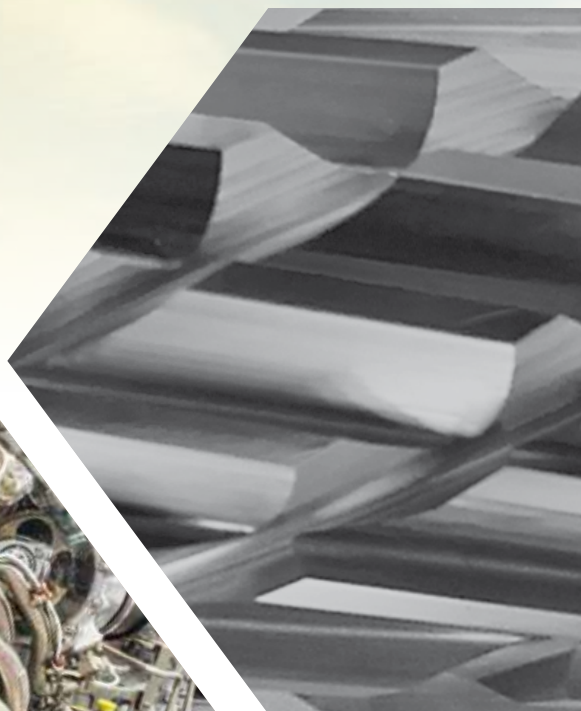




Aerospace



Composite Materials
High temperature alloys
Titanium alloys
Stainless steel

Complete product range for aerospace industry



MADE IN ITALY



*We develop products and processes
to propose 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.

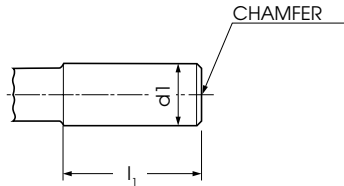
Today, Cerin provides its customers with the benefit of a long experience by offering a complete range of high performance cutters dedicated to the machining of aerospace materials.



COMPANY WITH
QUALITY SYSTEM
CERTIFIED BY DNV
ISO 9001

Shank design (for drilling and milling tools) DIN 6535

Straight cylindrical shank - Shape HA

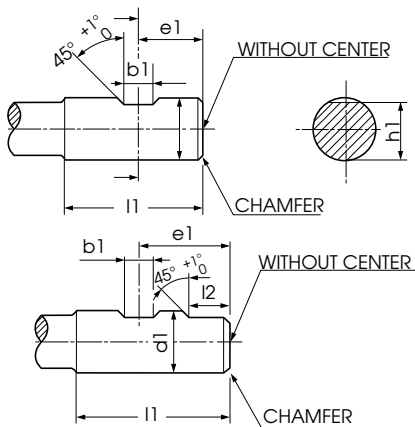


d_1	l_1	d_1	l_1	d_1	l_1
h6	+2/0	h6	+2/0	h6	+2/0
2	28	8	36	18	48
3	28	10	40	20	50
4	28	12	45	25	56
5	28	14	45	32	60
6	36	16	48		

Cylindrical shank - Shape HB

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

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

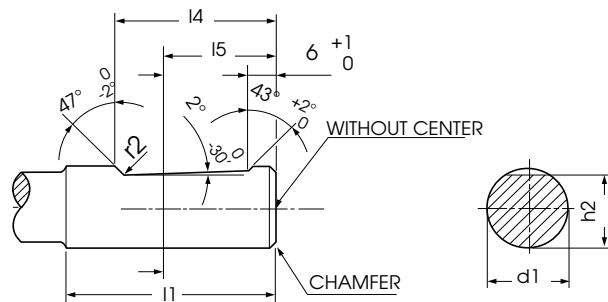


d_1	b_1	e_1	h_1	l_1	l_2
h6	+0,05/0	0/-1	h11	+2/0	+1/0
6	4,2	18	5,1	36	
8	5,5	18	6,9	36	
10	7	20	8,5	40	
12	8	22,5	10,4	45	
14	8	22,5	12,7	45	
16	10	24	14,2	48	
18	10	24	16,2	48	
20	11	25	18,2	50	
25	12	32	23	56	17
32	14	36	32	60	19

