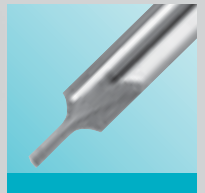
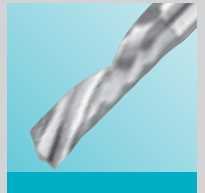


BELIN

A member of the **LMT** group



Production Tools

Plastic/Wood/FoamBoard/Solid Surface

12000 Series/Downcut Single Flute Spiral 'O'

13000 Series/Upcut Single Flute Spiral 'O'



Page 4-5

Milling Tool with 45° Chamfer and 3/32 Radius



Page 6

Plastic/Wood/Non-Ferrous Metal

193000 Series 2 Flute Helical Milling Tool Upcut



Page 7

Straight-cut 2 Flute Mill - Non Helical

31000 Series Special Left Hand Helix Left Hand Cut [counter clockwise rotation]



Page 8

Laminate/Wood Composite/MDO

43000 Series Compression Bit



Page 7

Aluminum/Brass/Copper/Non-Ferrous Metal

22000 Series/Downcut Single Flute Spiral 'O'

33000 Series/Upcut Single Flute Spiral 'O'



Page 9-10

Milling Tool with 45° Chamfer and 3/64 Radius



Page 9-10

176000 Series 2 Flute Slotting Cutter



'Panto' Milling Tool for Manual Machine [Brass]



Page 11

Steel/Stainless Steel/Ferrous Metal

102000 Series 3 Flute Center Cut Helical



15000 Series 4 Flute Center Cut Helical



16000 Series 2 Flute Center Cut Helical



Page 12

PCD Milling Tool

Surface/Conical Milling Tools



Page 13

201000 Series 2 Flute End Mill

202000 Series 2 Flute Inclined Cutter



Page 14

Shaping/Finishing Tools

Special Radius Milling Tool Various Radii/Cut Diameters



Page 15-16

Ball Nose/3-D Copying Cutters 117000 Series XXL



Page 17

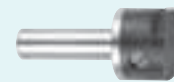
Surfacing Milling Tool Various-Angles/Radii



Page 18

Shaping/Finishing Tools

Natural Diamond Special for Plastic



Page 19

Chamfer/V-Bit Milling Tool for Plastic/Wood



Page 20

Chamfer/V-Bit Milling Tool for Plastic/Nylon/Wood



Page 21

Milling Tool for External Parts Plastic/Foamboard/Hardwood



Page 22

Special Applications

Thermoform – Manual Machine Cutter (HSS)



Page 17

Special Milling Tool for Bending/Folding Plastic
Special Cutter for Bending Aluminum Composite [alucobond]



Page 23

Diamond-shaped Fiberglass/Carbon Fiber/Glass Epoxy
Contour Cutter for PC



Page 24

Saw Cutters Special for Plastic

Drill Type 400 Solid Carbide



Page 25

Special Slotting/Milling Tool for Plastic



Page 26-27

Engraving Tools

Engraving Tool (DR • FI • P) for Plastic/Wood/Non-Ferous



Page 28

Engraving Tool (GR • GRP) for All Types of Material



Page 29-30

Vinyl Blades

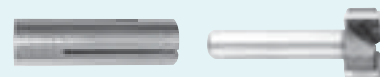
Blades for top surface cut out of vinyl [standard/thick/flourescent]



Page 31-32

Accessories

Tapering Drill Sleeve metric/inch-inch/metric conversion
90° Milling Tool for Re-Surfacing CNC Table



Page 33

Collet 'ER' Type



Page 34

Technical Notes, Cutting Formulas, General Information

Page 35-38

Catalog Index

Page 39

Solid Carbide Single Flute

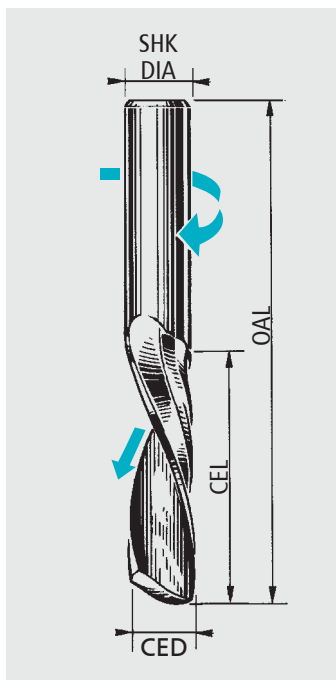
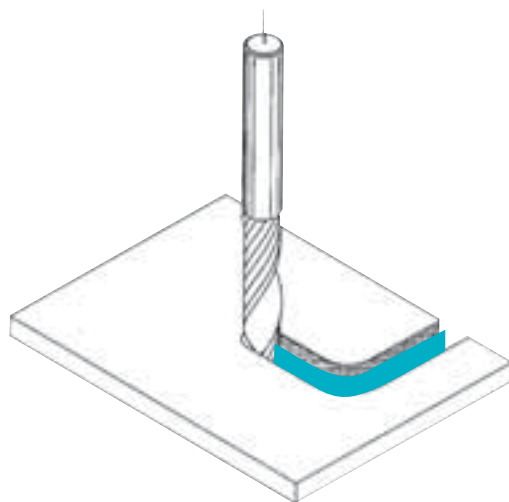
12000 Series Spiral 'O'

TOOL #	CED	CEL	SHK DIA	OAL	
12317	1/8	1/2	1/4	1 1/2	inches (in)
12476	3/16	5/8	1/4	2	
12635	1/4	3/4	1/4	2	
12952	3/8	1 1/8	3/8	3	
12127	1/2	1 1/4	1/2	3	
12010	1	4	3	30	metric (mm)
12015	1.5	6	3	30	
12020	2	8	2	30	
12020A	2	8	2	60	
12020B	2	8	3	30	
12025	2.5	8	2.5	30	
12025A	2.5	8	2.5	60	
12030	3	10	3	30	
12030A	3	10	3	60	
12030B	3	10	6	50	
12040	4	12	4	60	
12040A	4	20	4	60	
12040B	4	30	4	70	
12040C	4	12	6	50	
12050	5	16	5	60	
12050A	5	30	5	70	
12050B	5	16	6	50	
12060	6	20	6	60	
12060A	6	30	6	70	
12060B	6	38	6	80	
12080	8	22	8	60	
12080A	8	38	8	80	
12100	10	30	10	75	
12120	12	30	12	75	



Downcut
Left Hand Helix
Right Hand Cut

Designed to throw chip (waste) DOWN. Space between the material and the CNC table is required for vacuum/removal.



General Tolerances				
	CED	CEL	ShkD	OAL
Inch	-.001 -.003	+.039 - 0	h6	+.039 - 0
Metric	-.03 -.08	+1.0 - 0	h6	+1.0 - 0

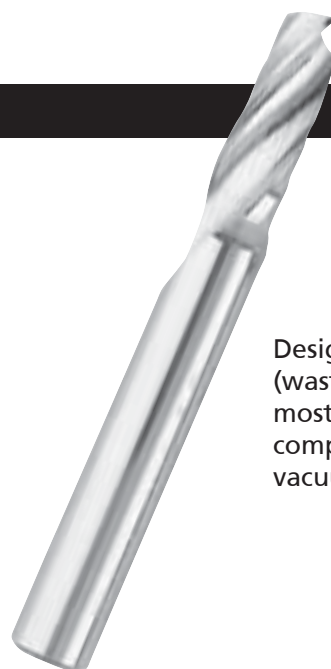
Catalog Abbreviations

IN	 Inch/Inches	MN	 Minute
MM	 Millimeters	Z	 Number of Flutes / Teeth
M	 Meters	R	 Radius
Ø	 Diameter	RPM	 Revolutions per Minute
D	 Diameter	IPM	 Inches per Minute
R	 Radius	Ap	 Max Depth of Cut
CEL	 Cutting Edge Diameter	Ch-CEL	 Chamfer Cutting Length
CEL	 Cutting Edge Length	R-CEL	 Radius Cutting Length
SHK DIA	 Shank Diameter	°	 Degree / Angle of Cut
SHK L	 Shank Length	TIP DIA	 Special Shaping / V-Bits
OAL	 Overall Length	π	 3.14
SFM	 Cutting Speed – Feet/Mn	Vc	 Cutting Speed – M/MN
T.I.R.	 Total Indicated Run-out		

Solid Carbide Single Flute

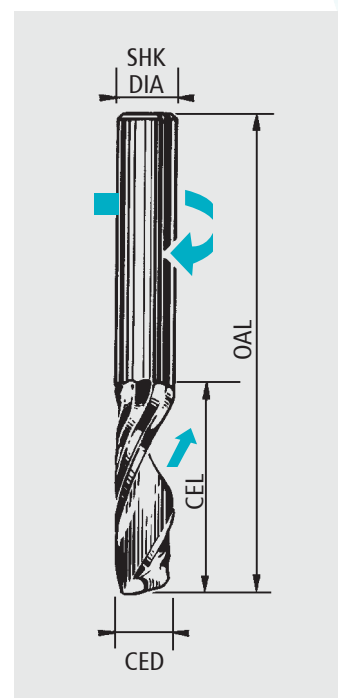
13000 Series Spiral 'O'

TOOL #	CED	CEL	SHK DIA	OAL	
13159	1/16	1/4	1/8	1 1/2	
13317	1/8	1/2	1/4	1 1/2	
13317A	1/8	1/2	1/8	2	
13317B	1/8	3/4	1/8	2	
13476	3/16	5/8	1/4	2	
13476A	3/16	5/8	3/16	2	
13476B	3/16	1 1/4	1/4	3	
13635	1/4	3/4	1/4	2	
13635A	1/4	1 1/2	1/4	3	
◆ 13635B	1/4	2 1/4	1/4	3 3/4	
13635C	1/4	1 1/8	1/4	3	
13952	3/8	1 1/8	3/8	3	
◆ 13952A	3/8	3 3/16	3/8	5	
13127	1/2	1 1/4	1/2	3	
13127A	1/2	2	1/2	4	
13190	3/4	1 1/4	3/4	4	
13254	1	1 1/2	1	4	
					inches (in)
13010	1	4	3	30	
13011	1.1	4	3	30	
13012	1.2	4	3	30	
13014	1.4	4	3	30	
13015	1.5	6	3	30	
13016	1.6	6	3	30	
13018	1.8	6	3	30	
13020	2	8	2	30	
13020A	2	8	2	60	
13020B	2	8	3	30	
13020C	2	8	6	60	
13025	2.5	8	2.5	30	
13025A	2.5	8	2.5	60	
13030	3	10	3	30	
13030A	3	10	3	60	
13030B	3	10	6	50	
13030C	3	20	3	60	
13030D	3	20	6	60	
13030E	3	15	3	40	
13040	4	12	4	60	
13040A	4	20	4	60	
13040B	4	30	4	70	
13040C	4	12	6	50	
13040D	4	20	6	60	
13040E	4	12	4	40	
13050	5	16	5	60	
13050A	5	30	5	70	
13050B	5	16	6	50	
13060	6	20	6	60	
13060A	6	30	6	70	
13060B	6	38	6	80	
13080	8	22	8	60	
13080A	8	38	8	80	
13100	10	30	10	75	
13120	12	30	12	75	
					metric (mm)



Upcut
Right Hand Helix
Right Hand Cut

Designed to throw chip (waste) UP. This is the most popular design and is compatible with most CNC vacuum systems.

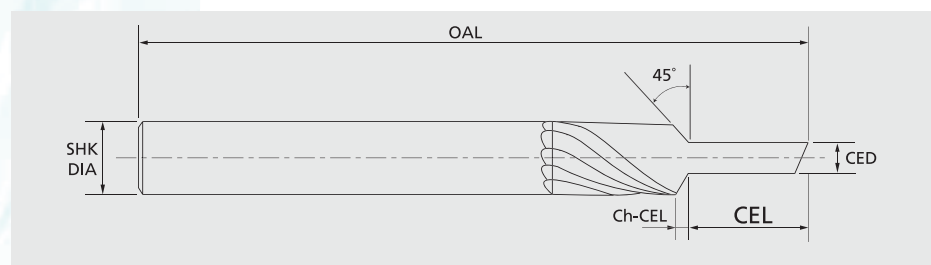


◆ XL CEL FOR ROUTING/MILLING FOAMBOARD MATERIAL ONLY

Solid Carbide Special End Mill

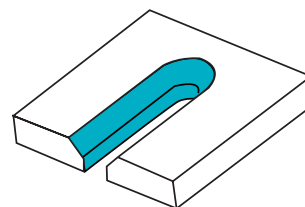
Single Flute + 45° Chamfer

TOOL #	CED	CEL	SHK DIA	OAL	Ch-CEL	
00192	3/16	11/64	3/8	2	3/32	(in)
00193	3/16	1/4	3/8	2	3/32	
99058	4	4.3	8	40	2	(mm)
00191	4	6.3	8	40	2	



**Upcut
Right Hand Helix
Right Hand Cut**

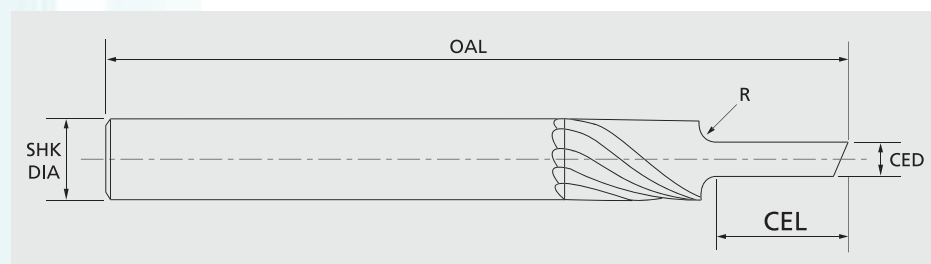
Designed to mill a small chamfer on the edge of the component in a one step process. Eliminates most secondary operations.



Solid Carbide Special End Mill

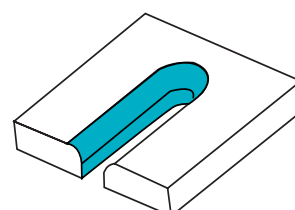
Single Flute + 3/32 Radius

TOOL #	CED	CEL	SHK DIA	OAL	R-CEL	
00196	3/16	11/64	3/8	2	3/32	(in)
00197	3/16	1/4	3/8	2	3/32	
00194	4	4.3	8	40	2	(mm)
00195	4	6.3	8	40	2	



**Upcut
Right Hand Helix
Right Hand Cut**

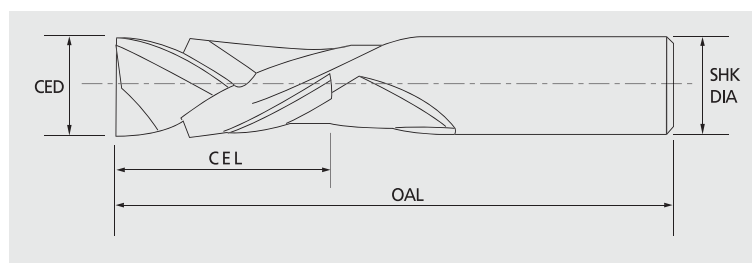
Designed to mill a small radius on the edge of the component in a one step process. Eliminates most secondary operations.



Solid Carbide

Compression Bit 2 Flute Upcut / 2 Flute Downcut

TOOL #	CED	CEL	SHK DIA	OAL	
43635	1/4	7/8	1/4	2 1/2	(in)
43952	3/8	1	3/8	3	
43127	1/2	1 1/8	1/2	3	
43060	6	22	6	65	(mm)
43080	8	25	8	76	
43100	10	30	10	76	
43120	12	35	12	80	



Right Hand Helix
Left Hand Helix
Right Hand Cut

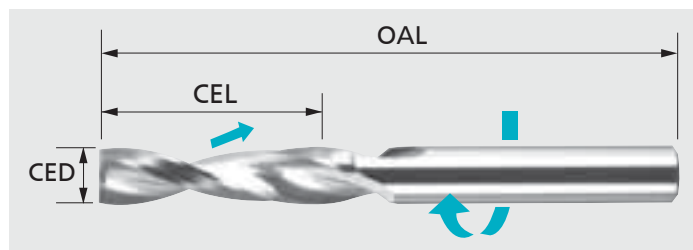
Designed to equalize up/down cutting pressure when milling laminated materials. Excellent edge finish on both sides.

