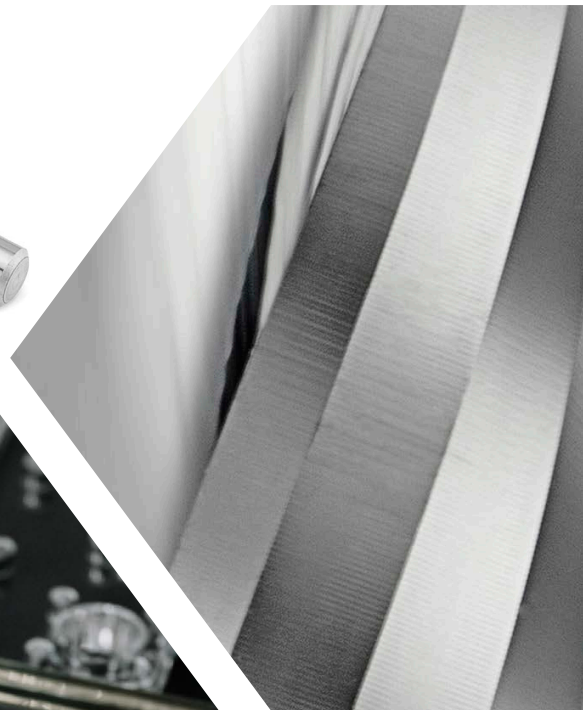




Cerini[®]
CUTTING TOOLS MANUFACTURING



Endmills for plastic materials
Endmills for plexiglass
Endmills for light alloys

Plastic and
Light Alloys
Milling





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.

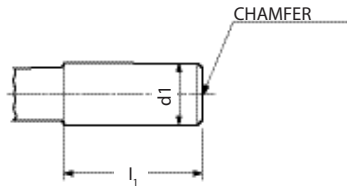
Today, Cerin provides its customers with the benefit of a long experience by offering a complete range of high performance cutters dedicated to the machining of plastic and light alloys.



COMPANY WITH
QUALITY SYSTEM
CERTIFIED BY DNV
ISO 9001

Shank design (for drilling and milling tools) DIN 6535

Straight cylindrical shank - Shape HA

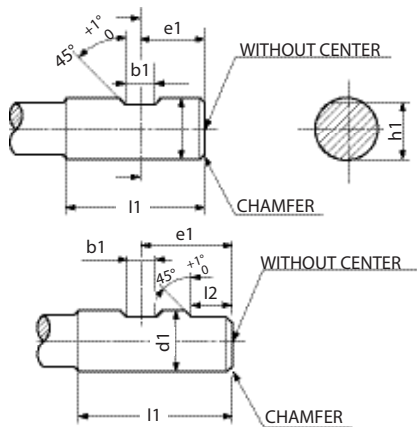


d_1	l_1	d_1	l_1	d_1	l_1
h6	+2/0	h6	+2/0	h6	+2/0
2	28	8	36	18	48
3	28	10	40	20	50
4	28	12	45	25	56
5	28	14	45	32	60
6	36	16	48		

Cylindrical shank - Shape HB

one Weldon flat - $d_1 = 6$ to 20 mm

two Weldon flats - $d_1 = 25$ to 32 mm

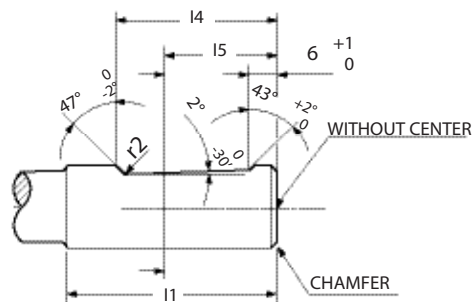


d_1	b_1	e_1	h_1	l_1	l_2
h6	+0,05/0	0/-1	h11	+2/0	+1/0
6	4,2	18	5,1	36	
8	5,5	18	6,9	36	
10	7	20	8,5	40	
12	8	22,5	10,4	45	
14	8	22,5	12,7	45	
16	10	24	14,2	48	
18	10	24	16,2	48	
20	11	25	18,2	50	
25	12	32	23	56	17
32	14	36	32	60	19

Cylindrical shank - Shape HE

one slope flat - $d_1 = 6$ to 20 mm

one slope flat - $d_1 = 25$ to 32 mm



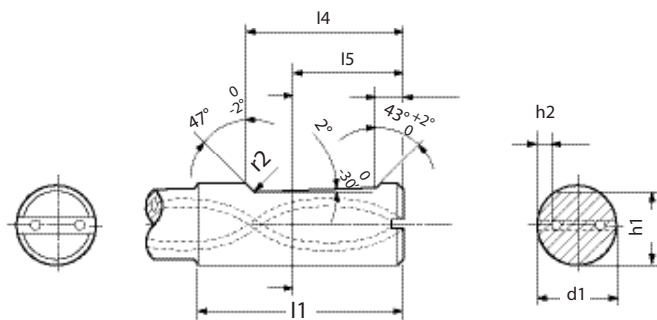
d_1	(b_2)	(b_3)	h_2	(h_3)	l_1	l_4	l_5	r_2
h6			h11		+2 / 0	0 / -1	Nominal size	min.
6	4,3		5,1		36	25	18	1,2
8	5,5		6,9		36	25	18	1,2
10	7,1		8,5		40	28	20	1,2
12	8,2		10,4		45	33	22,5	1,2
14	8,1		12,7		45	33	22,5	1,2
16	10,1		14,2		48	36	24	1,6
18	10,8		16,2		48	36	24	1,6
20	11,4		18,2		50	38	25	1,6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

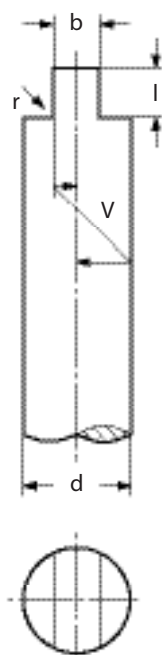
one slope flat - $d_1 = 6$ to 20 mm

one slope flat - $d_1 = 25$ to 32 mm



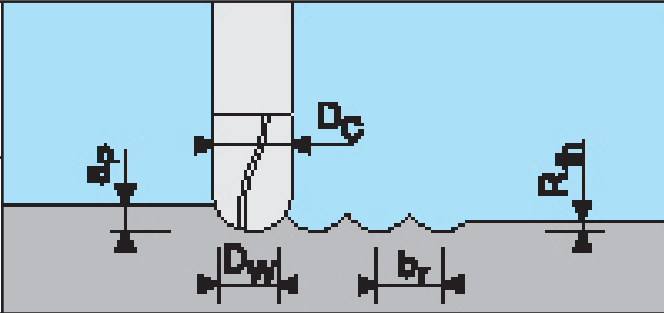
d_1	l_1	l_4	l_5	h_1	r_2	h_2
h6	+2/0	0/-1	Nominal size	h11		min.
6	36	25	18	5,3	1,2	1,3
8	36	25	18	7,1	1,2	1,5
10	40	28	20	8,9	1,2	1,8
12	45	33	22,5	10,9	1,2	2
14	45	33	22,5	12,4	1,2	2,5
16	48	36	24	14,5	1,6	2,5
18	48	36	24	16,2	1,6	2,8
20	50	38	25	18,2	1,6	3
25	56	44	32	23	1,6	3,7
32	60	48	35	30	1,6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