Cylindrical shank - Shape HE

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

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



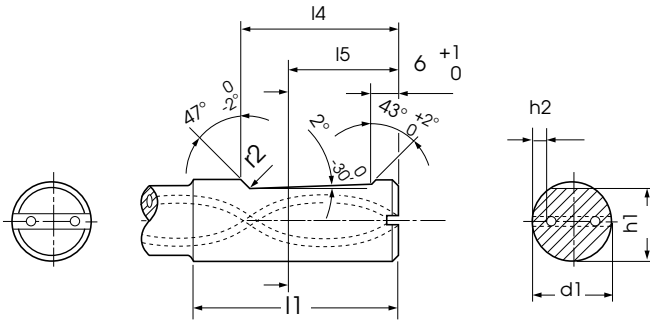
d_1	(b_2)	(b_3)	h_2	(h_3)	l_1	l_4	l_5	r_2
h6			h11		+2/0	0/-1	Nominal size	min.
6	4,3		5,1		36	25	18	1,2
8	5,5		6,9		36	25	18	1,2
10	7,1		8,5		40	28	20	1,2
12	8,2		10,4		45	33	22,5	1,2
14	8,1		12,7		45	33	22,5	1,2
16	10,1		14,2		48	36	24	1,6
18	10,8		16,2		48	36	24	1,6
20	11,4		18,2		50	38	25	1,6
25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

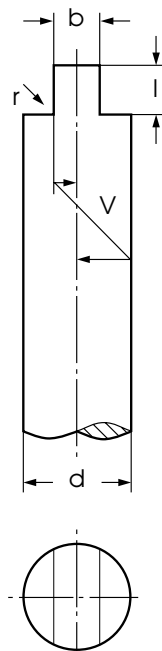
one slope flat - d1 = 6 to 20 mm

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	$b_r = 2\sqrt{R_{th} (D_c - R_{th})}$
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	$V_{fM} = \frac{V_f \times (D + D_c)}{D}$

AerospAcE

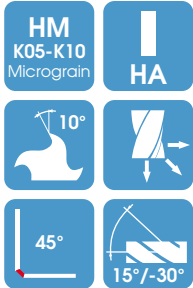
		Pag
	Endmills for CFRP	6
	Endmills for kevlar	10
	Endmills for GFRP	12
	Endmills for honeycomb materials	15
	Drills for CFRP	18
	PCD endmills	21
	Endmills for titanium and nickel	24
	Endmills for steel	28
	Endmills for aluminum	32

HPC CFRP MILLING HPC right helix endmill

High thickness CVD Diamond
Cer-DM



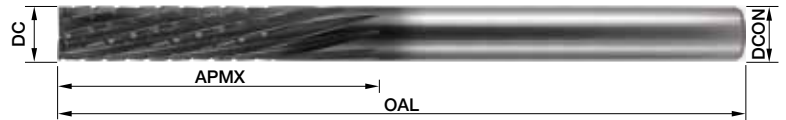
68DX



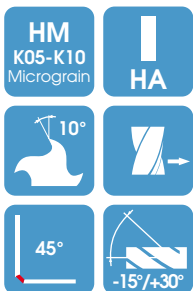
Cod.	DC	DC TOL.	APMX	OAL	DCON
			0/+2	0/+2	h6
68DX.040061660DM	4	+0,01/-0,03	16	60	6
68DX.060062060DM	6	+0,01/-0,03	20	60	6
68DX.060063575DM	6	+0,01/-0,03	35	75	6
68DX.080083275DM	8	+0,005/-0,04	32	75	8
68DX.0800840100DM	8	+0,005/-0,04	40	100	8
68DX.100103272DM	10	+0,005/-0,04	32	72	10
68DX.1001050100DM	10	+0,005/-0,04	50	100	10
68DX.120123283DM	12	0/-0,05	32	83	12
68DX.1201260120DM	12	0/-0,05	60	120	12

HPC CFRP MILLING HPC left helix endmill

High thickness CVD Diamond
Cer-DM



68SX

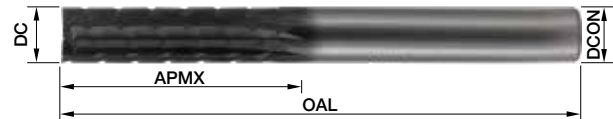


Cod.	DC	DC TOL.	APMX	OAL	DCON
			0/+2	0/+2	h6
68SX.040061680DM	4	+0,01/-0,03	16	80	6
68SX.060062080DM	6	+0,01/-0,03	20	80	6
68SX.0600635100DM	6	+0,01/-0,03	35	100	6
68SX.0800832100DM	8	+0,005/-0,04	32	100	8
68SX.0800840120DM	8	+0,005/-0,04	40	120	8
68SX.1001032100DM	10	+0,005/-0,04	32	100	10
68SX.1001050120DM	10	+0,005/-0,04	50	120	10
68SX.1201232100DM	12	0/-0,05	32	100	12
68SX.1201260150DM	12	0/-0,05	60	150	12