Plastic, Wood, Non-Ferrous Metal

Solid Carbide

Milling Tool 2 Flute Upcut

TOOL #	CED	CEL	SHK DIA	OAL	
193317	1/8	5/8	1/8	2	(in)
193476	3/16	3/4	3/16	2 1/2	
193635	1/4	1	1/4	2 1/2	
193952	3/8	1 1/4	3/8	3	
193127	1/2	1 1/2	1/2	3 1/4	
193050	5	20	5	70	(mm)
193060	6	22	6	76	
193080	8	25	8	76	
193100	10	30	10	76	
193120	12	35	12	80	



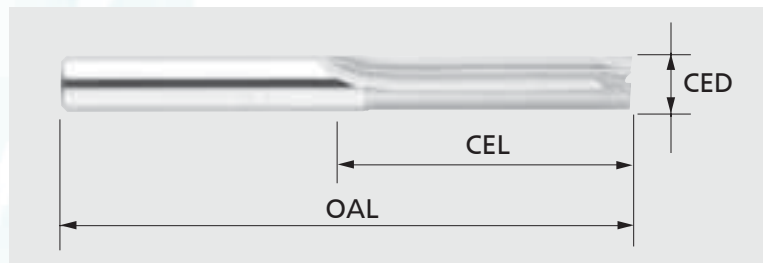
Right Hand Helix
Right Hand Cut

General Tolerances				
	CED	CEL	ShkD	OAL
Inch	-.001 -.003	+.039 - 0	h6	+.039 - 0
Metric	-.03 -.08	+1.0 - 0	h6	+1.0 - 0

Solid Carbide

Straight-Cut 2 Flute Non-Helical (Metric)

TOOL #	CED	CEL	SHK DIA	OAL	
95209A	3	15	3	60	(mm)
95209B	4	20	4	60	
95209C	5	20	5	60	
95209D	6	25	6	60	
95209E	8	35	8	80	



Right Hand Cut

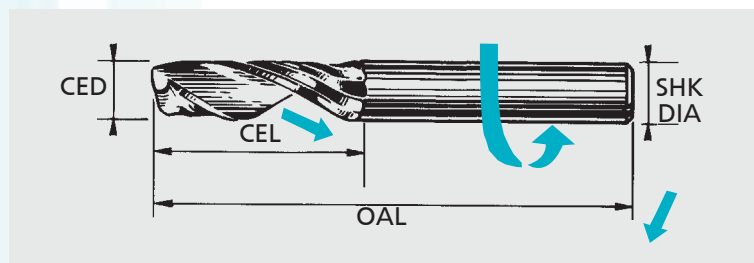
Designed as general purpose tool to rout/mill difficult to cut materials.



Solid Carbide

Milling Tool Single Flute Left Hand Cut* (Metric)

TOOL #	CED	CEL	SHK DIA	OAL	
31030	3	8	3	30	(mm)
31040	4	12	4	60	
31050	5	16	5	60	
31060	6	20	6	60	



Upcut Left Hand Helix Left Hand Cut

*Tool cuts in counter clockwise rotation only.



General Tolerances

	CED	CEL	ShkD	OAL
Inch	-.001 -.003	+.039 - 0	h6	+.039 - 0
Metric	-.03 -.08	+1.0 - 0	h6	+1.0 - 0

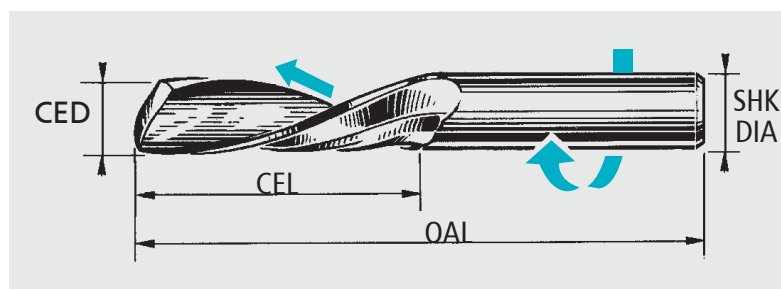
Catalog Abbreviations

IN	 Inch/Inches	MN	 Minute
MM	 Millimeters	Z	 Number of Flutes / Teeth
M	 Meters	R	 Radius
Ø	 Diameter	RPM	 Revolutions per Minute
D	 Diameter	IPM	 Inches per Minute
R	 Radius	Ap	 Max Depth of Cut
CED	 Cutting Edge Diameter	Ch-CEL	 Chamfer Cutting Length
CEL	 Cutting Edge Length	R-CEL	 Radius Cutting Length
SHK DIA	.. Shank Diameter	°	 Degree / Angle of Cut
SHK L	 Shank Length	TIP DIA	 Special Shaping / V-Bits
OAL	 Overall Length	π	 3.14
SFM	 Cutting Speed – Feet/Mn	Vc	 Cutting Speed – M/MN
T.I.R.	 Total Indicated Run-out		

Solid Carbide

22000 Series Single Flute Spiral 'O'

TOOL #	CED	CEL	SHK DIA	OAL	
22317	1/8	5/16	1/4	1 1/2	inches (in)
22476	3/16	1/2	1/4	2	
22635	1/4	5/8	1/4	2	
22015	1.5	4	3	30	metric (mm)
22020	2	5	3	30	
22025	2.5	6	3	30	
22030	3	8	3	30	
22040	4	12	4	60	
22040A	4	10	6	50	
22050	5	16	5	60	
22050A	5	12	6	50	
22060	6	15	6	50	
22080	8	20	8	60	
22100	10	23	10	60	



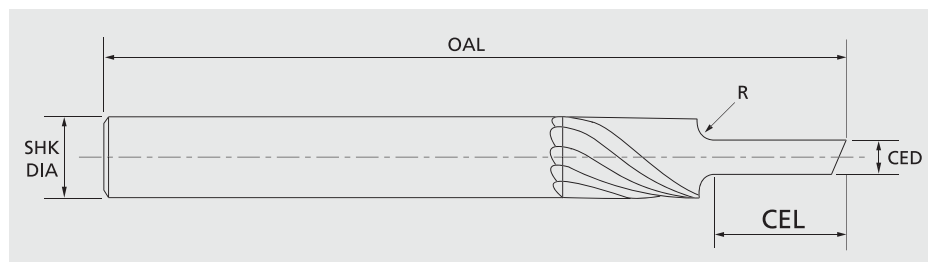
Downcut
Left Hand Helix
Right Hand Cut

Designed to throw chip (waste) DOWN. Space between the material and CNC table is required for vacuum/removal.

Solid Carbide Special End Mill

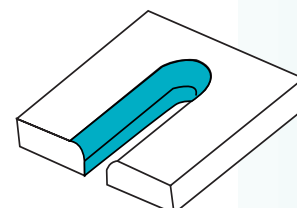
Single Flute + 3/64 Radius

TOOL #	CED	CEL	SHK DIA	OAL	R-CEL	
00203	3/16	3/32	1/4	2	3/64	(in)
00204	3/16	1/8	1/4	2	3/64	
00201	4	2.3	6	40	1	(mm)
00202	4	3.3	6	40	1	



Upcut
Right Hand Helix
Right Hand Cut

Designed to mill a small radius on the edge of the component in a one step process. Eliminates most secondary operations.



Solid Carbide

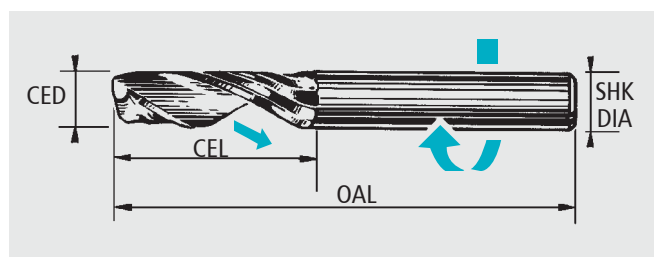
33000 Series Single Flute Spiral 'O'

TOOL #	CED	CEL	SHK DIA	OAL	
33317	1/8	5/16	1/4	1 1/2	inches (in)
33317A	1/8	5/16	1/8	1 1/2	
33476	3/16	1/2	1/4	2	
33476A	3/16	1/2	3/16	2	
33476B	3/16	5/8	3/16	2	
33635	1/4	5/8	1/4	2	
33635A	1/4	3/4	1/4	2	
33952	3/8	1	3/8	3	
33127	1/2	1 1/8	1/2	3 1/2	
33015	1.5	4	3	30	metric (mm)
33020	2	5	3	30	
33025	2.5	6	3	30	
33030	3	8	3	30	
33040	4	12	4	60	
33040A	4	10	6	50	
33040B	4	30	4	70	
33050	5	16	5	60	
33050A	5	12	6	50	
33050B	5	30	5	70	
33050C	5	25	8	70	
33050D	5	35	8	80	
33060	6	15	6	50	
33060A	6	15	6	70	
33060B	6	20	6	60	
33060C	6	30	6	70	
33060D	6	38	6	80	
33060E	6	30	8	80	
33080	8	20	8	60	
33080A	8	20	8	80	
33080B	8	38	8	80	
33100	10	23	10	60	
33100A	10	23	10	100	
33100B	10	30	10	75	



Upcut
Right Hand Helix
Right Hand Cut

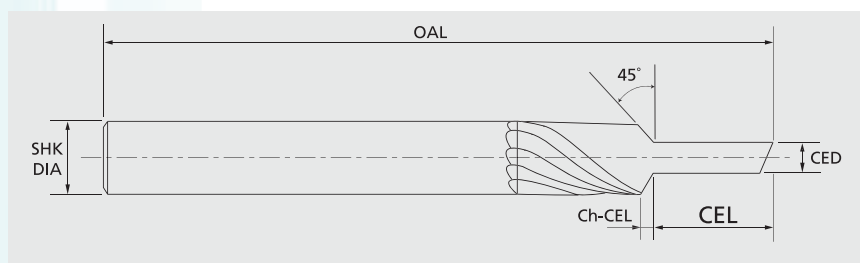
Designed to throw chip (waste) UP. This is the most popular design and is compatible with most CNC vacuum systems.



Solid Carbide Special End Mill

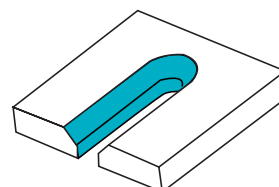
Single Flute + 45° Chamfer

TOOL #	CED	CEL	SHK DIA	OAL	Ch-CEL	
00199A	3/16	1/16	1/4	2	3/64	(in)
00199	3/16	3/32	1/4	2	3/64	
00200	3/16	1/8	1/4	2	3/64	
99203	4	2.3	6	40	1	(mm)
00198	4	3.3	6	40	1	



Upcut
Right Hand Helix
Right Hand Cut

Designed to mill a small chamfer on the edge of the component in a one step process. Eliminates most secondary operations.



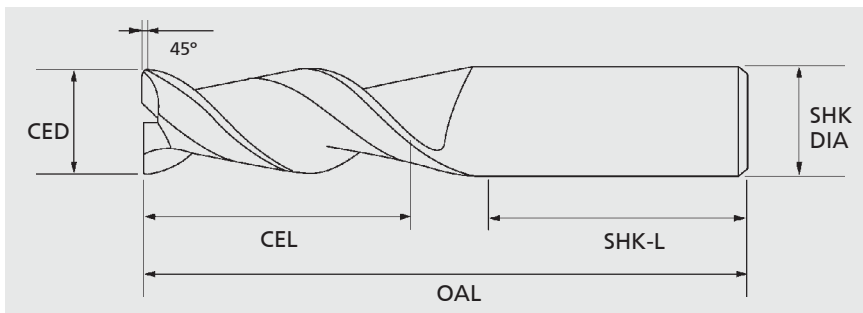
Slotting Cutter

2 Flute Special for Aluminum (Metric)

TOOL #	CED	CEL	SHK DIA	OAL	SHK-L	
176020	2	6	6	50	42	Metric (mm)
176030	3	7	6	50	40	
176040	4	8	6	50	38	
176050	5	10	6	50	35	
176060	6	10	6	50	-	
176080	8	15	8	60	-	
176100	10	18	10	65	-	
176120	12	20	12	70	-	
176140	14	22	14	75	-	



Upcut
Right Hand Helix
Right Hand Cut

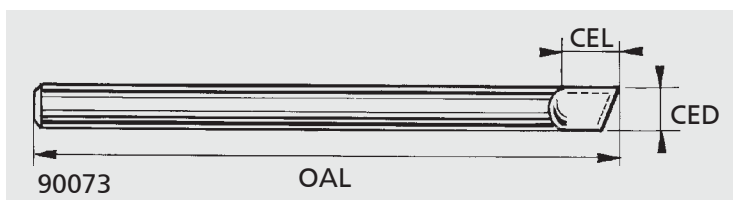


General Tolerances				
	CED	CEL	ShkD	OAL
Inch	-.001 -.003	+.039 - 0	h6	+.039 - 0
Metric	-.03 -.08	+1.0 - 0	h6	+1.0 - 0

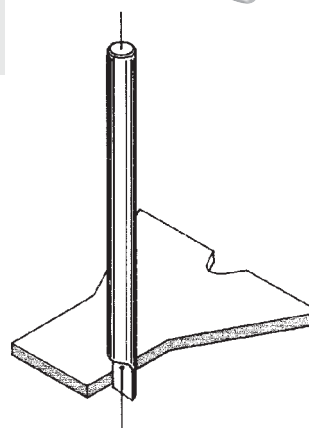
Milling Tool "Panto" Type

Special for Brass Manual Machine (Metric)

TOOL #	CED	CEL	OAL	
90073A	2	4	60	Metric (mm)
90073B	3	5	60	
90073C	4	6	60	
90073D	5	6	60	
90073E	6	10	60	
90073F	8	10	70	



Single Flute
Straight Cut



Solid Carbide

3 Flute Center Cut Helical

TOOL #	CED	CEL	SHK DIA	OAL	
102317	1/8	3/8	1/4	1 1/2	(in)
102476	3/16	7/16	1/4	1 7/8	
102635	1/4	5/8	1/4	2 3/8	
102030	3	10	3	40	(mm)
102040	4	11	4	48	
102060	6	16	6	60	

4 Flute Center Cut Helical (Metric)

TOOL #	CED	CEL	SHK DIA	OAL	
15010	1	4	3	38	Metric (mm)
15015	1.5	4.5	3	38	
15020	2	7	2	40	
15020A	2	6.3	3	35	
15025	2.5	8	2.5	40	
15025A	2.5	9	3	38	
15030	3	10	3	40	
15040	4	11	4	48	
15050	5	13	5	60	
15060	6	16	6	60	
15070	7	23	7	60	
15080	8	23	8	60	
15090	9	23	9	60	
15100	10	23	10	60	
15120	12	30	12	76	
15140	14	30	14	76	

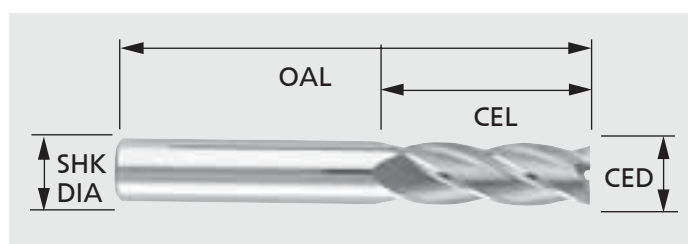
2 Flute Center Cut Helical (Metric)

TOOL #	CED	CEL	SHK DIA	OAL	
16010	1	4	3	38	Metric (mm)
16015	1.5	4.5	3	38	
16020	2	7	2	40	
16020A	2	6.3	3	35	
16025	2.5	8	2.5	40	
16025A	2.5	9	3	38	
16030	3	10	3	40	
16040	4	11	4	48	
16050	5	13	5	60	
16060	6	16	6	60	
16070	7	23	7	60	
16080	8	23	8	60	
16090	9	23	9	60	
16100	10	23	10	60	
16120	12	30	12	76	
16140	14	30	14	76	



**Upcut
Right Hand Helix
Right Hand Cut**

Recommend use of lubricant/coolant to achieve best results and longer tool life.