Shank with drive tenon DIN 1809



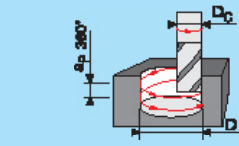
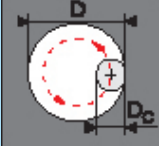
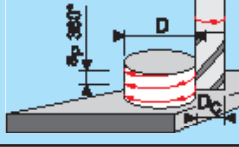
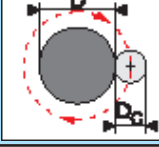
d		b	l	r	v
from	up to	h12	$\pm IT16^1$		
3	3,5	1,6	2,2	0,2	0,05
3,5	4	2	2,2	0,2	0,05
4	4,5	2,2	2,5	0,2	0,05
4,5	5,5	2,5	2,5	0,2	0,05
5,5	6,5	3	3	0,2	0,05
6,5	8	3,5	3,5	0,2	0,06
8	9,5	4,5	4,5	0,4	0,06
9,5	11	5	5	0,4	0,06
11	13	6	6	0,4	0,06
13	15	7	7	0,4	0,08
15	18	8	8	0,4	0,08
18	21	10	10	0,4	0,08
21	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	$b_r = 2 \sqrt{R_{th} (D_c - R_{th})}$
Average chip thickness	$h_m = f_z \times \sqrt{\frac{a_e}{D_c}}$	Working diameter	$D_w = 2 \sqrt{a_p (D_c - a_p)}$

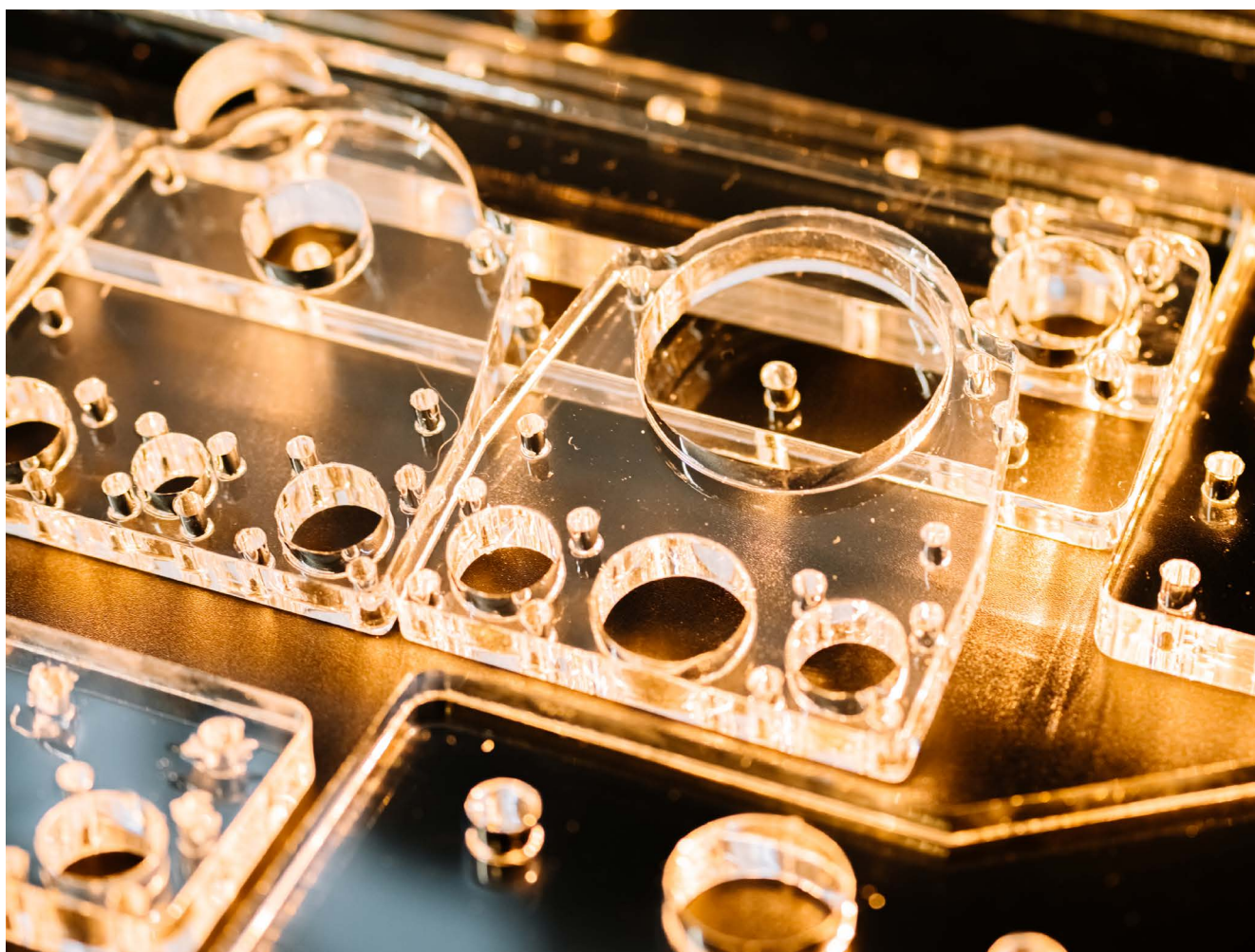
Formulae of calculation

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

		Pag
	Endmills for plastic materials	7
	Endmills for plexiglass polishing	18
	Endmills for light alloys	21