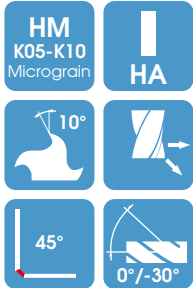
HPC CFRP MILLING

HPC straight flute endmill

High thickness CVD Diamond
Cer-DM



68TD

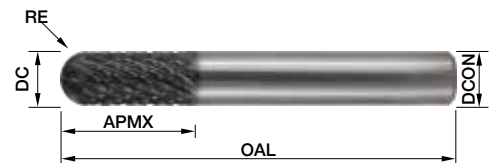


Cod.	DC	DC TOL.	APMX	OAL	DCON
			0/+2	0/+2	h6
68TD.040061680DM	4	+0,01/-0,03	16	80	6
68TD.060062080DM	6	+0,01/-0,03	20	80	6
68TD.0600635100DM	6	+0,01/-0,03	35	100	6
68TD.0800832100DM	8	+0,005/-0,04	32	100	8
68TD.0800840120DM	8	+0,005/-0,04	40	120	8
68TD.1001032100DM	10	+0,005/-0,04	32	100	10
68TD.1001050120DM	10	+0,005/-0,04	50	120	10
68TD.1201232100DM	12	0/-0,05	32	100	12
68TD.1201260150DM	12	0/-0,05	60	150	12

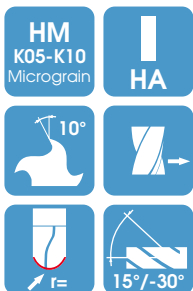
HPC CFRP MILLING

HPC ball nose right helix endmill

High thickness CVD Diamond
Cer-DM



68RDX



Cod.	DC	DC TOL.	APMX	OAL	DCON	RE
			0/+2	0/+2	h6	+0,015/-0,01
68RDX.040061960DM	4	+0,01/-0,03	19	60	6	2
68RDX.060062360DM	6	+0,01/-0,03	23	60	6	3
68RDX.080083675DM	8	+0,005/-0,04	36	75	8	4
68RDX.100103772DM	10	+0,005/-0,04	37	72	10	5
68RDX.120123883DM	12	0/-0,05	38	83	12	6





STANDARD CFRP MILLING

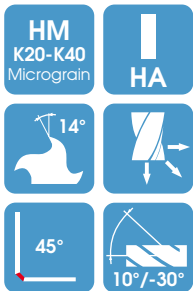
Right helix endmill

CVD Diamond Cer-D

Also available without diamond coating



68SU



Cod.		DC	DC TOL.	APMX	OAL	DCON
Coated	Uncoated			0/+2	0/+2	h6
68SU.050061660D	68SU.050061660	5	-0,01/-0,04	16	60	6
68SU.050062875D	68SU.050062875	5	-0,01/-0,04	28	75	6
68SU.060062060D	68SU.060062060	6	-0,01/-0,04	20	60	6
68SU.060063575D	68SU.060063575	6	-0,01/-0,04	35	75	6
68SU.080082263D	68SU.080082263	8	-0,015/-0,05	22	63	8
68SU.0800840100D	68SU.0800840100	8	-0,015/-0,05	40	100	8
68SU.100102572D	68SU.100102572	10	-0,015/-0,05	25	72	10
68SU.1001050100D	68SU.1001050100	10	-0,015/-0,05	50	100	10
68SU.120123083D	68SU.120123083	12	-0,02/-0,07	30	83	12
68SU.1201250100D	68SU.1201250100	12	-0,02/-0,07	50	100	12
68SU.160163592D	68SU.160163592	16	-0,02/-0,07	35	92	16
68SU.1601660125D	68SU.1601660125	16	-0,02/-0,07	60	125	16

