1
 $V_c = 500 - 2000 \text{ m/min}$

DPF	DPG	DM
Universal and finishing	Universal and roughing	Universal machining
$V_c = 1000 - 1500$	$V_c = 500 - 1000$	$V_c = 750 - 2000$
$f_z = 0.05 - 0.20$	$f_z = 0.1 - 0.25$	$f_z = 0.03 - 0.2$
$A_p = 0.05 - 2.0$	$A_p = 0.1 - 4.0$	$A_p = 0.03 - 1.0$

2
 $V_c = 400 - 1800 \text{ m/min}$

DPF	DPG	DM
Universal and finishing	Universal and roughing	Universal machining
$V_c = 500 - 1200$	$V_c = 400 - 1000$	$V_c = 450 - 1800$
$f_z = 0.05 - 0.20$	$f_z = 0.1 - 0.25$	$f_z = 0.03 - 0.2$
$A_p = 0.05 - 2.0$	$A_p = 0.1 - 4.0$	$A_p = 0.03 - 1.0$

3
 $V_c = 320 - 1500 \text{ m/min}$

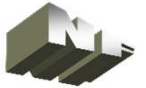
DPF	DPG	DM
Universal and finishing	Universal and roughing	Universal machining
$V_c = 350 - 1000$	$V_c = 320 - 900$	$V_c = 350 - 1500$
$f_z = 0.05 - 0.20$	$f_z = 0.1 - 0.25$	$f_z = 0.03 - 0.2$
$A_p = 0.05 - 2.0$	$A_p = 0.1 - 4.0$	$A_p = 0.03 - 1.0$

4
 $V_c = 200 - 900 \text{ m/min}$

DPF	DPG	DM
Universal and finishing	Universal and roughing	Universal machining
$V_c = 250 - 800$	$V_c = 200 - 750$	$V_c = 250 - 900$
$f_z = 0.05 - 0.20$	$f_z = 0.1 - 0.25$	$f_z = 0.03 - 0.2$
$A_p = 0.05 - 2.0$	$A_p = 0.1 - 4.0$	$A_p = 0.03 - 1.0$

5
 $V_c = 400 - 1800 \text{ m/min}$

DPF	DPG	DM
Universal and finishing	Universal and finishing	Universal machining
$V_c = 500 - 1200$	$V_c = 400 - 1000$	$V_c = 450 - 1800$
$f_z = 0.05 - 0.20$	$f_z = 0.1 - 0.25$	$f_z = 0.03 - 0.2$
$A_p = 0.05 - 2.0$	$A_p = 0.1 - 4.0$	$A_p = 0.03 - 1.0$


6
 $V_c = 320 - 1500 \text{ m/min}$

DPF	DPG	DM
Universal and finishing	Universal and roughing	Universal machining
$V_c = 350 - 1000$	$V_c = 320 - 900$	$V_c = 350 - 1500$
$f_z = 0.05 - 0.20$	$f_z = 0.1 - 0.25$	$f_z = 0.03 - 0.2$
$A_p = 0.05 - 2.0$	$A_p = 0.1 - 4.0$	$A_p = 0.03 - 1.0$

7
 $V_c = 320 - 1500 \text{ m/min}$

DPF	DPG	DM
Universal and finishing	Universal and roughing	Universal machining
$V_c = 350 - 1000$	$V_c = 320 - 900$	$V_c = 350 - 1500$
$f_z = 0.05 - 0.20$	$f_z = 0.1 - 0.25$	$f_z = 0.03 - 0.2$
$A_p = 0.05 - 2.0$	$A_p = 0.1 - 4.0$	$A_p = 0.03 - 1.0$

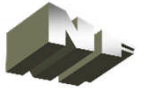
8
 $V_c = 200 - 900 \text{ m/min}$

DPF	DPG	DM
Universal and finishing	Universal and roughing	Universal machining
$V_c = 250 - 800$	$V_c = 200 - 750$	$V_c = 250 - 900$
$f_z = 0.05 - 0.20$	$f_z = 0.1 - 0.25$	$f_z = 0.03 - 0.2$
$A_p = 0.05 - 2.0$	$A_p = 0.1 - 4.0$	$A_p = 0.03 - 1.0$

9
 $V_c = 50 - 200 \text{ m/min}$

DPF	DPG	DM
Universal and finishing	Universal and roughing	Universal machining
$V_c = 70 - 150$	$V_c = 50 - 120$	$V_c = 60 - 200$
$f_z = 0.05 - 0.20$	$f_z = 0.1 - 0.25$	$f_z = 0.03 - 0.2$
$A_p = 0.05 - 2.0$	$A_p = 0.1 - 4.0$	$A_p = 0.03 - 1.0$