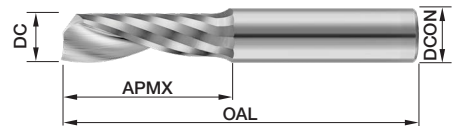


Plastic Materials Milling

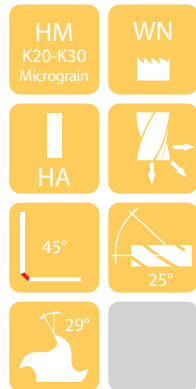


PLASTIC MATERIALS MILLING

Single flute endmill - Right helix



110

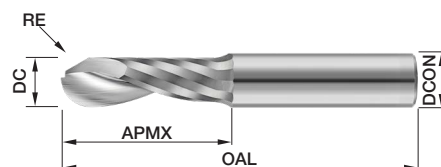


Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
110.015030640	1,5	6	40	3
110.020030640	2	6	40	3
110.020021040	2	10	40	2
110.020060550	2	5	50	6
110.020061060	2	10	60	6
110.025250640	2,5	6	40	2,5
110.030031240	3	12	40	3
110.030060750	3	7	50	6
110.030061060	3	10	60	6
110.030061260	3	12	60	6
110.030061560	3	15	60	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

PLASTIC MATERIALS MILLING

Ball nose single flute endmill - Right helix



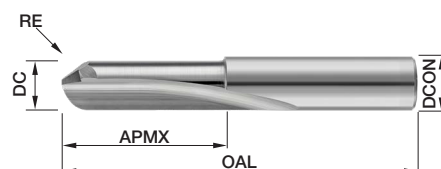
110R



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



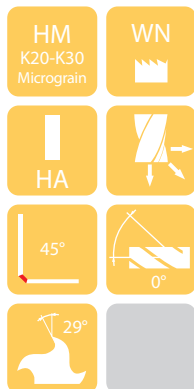
110TDR



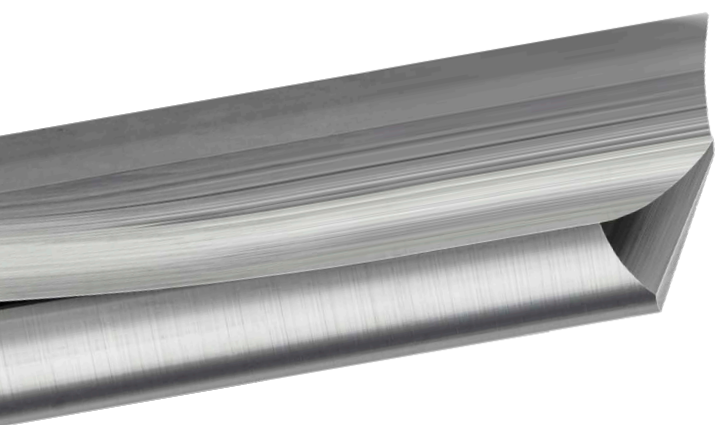
Cod.	DC	APMX	OAL	DCON	RE
	h10	0/+2	0/+2	h6	+/-0,05
110TDR.015030640	1,5	6	40	3	0,75
110TDR.020030640	2	6	40	3	1
110TDR.020061060	2	10	60	6	1
110TDR.030031240	3	12	40	3	1,5
110TDR.030061560	3	15	60	6	1,5
110TDR.040061560	4	15	60	6	2
110TDR.040062075	4	20	75	6	2
110TDR.050061660	5	16	60	6	2,5
110TDR.060062060	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



110TD

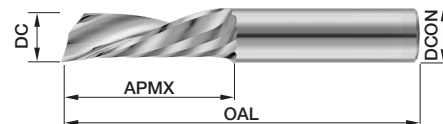


Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
110TD.015030640	1,5	6	40	3
110TD.020030640	2	6	40	3
110TD.020061060	2	10	60	6
110TD.030031240	3	12	40	3
110TD.030061560	3	15	60	6
110TD.040061560	4	15	60	6
110TD.040062075	4	20	75	6
110TD.050061660	5	16	60	6
110TD.060062060	6	20	60	6
110TD.060063060	6	30	60	6
110TD.060063575	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

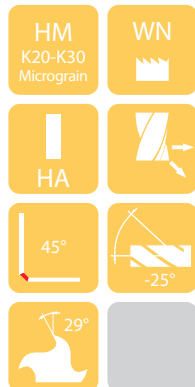


PLASTIC MATERIALS MILLING

Single flute endmill - Left helix, right hand cut



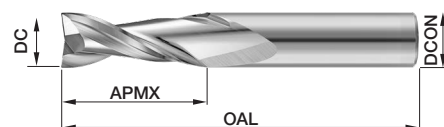
111



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

PLASTIC MATERIALS MILLING

2 flutes endmill - Right helix



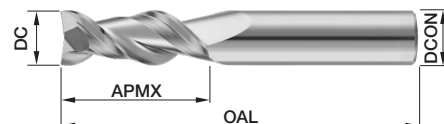
102



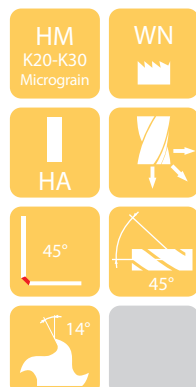
Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
102.020060650	2	6	50	6
102.020030850	2	8	50	3
102.030031240	3	12	40	3
102.030060750	3	7	50	6
102.030061250	3	12	50	6
102.040041440	4	14	40	4
102.040060950	4	9	50	6
102.040061450	4	14	50	6
102.050061150	5	11	50	6
102.050051650	5	16	50	5
102.060061350	6	13	50	6
102.060061850	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°



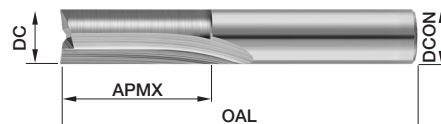
Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
102.020030850-45°	2	8	50	3
102.030031240-45°	3	12	40	3
102.030061250-45°	3	12	50	6
102.040041440-45°	4	14	40	4
102.040061450-45°	4	14	50	6
102.050061150-45°	5	11	50	6
102.050061650-45°	5	16	50	6
102.060061850-45°	6	18	50	6
102.060062560-45°	6	25	60	6
102.060063575-45°	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

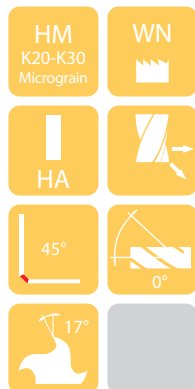
Plastic Materials Milling

PLASTIC MATERIALS MILLING

2 flutes endmill - Straight



100

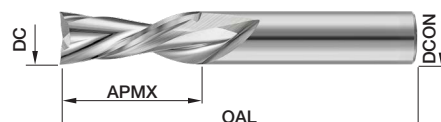


Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
100.030031240	3	12	40	3
100.030061250	3	12	50	6
100.040041440	4	14	40	4
100.040061450	4	14	50	6
100.050051650	5	16	50	5
100.060061850	6	18	50	6
100.080082063	8	20	63	8
100.100102572	10	25	72	10
100.120123083	12	30	83	12
100.160163592	16	35	92	16
100.2002045104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