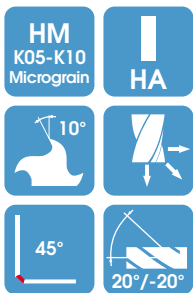


HPC CFRP MILLING HPC Up&Down Cutter

High thickness CVD Diamond
Cer-DM



104PH



Cod.	DC	DC TOL.	APMX	LH	OAL	DCON
			0/+2	0/+2	0/+2	h6
104PH.060061575DM	6	+0,01/-0,03	4	15	75	6
104PH.080082075DM	8	+0,005/-0,04	6	20	75	8
104PH.1001025100DM	10	+0,005/-0,04	7	25	100	10
104PH.1201230100DM	12	0/-0,05	8	30	100	12

419TD

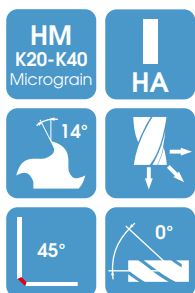


HPC KEVLAR MILLING

HPC 4 flutes cutter Up&Down chip breaker



419TD



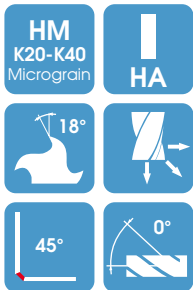
Cod.	DC	DC TOL.	APMX	OAL	DCON
			0/+2	0/+2	h6
419TD.060062060	6	h10	20	60	6
419TD.060063575	6	h10	35	75	6
419TD.080083275	8	h10	32	75	8
419TD.0800840100	8	h10	40	100	8
419TD.100103272	10	h10	32	72	10
419TD.1001050100	10	h10	50	100	10
419TD.120123283	12	h10	32	83	12
419TD.1201255120	12	h10	55	120	12



STANDARD KEVLAR MILLING
2 flutes cutter Up&Down chip breaker



119P

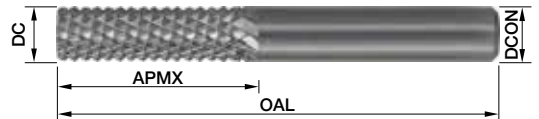


Cod.	DC	DC TOL.	APMX	OAL	DC ON
			0/+2	0/+2	h6
119P.030031250	3	h10	12	50	3
119P.030061875	3	h10	18	75	6
119P.040041450	4	h10	14	50	4
119P.040062075	4	h10	20	75	6
119P.050051650	5	h10	16	50	5
119P.050062575	5	h10	25	75	6
119P.060062060	6	h10	20	60	6
119P.0600635100	6	h10	35	100	6
119P.080082263	8	h10	22	63	8
119P.0800840100	8	h10	40	100	8
119P.100102572	10	h10	25	72	10
119P.1001050125	10	h10	50	125	10
119P.120123083	12	h10	30	83	12
119P.1201260125	12	h10	60	125	12
119P.160163592	16	h10	35	92	16
119P.1601675150	16	h10	75	150	16
119P.2002045104	20	h10	45	104	20
119P.2002075150	20	h10	75	150	20

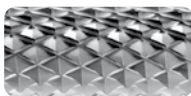
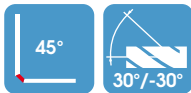
106 F, M, G

GLASS FIBER MILLING

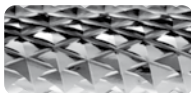
No front cut endmill



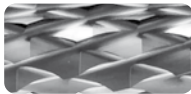
106 F, M, G



F



M



G

Cod.	DC	DC TOL.	APMX	OAL	DCON
			0/+2	0/+2	h6
106F.020060750	2	e9	7	50	6
106F.030061250	3	e9	12	50	6
106F.040062050	4	e9	20	50	6
106F.060061850	6	e9	18	50	6
106F.060063575	6	e9	35	75	6
106F.080082563	8	e9	25	63	8
106F.0800840100	8	e9	40	100	8
106F.100103072	10	e9	30	72	10
106F.120123283	12	e9	32	83	12
106M.020060750	2	e9	7	50	6
106M.030061250	3	e9	12	50	6
106M.040062050	4	e9	20	50	6
106M.060061850	6	e9	18	50	6
106M.060063575	6	e9	35	75	6
106M.080082563	8	e9	25	63	8
106M.0800840100	8	e9	40	100	8
106M.100103072	10	e9	30	72	10
106M.120123283	12	e9	32	83	12
106G.020060750	2	e9	7	50	6
106G.030061250	3	e9	12	50	6
106G.040062050	4	e9	20	50	6
106G.060061850	6	e9	18	50	6
106G.060063575	6	e9	35	75	6
106G.080082563	8	e9	25	63	8
106G.0800840100	8	e9	40	100	8
106G.100103072	10	e9	30	72	10
106G.120123283	12	e9	32	83	12



