Cerin®

CUTTING TOOLS MANUFACTURING

Endmills for plastic materials

Endmills for plexiglass

Endmills for light alloys

Plastic and Light Alloys Milling

Cerin®
CUTTING TOOLS MANUFACTURING

Products and processes for advanced solutions

Since 1971 Cerin has been among the Italian leaders in precision engineering. For more than 50 years of activity the company has been closely involved in solid carbide technological development as well as its many fields of application, both traditional and highly innovative.

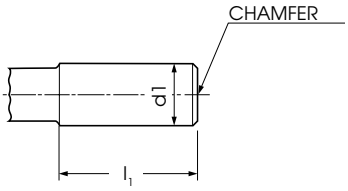
Today, Cerin provides its customers with the benefit of a long experience by offering a complete range of high performance cutters dedicated to the machining of plastic and light alloys.

QUALITY SYSTEM CERTIFICATION
DNV
ISO 9001

COMPANY WITH
QUALITY SYSTEM
CERTIFIED BY DNV
ISO 9001

Shank design (for drilling and milling tools) DIN 6535

Straight cylindrical shank - Shape HA

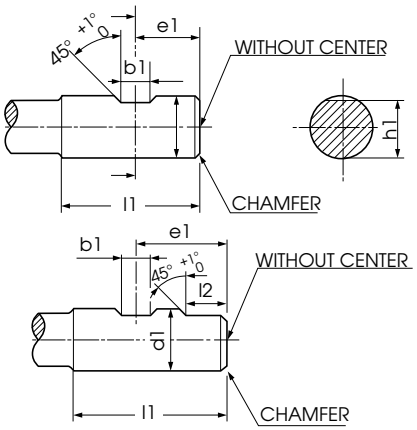


d_1	l_1	d_1	l_1	d_1	l_1
h6	+2/0	h6	+2/0	h6	+2/0
2	28	8	36	18	48
3	28	10	40	20	50
4	28	12	45	25	56
5	28	14	45	32	60
6	36	16	48		

Cylindrical shank - Shape HB

one Weldon flat - d1 = 6 to 20 mm

two Weldon flats - d1 = 25 to 32 mm

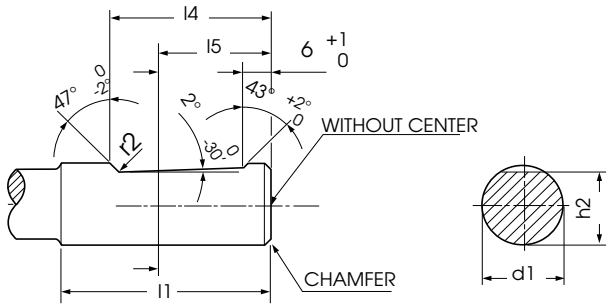


d_1	b_1	e_1	h_1	l_1	l_2
h6	+0,05/0	0/-1	h11	+2/0	+1/0
6	4,2	18	5,1	36	
8	5,5	18	6,9	36	
10	7	20	8,5	40	
12	8	22,5	10,4	45	
14	8	22,5	12,7	45	
16	10	24	14,2	48	
18	10	24	16,2	48	
20	11	25	18,2	50	
25	12	32	23	56	17
32	14	36	32	60	19

Cylindrical shank - Shape HE

one slope flat - d1 = 6 to 20 mm

one slope flat - d1 = 25 to 32 mm



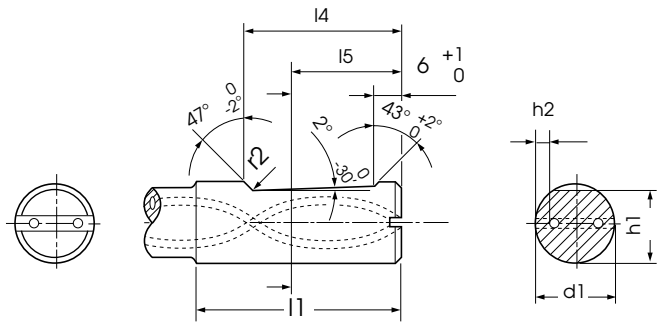
d_1	(b_2)	(b_3)	h_2	(h_3)	l_1	l_4	l_5	r_2
h6			h11		+2 / 0	0 / -1	Nominal size	min.
6	4,3		5,1		36	25	18	1,2
8	5,5		6,9		36	25	18	1,2
10	7,1		8,5		40	28	20	1,2
12	8,2		10,4		45	33	22,5	1,2
14	8,1		12,7		45	33	22,5	1,2
16	10,1		14,2		48	36	24	1,6
18	10,8		16,2		48	36	24	1,6
20	11,4		18,2		50	38	25	1,6
25	13,8	9,3	23	24,1	56	44	32	1,6
32	15,5	9,9	30	31,2	60	48	35	1,6

Shank design (for drilling and milling tools) similar to DIN 6535

Cylindrical shank - Shape HEK

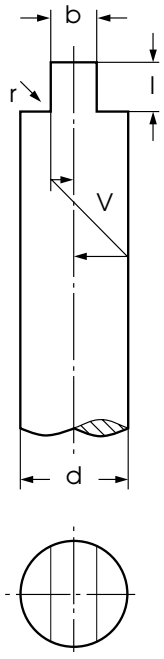
one slope flat - d1 = 6 to 20 mm

one slope flat - d1 = 25 to 32 mm



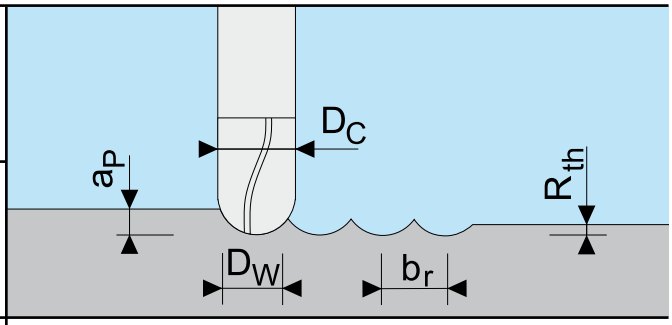
d_1	l_1	l_4	l_5	h_1	r_2	h_2
h6	+2/0	0/-1	Nominal size	h11		min.
6	36	25	18	5,3	1,2	1,3
8	36	25	18	7,1	1,2	1,5
10	40	28	20	8,9	1,2	1,8
12	45	33	22,5	10,9	1,2	2
14	45	33	22,5	12,4	1,2	2,5
16	48	36	24	14,5	1,6	2,5
18	48	36	24	16,2	1,6	2,8
20	50	38	25	18,2	1,6	3
25	56	44	32	23	1,6	3,7
32	60	48	35	30	1,6	4,5

Shank with drive tenon DIN 1809

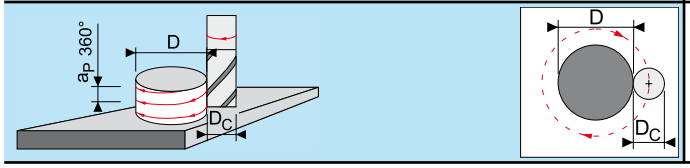


d		b	l	r	v
from	up to	h12	± IT16[1]		
3	3,5	1,6	2,2	0,2	0,05
3,5	4	2	2,2	0,2	0,05
4	4,5	2,2	2,5	0,2	0,05
4,5	5,5	2,5	2,5	0,2	0,05
5,5	6,5	3	3	0,2	0,05
6,5	8	3,5	3,5	0,2	0,06
8	9,5	4,5	4,5	0,4	0,06
9,5	11	5	5	0,4	0,06
11	13	6	6	0,4	0,06
13	15	7	7	0,4	0,08
15	18	8	8	0,4	0,08
18	21	10	10	0,4	0,08
21	24	11	11	0,6	0,1
24	27	13	13	0,6	0,1
27	30	14	14	0,6	0,1
30	34	16	16	0,6	0,1
34	38	18	18	0,6	0,1
38	42	20	19	0,6	0,15
42	46	22	20	1	0,15
46	50	24	22	1	0,15