104

PLASTIC MATERIALS MILLING

2 flutes endmill - Left helix, right hand cut



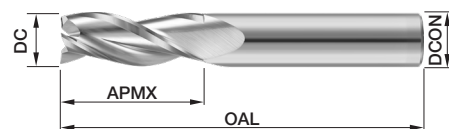
104



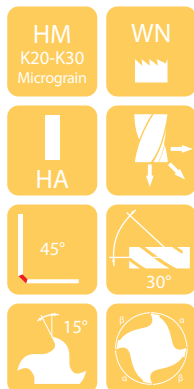
Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
104.020060650	2	6	50	6
104.030031240	3	12	40	3
104.030060950	3	9	50	6
104.030061250	3	12	50	6
104.040041440	4	14	40	4
104.040061350	4	13	50	6
104.050051650	5	16	50	5
104.060061850	6	18	50	6
104.080082063	8	20	63	8
104.100102572	10	25	72	10
104.120123083	12	30	83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

PLASTIC MATERIALS MILLING

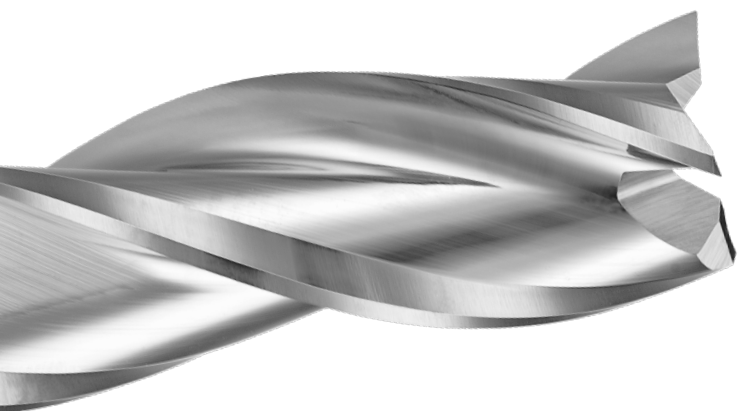
3 flutes endmill - Right helix



103I

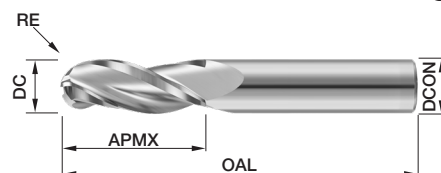


Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
103I.030061057	3	10	57	6
103I.040061357	4	13	57	6
103I.050061557	5	15	57	6
103I.060061857	6	18	57	6
103I.070082063	7	20	63	8
103I.080082063	8	20	63	8
103I.090102272	9	22	72	10
103I.100102572	10	25	72	10
103I.120123083	12	30	83	12
103I.140143083	14	30	83	14
103I.160163592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

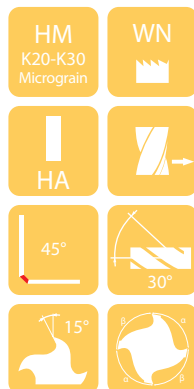


PLASTIC MATERIALS MILLING

3 flutes ball nose endmill - Right helix



103RI

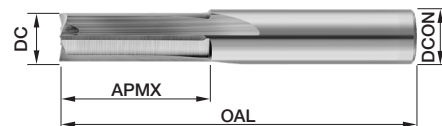


Cod.	DC	APMX	OAL	DCON	RE
	h10	0/+2	0/+2	h6	+/-0,05
103RI.030061057	3	10	57	6	1,5
103RI.040061357	4	13	57	6	2
103RI.050061557	5	15	57	6	2,5
103RI.060061857	6	18	57	6	3
103RI.070082063	7	20	63	8	3,5
103RI.080082063	8	20	63	8	4
103RI.090102272	9	22	72	10	4,5
103RI.100102572	10	25	72	10	5
103RI.120123083	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

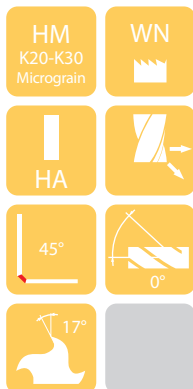


PLASTIC MATERIALS MILLING

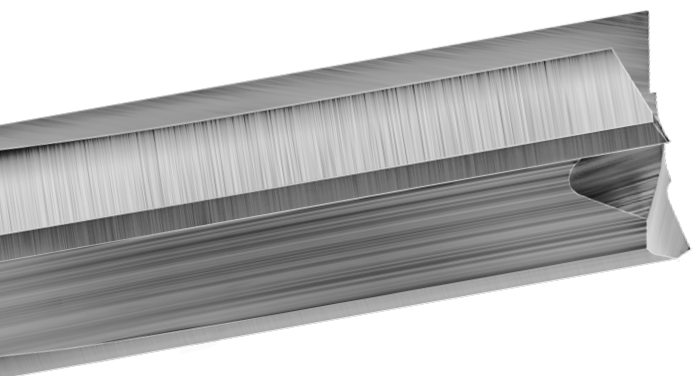
3 flutes endmill - Straight



101

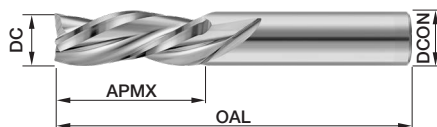


Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
101.030031240	3	12	40	3
101.040041440	4	14	40	4
101.050051650	5	16	50	5
101.060061850	6	18	50	6
101.080082063	8	20	63	8
101.100102572	10	25	72	10
101.120123083	12	30	83	12
101.160163592	16	35	92	16
101.2002045104	20	45	104	20

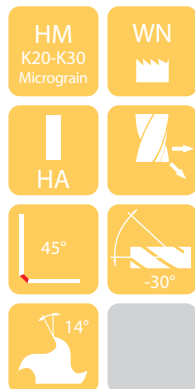


PLASTIC MATERIALS MILLING

3 flutes endmill - Left helix, right hand cut



105

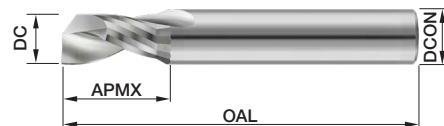


Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
105.030031240	3	12	40	3
105.040041440	4	14	40	4
105.050051650	5	16	50	5
105.060061850	6	18	50	6
105.080082063	8	20	63	8
105.100102572	10	25	72	10
105.120123083	12	30	83	12
105.160163592	16	35	92	16
105.2002045104	20	45	104	20