Catalog Abbreviations

IN Inch/Inches	MN Minute
MM Millimeters	Z Number of Flutes / Teeth
M Meters	R Radius
Ø Diameter	RPM Revolutions per Minute
D Diameter	IPM Inches per Minute
R Radius	Ap Max Depth of Cut
CED Cutting Edge Diameter	Ch-CEL Chamfer Cutting Length
CEL Cutting Edge Length	R-CEL Radius Cutting Length
SHK DIA Shank Diameter	° Degree / Angle of Cut
SHK L Shank Length	TIP DIA Special Shaping / V-Bits
OAL Overall Length	π 3.14
SFM Cutting Speed – Feet/Mn	Vc Cutting Speed – M/MN
T.I.R. Total Indicated Run-out	

General Tolerances

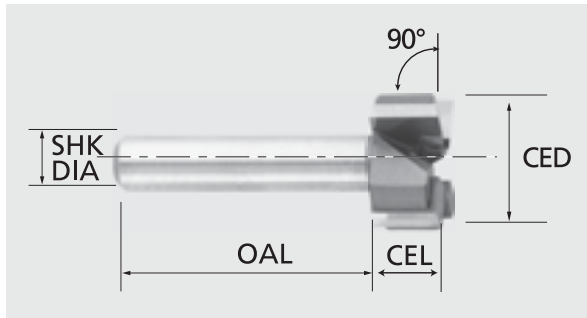
	CED	CEL	ShkD	OAL
Inch	-.001 -.003	+.039 - 0	h6	+.039 - 0
Metric	-.03 -.08	+1.0 - 0	h6	+1.0 - 0

PCD Long-life Cutter

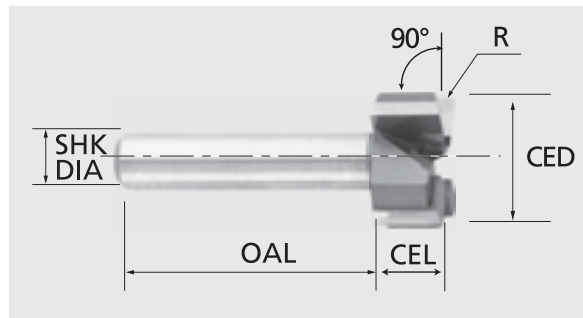
Surface/Conical Milling Tool (Metric)



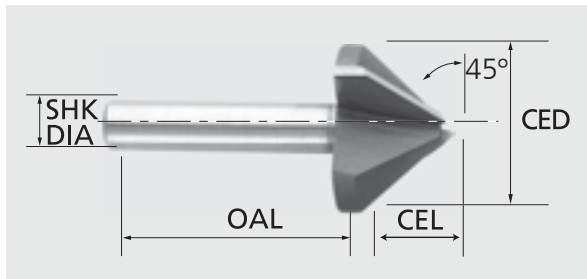
TOOL #	CED	CEL	SHK DIA	OAL	(mm)
98105	16	6	6	30	



TOOL #	CED	CEL	SHK DIA	OAL	R	(mm)
91176	10	6	6	30	0.5	
98103	10	6	6	30	1	
98104	10	6	6	30	2	
97251	20	7	8	30	1	



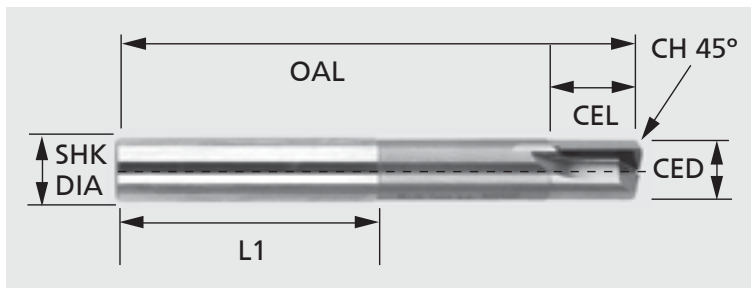
TOOL #	CED	CEL	SHK DIA	OAL	(mm)
02107	20	10	6	30	



PCD Milling Tool

Slotting End Mill 2 Flute

TOOL #	CEL	L1	OAL	CH 45°	Metric (mm)
201031	6	40	80	0.05	
201030	6	70	80	0.05	
201041	8	40	80	0.1	
201040	8	68	80	0.1	
201061	8	50	100	0.1	
201060	8	40	80	0.1	
201081	10	60	120	0.1	
201080	10	40	80	0.1	
201100	12	60	120	0.2	
201120	14	60	120	0.2	
201140	16	60	120	0.2	
201160	18	70	140	0.2	
201180	20	70	140	0.2	
201200	22	80	160	0.2	

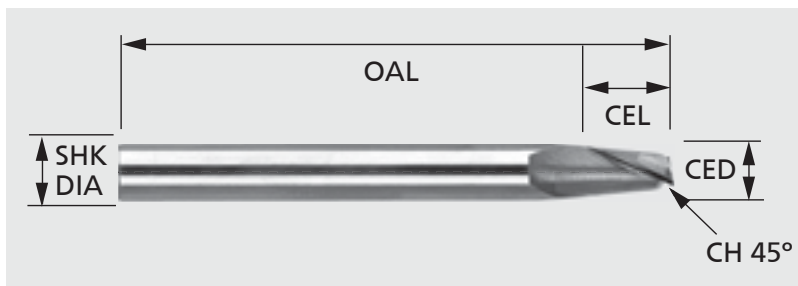


Right Hand Cut

PCD Milling Tool

Inclined Slotting Cutter 2 Flute

TOOL #	CED	CEL	SHK DIA	OAL	CH 45°	Metric (mm)
202030	3	6.4	4	50	0.05	
202040	4	9.5	4	76	0.1	
202050	5	9.5	5	76	0.1	
202060	6	9.5	6	76	0.1	
202080	8	9.5	8	76	0.1	
202100	10	12.7	10	89	0.2	
202120	12	12.7	12	89	0.2	



Right Hand Cut

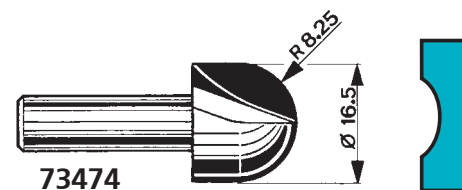
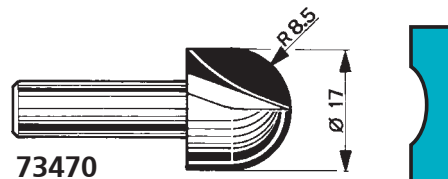
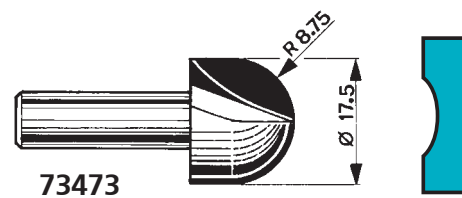
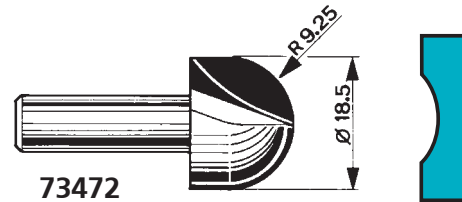
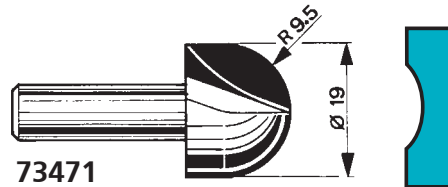
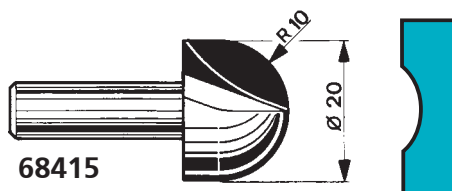
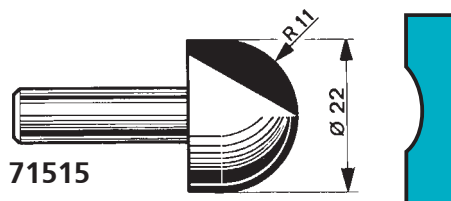
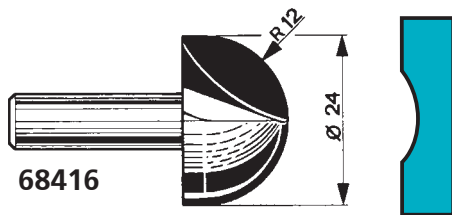
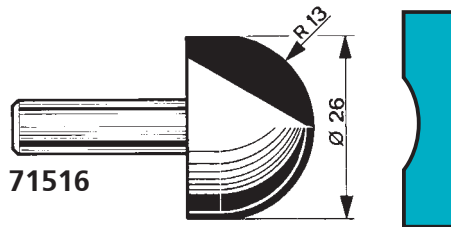
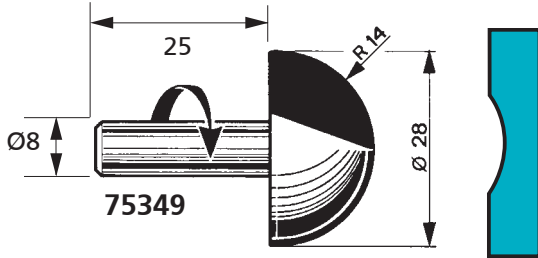
General Tolerances				
	CED	CEL	ShkD	OAL
Inch	-.001 -.003	+.039 - 0	h6	+.039 - 0
Metric	-.03 -.08	+1.0 - 0	h6	+1.0 - 0

Special Radius Milling Tool

2 Flute Spherical (Metric)



Right Hand Cut



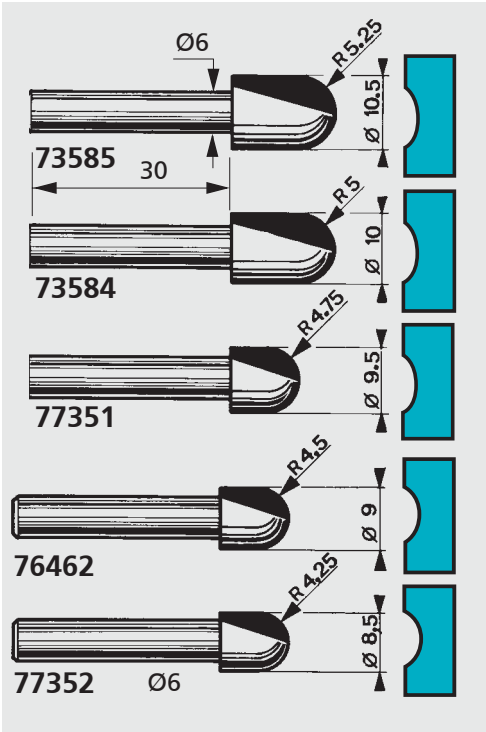
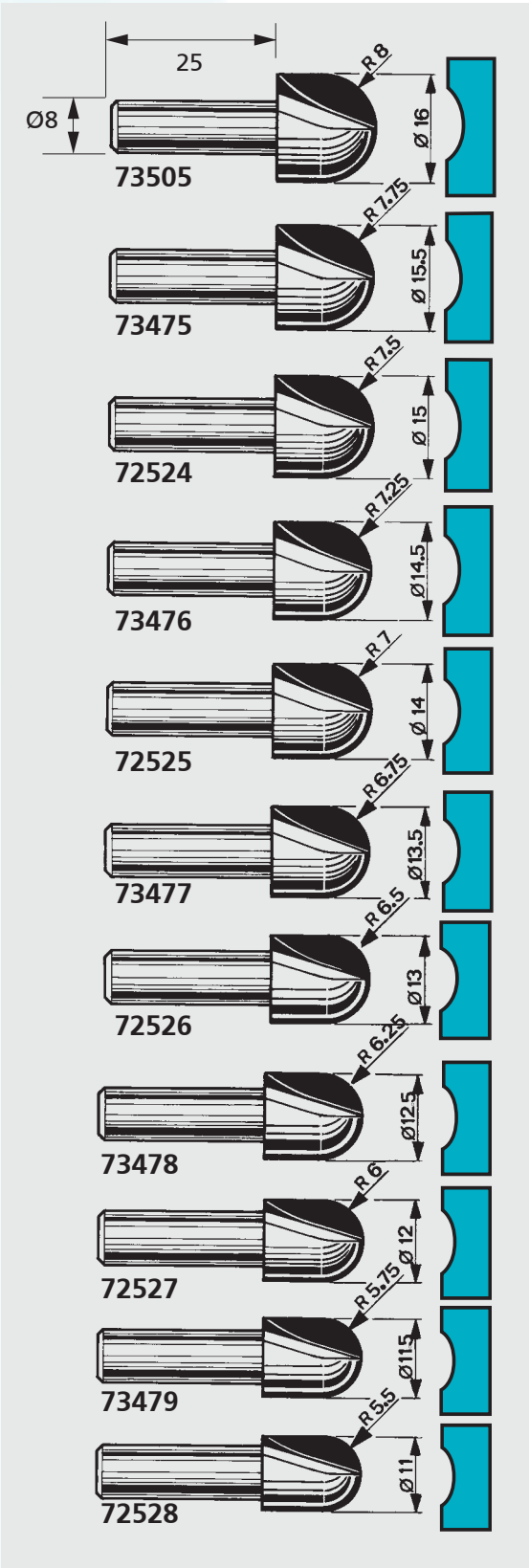
Ø Diameter

Special Radius Milling Tool

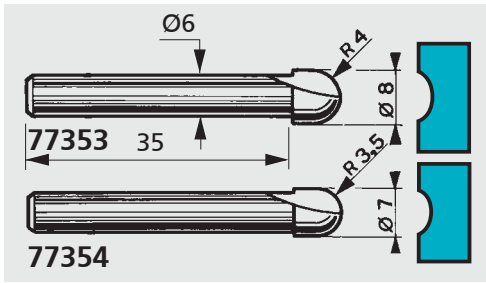
2 Flute Spherical (Metric)



Right Hand Cut



Ø Diameter



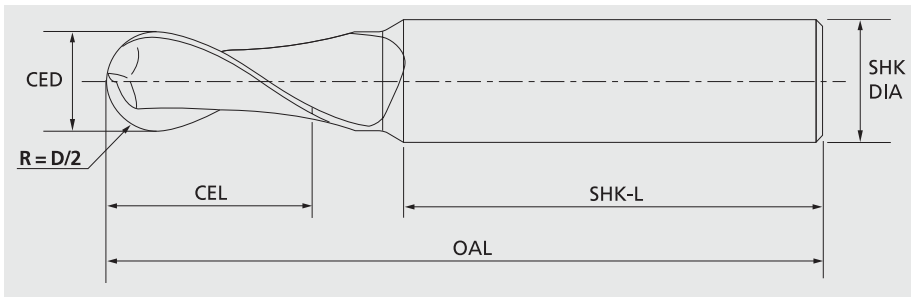
3D Copying Cutter

Ball Nose 2 Flute Center Cut XXL – Long Shank

TOOL #	CED	CEL	SHK DIA	OAL	SHK L	
117317	1/8	5/8	1/4	3 1/4	2 1/2	inches (in)
117476	3/16	7/8	1/4	4	3	
117635	1/4	1 1/4	1/4	5 1/8	–	
117952	3/8	1 5/8	3/8	7	–	
117127	1/2	2	1/2	8	–	
117020	2	10	4	80	66	metric (mm)
117030	3	15	6	90	72	
117040	4	20	6	100	76	
117050	5	20	6	100	78	
117060	6	30	6	130	–	
117080	8	40	8	150	–	
117100	10	50	10	180	–	
117120	12	50	12	200	–	