Order n°.	Ø End mill	Ø Shank	Ø Neck	Total length	Neck length	Cutt. edges	Radius
	Dc [h7]	Ds [h6]	Dn	L	Ln	z	r +/- 0.005
9010 2 09	2	6	1.5	42	9	1	1
9010 3 10	3	6	2.5	50	10	1	1.5
9010 3 09	3	6	2.5	75	9	2	1.5
9010 3 15	3	6	2.5	75	15	2	1.5
9010 3 21	3	6	2.5	75	21	2	1.5
9010 4 12	4	6	3.5	75	12	2	2.0
9010 4 20	4	6	3.5	75	20	2	2.0
9010 4 28	4	6	3.5	75	28	2	2.0
9010 5 15	5	6	4.4	75	15	2	2.5
9010 5 25	5	6	4.4	75	25	2	2.5
9010 5 35	5	6	4.4	75	35	2	2.5
9010 6 20	6	6	5.4	70	20	2	3.0
9010 6 18	6	6	5.4	100	18	2	3.0
9010 6 30	6	6	5.4	100	30	2	3.0
9010 6 42	6	6	5.4	100	42	2	3.0
9010 8 24	8	8	7.2	100	24	2	4.0
9010 8 40	8	8	7.2	100	40	2	4.0
9010 10 25	10	10	9.0	80	25	2	5.0
9010 10 30	10	10	9.0	100	30	2	5.0
9010 10 50	10	10	9.0	100	50	2	5.0
9010 12 36	12	12	11.0	105	36	2	6.0
9010 12 60	12	12	11.0	105	60	2	6.0
9010 16 45	16	16	15.0	100	45	2	8.0





Order n°.	Ø End mill	Ø Shank	Ø Neck	Total length	Neck length	Cutt. edges	Radius
	Dc [h7]	Ds [h6]	Dn	L	Ln	z	r +/- 0.005
9015 3 9	3	6	2.5	75	9	2	0.3
9015 3 15	3	6	2.5	75	15	2	0.3
9015 3 21	3	6	2.5	75	21	2	0.3 / 0.5
9015 4 12	4	6	3.5	75	12	2	0.3
9015 4 20	4	6	3.5	75	20	2	0.3
9015 4 28	4	6	3.5	75	28	2	0.3 / 0.5
9015 5 15	5	6	4.4	75	15	2	0.3
9015 5 25	5	6	4.4	75	25	2	0.3
9015 5 35	5	6	4.4	75	35	2	0.3 / 0.5
9015 6 18	6	6	5.4	100	18	2	0.3 / 0.5 / 1.0
9015 6 30	6	6	5.4	100	30	2	0.3 / 0.5 / 1.0
9015 6 42	6	6	5.4	100	42	2	0.3 / 0.5 / 1.0
9015 8 24	8	8	7.2	100	24	2	0.3 / 0.5 / 1.0
9015 8 40	8	8	7.2	100	40	2	0.3 / 0.5 / 1.0
9015 10 30	10	10	9.0	100	30	2	0.5 / 1.0 / 1.5
9015 10 50	10	10	9.0	100	50	2	0.5 / 1.0 / 1.5
9015 12 36	12	12	11.0	105	36	2	0.5 / 1.0 / 1.5
9015 12 60	12	12	11.0	105	60	2	0.5 / 1.0 / 1.5





Order n°.	Ø End mill	Ø Shank	Ø Neck	Total length	Neck length	Cutt/ edges	Chamfer
	Dc [h7]	Ds [h6]	Dn	L	Ln	z	in mm x 45°
9020 3 9	3	6	2.9	75	9	2	0.1
9020 3 15	3	6	2.9	75	15	2	0.1
9020 3 21	3	6	2.9	75	21	2	0.1
9020 4 15	4	6	3.8	50	15	1	0.2
9020 4 35	4	6	3.8	50	35	1	1.0
9020 4 12	4	6	3.8	90	12	2	0.1
9020 4 20	4	6	3.8	75	20	2	0.1
9020 4 28	4	6	3.8	75	28	2	0.1
9020 5 45	5	6	4.8	75	45	2	0.2
9020 5 15	5	6	4.8	75	15	2	0.1
9020 5 25	5	6	4.8	75	25	2	0.1
9020 5 35	5	6	4.8	75	35	2	0.1
9020 6 45	6	6	5.8	75	45	2	0.2
9020 6 18	6	6	5.8	100	18	2	0.1
9020 6 30	6	6	5.8	100	30	2	0.1
9020 6 42	6	6	5.8	100	42	2	0.1
9020 8 35	8	8	7.7	75	35	2	0.3
9020 8 24	8	8	7.7	100	24	2	0.1
9020 8 40	8	8	7.7	100	40	2	0.1
9020 10 35	10	10	9.7	75	35	2	0.5
9020 10 30	10	10	9.7	100	30	2	0.1
9020 10 50	10	10	9.7	100	50	2	0.1
9020 12 30	12	12	11.7	80	30	2	0.6
9020 12 36	12	12	11.7	105	36	2	0.1
9020 12 60	12	12	11.7	105	60	2	0.1