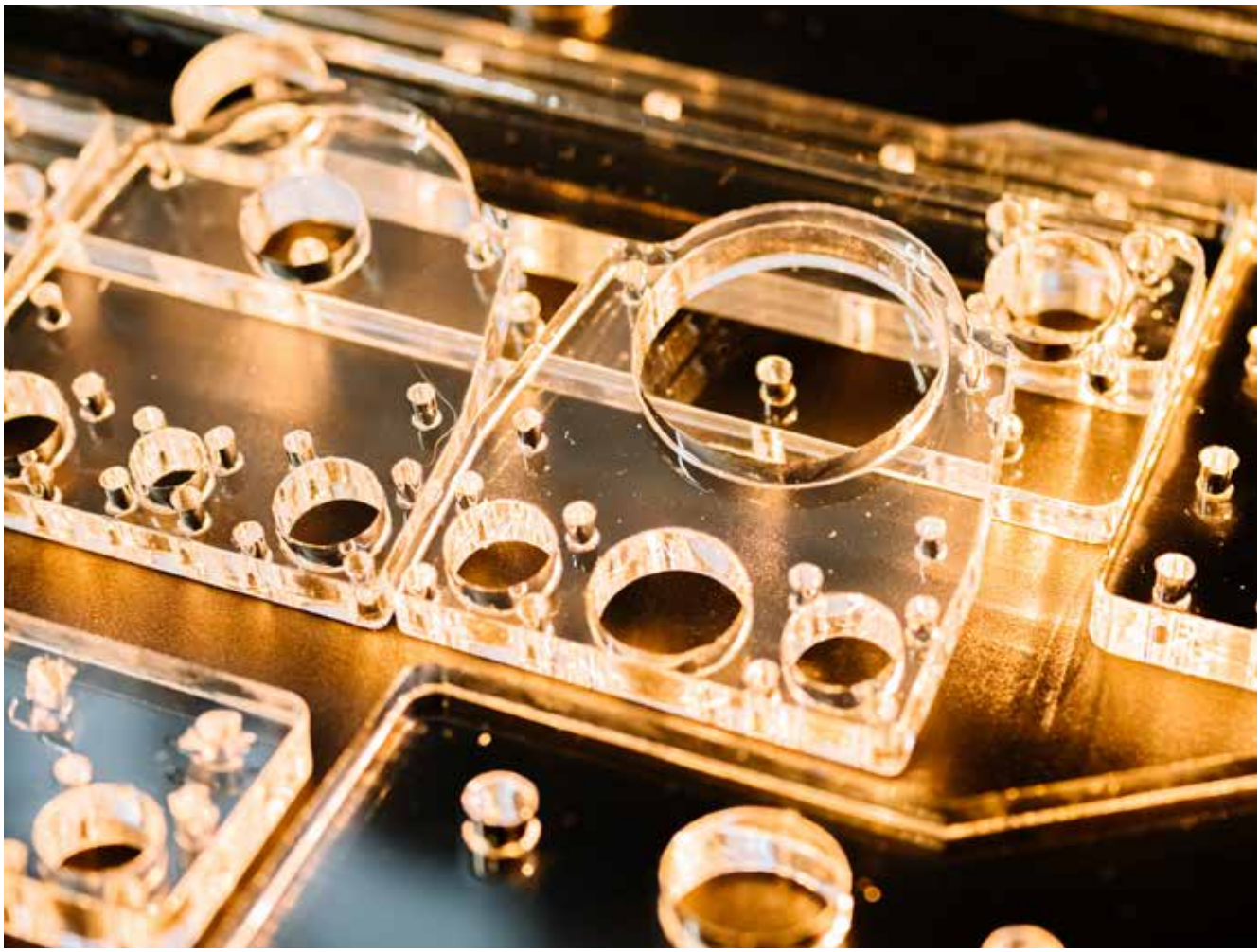
Formulae of calculation

End mills - Tours cutters - Ball nose cutters		Trace milling	
Revolution per minute	$n = \frac{V_c \times 1000}{D_c \times 3,14}$		
Cutting speed	$V_c = \frac{D_c \times 3,14 \times n}{1000}$		
Feed per tooth	$f_z = \frac{V_f}{Z_n \times n}$	R_{th} Surface roughness b_r Line offset D_w Working diameter	
Feed for revolution	$f = f_z \times Z_n$	Roughness	$R_{th} = \frac{D_c}{2} - \sqrt{\frac{D_c^2 - b_r^2}{4}}$
Feed per minute	$V_f = f_z \times Z_n \times n$	Line offset	$b_f = 2\sqrt{R_{th}(D_c - R_{th})}$
Average chip thickness	$h_m = f_z \times \sqrt{\frac{a_e}{D_c}}$	Working diameter	$D_w = 2\sqrt{a_p(D_c - a_p)}$

Formulae of calculation

Circular milling - Drill milling - Feed based on movement of the cutter axis VfM (mm/min.)		
	Internal profile	$V_{fM} = \frac{V_f \times (D - D_c)}{D}$
	External profile	$V_{fM} = \frac{V_f \times (D + D_c)}{D}$

Plastic and Light Alloys Milling

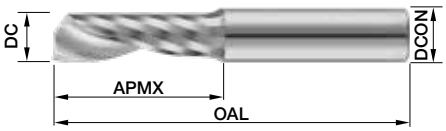


Plastic Materials
Milling

110

PLASTIC MATERIALS MILLING

Single flute endmill - Right helix



110

HM
K20-K30
Micrograin

WN

HA

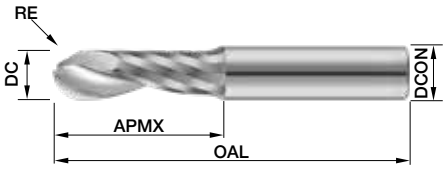
45°

25°

29°

Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
110.015030640	1,5	6	40	3
110.020030640	2	6	40	3
110.020021040	2	10	40	2
110.020060550	2	5	50	6
110.020061060	2	10	60	6
110.025250640	2,5	6	40	2,5
110.030031240	3	12	40	3
110.030060750	3	7	50	6
110.030061060	3	10	60	6
110.030061260	3	12	60	6
110.030061560	3	15	60	6
110.040041540	4	15	40	4
110.040060950	4	9	50	6
110.040061260	4	12	60	6
110.040061560	4	15	60	6
110.040062075	4	20	75	6
110.050061150	5	11	50	6
110.050051650	5	16	50	5
110.050061660	5	16	60	6
110.050062875	5	28	75	6
110.060061350	6	13	50	6
110.060062060	6	20	60	6
110.060062260	6	22	60	6
110.060063060	6	30	60	6
110.060063575	6	35	75	6
110.080081763	8	17	63	8
110.080082263	8	22	63	8
110.080083575	8	35	75	8
110.0800845100	8	45	100	8
110.100102572	10	25	72	10
110.100103580	10	35	80	10
110.1001055100	10	55	100	10
110.120123083	12	30	83	12
110.1201255110	12	55	110	12
110.140143083	14	30	83	14
110.160163592	16	35	92	16
110.1601670125	16	70	125	16
110.2002040104	20	40	104	20
110.2002060125	20	60	125	20

PLASTIC MATERIALS MILLING
Ball nose single flute endmill - Right helix

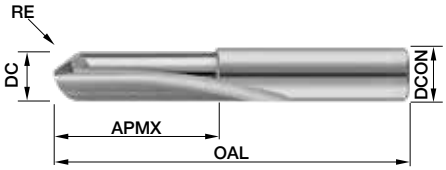


110R

HM K20-K30 Micrograin | WN | HA | 25° | 29° | r=

Cod.	DC	APMX	OAL	DCON	RE
	h10	0/+2	0/+2	h6	+/-0,05
110R.020030640	2	6	40	3	1
110R.020061060	2	10	60	6	1
110R.030031240	3	12	40	3	1,5
110R.030061260	3	12	60	6	1,5
110R.040041540	4	15	40	4	2
110R.040061560	4	15	60	6	2
110R.050061660	5	16	60	6	2,5
110R.050051650	5	16	50	5	2,5
110R.060062060	6	20	60	6	3
110R.060063060	6	30	60	6	3
110R.060063575	6	35	75	6	3
110R.080082263	8	22	63	8	4
110R.0800840100	8	40	100	8	4
110R.100102572	10	25	72	10	5
110R.1001055100	10	55	100	10	5
110R.120123083	12	30	83	12	6