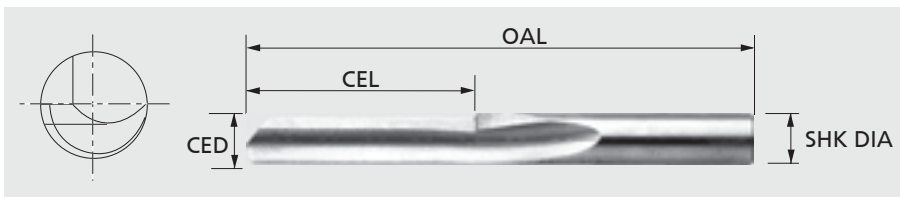
*Right Hand Helix
Right Hand Cut*



Special for Thermoform – Manual Machine

Straight Cut 1 Flute HSS

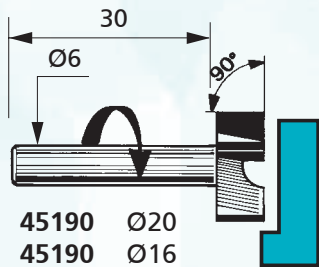
TOOL #	CED	CEL	SHK DIA	OAL	
194060	6	35	6	80	(mm)
194080	8	35	8	80	



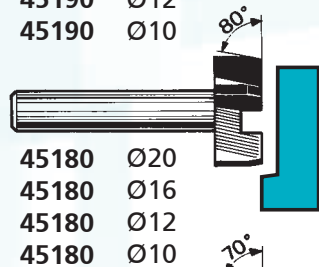
*Right
Hand Cut*

Surfacing Milling Tool

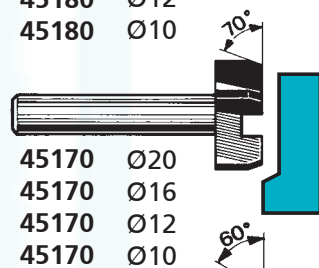
Various Angles/Radii (Metric)



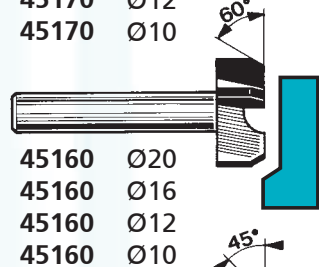
45190 Ø20
45190 Ø16
45190 Ø12
45190 Ø10



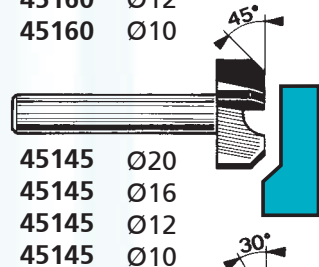
45180 Ø20
45180 Ø16
45180 Ø12
45180 Ø10



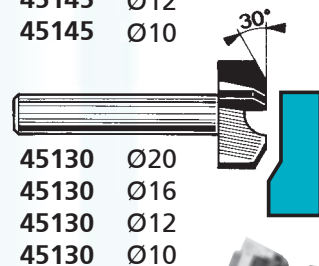
45170 Ø20
45170 Ø16
45170 Ø12
45170 Ø10



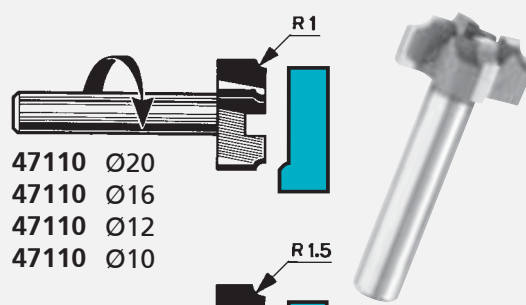
45160 Ø20
45160 Ø16
45160 Ø12
45160 Ø10



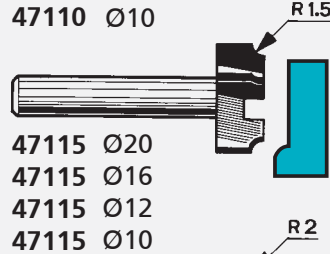
45145 Ø20
45145 Ø16
45145 Ø12
45145 Ø10



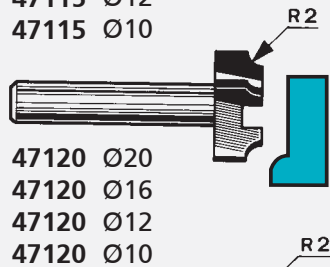
45130 Ø20
45130 Ø16
45130 Ø12
45130 Ø10



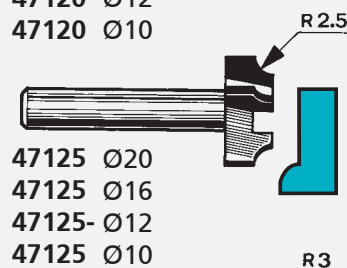
47110 Ø20
47110 Ø16
47110 Ø12
47110 Ø10



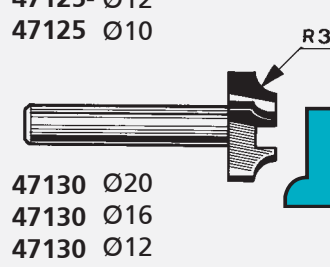
47115 Ø20
47115 Ø16
47115 Ø12
47115 Ø10



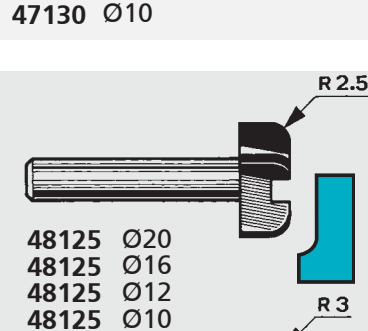
47120 Ø20
47120 Ø16
47120 Ø12
47120 Ø10



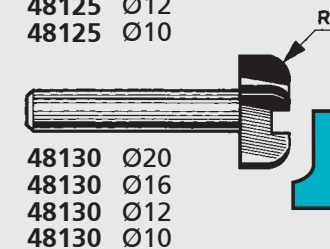
47125 Ø20
47125 Ø16
47125 Ø12
47125 Ø10



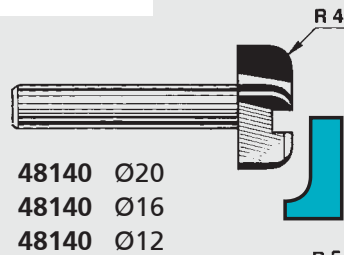
47130 Ø20
47130 Ø16
47130 Ø12
47130 Ø10



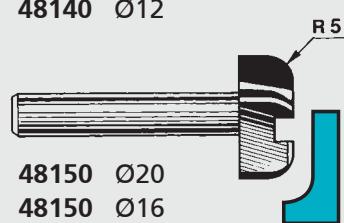
48125 Ø20
48125 Ø16
48125 Ø12
48125 Ø10



48130 Ø20
48130 Ø16
48130 Ø12
48130 Ø10

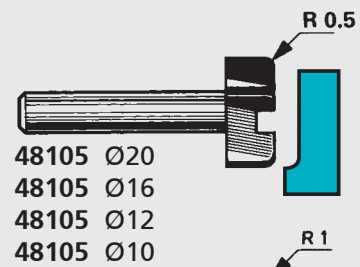


48140 Ø20
48140 Ø16
48140 Ø12

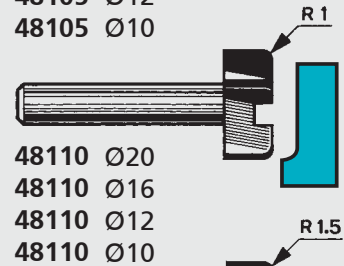


48150 Ø20
48150 Ø16

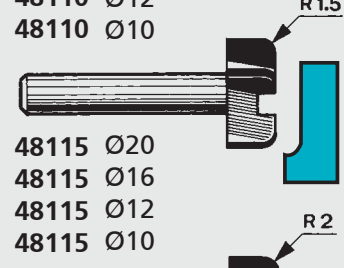
Ø Diameter



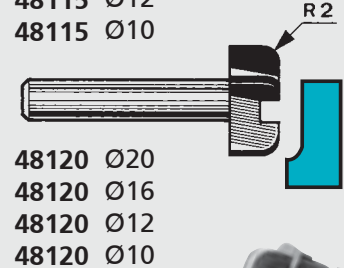
48105 Ø20
48105 Ø16
48105 Ø12
48105 Ø10



48110 Ø20
48110 Ø16
48110 Ø12
48110 Ø10



48115 Ø20
48115 Ø16
48115 Ø12
48115 Ø10



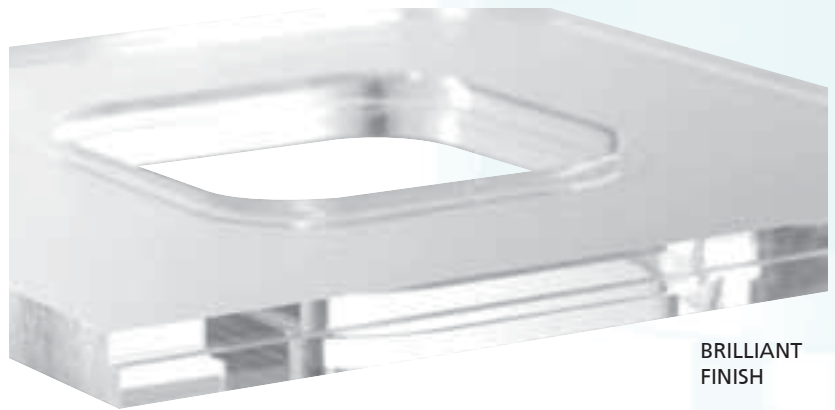
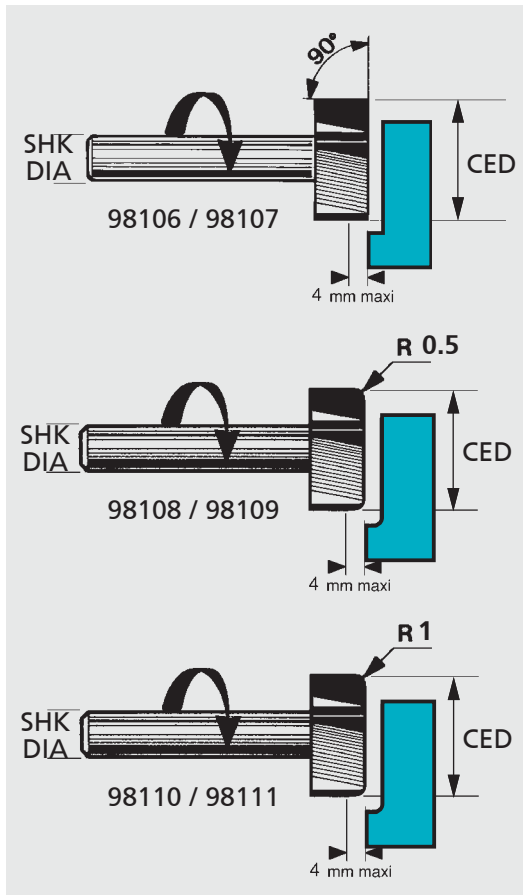
48120 Ø20
48120 Ø16
48120 Ø12
48120 Ø10



Natural Diamond

Single Flute Straight Cut (Metric)

TOOL #	CED	SHK DIA
98106	12	8
98107	20	8
98108	12	8
98109	20	8
98110	12	8
98111	20	8



BRILLIANT
FINISH



NATURAL

Catalog Abbreviations

IN	Inch/Inches	MN	Minute
MM	Millimeters	Z	Number of Flutes / Teeth
M	Meters	R	Radius
Ø	Diameter	RPM	Revolutions per Minute
D	Diameter	IPM	Inches per Minute
R	Radius	Ap	Max Depth of Cut
CED	Cutting Edge Diameter	Ch-CEL	Chamfer Cutting Length
CEL	Cutting Edge Length	R-CEL	Radius Cutting Length
SHK DIA	Shank Diameter	°	Degree / Angle of Cut
SHK L	Shank Length	TIP DIA	Special Shaping / V-Bits
OAL	Overall Length	π	3.14
SFM	Cutting Speed – Feet/Mn	Vc	Cutting Speed – M/MN
T.I.R.	Total Indicated Run-out		

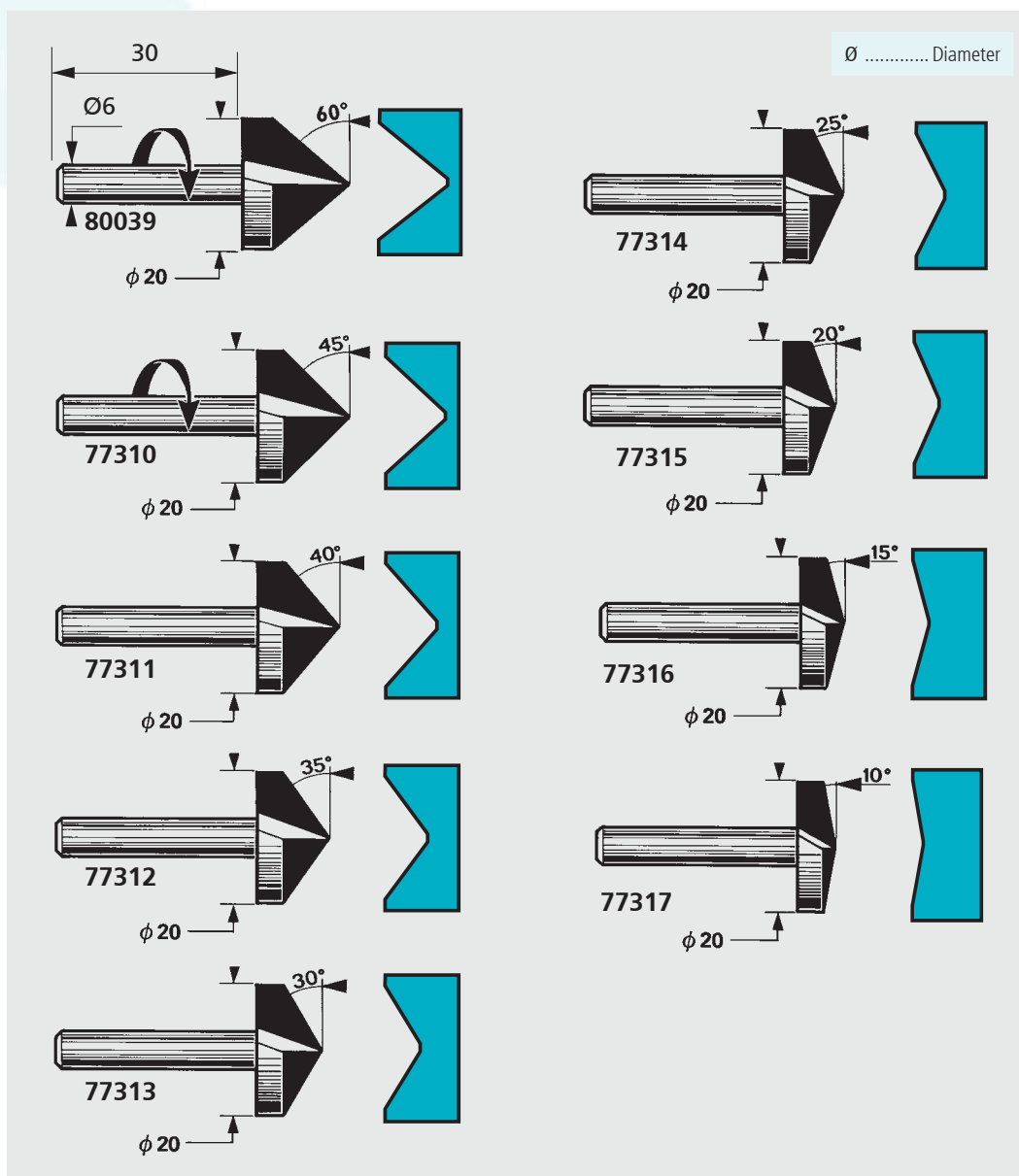
Conical Milling Tool

V-Bit 2 Flute (Metric)

TOOL #	V-Angle	V-Max Dia	Max Depth	SHK DIA	OAL
80039	60°	20	17.3	6	50.3
77310	45°	20	10	6	44
77311	40°	20	8.4	6	42.4
77312	35°	20	7	6	41
77313	30°	20	5.8	6	39.8
77314	25°	20	4.7	6	38.7
77315	20°	20	3.7	6	37.7
77316	15°	20	2.6	6	36.6
77317	10°	20	1.8	6	35.8