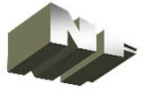




Order n°.	Ø End mill	Ø Shank	Ø Neck	Total length	Neck length	Cutt. edges	Sharp
	Dc [h7]	Ds [h6]	Dn	L	Ln	z	
9025 6 8	6	6	5.8	55	8	2	
9025 6 18	6	6	5.8	54	18	2	
9025 6 23	6	6	5.8	54	23	2	
9025 8 8	8	8	7.7	58	8	2	
9025 8 18	8	8	7.7	58	18	2	
9025 8 23	8	8	7.7	58	23	2	
9025 10 8	10	10	9.7	65	8	2	
9025 10 18	10	10	9.7	66	18	2	
9025 10 23	10	10	9.7	66	23	2	
9025 12 8	12	12	11.7	72	8	2	
9025 12 18	12	12	11.7	73	18	2	
9025 12 23	12	12	11.7	73	23	2	
9025 16 18	16	16	15	82	18	2	
9025 16 23	16	16	15	82	23	2	
9025 20 23	20	20	19	92	23	2	



Formulas and calculations [general drilling operations]



$$\text{Cutting speed } V_c = \frac{D \times \pi \times n}{1000} \text{ in m/min}$$

V_c: cutting speed in m/min
D: tool diameter in mm
π: value pí; ≈ 3.14
n: r.p.m.

$$\text{Revs. } n = \frac{V_c \times 1000}{D \times \pi} \text{ in r.p.m.}$$

n: r.p.m.
D: tool diameter in mm
π: value pí; ≈ 3.14
V_c: cutting speed in m/min

$$\text{Table feed } V_f = f_n \times n \text{ in mm/min}$$

V_f: table feed in mm/min
f_n: feed/rev. in mm
n: r.p.m.

$$\text{Feed/rev. } f_n = \frac{V_f}{n} \text{ in mm}$$

f_n: feed/rev. in mm
V_f: table feed in mm/min
n: r.p.m.

$$\text{Chip removal } Q = \frac{D \times f_n \times V_c}{4} \text{ in cm}^3/\text{min}$$

Q: chip removal in cm³/min
D: diameter tool in mm
f_n: feed/rev. in mm
V_c: cutting speed in m/min

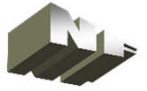
$$\text{Power } P_c = \frac{[f_n \times V_c \times D \times k_c]}{240 \times 10^3 \times \eta} \text{ in kW}$$

P_c: power requirement in kW
V_c: cutting speed m/mm
D: diameter tool in mm
K_c: specific cutting force
η: spindel efficiency [factor 0.85]

$$\text{Torque } M_c = \frac{P_c \times 30 \times 10^3}{\pi \times n} \text{ in Nm}$$

M_c: torque in Nm
P_c: power requirement in kW
n: r.p.m.
π: value pí ≈ 3.14

Formulas and calculations [general drilling operations]