PLASTIC MATERIALS MILLING
Ball nose single flute endmill - Straight



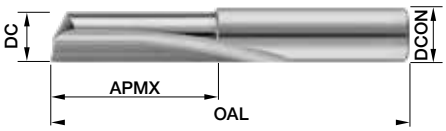
110TDR

HM K20-K30 Micrograin | WN | HA | 0° | 29° | r=

Cod.	DC	APMX	OAL	DCON	RE
	h10	0/+2	0/+2	h6	+/-0,05
110TDR.015030640	1,5	6	40	3	0,75
110TDR.020030640	2	6	40	3	1
110TDR.020061060	2	10	60	6	1
110TDR.030031240	3	12	40	3	1,5
110TDR.030061560	3	15	60	6	1,5
110TDR.040061560	4	15	60	6	2
110TDR.040062075	4	20	75	6	2
110TDR.050061660	5	16	60	6	2,5
110TDR.060062060	6	20	60	6	3
110TDR.060063060	6	30	60	6	3
110TDR.060063575	6	35	75	6	3
110TDR.080082263	8	22	63	8	4
110TDR.0800840100	8	40	100	8	4
110TDR.100102572	10	25	72	10	5
110TDR.1001055100	10	55	100	10	5
110TDR.120123083	12	30	83	12	6

PLASTIC MATERIALS MILLING

Single flute endmill - Straight

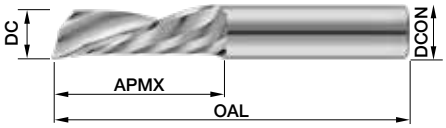


110TD

Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
110TD.015030640	1,5	6	40	3
110TD.020030640	2	6	40	3
110TD.020061060	2	10	60	6
110TD.030031240	3	12	40	3
110TD.030061560	3	15	60	6
110TD.040061560	4	15	60	6
110TD.040062075	4	20	75	6
110TD.050061660	5	16	60	6
110TD.060062060	6	20	60	6
110TD.060063060	6	30	60	6
110TD.060063575	6	35	75	6
110TD.080082263	8	22	63	8
110TD.0800840100	8	40	100	8
110TD.100102572	10	25	72	10
110TD.1001055100	10	55	100	10
110TD.120123083	12	30	83	12

PLASTIC MATERIALS MILLING

Single flute endmill - Left helix, right hand cut



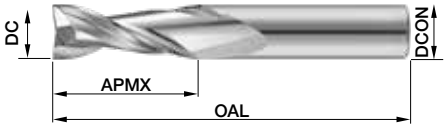
111

Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
111.015030640	1,5	6	40	3
111.020030640	2	6	40	3
111.020021040	2	10	40	2
111.020060550	2	5	50	6
111.020061060	2	10	60	6
111.025250640	2,5	6	40	2,5
111.030031240	3	12	40	3
111.030060750	3	7	50	6
111.030061060	3	10	60	6
111.030061260	3	12	60	6
111.030061560	3	15	60	6
111.040041540	4	15	40	4
111.040060950	4	9	50	6
111.040061260	4	12	60	6
111.040061560	4	15	60	6
111.040062075	4	20	75	6
111.050061150	5	11	50	6
111.050051650	5	16	50	5
111.050061660	5	16	60	6
111.050062875	5	28	75	6
111.060061350	6	13	50	6
111.060062060	6	20	60	6
111.060062260	6	22	60	6
111.060063060	6	30	60	6
111.060063575	6	35	75	6
111.080081763	8	17	63	8
111.080082263	8	22	63	8
111.080083575	8	35	75	8
111.0800845100	8	45	100	8
111.100102572	10	25	72	10
111.120123083	12	30	83	12
111.140143083	14	30	83	14
111.160163592	16	35	92	16
111.2002040104	20	40	104	20

102

PLASTIC MATERIALS MILLING

2 flutes endmill - Right helix



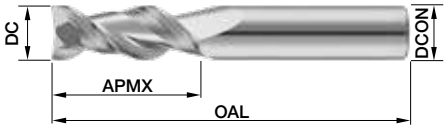
102

HM K20-K30 Micrograin | WN | HA | 45° | 30° | 14°

Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
102.020060650	2	6	50	6
102.020030850	2	8	50	3
102.030031240	3	12	40	3
102.030060750	3	7	50	6
102.030061250	3	12	50	6
102.040041440	4	14	40	4
102.040060950	4	9	50	6
102.040061450	4	14	50	6
102.050061150	5	11	50	6
102.050051650	5	16	50	5
102.060061350	6	13	50	6
102.060061850	6	18	50	6
102.060062560	6	25	60	6
102.060063575	6	35	75	6
102.080082063	8	20	63	8
102.080083075	8	30	75	8
102.0800840100	8	40	100	8
102.100102572	10	25	72	10
102.120123083	12	30	83	12
102.160163592	16	35	92	16
102.2002045104	20	45	104	20

PLASTIC MATERIALS MILLING

2 flutes endmill - 45° right helix



102-45°

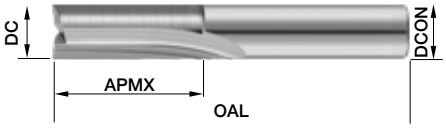
HM K20-K30 Micrograin | WN | HA | 45° | 45° | 14°

Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
102.020030850-45°	2	8	50	3
102.030031240-45°	3	12	40	3
102.030061250-45°	3	12	50	6
102.040041440-45°	4	14	40	4
102.040061450-45°	4	14	50	6
102.050061150-45°	5	11	50	6
102.050061650-45°	5	16	50	6
102.060061850-45°	6	18	50	6
102.060062560-45°	6	25	60	6
102.060063575-45°	6	35	75	6
102.080082063-45°	8	20	63	8
102.080083075-45°	8	30	75	8
102.0800840100-45°	8	40	100	8
102.100102572-45°	10	25	72	10
102.120123083-45°	12	30	83	12
102.160163592-45°	16	35	92	16
102.2002045104-45°	20	45	104	20

100

PLASTIC MATERIALS MILLING

2 flutes endmill - Straight



HM K20-K30 Micrograin | WN | HA | 45° | 0° | 17°

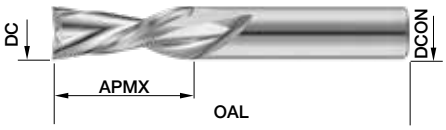
100

Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
100.030031240	3	12	40	3
100.030061250	3	12	50	6
100.040041440	4	14	40	4
100.040061450	4	14	50	6
100.050051650	5	16	50	5
100.060061850	6	18	50	6
100.080082063	8	20	63	8
100.100102572	10	25	72	10
100.120123083	12	30	83	12
100.160163592	16	35	92	16
100.2002045104	20	45	104	20

104

PLASTIC MATERIALS MILLING

2 flutes endmill - Left helix, right hand cut



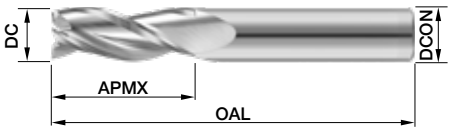
HM K20-K30 Micrograin | WN | HA | 45° | -30° | 14°

104

Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
104.020060650	2	6	50	6
104.030031240	3	12	40	3
104.030060950	3	9	50	6
104.030061250	3	12	50	6
104.040041440	4	14	40	4
104.040061350	4	13	50	6
104.050051650	5	16	50	5
104.060061850	6	18	50	6
104.080082063	8	20	63	8
104.100102572	10	25	72	10
104.120123083	12	30	83	12
104.160163592	16	35	92	16
104.2002045104	20	45	104	20

PLASTIC MATERIALS MILLING

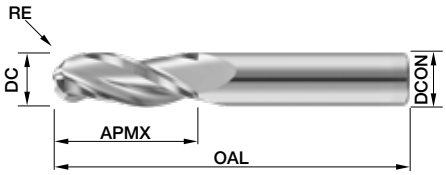
3 flutes endmill - Right helix



103I

Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
103I.030061057	3	10	57	6
103I.040061357	4	13	57	6
103I.050061557	5	15	57	6
103I.060061857	6	18	57	6
103I.070082063	7	20	63	8
103I.080082063	8	20	63	8
103I.090102272	9	22	72	10
103I.100102572	10	25	72	10
103I.120123083	12	30	83	12
103I.140143083	14	30	83	14
103I.160163592	16	35	92	16
103I.180183592	18	35	92	18
103I.2002045104	20	45	104	20