Right Hand Cut



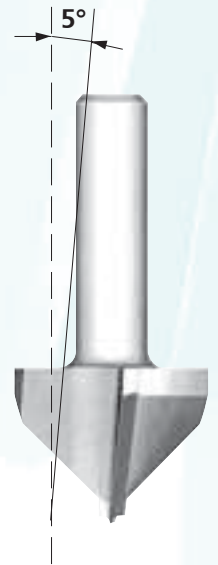
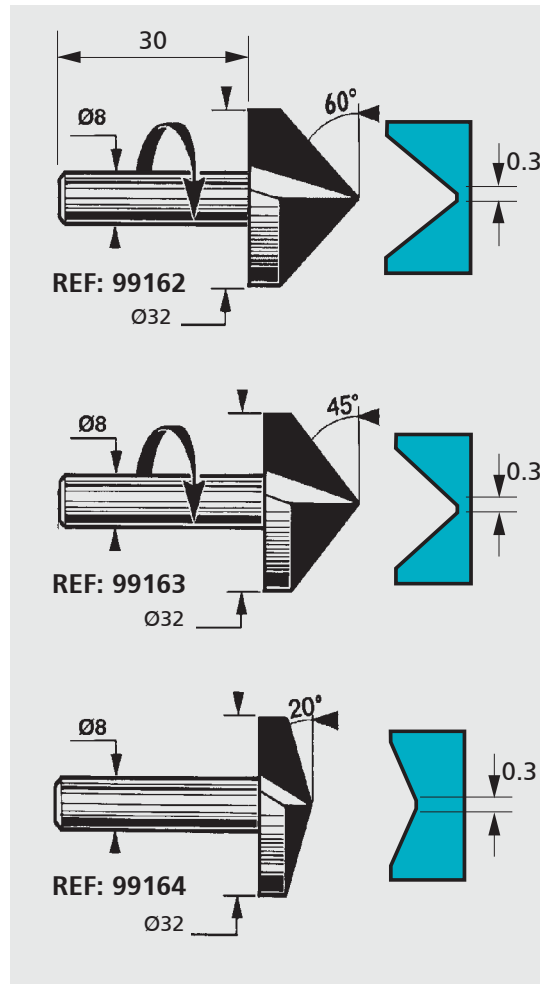
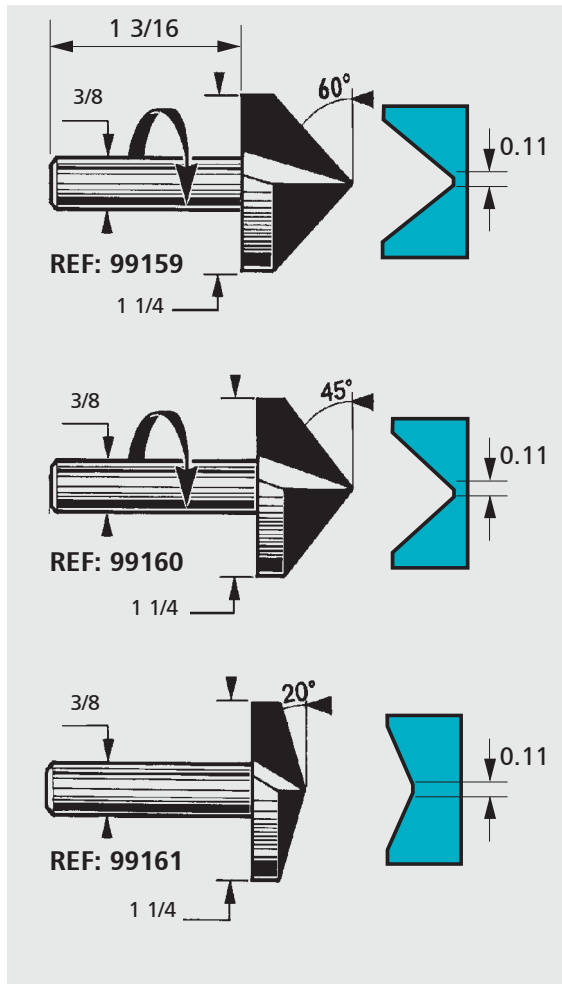
Conical Milling Tool

V-Bit 2 Flute

TOOL #	V-Angle	V-Max Dia	SHK DIA	SHK L	
99159	60°	1 1/4	3/8	1 3/16	(in)
99160	45°	1 1/4	3/8	1 3/16	
99161	20°	1 1/4	3/8	1 3/16	
99162	60°	32	8	30	(mm)
99163	45°	32	8	30	
02013	40°	32	8	30	
02014	35°	32	8	30	
02015	30°	32	8	30	
99164	20°	32	8	30	



Right Hand Cut



Ø Diameter

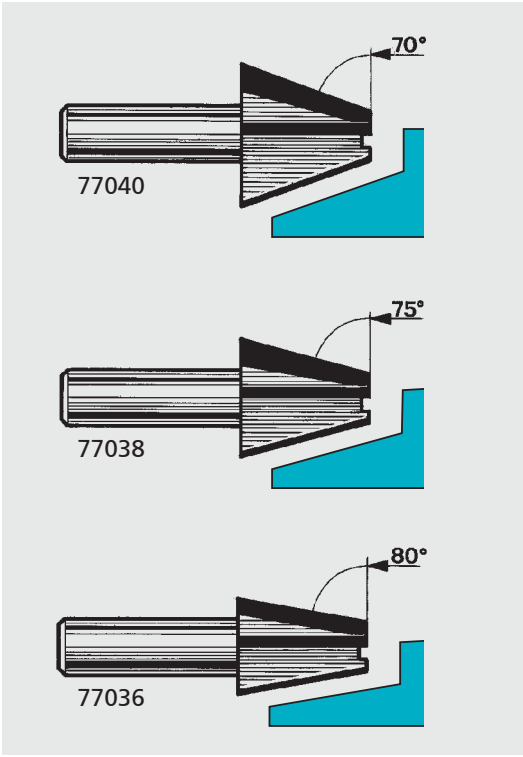
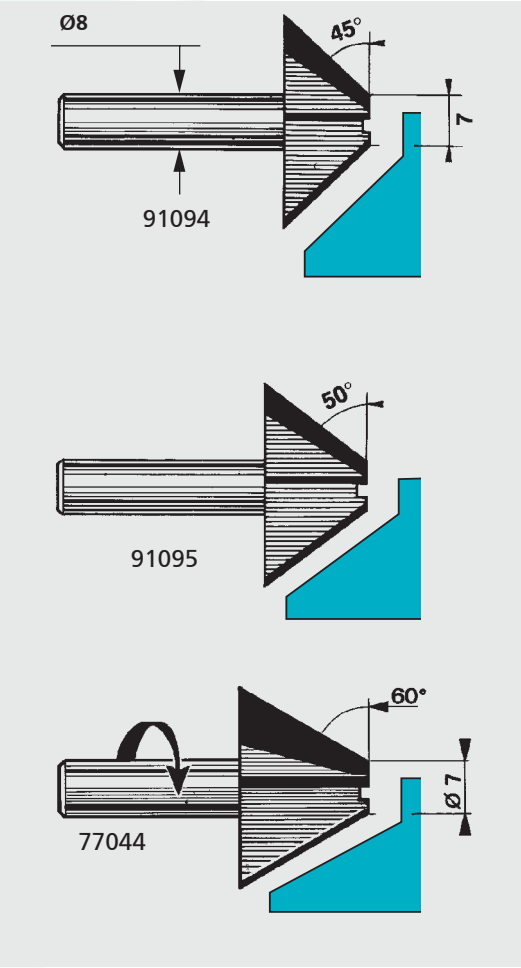
Milling Tool for External Parts

4 Flute (Metric)

TOOL #	Angle	TIP	Max CEL	SHK DIA	OAL
91094	45°	7	12	8	37
91095	50°	7	14	8	39
77044	60°	7	18	8	43
77040	70°	7	18	8	43
77038	75°	7	18	8	43
77036	80°	7	18	8	43



Right Hand Cut



Ø Diameter

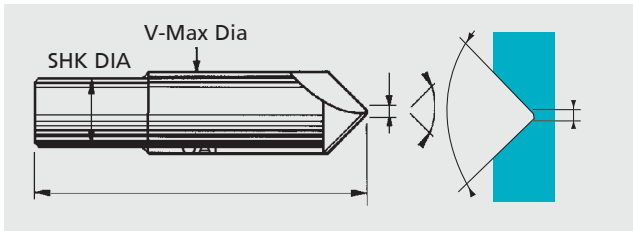
Catalog Abbreviations

IN Inch/Inches	MN Minute
MM Millimeters	Z Number of Flutes / Teeth
M Meters	R Radius
Ø Diameter	RPM Revolutions per Minute
D Diameter	IPM Inches per Minute
R Radius	Ap Max Depth of Cut
CED Cutting Edge Diameter	Ch-CEL Chamfer Cutting Length
CEL Cutting Edge Length	R-CEL Radius Cutting Length
SHK DIA Shank Diameter	° Degree / Angle of Cut
SHK L Shank Length	TIP DIA Special Shaping / V-Bits
OAL Overall Length	π 3.14
SFM Cutting Speed – Feet/Mn	Vc Cutting Speed – M/MN
T.I.R. Total Indicated Run-out	

Special Milling Tool for Folding

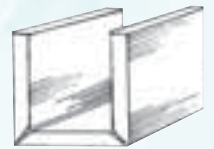
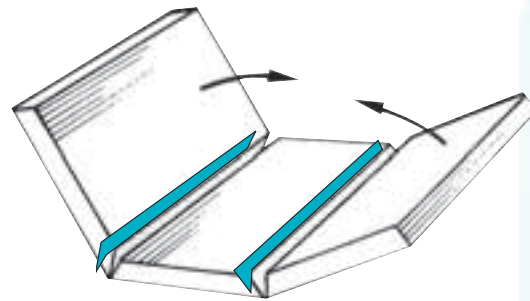
2 Flute 90° (Metric)

TOOL #	V-Angle	V-Max Dia	SHK DIA	TIP DIA	OAL
91106	90	8	8	0.2	50
91105	90	12	12	0.2	50
96188	90	16	8	0.2	50
00209	90	16	8	0.5	50
00210	90	16	8	1.0	50



Ø Diameter

Right Hand Cut

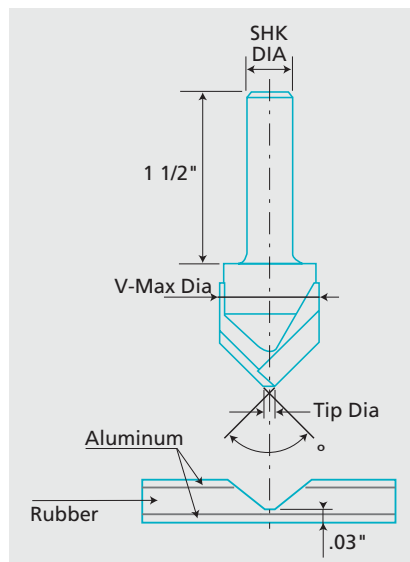


Special Cutter for Aluminum Composite

2 Flute V-Bit for Bending 90° - 135°

TOOL #	V-Angle	V-Max Dia	SHK DIA	TIP DIA	OAL	
99167	90°	3/4	3/8	1/8	2 3/8	(in)
99167A	108°	3/4	3/8	7/64	2 3/8	
99168	135°	3/4	3/8	5/64	2 3/8	
99165	90°	20	8	3	60	(mm)
99166	135°	20	8	2	60	

Right Hand Cut



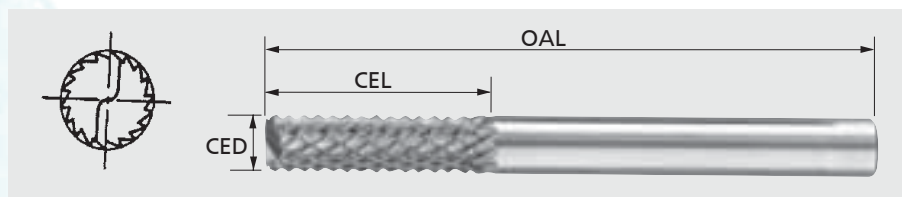
Diamond-Shaped Flutes

Straight Cut ♦♦♦

TOOL #	CED	CEL	SHK DIA	OAL	inches (in)
118317	1/8	1/2	1/8	1 1/2	
118476	3/16	11/16	3/16	2	
118635	1/4	7/8	1/4	2 1/2	
					metric (mm)
118030	3	12	3	38	
118040	4	16	4	50	
118060	6	19	6	63	
118060A	6	25	6	75	
118080	8	25	8	63	
118100	10	25	10	75	



Right Hand Cut



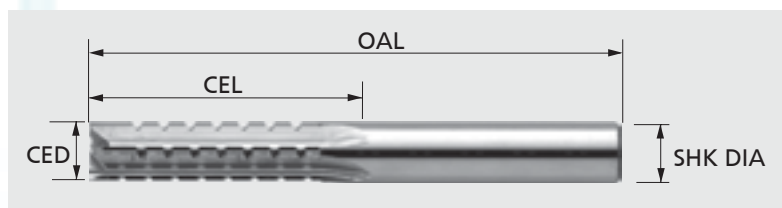
Special Contour Cutter

Straight Cut for PC (Metric)

TOOL #	CED	CEL	SHK DIA	OAL	metric (mm)
02105A	5	19	5	60	
02105B	6	23	6	60	
02105C	8	30	8	70	



Right Hand Cut

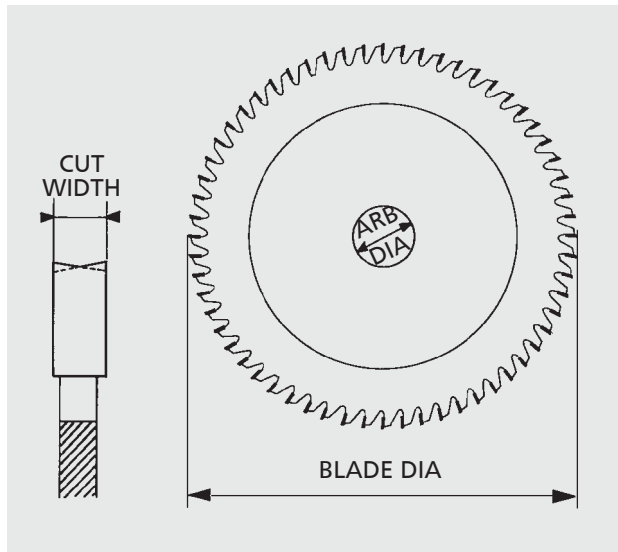


Solid Carbide Saw Cutter

64 Teeth (Metric)



TOOL #	CUT WIDTH	ARBOR DIA	BLADE DIA
20030	1.6	30	200



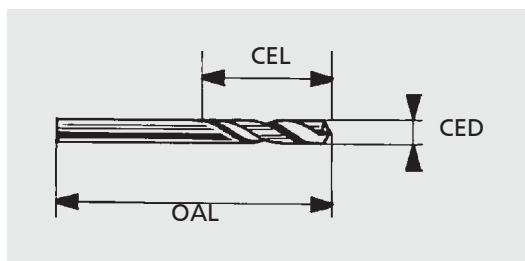
Solid Carbide Drills – 400 Series

Standard Dimensions Listed (Metric)

CED	CEL	OAL	CED	CEL	OAL
1	6	26	3.8 to 4.2	22	55
1.1	7	28	4.3 to 4.7	24	58
1.2 to 1.3	8	30	4.8 to 5.3	26	62
1.4 to 1.5	9	32	5.4 to 6.0	28	66
1.6 to 1.7	10	34	6.1 to 6.7	31	70
1.8 to 1.9	11	36	6.8 to 7.5	34	74
2.0 to 2.1	12	38	7.6 to 8.5	37	79
2.2 to 2.3	13	40	8.6 to 9.5	40	84
2.4 to 2.6	14	43	9.6 to 10.5	43	89
2.7 to 3.0	16	46	10.6 to 11.8	47	95
3.1 to 3.3	18	49	11.9 to 13.2	51	102
3.4 to 3.7	20	52	13.3 to 14.0	54	107