Specific cutting force k_c in N/mm^2

- mc

$$k_c = k_{c1} \times [f_z \times \sin K_r] \times [1 - \gamma : 100]$$

Feed force F_f in N

D

$$F_f = 0.5 \times k_c \times \frac{D}{2} \times f_n \times \sin K_r$$

k_c : specific cutting force in N/mm^2

k_{c1} : value cutting force in N/mm^2

γ : helix angle SC drills/rake angle insert in $^\circ$

K_r : attack angle in $^\circ$

f_z : feed/tooth in mm

$f_z = f_n$ for effective 1 cutting edge

$f_z = f_n : 2$ for effective 2 cutting edges

$f_z = f_n : 3$ voor effectieve 3 cutting edges

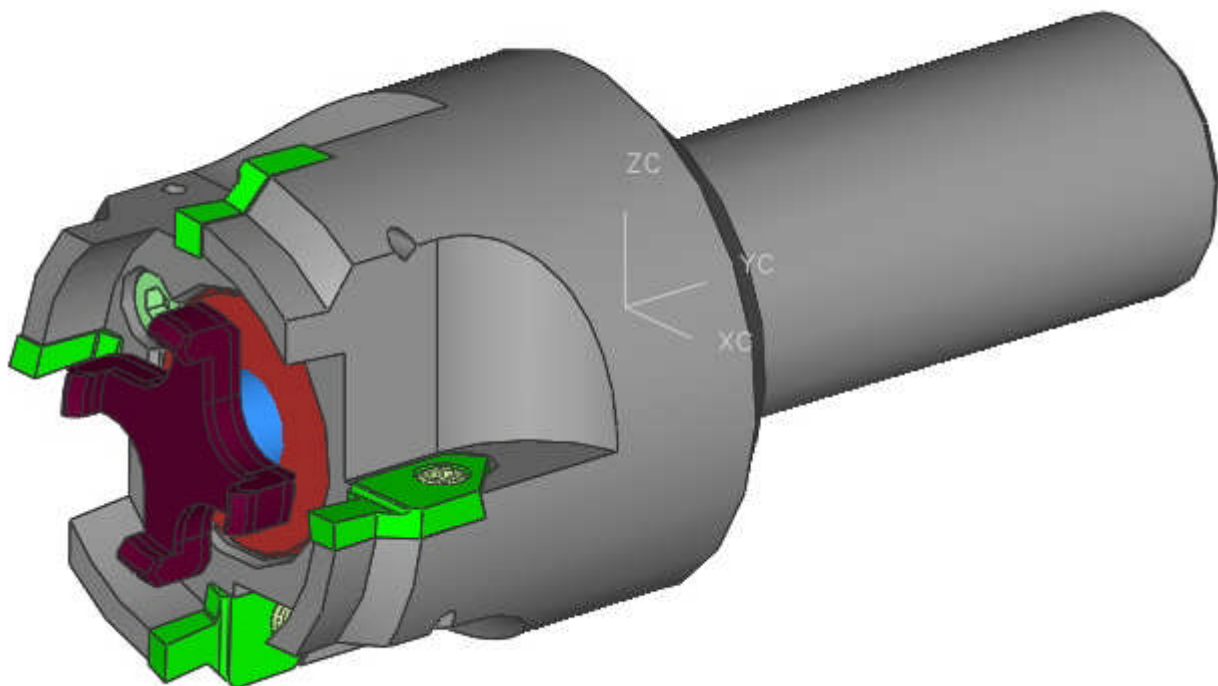
F_f : feed force in N

D: tool diameter in mm

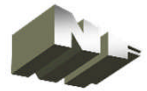
k_c : specific cutting force in N/mm^2

K_r : attack angle in $^\circ$

f_n : feed/revs. in mm



Initial values specific cutting forces



Material group 1										
fz	0.05	0.06	0.10	0.16	0.20	0.25	0.30	0.4	0.5	0.8
kc	1554	1490	1325	1189	1129	1073	1029	963	915	821

Material group 2										
fz	0.05	0.06	0.10	0.16	0.20	0.25	0.30	0.4	0.5	0.8
kc	1554	1490	1325	1189	1129	1073	1029	963	915	821

Material group 3										
fz	0.05	0.06	0.10	0.16	0.20	0.25	0.30	0.4	0.5	0.8
kc	1653	1585	1410	1265	1202	1142	1025	1095	973	874

Material group 4										
fz	0.05	0.06	0.10	0.16	0.20	0.25	0.30	0.4	0.5	0.8
kc	1653	1585	1410	1265	1202	1142	1025	1095	973	874

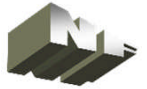
Material group 5										
fz	0.05	0.06	0.10	0.16	0.20	0.25	0.30	0.4	0.5	0.8
kc	1753	1681	1494	1341	1274	1210	1161	1086	1032	926

Material group 6										
fz	0.05	0.06	0.10	0.16	0.20	0.25	0.30	0.4	0.5	0.8
kc	1554	1490	1325	1189	1129	1073	1029	936	915	821

Material group 7										
fz	0.05	0.06	0.10	0.16	0.20	0.25	0.30	0.4	0.5	0.8
kc	2072	1980	1743	1550	1465	1386	1324	1232	1165	1036

Formulas and calculations

[general boring operations]



$$\text{Cutting speed } V_c = \frac{D \times \pi \times n}{1000} \text{ in m/min}$$

V_c: cutting speed in m/min
D: tool diameter in mm
π: value pi; ≈ 3.14
n: r.p.m.

$$\text{Revs. } n = \frac{V_c \times 1000}{D \times \pi} \text{ in r.p.m.}$$

n: r.p.m.
D: tool diameter in mm
π: value pi; ≈ 3.14
V_c: cutting speed in m/min

$$\text{Table feed } V_f = f_z \times z \times n \text{ in mm/min}$$

$$f_n = f_z \times z \text{ [2 of 3 eff.]}$$

V_f: table feed in mm/min
f_z: feed/teeth in mm
f_n: feed/rev. in mm
z: number of teeth
n: r.p.m.