PLASTIC MATERIALS MILLING
3 flutes ball nose endmill - Right helix

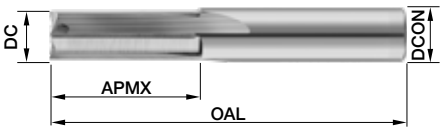


103RI

Cod.	DC	APMX	OAL	DCON	RE
	h10	0/+2	0/+2	h6	+/-0,05
103RI.030061057	3	10	57	6	1,5
103RI.040061357	4	13	57	6	2
103RI.050061557	5	15	57	6	2,5
103RI.060061857	6	18	57	6	3
103RI.070082063	7	20	63	8	3,5
103RI.080082063	8	20	63	8	4
103RI.090102272	9	22	72	10	4,5
103RI.100102572	10	25	72	10	5
103RI.120123083	12	30	83	12	6
103RI.140143083	14	30	83	14	7
103RI.160163592	16	35	92	16	8
103RI.180183592	18	35	92	18	9
103RI.2002045104	20	45	104	20	10

PLASTIC MATERIALS MILLING

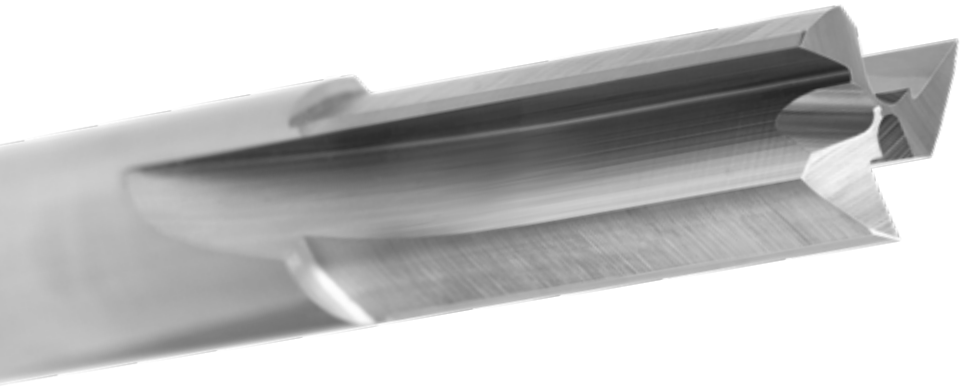
3 flutes endmill - Straight



101

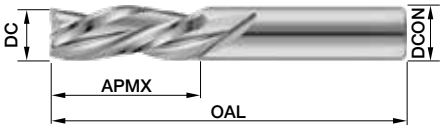
HM K20-K30 Micrograin | WN | HA | 45° | 0° | 17°

Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
101.030031240	3	12	40	3
101.040041440	4	14	40	4
101.050051650	5	16	50	5
101.060061850	6	18	50	6
101.080082063	8	20	63	8
101.100102572	10	25	72	10
101.120123083	12	30	83	12
101.160163592	16	35	92	16
101.2002045104	20	45	104	20



PLASTIC MATERIALS MILLING

3 flutes endmill - Left helix, right hand cut



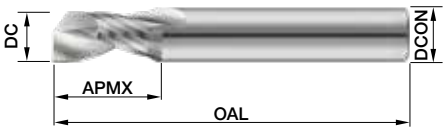
105

HM K20-K30 Micrograin | WN | HA | 45° | -30° | 14°

Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
105.030031240	3	12	40	3
105.040041440	4	14	40	4
105.050051650	5	16	50	5
105.060061850	6	18	50	6
105.080082063	8	20	63	8
105.100102572	10	25	72	10
105.120123083	12	30	83	12
105.160163592	16	35	92	16
105.2002045104	20	45	104	20

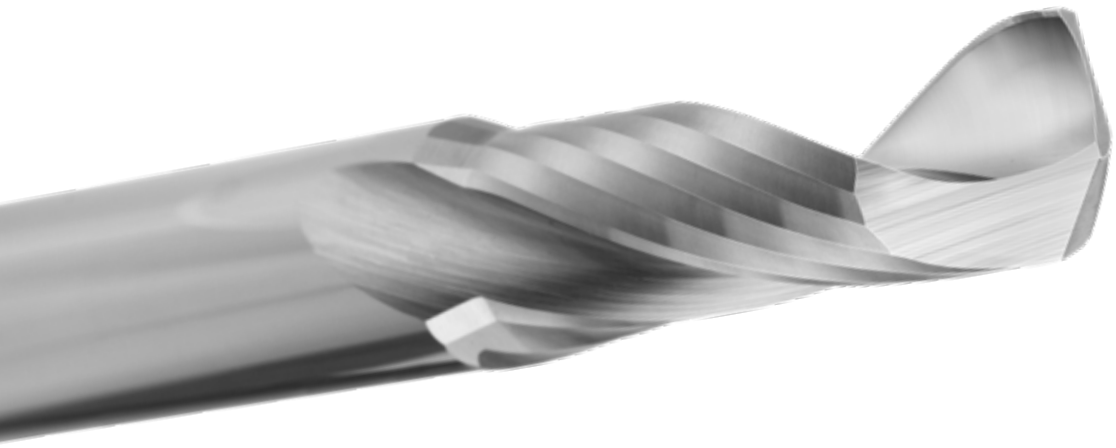
PLEXIGLASS MILLING AND POLISHING

Single flute endmill - Right helix



110P

Cod.	DC	APMX	OAL	DCON
	e9	0/+2	0/+2	h6
110P.040060658	4	6	58	6
110P.040061558	4	15	58	6
110P.050060758	5	7	58	6
110P.050062258	5	22	58	6
110P.060062258	6	22	58	6
110P.060063270	6	32	70	6
110P.080082263	8	22	63	8
110P.080083270	8	32	70	8
110P.100103272	10	32	72	10
110P.1001042100	10	42	100	10
110P.120123283	12	32	83	12
110P.1201252100	12	52	100	12