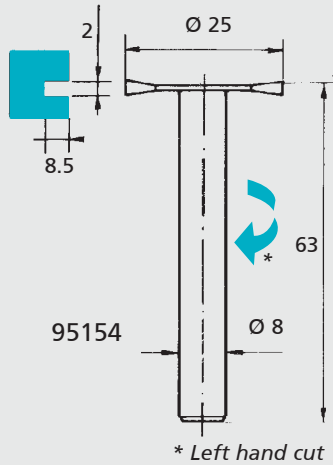
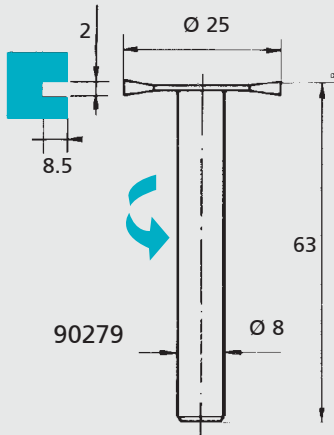


**Up Cut
Right Hand Helix
Right Hand Cut**

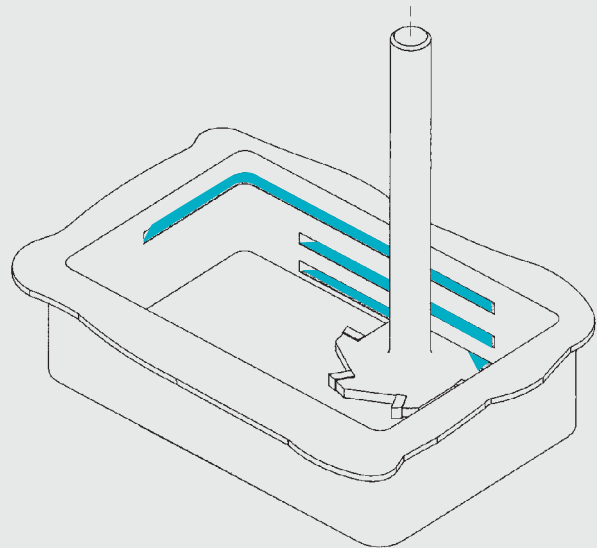
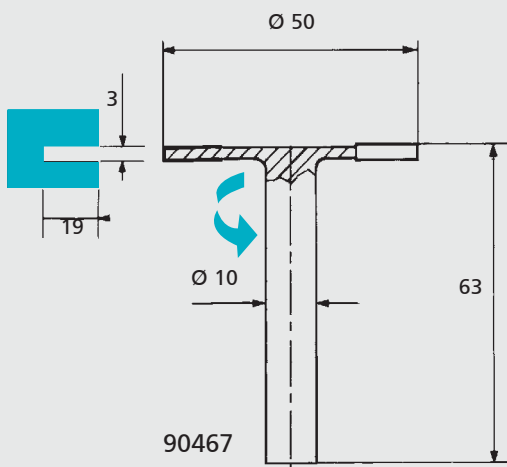
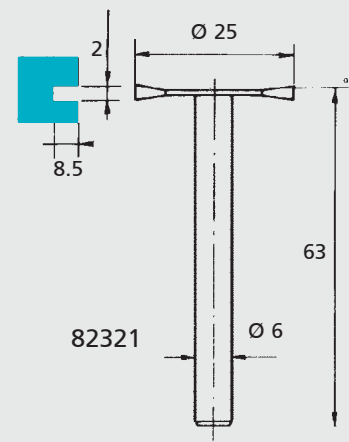
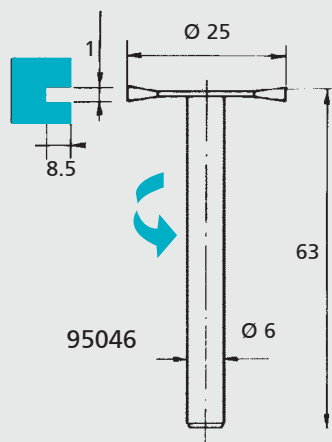
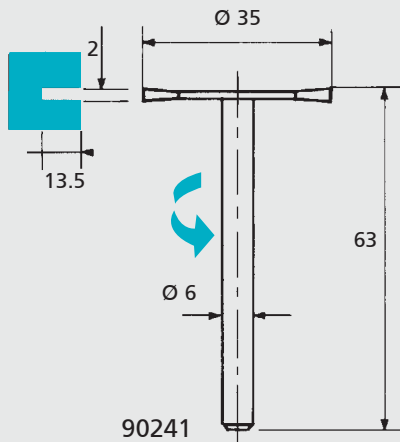


Special Slotting Tool

6 Flute (Metric)



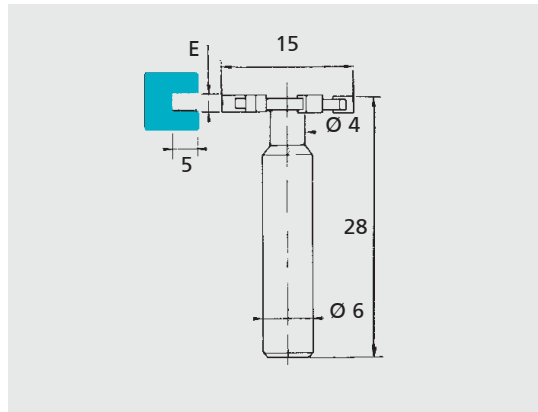
Ø Diameter



Special Slotting Tool

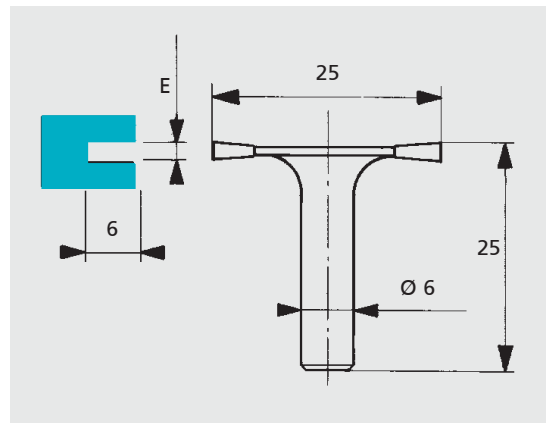
6 Flute (Metric)

TOOL #	E	Ø
18112	1.2	15
18114	1.4	15
18116	1.6	15
18118	1.8	15
18120	2.0	15



Ø Diameter

TOOL #	E	Ø
18010	1.0	25
18011	1.1	25
18012	1.2	25
18013	1.3	25
18014	1.4	25
18015	1.5	25
18016	1.6	25
18018	1.8	25
18020	2.0	25



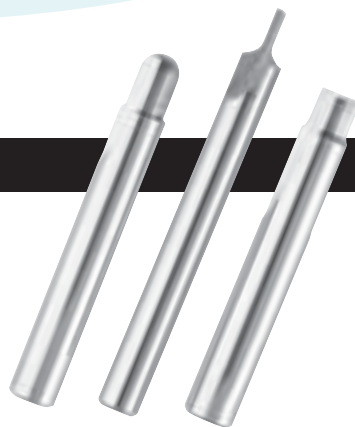
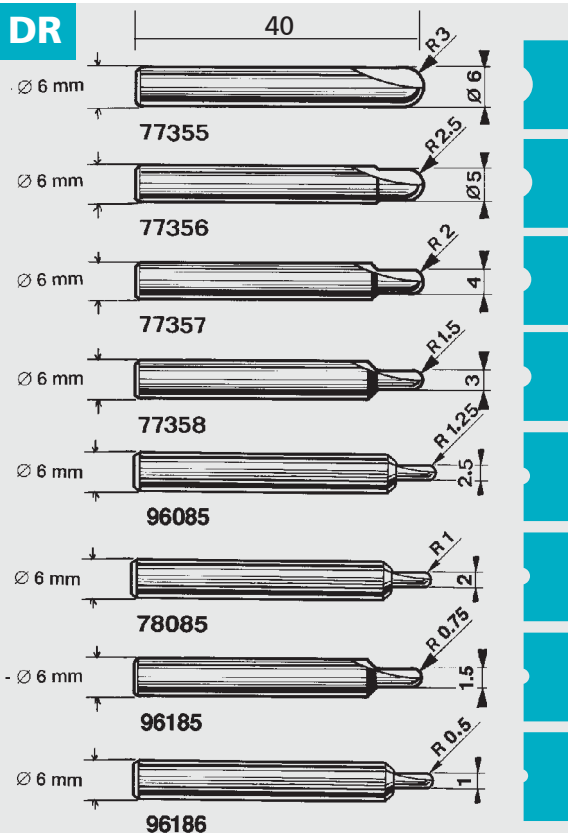
Catalog Abbreviations

IN Inch/Inches	MN Minute
MM Millimeters	Z Number of Flutes / Teeth
M Meters	R Radius
Ø Diameter	RPM Revolutions per Minute
D Diameter	IPM Inches per Minute
R Radius	Ap Max Depth of Cut
CED Cutting Edge Diameter	Ch-CEL Chamfer Cutting Length
CEL Cutting Edge Length	R-CEL Radius Cutting Length
SHK DIA .. Shank Diameter	° Degree / Angle of Cut
SHK L Shank Length	TIP DIA Special Shaping / V-Bits
OAL Overall Length	π 3.14
SFM Cutting Speed – Feet/Mn	Vc Cutting Speed – M/MN
T.I.R. Total Indicated Run-out	

Engraving Tool (DR • FI • P)

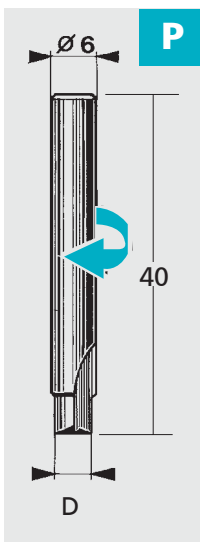
(Metric)

DR



Right Hand Cut

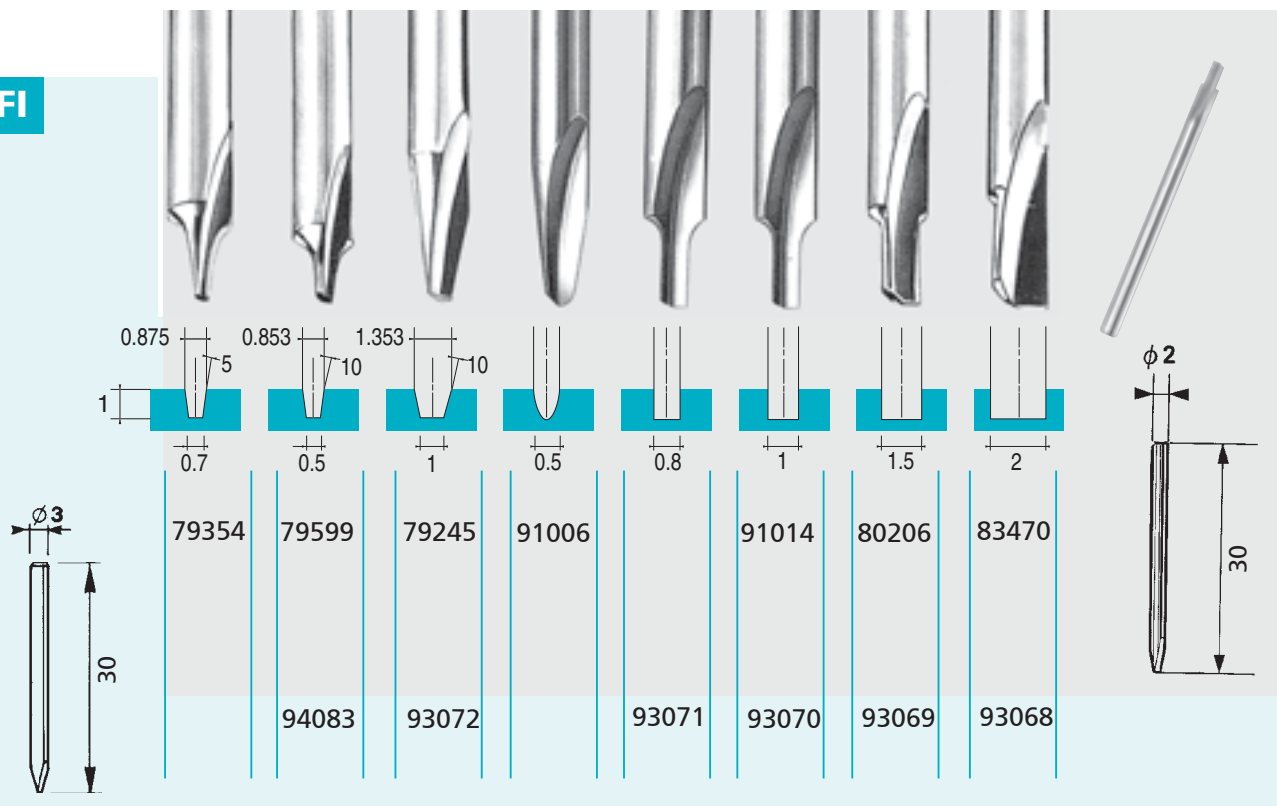
P



TOOL #	D
19020	2
19025	2.5
19030	3
19035	3
19040	4
19045	4.5
19050	5
19055	5.5
19060	6
19080	8

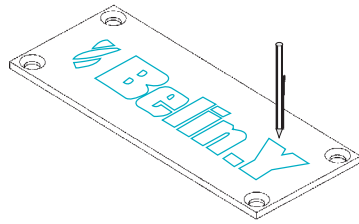
Ø Diameter

FI



Engraving Tool (GR)

Ultra Micrograin Carbide

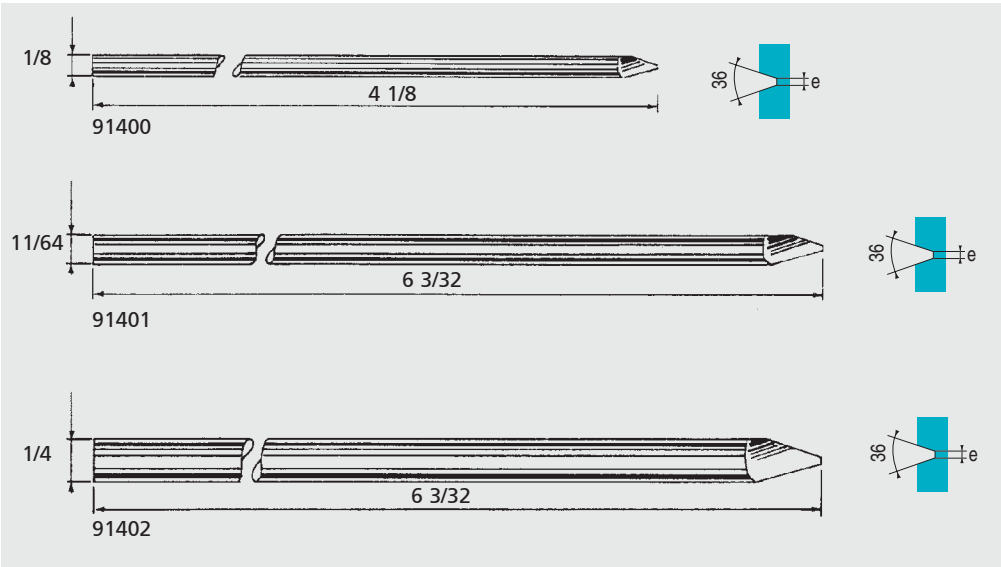


Right Hand Cut

Inches	Metric
 00187	 94163
 00186	 94162
 00185	 94161
 00184	 92176
 00183	 92175
 00182	 91101
 00181	 91100
 00180	 91099
 00179	 91098
 00178	 91097
 00177	 91096