$$\text{Feed/tooth } f_z = \frac{V_f}{z \times n} \text{ in mm}$$

f_z: feed/teeth in mm
V_f: table feed in mm/min
z: number of teeth
n: r.p.m.

$$P_c = \frac{A_p \times f_n \times k_c \times V_c}{60000 \times 10^3 \times \eta} \times [1 - A_p : D] \text{ in kW}$$

P_c: power requirement in kW
A_p: D.O.C. in mm
f_n: feed/rev. in mm
K_c: specific cutting force in N/mm²
V_c: cutting speed in m/min
D: tool diameter in mm
η: spindle efficiency [factor 0.85]

Feed force F_f

$$F_f \approx 0.5 \times A_p \times f_n \times k_c \times \sin K_r \text{ in Nm}$$

F_f: feed force in Nm
A_p: D.O.C. in mm
f_n: feed/rev. in mm
K_c: specific cutting force in N/mm²
K_r: attack angle in °

$$Q = \frac{A_p \times V_f}{1000} \text{ in cm}^3/\text{min}$$

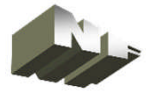
Q: chip removal in cm³/min
V_f: table feed in mm/min
A_p: D.O.C. in mm

$$\text{Surface roughness } R_{th} = \frac{125 \times f_n^2}{r}$$

R_{th}: theoretical surface roughness μm
f_n: feed in mm/rev.
r: radius cutting edge

Formulas and calculations

[general milling operations]



$$\text{Cutting speed } V_c = \frac{D \times \pi \times n}{1000} \text{ in m/min}$$

V_c: cutting speed in m/min
D: tool diameter in mm
π: value pí; ≈ 3.14
n: r.p.m.

$$\text{Revs. } n = \frac{V_c \times 1000}{D \times \pi} \text{ in r.p.m.}$$

n: r.p.m.
D: tool diameter in mm
π: value pí; ≈ 3.14
V_c: cutting speed in m/min

$$\text{Table feed } V_f = f_z \times z \times n \text{ in mm/min}$$

V_f: table feed in mm/min
f_z: feed/tooth in mm
z: number of teeth
n: r.p.m.

$$\text{Feed/tooth } f_z = \frac{V_f}{z \times n} \text{ in mm}$$

f_z: feed/tooth in mm
V_f: table feed in mm/min
z: number of teeth
n: r.p.m.

$$\text{Chip removal } Q = \frac{A_p \times A_e \times V_f}{1000} \text{ in cm}^3/\text{min}$$

Q: verspaand volume in cm³/min
A_p: snedediepte in mm
A_e: snedebreedte in mm
V_f: tafelvoeding in mm/min

$$\text{Surf. roughness } R_{th} = [D : 2] - \frac{\sqrt{[D^2 - A_e^2]}}{4} \text{ in } \mu\text{m}$$

R_{th}: theoretical surface roughness in μm
D: tool diameter in mm
A_e: W.O.C. in mm

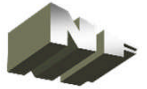
$$\text{Power } P_c = \frac{[A_p \times A_e \times V_f \times k_c]}{60000 \times 10^3 \times \eta} \text{ in kW}$$

P_c: power requirement in kW
A_p: D.O.C. in mm
A_e: W.O.C. in mm
K_c: specific cutting force
η: spindel efficiency [factor 0.85]

$$\text{Torque } M_c = \frac{[D : 2] \times f_z \times z \times k_c}{8000} \text{ in Nm}$$

M_c: torque in Nm
D: tool diameter in mm
f_z: feed/tooth in mm
z: number of teeth
K_c: specific cutting force in N/mm²

Formulas and calculations [shoulder end mill operations]



When $A_e \leq 0.25 \times D$

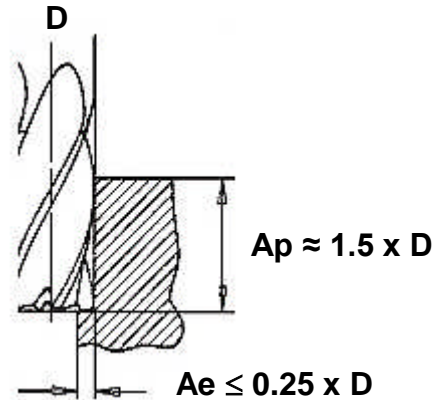
Average chip thickness $h_m = f_z \times \sqrt{[A_e : D]}$