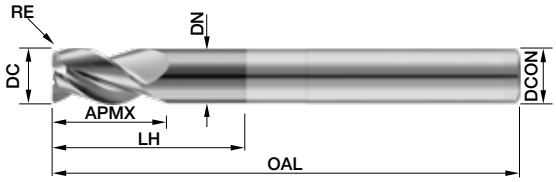
Light Alloys Milling

303

ALUMINUM ALLOYS HIGH REMOVAL MILLING

3 flutes torus radius endmill - Right helix

CVD DLC Cer-DL



303

HM
K20-K30
Micrograin

WN

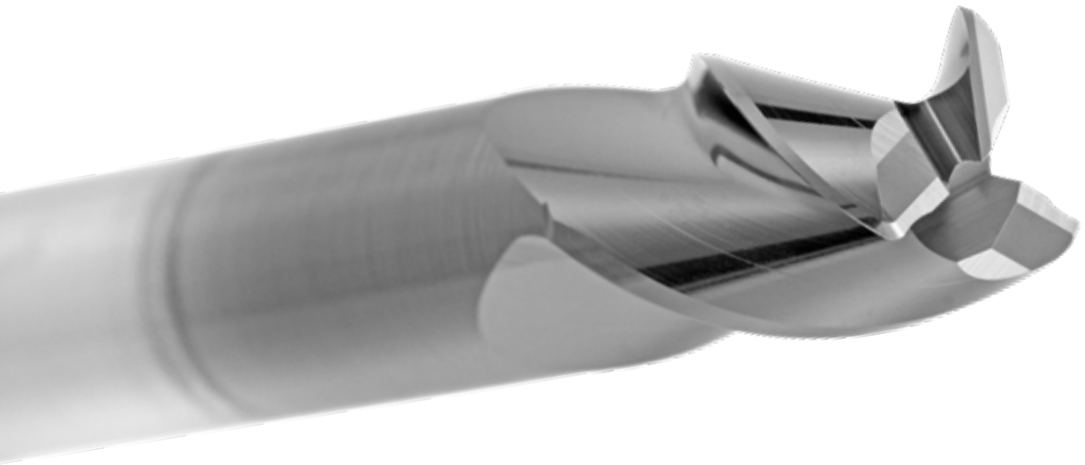
HA

r =

40°

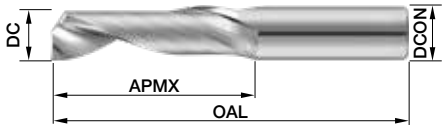
18°

Cod.	DC	APMX	LH	OAL	DCON	RE	DN
	h6	0/+2	0/+2	0/+2	h6	+/-0,03	0/-0,05
303.040060657R02DL	4	6	12	57	6	0,2	3,9
303.040060670R02DL	4	6	20	70	6	0,2	3,9
303.060060957R03DL	6	9	18	57	6	0,3	5,8
303.060060970R03DL	6	9	30	70	6	0,3	5,8
303.080081263R04DL	8	12	24	63	8	0,4	7,8
303.080081280R04DL	8	12	40	80	8	0,4	7,8
303.100101572R05DL	10	15	30	72	10	0,5	9,8
303.100101590R05DL	10	15	50	90	10	0,5	9,8
303.120121883R06DL	12	18	36	83	12	0,6	11,8
303.1201218100R06DL	12	18	60	100	12	0,6	11,8
303.160162493R08DL	16	24	48	93	16	0,8	15,8
303.1601624120R08DL	16	24	80	120	16	0,8	15,8
303.2002030104R10DL	20	30	60	104	20	1	19,8
303.2002030150R10DL	20	30	100	150	20	1	19,8



ALUMINUM ALLOYS MILLING

Single flute endmill - Right helix



110A

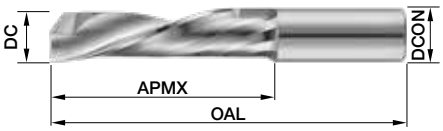
HM K20-K30 Micrograin | WN | HA | 45° | 30° | 22°

Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
110A.015030640	1,5	6	40	3
110A.020021040	2	10	40	2
110A.020030840	2	8	40	3
110A.020060650	2	6	50	6
110A.025060850	2,5	8	50	6
110A.030031040	3	10	40	3
110A.030060750	3	7	50	6
110A.030061050	3	10	50	6
110A.035061050	3,5	10	50	6
110A.040041250	4	12	50	4
110A.040060950	4	9	50	6
110A.040061250	4	12	50	6
110A.045061250	4,5	12	50	6
110A.050051450	5	14	50	5
110A.050061150	5	11	50	6
110A.050061450	5	14	50	6
110A.055061450	5,5	14	50	6
110A.060061450	6	14	50	6
110A.060062060	6	20	60	6
110A.060063575	6	35	75	6
110A.080081763	8	17	63	8
110A.080082563	8	25	63	8
110A.100102572	10	25	72	10
110A.120122583	12	25	83	12

111

ALUMINUM ALLOYS MILLING

Single flute endmill - Left helix, right hand cut



111A

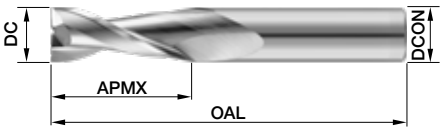
HM K20-K30 Micrograin | WN | HA | 45° | -25° | 22°

Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
111A.015030640	1,5	6	40	3
111A.020021040	2	10	40	2
111A.020030840	2	8	40	3
111A.020060650	2	6	50	6
111A.025060850	2,5	8	50	6
111A.030031040	3	10	40	3
111A.030060750	3	7	50	6
111A.030061050	3	10	50	6
111A.035061050	3,5	10	50	6
111A.040041250	4	12	50	4
111A.040060950	4	9	50	6
111A.040061250	4	12	50	6
111A.045061250	4,5	12	50	6
111A.050051450	5	14	50	5
111A.050061150	5	11	50	6
111A.050061450	5	14	50	6
111A.055061450	5,5	14	50	6
111A.060061450	6	14	50	6
111A.060062060	6	20	60	6
111A.060063575	6	35	75	6
111A.080081763	8	17	63	8
111A.080082563	8	25	63	8
111A.100102572	10	25	72	10
111A.120122583	12	25	83	12

102

ALUMINUM ALLOYS MILLING

2 flutes endmill - Right helix



102A

HM K20-K30 Micrograin | WN | HA | 45° | 30° | 25°

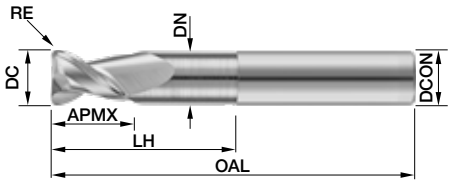
Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
102A.030061250	3	12	50	6
102A.040061450	4	14	50	6
102A.060061850	6	18	50	6
102A.080082063	8	20	63	8
102A.100102572	10	25	72	10
102A.120123083	12	30	83	12
102A.160163592	16	35	92	16
102A.2002045104	20	45	104	20

ALUMINUM ALLOYS MILLING

2 flutes torus radius endmill - Right helix

PVD TiB2 Cer-Al

Also available without coating



102TC/TCL

HM K20-K30 Micrograin

WN

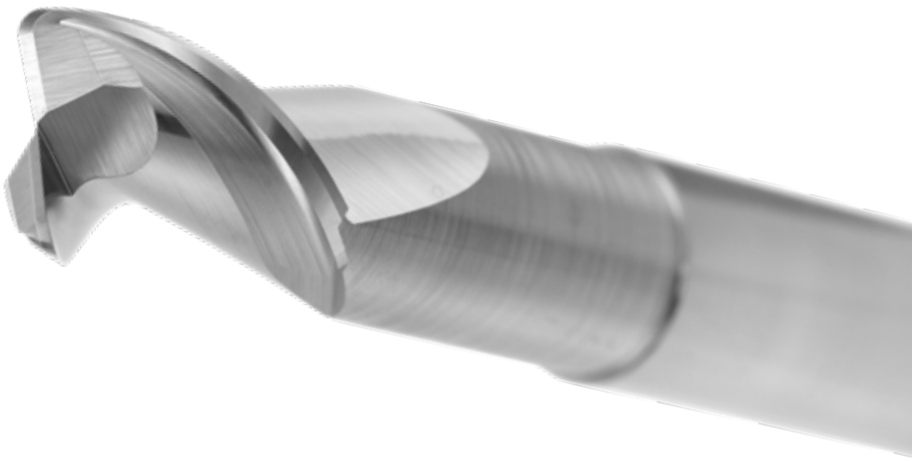
HA

r =

40°

20°

Cod.		DC	APMX	LH	OAL	DCON	RE	DN
Coated	Uncoated	e8	0/+2	0/+2	0/+2	h6	+0,03/+0	0/-0,05
102TC.020-40°G	102TC.020-40°	2	4	6	57	6	0,5	1,8
102TC.030-40°G	102TC.030-40°	3	5	9	57	6	0,5	2,8
102TCL.030-40°G	102TCL.030-40°	3	6	50	100	6	0,5	2,8
102TC.040-40°G	102TC.040-40°	4	6	12	57	6	0,5	3,7
102TCL.040-40°G	102TCL.040-40°	4	8	50	100	6	0,5	3,7
102TC.050-40°G	102TC.050-40°	5	7	15	57	6	0,5	4,6
102TCL.050-40°G	102TCL.050-40°	5	10	50	100	6	0,5	4,6
102TC.060-40°G	102TC.060-40°	6	8	20	57	6	1	5,5
102TCL.060-40°G	102TCL.060-40°	6	12	50	100	6	1	5,5
102TC.080-40°G	102TC.080-40°	8	10	26	63	8	1	7,4
102TCL.080-40°G	102TCL.080-40°	8	16	50	100	8	1	7,4
102TC.100-40°G	102TC.100-40°	10	12	31	72	10	1,5	9,2
102TCL.100-40°G	102TCL.100-40°	10	20	70	120	10	1,5	9,2
102TC.120-40°G	102TC.120-40°	12	14	37	83	12	1,5	11
102TCL.120-40°G	102TCL.120-40°	12	24	100	150	12	1,5	11
102TC.140-40°G	102TC.140-40°	14	16	41	83	14	2	13
102TCL.140-40°G	102TCL.140-40°	14	28	100	150	14	2	13
102TC.160-40°G	102TC.160-40°	16	18	43	92	16	2	15
102TCL.160-40°G	102TCL.160-40°	16	32	100	150	16	2	15
102TC.200-40°G	102TC.200-40°	20	22	53	104	20	2,5	19
102TCL.200-40°G	102TCL.200-40°	20	40	100	150	20	2,5	19