Gravograph Machine – GR

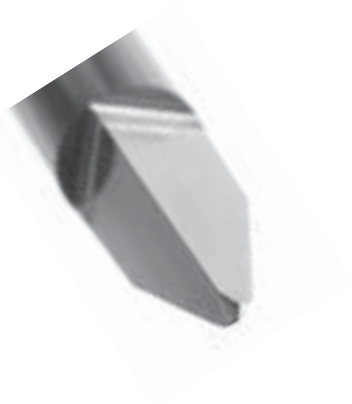
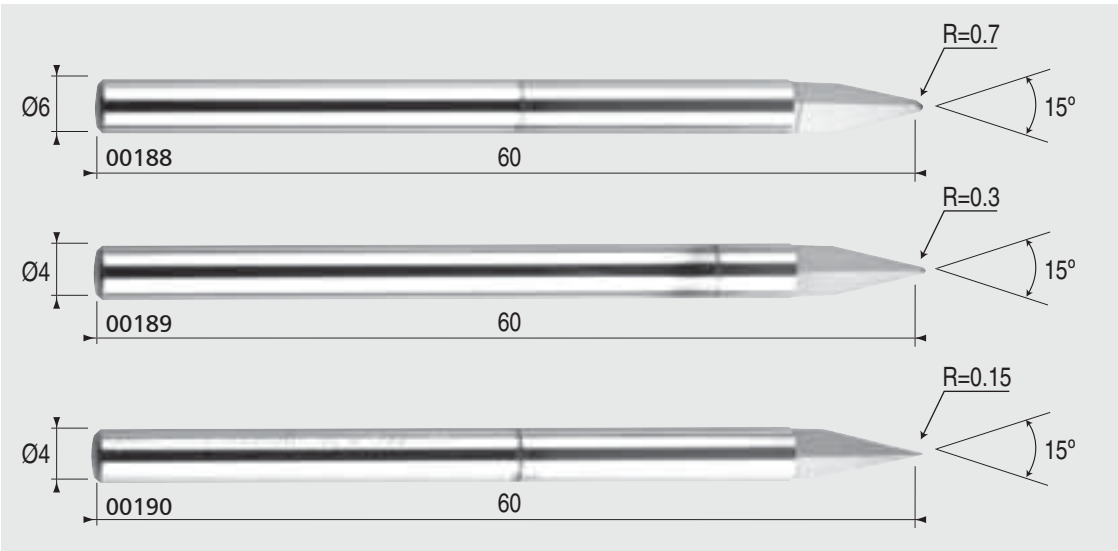
Engraving Tool (GR • GRP)



Tip 'e' available for 91400 series in following tips:

Inch	Metric
.013	0.32
.019	0.50
.030	0.75
.039	1.00
.049	1.25
.078	2.00

Pyramidal Engraving Cutter* / Xtialn Coated – GRP (Metric)



Ø Diameter

* Special cutter for form manufacturing or engraving of hard materials (steel, inox, treated steel)

Vinyl Blades for Top Surface Cut Out of Standard, Thick and Fluorescent Materials



Belin Performance blades made of ultra micrograin carbide provide the highest quality cutting performance and longer blade life. Check and reduce pressure setting on your plotter machine to avoid cutting through the material.

Graphix: 2 - 3 - 4 - Sprint Super-Sprint - Advantage

★ REF: 84272 ♦ REF: 94147

Graphix: ENVISION 375 - 750

★ REF: 00176

Graphix: GSX

★ REF: 94177

KONGSBERG

★ REF: 92171 ♦ REF: 92172

Roland: CAMMI - PNC 1100 - 1500 - 1900 - 450

★ REF: 91115 ♦ REF: 92054

Aristo: AG 50 AG 130

★ REF: 91112 ♦ REF: 94148

Wild: TA 30 - 41/40 - 410 - 500 Zund : P700 - P1200 plus - P2000

★ REF: 95126

Wild: TA 30 - 41/40 - 410... Zund: P700 - P1200 plus - P2000

★ REF: 91113 ♦ REF: 94149

Wild: TA 30 - 41/40 - 410... -500 Zund: P700 - P1200 plus - P2000

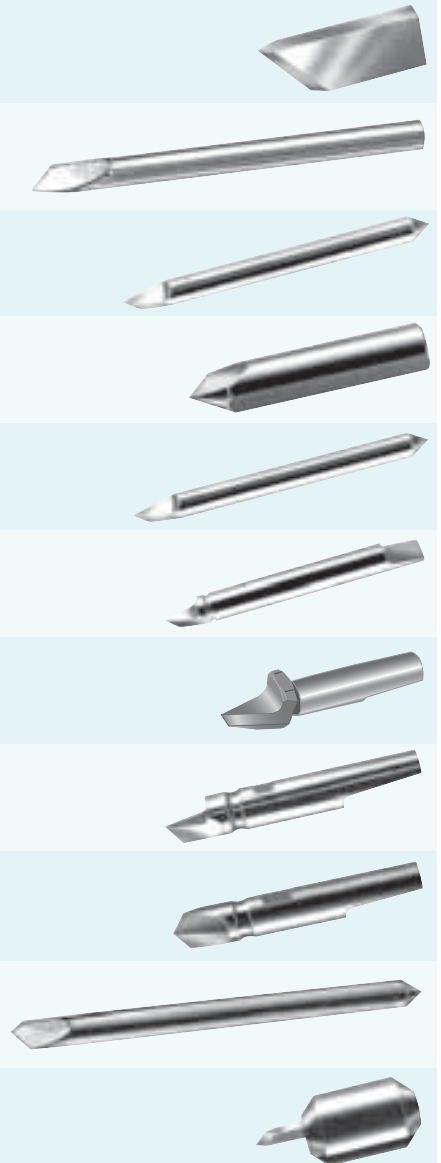
★ REF: 91114 ♦ REF: 94150

SUMMA GRAPHICS: D 610

★ REF: 94170 ♦ REF: 94171

SUMMA GRAPHICS: 69 - T600 HOUSTON

★ REF: 91116



★ *Standard Usage* ♦ *Blade for thick or fluorescent materials*

Vinyl Blades for Top Surface Cut Out of Standard, Thick and Fluorescent Materials

Belin Performance blades made of ultra micrograin carbide provide the highest quality cutting performance and longer blade life. Check and reduce pressure setting on your plotter machine to avoid cutting through the material.

GRAPHITYP: CSR 466 - 700 - TURBO

★ REF: 91272 ♦ REF: 93196



GRAPHITYP: CSR 466 - 700 - TURBO

★ REF: 93278



GRAPHTEC:

★ REF: 93342



MECANUMERIC

★ REF: 94046



SEI: 750 - 1400 CSR: 1000 - 1200 - 2400

★ REF: 94012 ♦ REF: 94151



SEI

★ REF: 94155 ♦ REF: 94156



CSR ECOM 2

★ REF: 93343



MUTHO

★ REF: 96065



MUTHO

★ REF: 94152 ♦ REF: 95003



MIMAKI

★ REF: 94153 ♦ REF: 94154



CREAGRAPH

★ REF: 94165 ♦ REF: 94166



IOLINE

★ REF: 94159 ♦ REF: 94160



WIDMATIC

★ REF: 98293



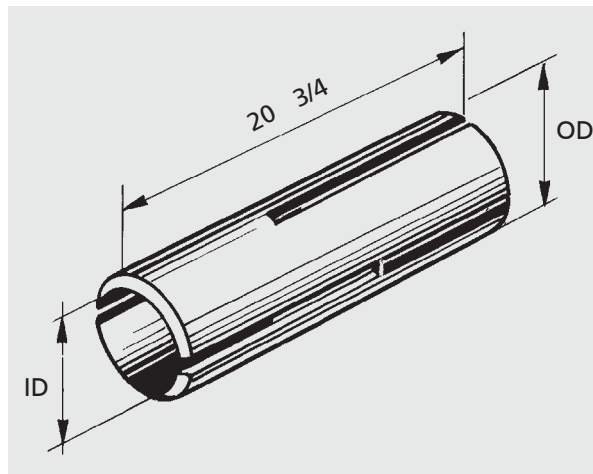
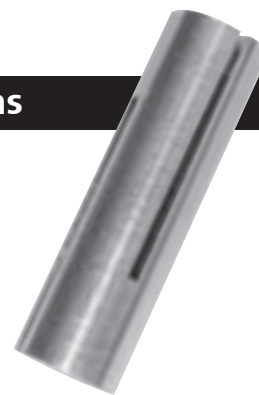
★ *Standard Usage*

♦ *Blade for thick or fluorescent materials*

Tapering Drill Sleeve

Reducer Sleeves for Converting Metric & Inch Dimensions

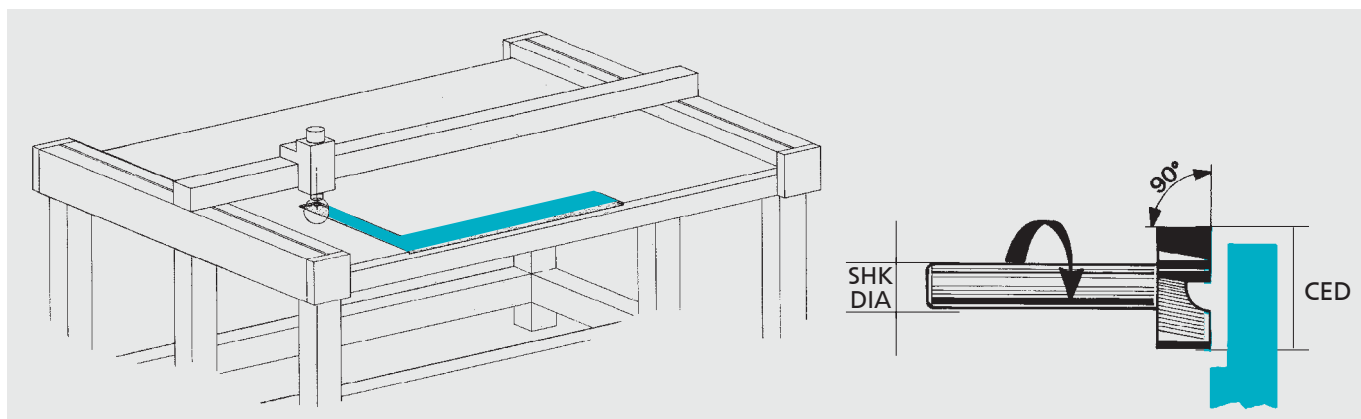
TOOL #	OD	ID	OAL	
86060H	1/4	2 mm	3/4	Inch [in] to Metric [mm]
86060I	1/4	2.5 mm	3/4	
86060J	1/4	3 mm	3/4	
86060K	1/4	4 mm	3/4	
86060A	4	2	20	Metric [mm] to Metric [mm]
86060B	4	2.5	20	
86060C	4	3	20	
86060D	6	2	20	
86060E	6	2.5	20	
86060F	6	3	20	
86060G	6	4	20	
86060L	6	3.17 / 1/8"	20	Metric [mm] to Inch [in]



Special Milling Tool

Re-Surface / Level Table 4 Solid Carbide Cutters

TOOL #	CED	CEL	SHK DIA	OAL	DEG	
45190A	3/4	1/4	1/4	1 1/2	90°	(in)
45190B	1 3/16	1/4	3/8	1 1/2	90°	
45190 - 20	20	6	6	38	90°	(mm)
45190 - 30	30	6	8	38	90°	



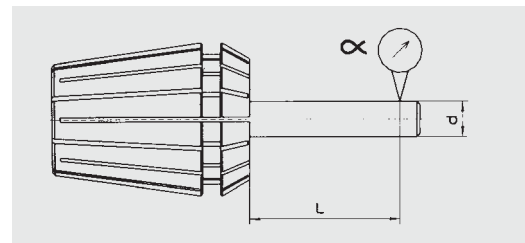
ER 16 (Standard)

Inch

Clamping range of collet for tool holding/grip

COLLET #	Diameter	Decimal (in)	
09816079*	1/32"	.0394	.0197
09816159*	1/16"	.0787	.0394
09816238*	3/32"	.9375	.7375
09816317	1/8"	.1250	.0850
09816476	3/16"	.1875	.1475
09816635	1/4"	.2500	.2100
09816952	3/8"	.3750	.3350

* Micro bore



ER 25 (Standard)

Inch

Clamping range of collet for tool holding/grip

COLLET #	Diameter	Decimal (in)	
09825079*	1/32"	.0394	.0197
09825159*	1/16"	.0787	.0394
09825238*	3/32"	.0984	.0591
09825317	1/8"	.1250	.0850
09825476	3/16"	.1875	.1475
09825635	1/4"	.2500	.2100
09825952	3/8"	.3750	.3350
09825127	1/2"	.5000	.4600
09825158	5/8"	.6250	.5820

* Micro bore

Metric

Shaft Diameter	Shaft Length	T.I.R.*
2-3	10	.01
4-5-6	16	.01
7-8-10	25	.01
12-18	40	.01

*Total Indicated Run-out

ER 32 (Standard)

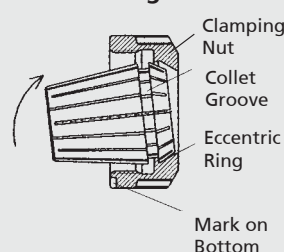
Inch

Clamping range of collet for tool holding/grip

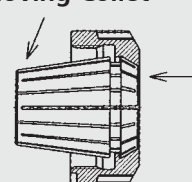
COLLET #	Diameter	Decimal (in)	
09832159*	1/16"	.0787	.0394
09832238*	3/32"	.0984	.0591
09832317	1/8"	.1250	.0850
09832476	3/16"	.1875	.1475
09832635	1/4"	.2500	.2100
09832952	3/8"	.3750	.3350
09832127	1/2"	.5000	.4600
09832158	5/8"	.6250	.5820
09832190	3/4"	.7500	.7100

* Micro bore

Assembling Collet

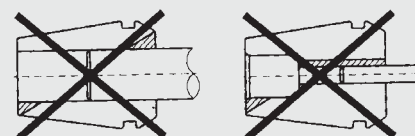
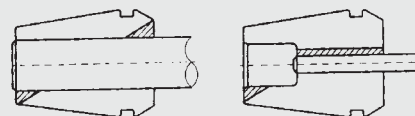


Removing Collet



Never place Collet into spindle/toolholder without first assembling into the Clamping Nut.

Select Collet that is slightly larger than tool.
Never clamp oversize tool shanks in Collet.



Insert tool the full length of the Collet.
Never insert tool less than 2/3 of the Collet.

Metric and ultra-precision collets available upon request.

RDO/EOC type collets available upon request.

m = meter = 39.37 inches
mm = millimeter = .039 inches
mn = minute

BELIN PRECISION TOOLS

METRIC FORMULAS

Recommended cutting & feed rates for specific materials

- Select [Vc] for specific material to rout/mill – **calculate** RPM and Feed Rates using Belin formula
- Plunge at 40-60% [hard materials 20-30%] of the calculated feed rate / avoid tool hitting table in plunge
- Best results are achieved with stable material /proper hold down / no vibration
- Machine rigidity / software / setup / minimal runout [side pressure] - gives best results and longer tool life
- Follow Max. Depth of Cut [Ap] - and - Lubrication/Coolant recommendations for best results
- The quality, efficiency and performance of Belin tools depend on numerous interdependent factors

	Units
Vc Cutting Speed	m/mn
Tool Diameter	mm
R Tool Radius	mm
Ad Feed Rate per minute	mm
N Rotation per minute	RPM
Z Number of teeth / flutes	
Ap Maximum depth of cut	mm

Material	Vc	Metric - Ad (Feed rate per minute) Cutting Edge Diameters in mm			Ap 	Lubricant	Recommended		
		Ø < 3mm	3mm < Ø < 8mm	Ø > 8mm					
Aluminum Pure	200<Vc<400	0.01xDxZxN R	0.02xDxZxN D	0.025xDxZxN D	Ap	Petrol or RGV Swarf soft, sticky	176 22000 33000 99203	176	176
Aluminum Alloy	200<Vc<400	0.01xDxZxN R	0.02xDxZxN D	0.025xDxZxN D	Ap	Cutting oil emulsion Drier swarf	176 22000 33000 99203	102 176 15000 16000	102 176 15000 16000
Brass	150<Vc<300	0.01xDxZxN R	0.02xDxZxN D	0.025xDxZxN D	Ap	Cutting oil emulsion	176 22000 33000 99203	102 176 15000 16000	102 176 15000 16000
Bronze- Zinc	100<Vc<150	0.01xDxZxN R	0.02xDxZxN D	0.025xDxZxN D	Ap	Cutting oil emulsion	176 22000 33000 99203	102 176 15000 16000	102 176 15000 16000
Material	Vc	Ø < 4mm	4mm < Ø < 8mm	Ø > 8mm					
Plastics - Bakelite	50<Vc<100	0.03xDxZxN 1.5xR	0.04xDxZxN 1.5xD	0.045xDxZxN 1.5xD	Ap	Air	12000 13000 91361 94106 99058	13000 91361 94106	13000 91361 94106
Plastics - PVC	100< Vc <200	0.03xDxZxN 1.5xR	0.04xDxZxN 1.5xD	0.045xDxZxN 1.5xD	Ap	Air	12000 13000 91361 94106 99058	13000 91361 94106	13000 91361 94106
Plastics - Acetate Plexiglas - Nylon	300< Vc <500	0.03xDxZxN 1.5xR	0.04xDxZxN 1.5xD	0.045xDxZxN 1.5xD	Ap	Air Vaporized water	12000 13000 91361 94106 99058	13000 91361 94106	13000 91361 94106
Material	Vc	Ø < 3mm	3mm < Ø < 8mm	Ø > 8mm					
Wood	300< Vc <400	0.01xDxZxN 1.5xR	0.02xDxZxN 1.5xD	0.025xDxZxN 1.5xD	Ap	Air	12000 13000 91361 94106 99058	13000 91361 94106	13000 91361 94106
Material	Vc	Ø < 3mm	3mm < Ø < 8mm	Ø > 8mm					
Stainless Steel	90	0.0033xDxZxN R	0.0045xDxZxN R	0.0045xDxZxN R	Ap	Cutting oil emulsion	102 16000	102 15000	102 16000

$$\text{Formulas: } N = \frac{1000 \times Vc}{\Pi \times D} \quad Vc = \frac{\Pi \times D \times N}{1000}$$

For other tool profiles refer to bottom of catalog page for cutting information.