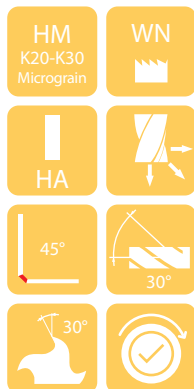


PLEXIGLASS MILLING AND POLISHING

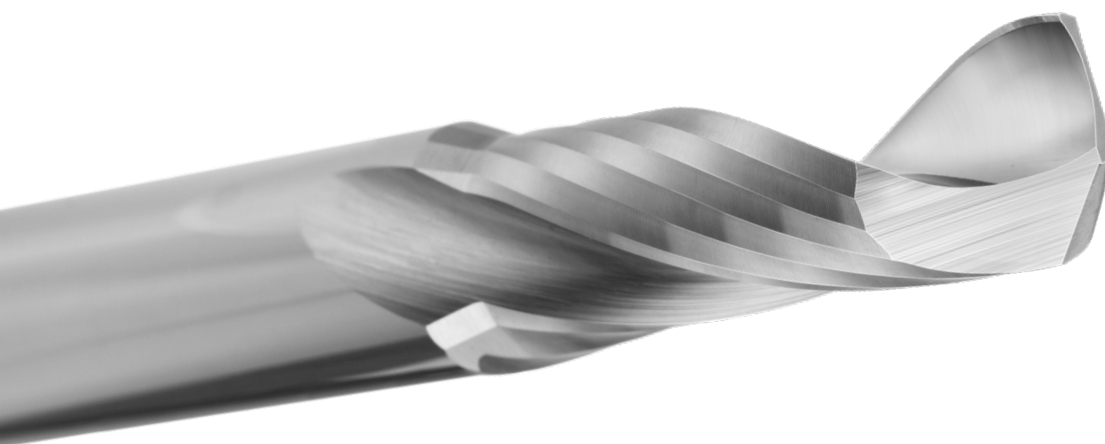
Single flute endmill - Right helix



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

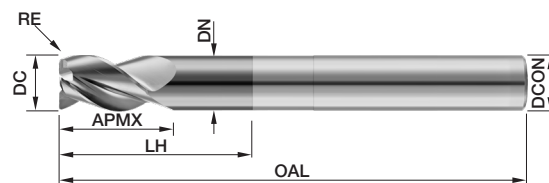


303

ALUMINUM ALLOYS HIGH REMOVAL MILLING

3 flutes torus radius endmill - Right helix

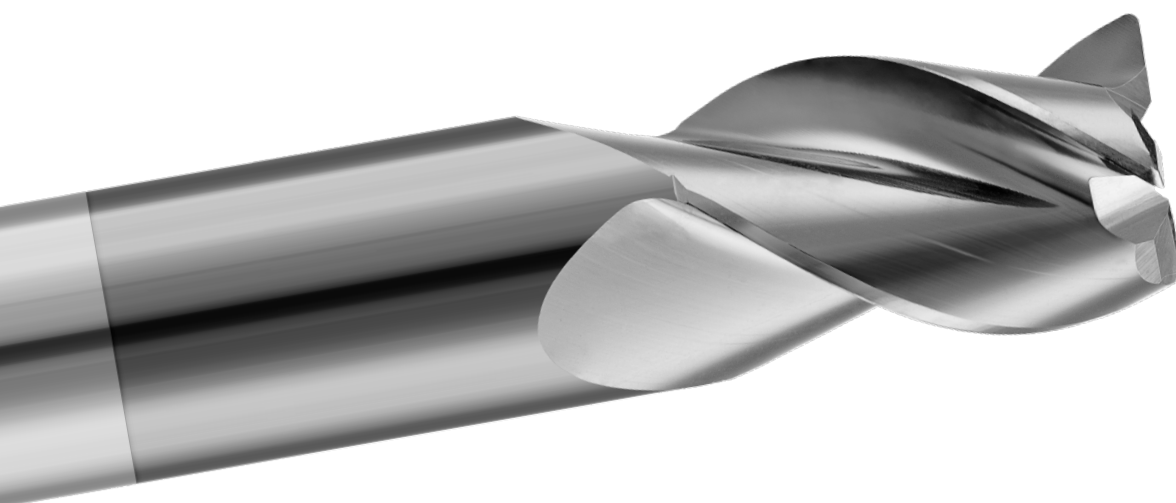
CVD DLC Cer-DL



303

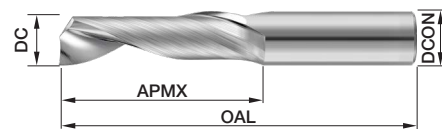


Cod.	DC	APMX	LH	OAL	DCON	RE	DN
	h6	0/+2	0/+2	0/+2	h6	+/-0,03	0/-0,05
303.040060657R02DL	4	6	12	57	6	0,2	3,9
303.040060670R02DL	4	6	20	70	6	0,2	3,9
303.060060957R03DL	6	9	18	57	6	0,3	5,8
303.060060970R03DL	6	9	30	70	6	0,3	5,8
303.080081263R04DL	8	12	24	63	8	0,4	7,8
303.080081280R04DL	8	12	40	80	8	0,4	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

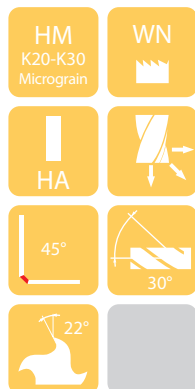


ALUMINUM ALLOYS MILLING

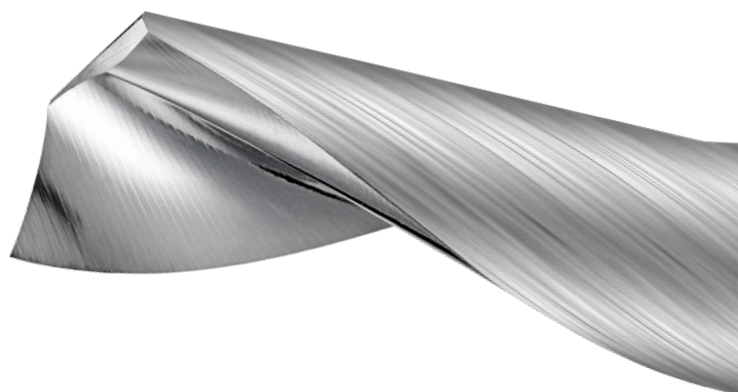
Single flute endmill - Right helix



110A

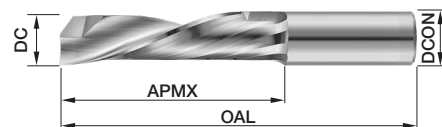


Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
110A.015030640	1,5	6	40	3
110A.020021040	2	10	40	2
110A.020030840	2	8	40	3
110A.020060650	2	6	50	6
110A.025060850	2,5	8	50	6
110A.030031040	3	10	40	3
110A.030060750	3	7	50	6
110A.030061050	3	10	50	6
110A.035061050	3,5	10	50	6
110A.040041250	4	12	50	4
110A.040060950	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