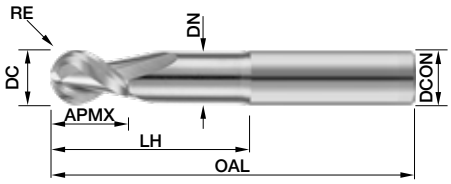
102

ALUMINUM ALLOYS MILLING

2 flutes ball nose endmill - Right helix

PVD TiB2 Cer-Al

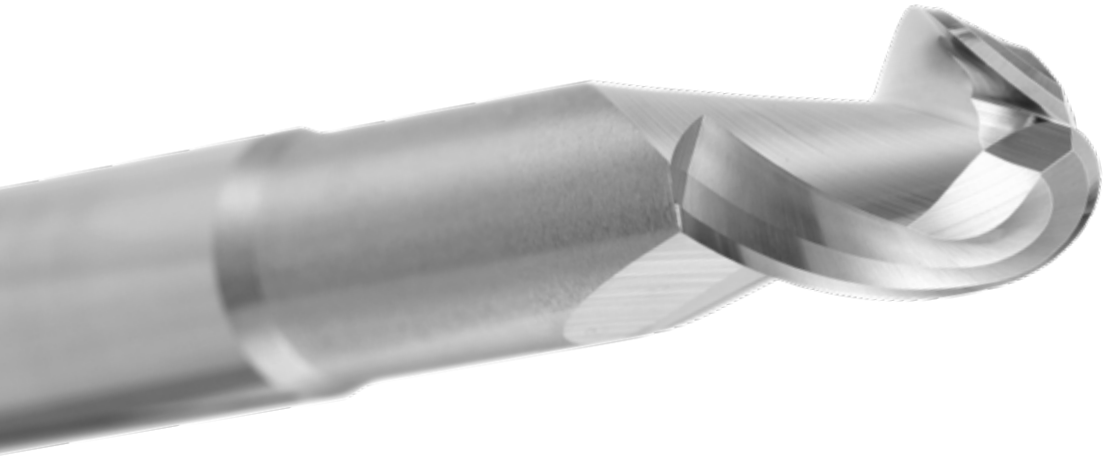
Also available without coating



HM K20-K30 Micrograin | WN | HA | f= | 40° | 20°

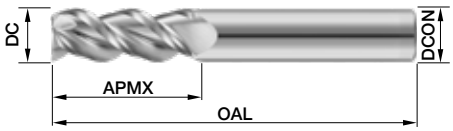
102RC/RCL

Cod.		DC	DC TOL.	APMX	LH	OAL	DCON	RE	DN
Coated	Uncoated			0/+2	0/+2	0/+2	h6	f8	0/-0,05
102RC.020-40°G	102RC.020-40°	2	-0,012/-0,040	4	6	57	6	1	1,8
102RC.030-40°G	102RC.030-40°	3	-0,012/-0,040	5	9	57	6	1,5	2,8
102RCL.030-40°G	102RCL.030-40°	3	-0,012/-0,040	6	50	100	6	1,5	2,8
102RC.040-40°G	102RC.040-40°	4	-0,012/-0,040	6	12	57	6	2	3,7
102RCL.040-40°G	102RCL.040-40°	4	-0,012/-0,040	8	50	100	6	2	3,7
102RC.050-40°G	102RC.050-40°	5	-0,012/-0,040	7	15	57	6	2,5	4,6
102RCL.050-40°G	102RCL.050-40°	5	-0,012/-0,040	10	50	100	6	2,5	4,6
102RC.060-40°G	102RC.060-40°	6	-0,012/-0,040	8	20	57	6	3	5,5
102RCL.060-40°G	102RCL.060-40°	6	-0,012/-0,040	12	50	100	6	3	5,5
102RC.080-40°G	102RC.080-40°	8	-0,020/-0,056	10	26	63	8	4	7,4
102RCL.080-40°G	102RCL.080-40°	8	-0,020/-0,056	16	50	100	8	4	7,4
102RC.100-40°G	102RC.100-40°	10	-0,020/-0,056	12	31	72	10	5	9,2
102RCL.100-40°G	102RCL.100-40°	10	-0,020/-0,056	20	70	120	10	5	9,2
102RC.120-40°G	102RC.120-40°	12	-0,020/-0,056	14	37	83	12	6	11
102RCL.120-40°G	102RCL.120-40°	12	-0,020/-0,056	24	100	150	12	6	11
102RC.140-40°G	102RC.140-40°	14	-0,026/-0,070	16	41	83	14	7	13
102RCL.140-40°G	102RCL.140-40°	14	-0,026/-0,070	28	100	150	14	7	13
102RC.160-40°G	102RC.160-40°	16	-0,026/-0,070	18	43	92	16	8	15
102RCL.160-40°G	102RCL.160-40°	16	-0,026/-0,070	32	100	150	16	8	15
102RC.200-40°G	102RC.200-40°	20	-0,026/-0,070	22	53	104	20	10	19
102RCL.200-40°G	102RCL.200-40°	20	-0,026/-0,070	40	100	150	20	10	19



ALUMINUM ALLOYS MILLING

3 flutes endmill - 45° Right helix



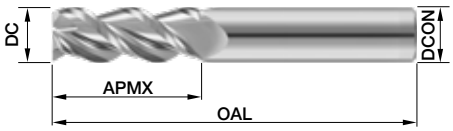
103I-45°

Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
103I.030061057-45°	3	10	57	6
103I.040061357-45°	4	13	57	6
103I.050061557-45°	5	15	57	6
103I.060061857-45°	6	18	57	6
103I.070082063-45°	7	20	63	8
103I.080082063-45°	8	20	63	8
103I.090102272-45°	9	22	72	10
103I.100102572-45°	10	25	72	10
103I.120123083-45°	12	30	83	12
103I.140143083-45°	14	30	83	14
103I.160163592-45°	16	35	92	16
103I.180183592-45°	18	35	92	18
103I.2002045104-45°	20	45	104	20

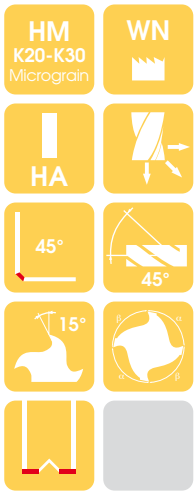
103

ALUMINUM ALLOYS MILLING

3 flutes endmill - 45° Right helix
Special front geometry for better surface finish



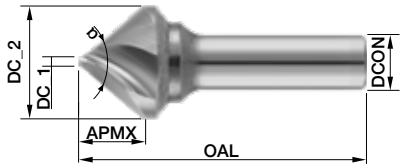
103PI-45°



Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
103PI.030061057-45°	3	10	57	6
103PI.040061357-45°	4	13	57	6
103PI.050061557-45°	5	15	57	6
103PI.060061857-45°	6	18	57	6
103PI.080082063-45°	8	20	63	8
103PI.100102572-45°	10	25	72	10
103PI.120123083-45°	12	30	83	12
103PI.160163592-45°	16	35	92	16
103PI.2002045104-45°	20	45	104	20