BELIN PRECISION TOOLS

INCH FORMULAS

Recommended cutting & feed rates for specific materials

- Select [SFM] for specific material to rout/mill – **calculate** RPM and Feed Rates using Belin formula
- Plunge at 40-60% [hard materials 20-30%] of the calculated feed rate / avoid tool hitting table in plunge
- Best results are achieved with stable material /proper hold down / no vibration
- Machine rigidity / software / setup / minimal runout [side pressure] - gives best results and longer tool life
- Follow Max. Depth of Cut [Ap] - and - Lubrication/Coolant recommendations for best results
- The quality, efficiency and performance of Belin tools depend on numerous interdependent factors

	Units
SFM	Cutting Speed
D	Tool Diameter
R	Tool Radius
IPM	Inches per minute / Feed Rate
RPM	Revolutions per minute
Z	Number- Flutes /Teeth
Ap	Maximum depth of cut
	Inches

IPM (Feed rate per minute) by Cutting Edge Diameters - inches				Ap- Max depth of cut each pass	Lubricant/Coolant	Recommended		
Materials	SFM	Up to 1/8"	3/16" to 3/8"	3/8" to 1"				
Aluminum Pure	> 1000	.0004xDxZxRPM x25.4 R	.0008xDxZxRPM x25.4 D	.001xDxZxRPM x25.4 D	Ap	Petrol or RGV Swarf soft, sticky oil	176000 22000 33000	176000 00199 00203
Aluminum Alloy	> 1000	.0004xDxZxRPM x25.4 R	.0008xDxZxRPM x25.4 D	.001xDxZxRPM x25.4 D	Ap	Cutting emulsion Drier swarf	99203	102000 176000 16000
Brass	490 < > 1000	.0004xDxZxRPM x25.4 R	.0008xDxZxRPM x25.4 D	.001xDxZxRPM x25.4 D	Ap	Cutting oil emulsion	176000 22000 33000	102000 176000 16000
Bronze- Zinc	330 < > 500	.0004xDxZxRPM x25.4 R	.0008xDxZxRPM x25.4 D	.001xDxZxRPM x25.4 D	Ap	Cutting oil emulsion	99203	
Materials	SFM	Up to 1/8"	3/16" to 3/8"	3/8" to 1"				
Plastics - Bakelite	160 < > 330	.0012xDxZxRPM x25.4 1.5xR	.0016xDxZxRPM x25.4 1.5xD	.0018xDxZxRPM x25.4 1.5xD	Ap	Air	12000 13000 91361	13000 91361 91361
Plastics - PVC	330 < > 700	.0012xDxZxRPM x25.4 1.5xR	.0016xDxZxRPM x25.4 1.5xD	.0018xDxZxRPM x25.4 1.5xD	Ap	Air	94106 99058	94106 00196 00192
Plastics - Acetate Plexiglas - Nylon	980 < > 1600	.0012xDxZxRPM x25.4 1.5xR	.0016xDxZxRPM x25.4 1.5xD	.0018xDxZxRPM x25.4 1.5xD	Ap	Vaporised water		43000
Materials	SFM	Up to 1/8"	3/16" to 3/8"	3/8" to 1"				
Wood	980 < > 1300	.0004xDxZxRPM x25.4 1.5xR	.0008xDxZxRPM x25.4 1.5xD	.001xDxZxRPM x25.4 1.5xD	Ap	Air		
Materials	SFM	Up to 1/8"	3/16" to 3/8"	3/8" to 1"				
Stainless steel	300	.00013xDxZxRPMx25.4 R	.00018xDxZxRPM x25.4 R	.00018xDxZxRPMx25.4 R	Ap	Cutting oil emulsion	102000 16000	102000 15000 16000

Formulas: $RPM = \frac{SFM}{0.2618 \times D}$ $SFM = 0.262 \times D \times RPM$

For other tool profiles refer to bottom of catalog page for cutting information.

Follow the CNC machine manufacturer guidelines for setup — alignment — calibration and maintenance schedules. Regular attention to these guidelines will keep your CNC machine in top operating condition. Belin Precision Tools work best in well-maintained CNC machines giving excellent cutting performance and longer tool life.

CNC Rigidity – Setup – machine stability is when material hold down is achieved with no movement and minimal vibration. Also, consider that software programs need to be verified and the spindle(s) aligned and calibrated, creating the optimum working conditions to minimize runout side pressures giving the best cut/edge quality and longer tool life.

Collets – inspect often, especially if you change tools hourly — daily — weekly. Clean and inspect collets at every tool changeover. Replace collets at the first sign of wear. Worn or dirty collets will contribute to shorter tool life and tool breakage.

Plunging the material – harder the material to be routed/milled, the softer you should plunge. Reducing the plunge helps to avoid damaging the tool as it “hits” the material. Consider slower plunge when using small diameter tools, extra long cutting length tools and flatter tipped tools.

Examples:

Plastic/Wood – 40-60% of the calculated feed rate [IPM]

Aluminum/Non-Ferrous – 35-50% of the calculated feed rate [IPM]

Steel/Ferrous Metal – 20-30% of the calculated feed rate [IPM]

Depth of Cut – ‘Ap’ – important to follow the recommended ‘Ap’ listed on the Belin Cutting Formula Chart. Smaller cutting edge diameters and harder material being routed/milled require the depth of cut ‘Ap’ be reduced. Exceeding the recommended ‘Ap’ can contribute to less than optimal edge quality, shorter tool life and tool breakage.

Examples:

1/8" CED - rout/mill aluminum – ‘Ap’ R- radius = 1/16" ‘Ap’ per pass/cut

1/4" CED - rout/mill steel/ferrous metal – ‘Ap’ R- radius = 1/8" ‘Ap’ per pass/cut

3/16" CED - rout/mill aluminum – ‘Ap’ D- diameter = 3/16" ‘Ap’ per pass/cut

1/8" CED - rout/mill plastic/wood – ‘Ap’ 1.5 x R- radius = 3/16" ‘Ap’ per pass/cut

1/4" CED - rout/mill plastic/wood – ‘Ap’ 1.5 x D- diameter = 3/8" ‘Ap’ per pass/cut

Lubricant - Coolant – follow recommendation on the Belin Cutting Formula Chart for safe CNC production. Routing – Milling without recommended lubricant-coolant will contribute to shorter tool life, less than optimum edge quality and tool breakage.

Problems to consider when lubricant – coolant is not used:

- ❖ Contributes to weld back when routing – milling most plastic materials
- ❖ Excessive heat builds up of when routing – milling non-ferrous and ferrous metal creating an unsafe working environment and potential fire hazard.

RPM Formula/Cutting Edge Diameters (1/16" Thru 1")

SFM listed by material type on the Belin Cutting Formula Chart.
Calculate RPM by multiplying .262* x CED = .0000 (listed below) –
that result is then divided into SFM which = RPM
*[Pi (3.14) divided by 12 = .262 rounded]

$$\text{RPM} = \frac{\text{SFM}}{.262 \times \text{CED}}$$

1/16 - .063 x .262 = .0165	9/16 - .563 x .262 = .1475
1/8 - .125 x .262 = .0328	5/8 - .625 x .262 = .1638
3/16 - .188 x .262 = .0493	11/16 - .688 x .262 = .1803
1/4 - .250 x .262 = .0655	3/4 - .750 x .262 = .1965
5/16 - .313 x .262 = .0820	13/16 - .813 x .262 = .2130
3/8 - .375 x .262 = .0983	7/8 - .875 x .262 = .2293
7/16 - .438 x .262 = .1148	15/16 - .938 x .262 = .2458
1/2 - .500 x .262 = .1310	1/1 - 1.000 x .262 = .2620

DECIMAL / METRIC CONVERTER

Inch		mm	Inch		mm
1/64	.015	0.396	33/64	.515	13.096
1/32	.031	0.793	17/32	.531	13.493
3/64	.046	1.190	35/64	.546	13.890
1/16	.062	1.587	9/16	.562	14.287
5/64	.078	1.984	37/64	.578	14.684
3/32	.093	2.381	19/32	.593	15.081
7/64	.109	2.778	39/64	.609	15.478
1/8	.125	3.175	5/8	.625	15.875
9/64	.140	3.571	41/64	.640	16.271
5/32	.156	3.968	21/32	.656	16.668
11/64	.171	4.365	43/64	.671	17.065
3/16	.187	4.762	11/16	.687	17.462
13/64	.203	5.159	45/64	.703	17.859
7/32	.218	5.556	23/32	.718	18.256
15/64	.234	5.953	47/64	.734	18.653
1/4	.250	6.350	3/4	.750	19.050
17/64	.265	6.746	49/64	.765	19.446
9/32	.281	7.143	25/32	.781	19.843
19/64	.296	7.540	51/64	.796	20.240
5/16	.312	7.937	13/16	.812	20.637
21/64	.328	8.334	53/64	.828	21.034
11/32	.343	8.731	27/32	.843	21.431
23/64	.359	9.123	55/64	.859	21.828
3/8	.375	9.525	7/8	.875	22.225
25/64	.390	9.921	57/64	.890	22.621
13/32	.406	10.318	29/32	.906	23.018
27/64	.421	10.715	59/64	.921	23.415
7/16	.437	11.112	15/16	.937	23.812
29/64	.453	11.509	61/64	.953	24.209
15/32	.468	11.906	31/32	.968	24.606
31/64	.484	12.303	63/64	.984	25.003
1/2	.500	12.700	1/1	1.000	25.400

Examples of RPM calculated for:

ALUMINUM - SFM 1000

Material to be routed - milled - Aluminum – SFM 1000

Formula .262 x CED [Cutting Edge Diameter] .262 x 1/4" [.250] = .0655

SFM – 1000 divided by .0655 = 15,267 RPM

PLASTIC/WOOD - SFM - select by material type – SFM range 160 to 1600

Material to be routed - milled - example Plexiglas - 1200 SFM

Material to be routed - milled - example PVC - 600 SFM

Material to be routed - milled - example Hardwood - 980 SFM

Formula .262 x CED [Cutting Edge Diameter] .262 x 3/16" [.188] = .0493

SFM – 1200 divided by .0493 = 24,340 RPM for Plexiglas

SFM – 600 divided by .0493 = 12,170 RPM for PVC

SFM – 980 divided by .0493 = 19,880 RPM for Hardwood

STEEL/FERROUS METAL - SFM 300

Material to be routed - milled - Stainless Steel – SFM 300

Formula .262 x CED [Cutting Edge Diameter] .262 x 3/16" [.188] = .0493

SFM – 300 divided by .0493 = 6085 RPM

REFERENCES	PAGE	REFERENCES	PAGE	REFERENCES	PAGE	REFERENCES	PAGE	REFERENCES	PAGE	REFERENCES	PAGE
00176	31	02014	21	73 ...	15,16	90241	26	93070	28	95126	31
00177	29	02015	21	75349	15	90279	26	93071	28	95154	26
00178	29	02105 –	24	76462	16	90467	26	93072	28	95209 –	8
00179	29	02107	13	77036	22	91006	28	93196	32	96065	32
00180	29	098 ...	34	77038	22	91014	28	93278	32	96085	28
00181	29	102 ...	12	77040	22	91094	22	93342	32	96185	28
00182	29	117 ...	17	77044	22	91095	22	93343	32	96186	28
00183	29	118 ...	24	77310	20	91096	29	94012	32	96188	23
00184	29	12 ...	4	77311	20	91097	29	94046	32	97251	13
00185	29	13 ...	5	77312	20	91098	29	94083	28	98103	13
00186	29	15 ...	12	77313	20	91099	29	94147	31	98104	13
00187	29	16 ...	12	77314	20	91100	29	94148	31	98105	13
00188	30	176 ...	11	77315	20	91101	29	94149	31	98106	19
00189	30	18 ...	27	77316	20	91105	23	94150	31	98107	19
00190	30	19 ...	28	77317	20	91106	23	94151	32	98108	19
00191	6	193 ...	7	77351	16	91112	31	94152	32	98109	19
00192	6	194 ...	17	77352	16	91113	31	94153	32	98110	19
00193	6	20030	25	77353	16	91114	31	94154	32	98111	19
00194	6	201 ...	14	77354	16	91115	31	94155	32	98293	32
00195	6	202 ...	14	77355	28	91116	31	94156	32	99058	6
00196	6	22 ...	9	77356	28	91176	13	94159	32	99159	21
00197	6	31 ...	8	77357	28	91272	32	94160	32	99160	21
00198	10	33 ...	10	77358	28	91400	30	94161	29	99161	21
00199 –	10	400 ...	25	78085	28	91401	30	94162	29	99162	21
00200	10	43 ...	7	79 ...	28	91402	30	94163	29	99163	21
00201	9	45 ...	18	80039	20	92054	31	94165	32	99164	21
00202	9	45190 A / B	33	80206	28	92171	31	94166	32	99165	23
00203	9	47 ...	18	82321	26	92172	31	94170	31	99166	23
00204	9	48 ...	18	83470	28	92175	29	94171	31	99167 –	23
00209	23	68 ...	15	84272	31	92176	29	94177	31	99168	23
00210	23	71 ...	15	86 ...	33	93068	28	95003	32	99203	10
02013	21	72 ...	16	90073 –	11	93069	28	95046	26		

BELIN

A member of the **LMT** group

BELIN Yvon s.a.
BP 6
01590 LAVANCIA
FRANCE
*HEAD OFFICE AND PLANT LAVANCIA
(JURA) - FRANCE*

TEL: 33 4 74 75 89 89
TELEFAX: 33 4 74 75 89 90
E-MAIL: belin@belin-y.com
Web site: www.belin-y.com



Distributed by:

BELIN PRECISION TOOLS

Lanson & Associates

2475 Jen Drive, #3
Melbourne, FL 32940 USA
Ph: 321.757.3232
Fx: 321.757.3225
E-mail: info@belintools.com
Web site: www.belintools.com

CNC Production Tools for Routing/Milling:

Plastic:

Bakelite
Acrylic
PVC
Acetate
Plexiglass
Nylon
Polycarbonate
Solid Surface
Foam Board

Wood / Wood Composite:

Hard/Soft - Wood - Various Types
Plywood/MDO
Laminated Materials

Non-ferrous Metal:

Aluminum
Aluminum Alloy
Aluminum Composite
Brass
Copper
Zinc

Ferrous Metal:

Steel
Stainless Steel
Titanium

Special Applications:

Fiberglass/Glass Epoxy
Graphite/Carbon Fiber/Resin
Composite Materials