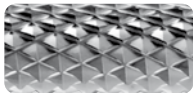
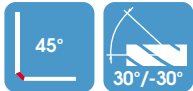
108 F, M, G

GLASS FIBER MILLING

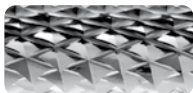
Z=2 front cut endmill



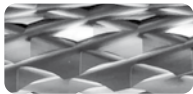
108 F, M, G



F



M



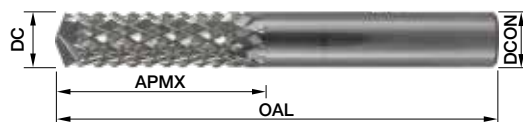
G

Cod.	DC	DC TOL.	APMX	OAL	DCON
			0/+2	0/+2	h6
108F.020060750	2	e9	7	50	6
108F.030061250	3	e9	12	50	6
108F.040062050	4	e9	20	50	6
108F.060061850	6	e9	18	50	6
108F.060063575	6	e9	35	75	6
108F.080082563	8	e9	25	63	8
108F.0800840100	8	e9	40	100	8
108F.100103072	10	e9	30	72	10
108F.120123283	12	e9	32	83	12
108M.020060750	2	e9	7	50	6
108M.030061250	3	e9	12	50	6
108M.040062050	4	e9	20	50	6
108M.060061850	6	e9	18	50	6
108M.060063575	6	e9	35	75	6
108M.080082563	8	e9	25	63	8
108M.0800840100	8	e9	40	100	8
108M.100103072	10	e9	30	72	10
108M.120123283	12	e9	32	83	12
108G.020060750	2	e9	7	50	6
108G.030061250	3	e9	12	50	6
108G.040062050	4	e9	20	50	6
108G.060061850	6	e9	18	50	6
108G.060063575	6	e9	35	75	6
108G.080082563	8	e9	25	63	8
108G.0800840100	8	e9	40	100	8
108G.100103072	10	e9	30	72	10
108G.120123283	12	e9	32	83	12

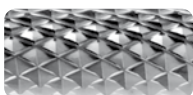


109 F, M, G

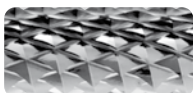
GLASS FIBER MILLING
Z=2 drilling front cut endmill



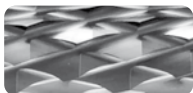
109 F, M, G



F



M



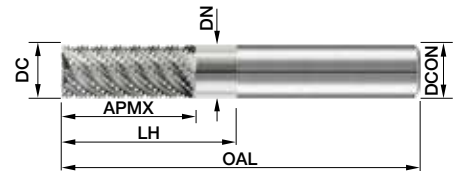
G

Cod.	DC	DC TOL.	APMX	OAL	DCON
			0/+2	0/+2	h6
109F.020060750	2	e9	7	50	6
109F.030061250	3	e9	12	50	6
109F.040062050	4	e9	20	50	6
109F.060061850	6	e9	18	50	6
109F.060063575	6	e9	35	75	6
109F.080082563	8	e9	25	63	8
109F.0800840100	8	e9	40	100	8
109F.100103072	10	e9	30	72	10
109F.120123283	12	e9	32	83	12
109M.020060750	2	e9	7	50	6
109M.030061250	3	e9	12	50	6
109M.040062050	4	e9	20	50	6
109M.060061850	6	e9	18	50	6
109M.060063575	6	e9	35	75	6
109M.080082563	8	e9	25	63	8
109M.0800840100	8	e9	40	100	8
109M.100103072	10	e9	30	72	10
109M.120123283	12	e9	32	83	12
109G.020060750	2	e9	7	50	6
109G.030061250	3	e9	12	50	6
109G.040062050	4	e9	20	50	6
109G.060061850	6	e9	18	50	6
109G.060063575	6	e9	35	75	6
109G.080082563	8	e9	25	63	8
109G.0800840100	8	e9	40	100	8
109G.100103072	10	e9	30	72	10
109G.120123283	12	e9	32	83	12