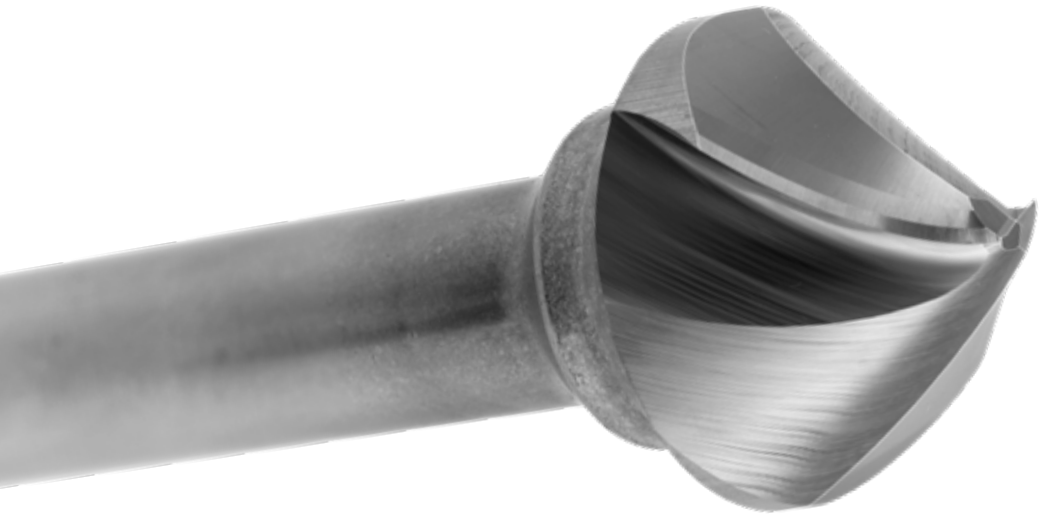
COMPOSITE ALUMINUM PANELS MILLING

3 flutes tapered endmill - 45° right helix



103K

Cod.	DC_2	APMX	OAL	DCON	DC_1	a
	+/-0,1	0/+2	-0,5	h6	+/-0,05	+/-0,5°
103K.16 90° G.10	16	7,5	58	10	1	90°
103K.16 92° G.10	16	7,2	58	10	1	92°
103K.25 90° G.10	25	11,8	58	10	1,5	90°
103K.25 92° G.10	25	11,3	58	10	1,5	92°



Plastic Milling - working parameters

Tool	ISO	Material	Designation	Short version Vc [m/min]	Long version Vc [m/min]	ap max x DC	DC = 1,5 mm fz [mm] ae 0,1-0,2 x DC	DC = 1,5 mm fz [mm] ae 0,3-0,4 x DC	DC = 1,5 mm fz [mm] ae 0,6-1,0 x DC	DC = 2 mm fz [mm] ae 0,1-0,2 x DC	DC = 2 mm fz [mm] ae 0,3-0,4 x DC	DC = 2 mm fz [mm] ae 0,6-1,0 x DC	DC = 2,5 mm fz [mm] ae 0,1-0,2 x DC	DC = 2,5 mm fz [mm] ae 0,3-0,4 x DC	DC = 2,5 mm fz [mm] ae 0,6-1,0 x DC	DC = 3 mm fz [mm] ae 0,1-0,2 x DC	DC = 3 mm fz [mm] ae 0,3-0,4 x DC	DC = 3 mm fz [mm] ae 0,6-1,0 x DC
100/101/102(45°) 103I/103RI*/104/105	N	Termoset polymers - short chipping	Bachelite	550	440	1,0	0,002	0,001	0,001	0,002	0,001	0,001				0,002	0,001	0,001
		Termoset polymers - short chipping	Vetronite	550	440	1,0	0,002	0,001	0,001	0,002	0,001	0,001				0,002	0,001	0,001
110/110P/110R* 110TD/110TDR*/111		Termoplastic polymers - long chipping	Policarbonato	350-600	280-480	1,0	0,144	0,072	0,048	0,144	0,072	0,048	0,192	0,096	0,064	0,240	0,120	0,080
		Termoplastic polymers - long chipping	Plexiglass (PMMA)	500-950	400-760	1,0	0,144	0,072	0,048	0,144	0,072	0,048	0,192	0,096	0,064	0,240	0,120	0,080
		Termoplastic polymers - long chipping	Polistirolo	400-500	320-400	1,0	0,114	0,057	0,038	0,114	0,057	0,038	0,148	0,074	0,049	0,182	0,091	0,061
		Termoplastic polymers - long chipping	Teflon	500-700	400-560	1,0	0,114	0,057	0,038	0,114	0,057	0,038	0,148	0,074	0,049	0,182	0,091	0,061

* Ball nose end mills: calculate [rpm] as per Tab.K

Light Alloy - working parameters

Tool	ISO	Material	Streght [MPa]	N.	Designation	Short version Vc [m/min]	Long version Vc [m/min]	ap max x DC	DC = 1,5 mm fz [mm] ae 0,1-0,2 x DC	DC = 1,5 mm fz [mm] ae 0,3-0,4 x DC	DC = 1,5 mm fz [mm] ae 0,6-1,0 x DC	DC = 2 mm fz [mm] ae 0,1-0,2 x DC	DC = 2 mm fz [mm] ae 0,3-0,4 x DC	DC = 2 mm fz [mm] ae 0,6-1,0 x DC	DC = 2,5 mm fz [mm] ae 0,1-0,2 x DC	DC = 2,5 mm fz [mm] ae 0,3-0,4 x DC	DC = 2,5 mm fz [mm] ae 0,6-1,0 x DC	DC = 3 mm fz [mm] ae 0,1-0,2 x DC	DC = 3 mm fz [mm] ae 0,3-0,4 x DC	DC = 3 mm fz [mm] ae 0,6-1,0 x DC	DC = 3,5 mm fz [mm] ae 0,1-0,2 x DC	DC = 3,5 mm fz [mm] ae 0,3-0,4 x DC	DC = 3,5 mm fz [mm] ae 0,6-1,0 x DC	DC fz [mm] ae 0,1-0,2 x DC
102TC 102TCL 102RC* 102RCL*	N	Aluminum (unalloyed, low alloy)	< 350	3,0255	A199,5	300	240	0,5				0,097	0,073	0,029				0,117	0,088	0,035				0,140
		Aluminum alloy Si<0,5%	< 500	3,0515	AlMni	300	240	0,5				0,097	0,073	0,029				0,117	0,088	0,035				0,140
		Aluminum alloy 0,5%<Si<10%	< 400	3,2152	GD-AlSi16Cu4	300	240	0,5				0,097	0,073	0,029				0,117	0,088	0,035				0,140
		Aluminum alloy 10%<Si<15%	< 400	3,2381	G-AlSi10Mg	150	120	0,5				0,049	0,036	0,015				0,058	0,044	0,018				0,070
		Aluminum alloy Si>15%	< 400		G-AlSi17Cu4																			
110A 111A 102A 102-45°		Aluminum (unalloyed, low alloy)	< 350	3,0255	A199,5	300	240	1,0	0,026	0,020	0,008	0,035	0,026	0,011	0,044	0,033	0,013	0,053	0,039	0,016	0,061	0,046	0,018	0,070
		Aluminum alloy Si<0,5%	< 500	3,0515	AlMni	300	240	1,0	0,026	0,020	0,008	0,035	0,026	0,011	0,044	0,033	0,013	0,053	0,039	0,016	0,061	0,046	0,018	0,070
		Aluminum alloy 0,5%<Si<10%	< 400	3,2152	GD-AlSi16Cu4	300	240	1,0	0,026	0,020	0,008	0,035	0,026	0,011	0,044	0,033	0,013	0,053	0,039	0,016	0,061	0,046	0,018	0,070
		Aluminum alloy 10%<Si<15%	< 400	3,2381	G-AlSi10Mg	150	120	1,0	0,013	0,010	0,004	0,018	0,013	0,005	0,022	0,016	0,007	0,026	0,020	0,008	0,031	0,023	0,009	0,035
		Aluminum alloy Si>15%	< 400		G-AlSi17Cu4																			
103I-45° 103PI 103K**		Aluminum (unalloyed, low alloy)	< 350	3,0255	A199,5	300	240	1,0										0,053	0,039	0,016				0,070
		Aluminum alloy Si<0,5%	< 500	3,0515	AlMni	300	240	1,0										0,053	0,039	0,016				0,070
		Aluminum alloy 0,5%<Si<10%	< 400	3,2152	GD-AlSi16Cu4	300	240	1,0										0,053	0,039	0,016				0,070
		Aluminum alloy 10%<Si<15%	< 400	3,2381	G-AlSi10Mg	200	160	1,0										0,026	0,020	0,008				0,035
		Aluminum alloy Si>15%	< 400		G-AlSi17Cu4																			
303		Aluminum (unalloyed, low alloy)	< 350	3,0255	A199,5	500	400	1,0																0,140
		Aluminum alloy Si<0,5%	< 500	3,0515	AlMni	500	400	1,0																0,140
		Aluminum alloy 0,5%<Si<10%	< 400	3,2152	GD-AlSi16Cu4	500	400	1,0																0,140
		Aluminum alloy 10%<Si<15%	< 400	3,2381	G-AlSi10Mg	300	240	1,0																0,070
		Aluminum alloy Si>15%	< 400		G-AlSi17Cu4																			