ALUMINUM ALLOYS MILLING

Single flute endmill - Left helix, right hand cut



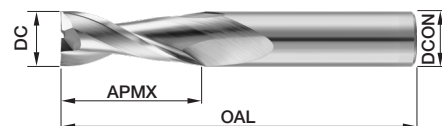
111A



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

ALUMINUM ALLOYS MILLING

2 flutes endmill - Right helix



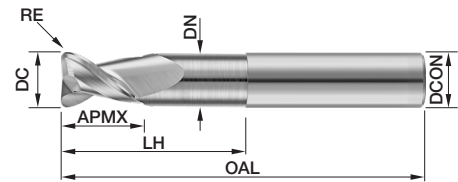
102A



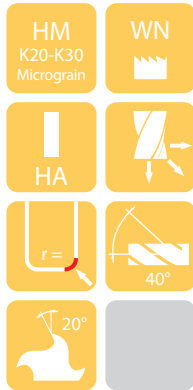
Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
102A.030061250	3	12	50	6
102A.040061450	4	14	50	6
102A.060061850	6	18	50	6
102A.080082063	8	20	63	8
102A.100102572	10	25	72	10
102A.120123083	12	30	83	12
102A.160163592	16	35	92	16
102A.2002045104	20	45	104	20

ALUMINUM ALLOYS MILLING

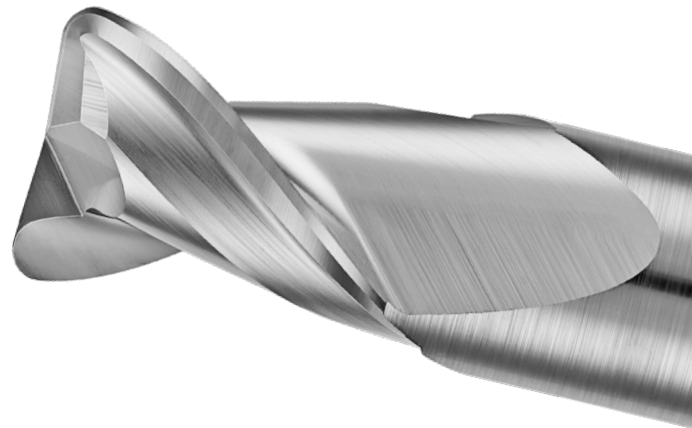
2 flutes torus radius endmill - Right helix

Also available with
Cer-taC coating

102TC/TCL



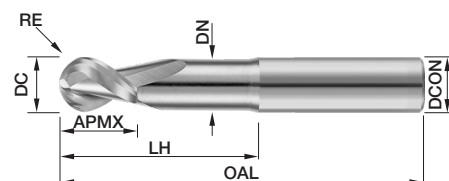
Cod.		DC	APMX	LH	OAL	DCON	RE	DN
Coated	Uncoated	e8	0/+2	0/+2	0/+2	h6	+0,03/+0	0/-0,05
102TC.020-40°TAC	102TC.020-40°	2	4	6	57	6	0,5	1,8
102TC.030-40°TAC	102TC.030-40°	3	5	9	57	6	0,5	2,8
102TCL.030-40°TAC	102TCL.030-40°	3	6	50	100	6	0,5	2,8
102TC.040-40°TAC	102TC.040-40°	4	6	12	57	6	0,5	3,7
102TCL.040-40°TAC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



ALUMINUM ALLOYS MILLING

2 flutes ball nose endmill - Right helix

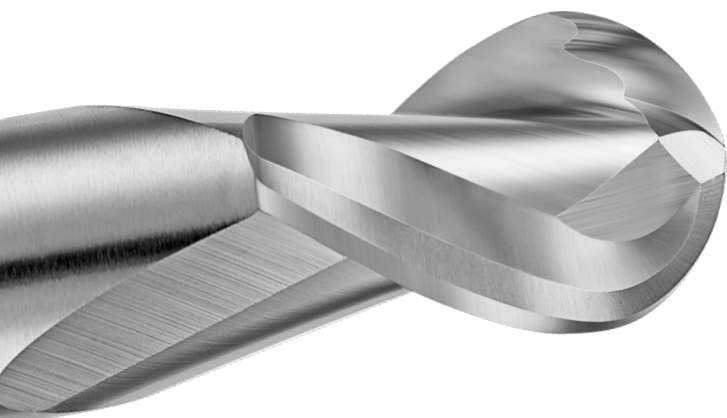
Also available with
CertaC coating



102RC/RCL

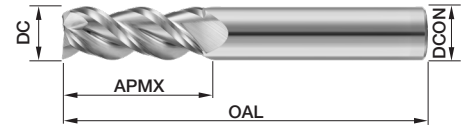


Cod.		DC	DC TOL.	APMX	LH	OAL	DCON	RE	DN
Coated	Uncoated			0/+2	0/+2	0/+2	h6	f8	0/-0,05
102RC.020-40°TAC	102RC.020-40°	2	-0,012/-0,040	4	6	57	6	1	1,8
102RC.030-40°TAC	102RC.030-40°	3	-0,012/-0,040	5	9	57	6	1,5	2,8
102RCL.030-40°TAC	102RCL.030-40°	3	-0,012/-0,040	6	50	100	6	1,5	2,8
102RC.040-40°TAC	102RC.040-40°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