h_m : average chip thickness in mm

D : tool diameter in mm

A_e : W.O.C. in mm

f_z : feed/tooth in mm



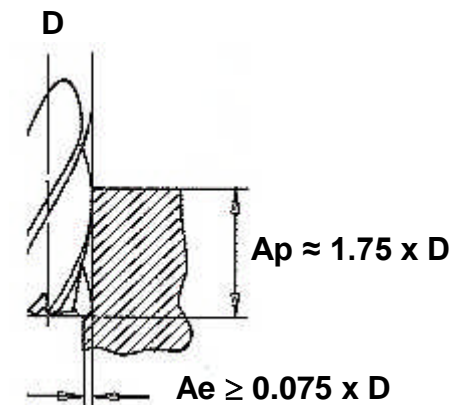
When $A_e \leq 0.25 \times D$

Chip thickn. compensation factor $f_h = \frac{f_z}{h_m}$

h_m : average chip thickness in mm

f_z : feed/tooth in mm

f_h : value chip thickness factor



When $A_e \leq 0.25 \times D$

$f_{zmax} = f_z \times f_h$ [=> h_m compensation]

h_m : average chip thickness in mm

f_{zmax} : maximum feed/tooth in mm

f_z : feed/tooth in mm

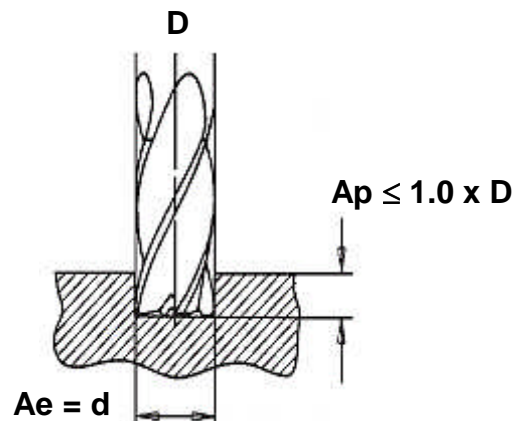
f_h : value chip thickness factor

When $A_e = D$

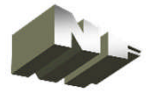
$f_z = h_m$

h_m : average chip thickness in mm

f_z : feed/tooth in mm



Formulas and calculations [face mill operations]



Max. cutting diameter at a determined D.O.C.

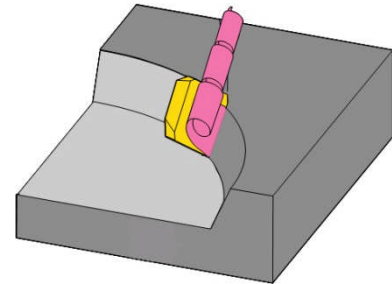
$$D_{max} = D + \frac{2 \times A_p}{\tan K_r}$$

D_{max} : maximum tool diameter in cut in mm

D : tool diameter in mm

A_p : D.O.C. in mm

K_r : inclination angle face mill



Center line mill in cut on the workpiece

$$A_v \text{ Chip thckn. } h_m = \frac{180 \times \sin K_r \times A_e \times f_z}{\pi \times D_{max} \times \arcsin [A_e : D_{max}]}$$

h_m : average chip thickness in mm

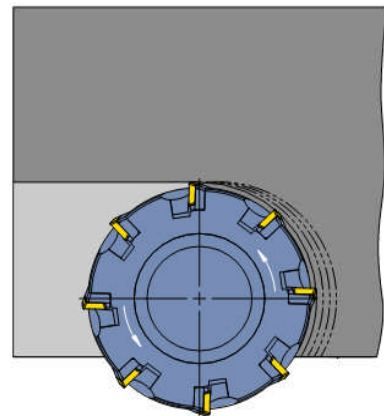
D_{max} : maximum tool diameter in mm

A_e : W.O.C. in mm

f_z : feed/tooth in mm

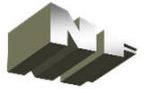
π : value pi; ≈ 3.14

K_r : inclination angle face mill



Formulas and calculations

[face mill operations with round inserts]



Max. cutting diameter at a determined D.O.C.