* Ball nose end mills: calculate [rpm] as per Tab.K
** Working parameters for DC/2

Tab. K

Tab. K							
ap	DC x 0,05	DC x 0,1	DC x 0,15	DC x 0,2	DC x 0,25	DC x 0,3	DC x 0,4	DC x 0,5
K	2,3	1,7	1,4	1,3	1,2	1,1	1,0	1,0

n[rpm] = K x Vc[m/min] x 1000 / (Dc[mm] x 3,14)

DC = 4 mm			DC = 5 mm			DC = 6 mm			DC = 7 mm			DC = 8 mm			DC = 10 mm			DC = 12 mm			DC = 14 mm			DC = 16 mm			DC = 20 mm		
ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC
fz [mm]			fz [mm]			fz [mm]			fz [mm]			fz [mm]			fz [mm]			fz [mm]			fz [mm]			fz [mm]			fz [mm]		
0,002	0,001	0,001	0,003	0,002	0,001	0,004	0,002	0,001	0,004	0,002	0,001	0,005	0,002	0,002	0,006	0,003	0,002	0,007	0,004	0,002				0,010	0,005	0,003	0,012	0,006	0,004
0,002	0,001	0,001	0,003	0,002	0,001	0,004	0,002	0,001	0,004	0,002	0,001	0,005	0,002	0,002	0,006	0,003	0,002	0,007	0,004	0,002				0,010	0,005	0,003	0,012	0,006	0,004
0,300	0,150	0,100	0,300	0,150	0,100	0,300	0,150	0,100				0,300	0,150	0,100	0,360	0,180	0,120	0,360	0,180	0,120	0,405	0,203	0,135	0,450	0,225	0,150	0,450	0,225	0,150
0,300	0,150	0,100	0,300	0,150	0,100	0,300	0,150	0,100				0,300	0,150	0,100	0,360	0,180	0,120	0,360	0,180	0,120	0,405	0,203	0,135	0,450	0,225	0,150	0,450	0,225	0,150
0,228	0,114	0,076	0,228	0,114	0,076	0,228	0,114	0,076				0,228	0,114	0,076	0,274	0,137	0,091	0,274	0,137	0,091	0,308	0,154	0,103	0,342	0,171	0,114	0,342	0,171	0,114
0,228	0,114	0,076	0,228	0,114	0,076	0,228	0,114	0,076				0,228	0,114	0,076	0,274	0,137	0,091	0,274	0,137	0,091	0,308	0,154	0,103	0,342	0,171	0,114	0,342	0,171	0,114

= 4 mm		DC = 4,5 mm			DC = 5 mm			DC = 5,5 mm			DC = 6 mm			DC = 7 mm			DC = 8 mm		
ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC
[mm]		fz [mm]			fz [mm]			fz [mm]			fz [mm]			fz [mm]			fz [mm]		
0,105	0,042				0,175	0,131	0,053				0,210	0,158	0,063				0,280	0,210	0,084
0,105	0,042				0,175	0,131	0,053				0,210	0,158	0,063				0,280	0,210	0,084
0,105	0,042				0,175	0,131	0,053				0,210	0,158	0,063				0,280	0,210	0,084
0,053	0,021				0,088	0,066	0,026				0,105	0,079	0,032				0,140	0,105	0,042
0,053	0,021	0,079	0,059	0,024	0,088	0,066	0,026	0,096	0,072	0,029	0,105	0,079	0,032				0,140	0,105	0,042
0,053	0,021	0,079	0,059	0,024	0,088	0,066	0,026	0,096	0,072	0,029	0,105	0,079	0,032				0,140	0,105	0,042
0,053	0,021	0,079	0,059	0,024	0,088	0,066	0,026	0,096	0,072	0,029	0,105	0,079	0,032				0,140	0,105	0,042
0,026	0,011	0,039	0,030	0,012	0,044	0,033	0,013	0,048	0,036	0,014	0,053	0,039	0,016				0,070	0,053	0,021
0,053	0,021				0,088	0,066	0,026				0,105	0,079	0,032	0,123	0,092	0,037	0,140	0,105	0,042
0,053	0,021				0,088	0,066	0,026				0,105	0,079	0,032	0,123	0,092	0,037	0,140	0,105	0,042
0,053	0,021				0,088	0,066	0,026				0,105	0,079	0,032	0,123	0,092	0,037	0,140	0,105	0,042
0,026	0,011				0,044	0,033	0,013				0,053	0,039	0,016	0,061	0,046	0,018	0,070	0,053	0,021
0,105	0,042										0,210	0,158	0,063				0,280	0,210	0,084
0,105	0,042										0,210	0,158	0,063				0,280	0,210	0,084
0,105	0,042										0,210	0,158	0,063				0,280	0,210	0,084
0,053	0,021										0,105	0,079	0,032				0,140	0,105	0,042

DC = 9 mm			DC = 10 mm			DC = 12 mm			DC = 14 mm			DC = 16 mm			DC = 18 mm			DC = 20 mm		
ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC	ae 0,1-0,2 x DC	ae 0,3-0,4 x DC	ae 0,6-1,0 x DC
fz [mm]			fz [mm]			fz [mm]			fz [mm]			fz [mm]			fz [mm]			fz [mm]		
			0,350	0,263	0,105	0,420	0,315	0,126				0,560	0,420	0,168				0,700	0,525	0,210
			0,350	0,263	0,105	0,420	0,315	0,126				0,560	0,420	0,168				0,700	0,525	0,210
			0,350	0,263	0,105	0,420	0,315	0,126				0,560	0,420	0,168				0,700	0,525	0,210
			0,175	0,131	0,053	0,210	0,158	0,063				0,280	0,210	0,084				0,350	0,263	0,105
			0,175	0,131	0,053	0,210	0,158	0,063				0,280	0,210	0,084				0,350	0,263	0,105
			0,175	0,131	0,053	0,210	0,158	0,063				0,280	0,210	0,084				0,350	0,263	0,105
			0,175	0,131	0,053	0,210	0,158	0,063				0,280	0,210	0,084				0,350	0,263	0,105
			0,088	0,066	0,026	0,105	0,079	0,032				0,140	0,105	0,042				0,175	0,131	0,053
0,158	0,118	0,047	0,175	0,131	0,053	0,210	0,158	0,063	0,245	0,184	0,074	0,280	0,210	0,084	0,315	0,236	0,095	0,350	0,263	0,105
0,158	0,118	0,047	0,175	0,131	0,053	0,210	0,158	0,063	0,245	0,184	0,074	0,280	0,210	0,084	0,315	0,236	0,095	0,350	0,263	0,105
0,158	0,118	0,047	0,175	0,131	0,053	0,210	0,158	0,063	0,245	0,184	0,074	0,280	0,210	0,084	0,315	0,236	0,095	0,350	0,263	0,105
0,079	0,059	0,024	0,088	0,066	0,026	0,105	0,079	0,032	0,123	0,092	0,037	0,140	0,105	0,042	0,158	0,118	0,047	0,175	0,131	0,053
			0,350	0,263	0,105	0,420	0,315	0,126				0,560	0,420	0,168				0,700	0,525	0,210
			0,350	0,263	0,105	0,420	0,315	0,126				0,560	0,420	0,168				0,700	0,525	0,210
			0,350	0,263	0,105	0,420	0,315	0,126				0,560	0,420	0,168				0,700	0,525	0,210
			0,175	0,131	0,053	0,210	0,158	0,063				0,280	0,210	0,084				0,350	0,263	0,105

Notes

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Plastic and Light Alloys Milling

Cerin®
CUTTING TOOLS MANUFACTURING

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