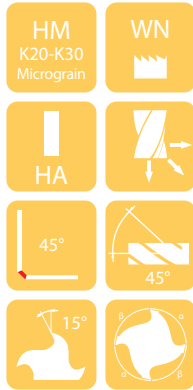


ALUMINUM ALLOYS MILLING

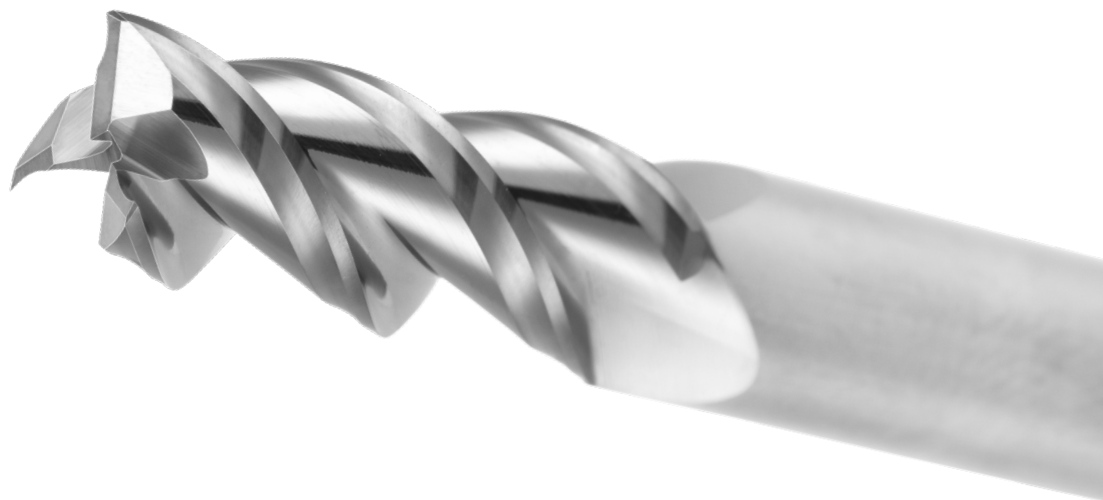
3 flutes endmill - 45° Right helix



103I-45°



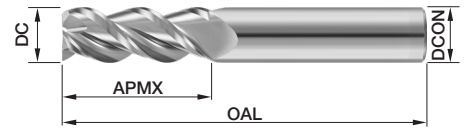
Cod.	DC	APMX	OAL	DCON
	h10	0/+2	0/+2	h6
103I.030061057-45°	3	10	57	6
103I.040061357-45°	4	13	57	6
103I.050061557-45°	5	15	57	6
103I.060061857-45°	6	18	57	6
103I.070082063-45°	7	20	63	8
103I.080082063-45°	8	20	63	8
103I.090102272-45°	9	22	72	10
103I.100102572-45°	10	25	72	10
103I.120123083-45°	12	30	83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



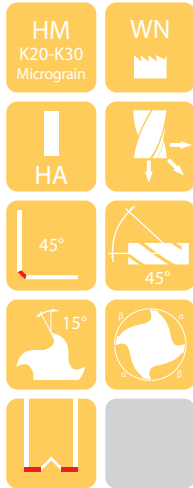
ALUMINUM ALLOYS MILLING

3 flutes endmill - 45° Right helix

Special front geometry for better surface finish



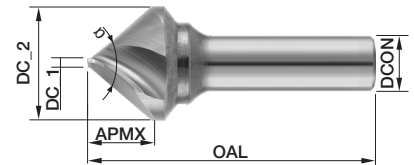
103PI-45°



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

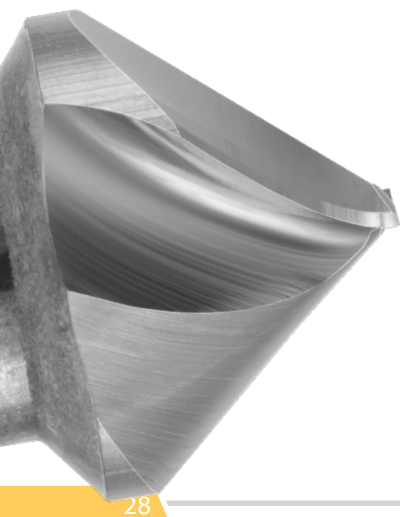
3 flutes tapered endmill - 45° right helix

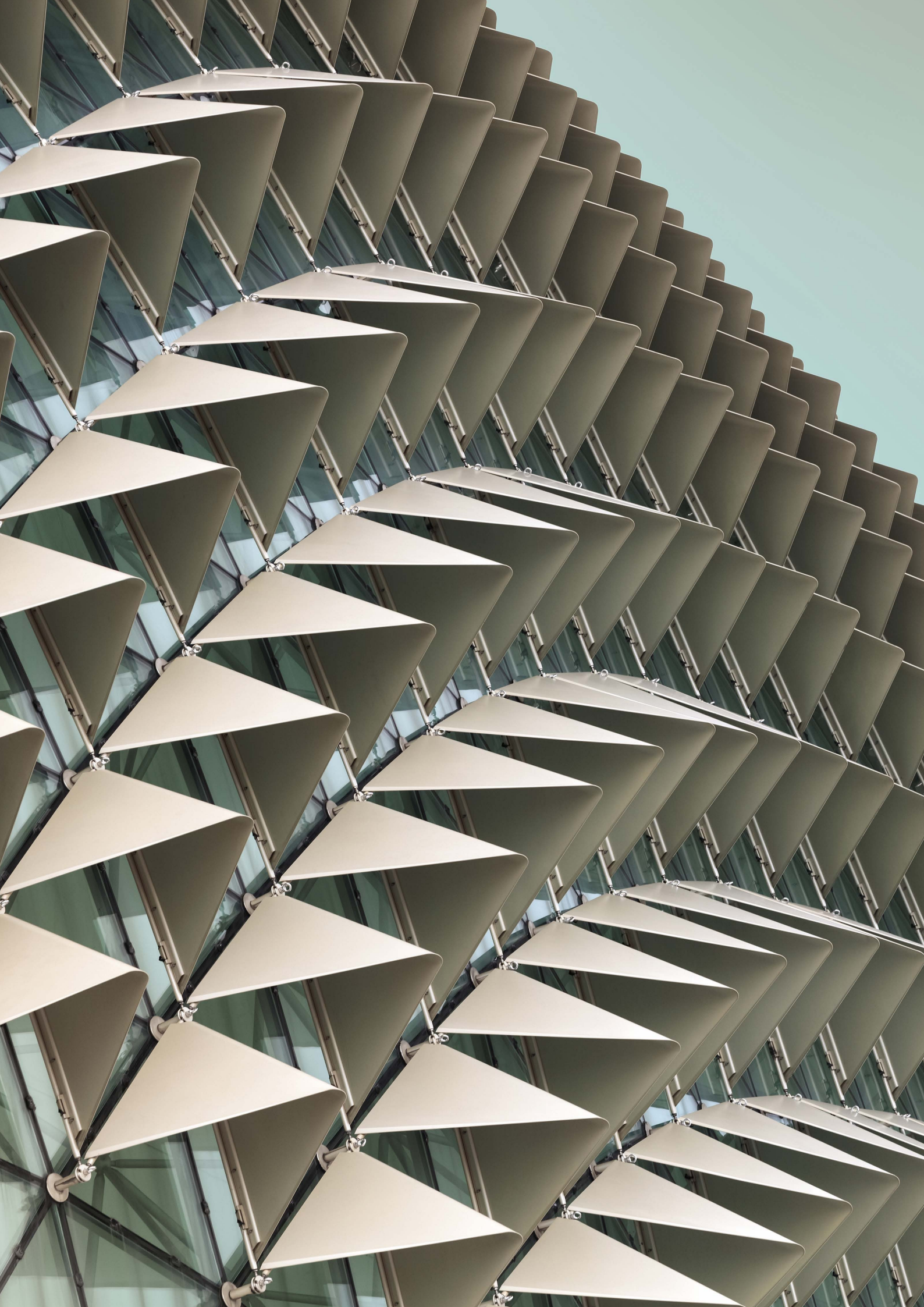


103K



Cod.	DC_2	APMX	OAL	DCON	DC_1	α
	+/-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