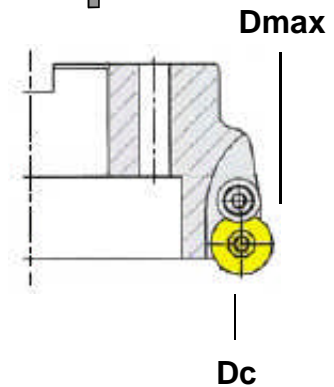
$$D_{max} = D_c + \sqrt{D_{wpl}^2 - [D_{wpl} - 2 \times A_p]^2}$$

D_{max} : maximum tool diameter in cut in mm

D_{wpl} : diameter of the inserts in mm

D_c : smallest cutting diameter of the end mill in mm

A_p : D.O.C. in mm

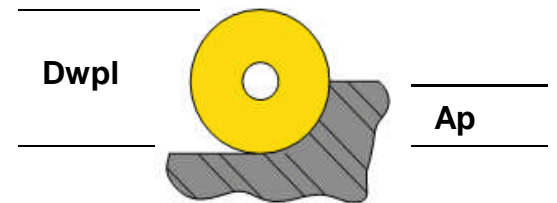


Centerline mill cutting on the workpiece

$$180 \times \sin Kr \times A_e \times f_z$$

$$A_v \text{ Chip thickn. } h_m = \frac{180 \times \sin Kr \times A_e \times f_z}{\pi \times D_{max} \times \arcsin [A_e : D_{max}]}$$

$$\pi \times D_{max} \times \arcsin [A_e : D_{max}]$$



h_m : average chip thickness in mm

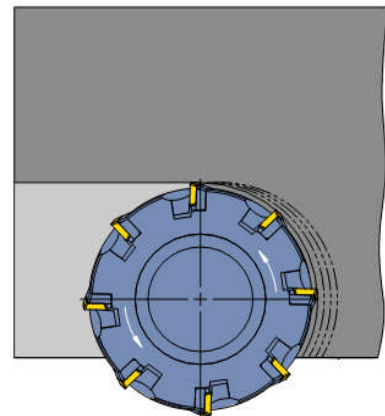
D_{max} : maximum tool diameter in mm

A_e : W.O.C. in mm

f_z : feed/tooth in mm

π : value pi; ≈ 3.14

Kr : inclination angle face mill [tangent to circle]



Radius in contact R_c at a determined D.O.C.

$$\sqrt{D_{wpl}^2 - [D_{wpl} - 2 \times A_p]^2}$$

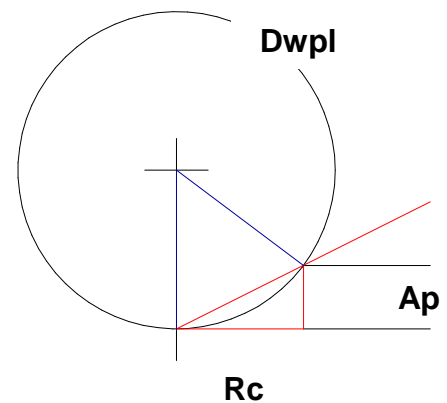
$$R_c = \frac{\sqrt{D_{wpl}^2 - [D_{wpl} - 2 \times A_p]^2}}{2}$$

2

R_c : radius in contact at a determined D.O.C. in mm

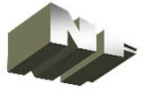
D_{wpl} : insert diameter in mm

A_p : D.O.C. in mm



Formulas and calculations

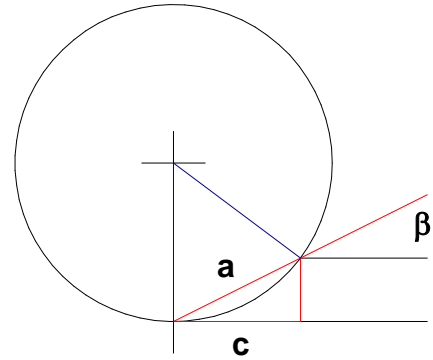
[face mill operations with round inserts]



Inclination angle K_r radius insert at a determined D.O.C.