				Short version	Long version	ap max x DC	DC = 1,5 mm			DC = 2 mm			DC = 2,5 mm			DC = 3 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	
Tool	ISO	Material	Designation	Vc [m/min]			fz [mm]			fz [mm]			fz [mm]			fz [mm]			
100/101/102(45°) 103/103RI*/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
			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	Polikarbonato	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	Polistirol	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

						Short version	Long version	ap max x DC	DC = 1,5 mm			DC = 2 mm			DC = 2,5 mm			DC = 3 mm			DC = 3,5 mm			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	
Tool	ISO	Material	Streght [MPa]	N.	Designation	Vc [m/min]			fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	
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

$$n[\text{rpm}] = K \times V_c[\text{m/min}] \times 1000 / (D_c[\text{mm}] \times 3,14)$$

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 01-0,2x DC	ae 03-0,4x DC	ae 06-1,0x DC	ae 01-0,2x DC	ae 03-0,4x DC	ae 06-1,0x DC	ae 01-0,2x DC	ae 03-0,4x DC	ae 06-1,0x DC	ae 01-0,2x DC	ae 03-0,4x DC	ae 06-1,0x DC	ae 01-0,2x DC	ae 03-0,4x DC	ae 06-1,0x DC	ae 01-0,2x DC	ae 03-0,4x DC	ae 06-1,0x DC	ae 01-0,2x DC	ae 03-0,4x DC	ae 06-1,0x DC	ae 01-0,2x DC	ae 03-0,4x DC	ae 06-1,0x DC	ae 01-0,2x DC	ae 03-0,4x DC	ae 06-1,0x DC	ae 01-0,2x DC	ae 03-0,4x DC	ae 06-1,0x 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	0,360	0,180	0,120	0,405	0,203	0,135	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	0,360	0,180	0,120	0,405	0,203	0,135	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			DC = 9 mm			DC = 10 mm			DC = 12 mm			DC = 14 mm			DC = 16 mm			DC = 18 mm			DC = 20 mm		
ae 03-0,4 x DC	ae 06-1,0 x DC		ae 01-0,2 x DC	ae 03-0,4 x DC	ae 06-1,0 x DC	ae 01-0,2 x DC	ae 03-0,4 x DC	ae 06-1,0 x DC	ae 01-0,2 x DC	ae 03-0,4 x DC	ae 06-1,0 x DC	ae 01-0,2 x DC	ae 03-0,4 x DC	ae 06-1,0 x DC	ae 01-0,2 x DC	ae 03-0,4 x DC	ae 06-1,0 x DC	ae 01-0,2 x DC	ae 03-0,4 x DC	ae 06-1,0 x DC	ae 01-0,2 x DC	ae 03-0,4 x DC	ae 06-1,0 x DC	ae 01-0,2 x DC	ae 03-0,4 x DC	ae 06-1,0 x DC	ae 01-0,2 x DC	ae 03-0,4 x DC	ae 06-1,0 x DC	ae 01-0,2 x DC	ae 03-0,4 x DC	ae 06-1,0 x DC	ae 01-0,2 x DC	ae 03-0,4 x DC	ae 06-1,0 x DC						
fz [mm]			fz [mm]			fz [mm]			fz [mm]			fz [mm]			fz [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				0,350	0,263	0,105	0,420	0,315	0,126			0,560	0,420	0,168		0,700	0,525	0,210			
0,105	0,042					0,175	0,131	0,053				0,210	0,158	0,063				0,280	0,210	0,084				0,350	0,263	0,105	0,420	0,315	0,126			0,560	0,420	0,168		0,700	0,525	0,210			
0,105	0,042					0,175	0,131	0,053				0,210	0,158	0,063				0,280	0,210	0,084				0,350	0,263	0,105	0,420	0,315	0,126			0,560	0,420	0,168		0,700	0,525	0,210			
0,053	0,021					0,088	0,066	0,026				0,105	0,079	0,032				0,140	0,105	0,042				0,175	0,131	0,053	0,210	0,158	0,063			0,280	0,210	0,084		0,350	0,263	0,105			
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				0,175	0,131	0,053	0,210	0,158	0,063			0,280	0,210	0,084		0,350	0,263	0,105			
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				0,175	0,131	0,053	0,210	0,158	0,063			0,280	0,210	0,084		0,350	0,263	0,105			
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				0,175	0,131	0,053	0,210	0,158	0,063			0,280	0,210	0,084		0,350	0,263	0,105			
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				0,088	0,066	0,026	0,105	0,079	0,032			0,140	0,105	0,042		0,175	0,131	0,053			
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	0,158	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	
0,053	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	0,158	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	
0,053	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	0,158	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	
0,026	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	0,079	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	
0,105	0,042										0,210	0,158	0,063					0,280	0,210	0,084				0,350	0,263	0,105	0,420	0,315	0,126			0,560	0,420	0,168		0,700	0,525	0,210			
0,105	0,042										0,210	0,158	0,063					0,280	0,210	0,084				0,350	0,263	0,105	0,420	0,315	0,126			0,560	0,420	0,168		0,700	0,525	0,210			
0,105	0,042										0,210	0,158	0,063					0,280	0,210	0,084				0,350	0,263	0,105	0,420	0,315	0,126			0,560	0,420	0,168		0,700	0,525	0,210			
0,053	0,021										0,105	0,079	0,032					0,140	0,105	0,042				0,175	0,131	0,053	0,210	0,158	0,063			0,280	0,210	0,084		0,350	0,263	0,105			

This image shows a full-page view of a blank sheet of lined paper. At the top left, there is a yellow rectangular header with the word "Notes" written in bold black font. The rest of the page is white with horizontal grey lines spaced evenly apart, providing a template for writing.

Plastic and Light Alloys Milling



Cerin®
CUTTING TOOLS MANUFACTURING

Cerin S.p.A. - Via Enrico Fermi 15
37010 AFFI (Verona) Italy
Tel. +39 045 7200 844 - Fax +39 045 7200 835
E-mail: cerin@cerin.it - www.cerin.it