$$\cos \beta = \frac{c}{a}$$

Inclination angle $K_r = [\cos \beta = \frac{c}{a}]$ in degrees



K_r : incl. \angle radius insert at a determined D.O.C. in degrees

A_p : D.O.C. in mm

c : side adjacent to the angle in mm

a : hypotenuse in mm

$\cos \beta$: angle in degrees

When $A_e \leq 0.25 \times D$

$$h_m = f_z \times \sqrt{A_e : D}$$

h_m : average chip thickness in mm

D : tool diameter in mm

A_e : W.O.C. in mm

f_z : feed/tooth in mm

When $A_e \leq 0.25 \times D$

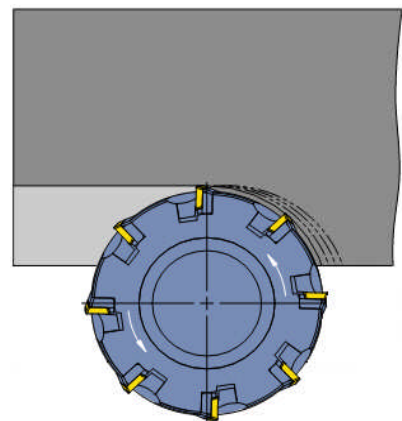
$$f_h = \frac{f_z}{h_m}$$

Chip thickness compensation factor $f_h = \frac{f_z}{h_m}$

h_m : average chip thickness in mm

f_z : feed/tooth in mm

f_h : value chip thickness factor



When $A_e \leq 0.25 \times D$

$$f_{zmax} = f_z \times f_h [= > h_m \text{ compensation}]$$

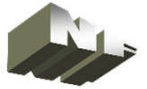
h_m : average chip thickness in mm

f_{zmax} : maximum feed/tooth in mm

f_z : feed/tooth in mm

f_h : value chip thickness factor

Formulas and calculations [radius end mill operations]



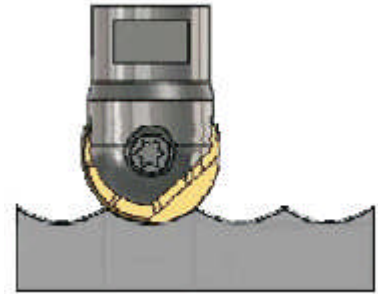
Max. cutting diameter at a determined D.O.C.

$$D_{max} = \sqrt{D - [D - 2 \times A_p]^2}$$

D_{max}: maximum tool diameter in cut in mm

D: tool diameter in mm

A_p: D.O.C. in mm



Center line mill in cut on the workpiece

$$D \times h_m \text{ [see face mill operations]}$$

$$\text{Feed/tooth } f_z = \frac{\dots}{D_{max}}$$

D_{max}

D: tool diameter in mm

h_m: average chip thickness in mm

D_{max}: maximum tool diameter in mm

f_z: feed/tooth in mm

When $A_e \leq 0.25 \times D$

$$\text{Average chip thickness } h_m = f_z \times \sqrt{[A_e : D]}$$

h_m: average chip thickness in mm

D: tool diameter in mm

A_e: W.O.C. in mm

f_z: feed/tooth in mm

$A_e \leq 0.25 \times D$ on the workpiece

$$D \times h_m$$

$$\text{Feed/tooth } f_z = \frac{\dots}{\sqrt{D_{max}^2 - [D_{max} - 2 \times A_e]^2}}$$

$$\sqrt{D_{max}^2 - [D_{max} - 2 \times A_e]^2}$$

D: tool diameter in mm

h_m: average chip thickness in mm

D_{max}: maximum tool diameter in mm

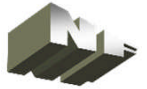
f_z: feed/tooth in mm

A_e: W.O.C. in mm



Formulas and calculations

[ID - and OD circular machining]



Real table feed

$$V_f = n \times f_z \times z$$

V_f : table feed in mm/min

n : r.p.m.

f_z : feed/tooth in mm

z : number of teeth

Programmed table feed ID machining on the center line of the tool

$$V_f \times [D_{mach} - D]$$

$$V_{fprog} = \frac{\quad}{D_{mach}}$$

D_{mach}

V_f : table feed in mm/min

V_{fprog} : table feed on the center line of the tool in mm/min

D_{mach} : diameter of the machined hole in mm

D : diameter of the tool in mm

Real table feed

$$V_f = n \times f_z \times z$$

V_f : table feed in mm/min

n : r.p.m.

f_z : feed/tooth in mm

z : number of teeth

Programmed tafelvoeding OD machining on the center line of the tool

$$V_f \times [D_{mach} + D]$$

$$V_{fprog} = \frac{\quad}{D_{mach}}$$

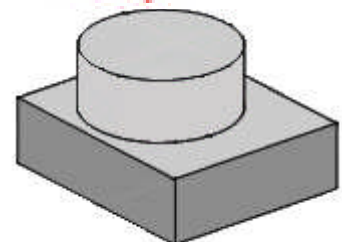
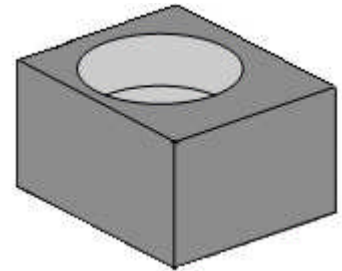
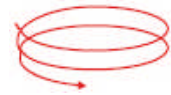
D_{mach}

V_f : table feed in mm/min

V_{fprog} : table feed on the center line of the tool in mm/min

D_{mach} : diameter of the machined hole in mm

D : diameter of the tool in mm





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Chamber of commerce.: Groningen 08 15 29 56 VAT n°: NL0613.54.053.B01