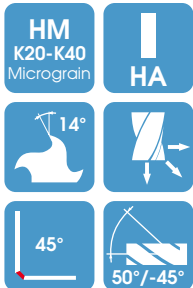


HONEYCOMB MATERIALS MILLING

Multiflute endmill with chipbraker



77SU

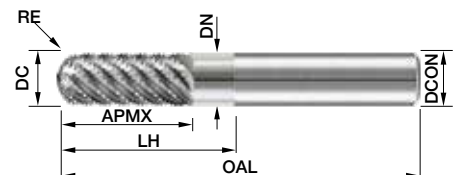


Cod.	DC	DC TOL.	APMX	LH	OAL	DCON	DN
			0/+2	0/+2	0/+2	h6	0/-0,05
77SU.060061650	6	e9	16	16	50	6	6
77SU.060061650E	6	e9	16	16	50	6	6
77SU.080081963	8	e9	19	26	63	8	7,9
77SU.080081963E	8	e9	19	26	63	8	7,9
77SU.100102272	10	e9	22	32	72	10	9,8
77SU.100102272E	10	e9	22	32	72	10	9,8
77SU.120122683	12	e9	26	37	83	12	11,8
77SU.120122683E	12	e9	26	37	83	12	11,8
77SU.1401217100	14	e9	17	17	100	12	12
77SU.1401217100E	14	e9	17	17	100	12	12
77SU.1601217100	16	e9	17	24	100	12	14
77SU.1601217100E	16	e9	17	24	100	12	14
77SU.2001217100	20	e9	17	24	100	12	16,5
77SU.2001217100E	20	e9	17	24	100	12	16,5
77SU.2401210100	24	e9	10	17	100	12	17,5
77SU.2401210100E	24	e9	10	17	100	12	17,5
77SU.2401217100	24	e9	17	24	100	12	17,5
77SU.2401217100E	24	e9	17	24	100	12	17,5
77SU.4401217100	44*	e9	17	28	100	12	20
77SU.4401217100E	44*	e9	17	28	100	12	20

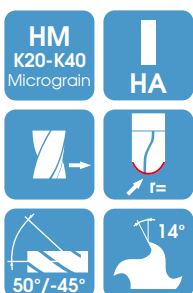
* Vertical machining not allowed

HONEYCOMB MATERIALS MILLING

Ball nose multiflute endmill with chipbraker



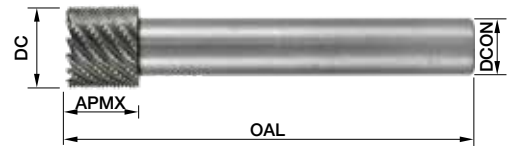
77RSU



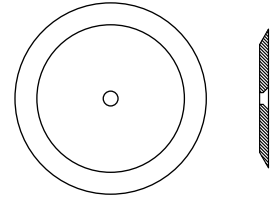
Cod.	DC	DC TOL.	APMX	LH	OAL	DCON	DN	RE
			0/+2	0/+2	0/+2	h6	0/-0,05	+/-0,05
77RSU.100102272	10	e9	22	32	72	10	9,8	5
77RSU.120122683	12	e9	26	37	83	12	11,8	6
77RSU.1601217100	16	e9	17	24	100	12	14	8

77SUP

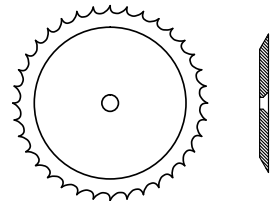
HONEYCOMB MATERIALS MILLING
Assembled multiflute endmill with cutting plate



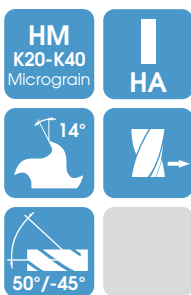
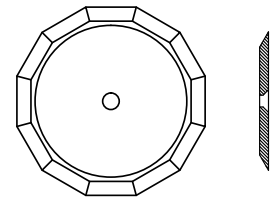
	Item	Plate	Shank	Cutter
77SUP.L.	.120122683	0GD130390°L	0C12078023M4	77SUP.1226
	.2001220100	0GDCON103120°L	0C12089717M4	77SUP.2020
	.2401217100	0GDCON503120°L	0C12089714M4	77SUP.2417
	.4401217100	0GD4703120°L	0C12089714M4	77SUP.4417



	Item	Plate	Shank	Cutter
77SUP.D.	.120122683	0GD130390°D	0C12078023M4	77SUP.1226
	.2001220100	0GDCON103120°D	0C12089717M4	77SUP.2020
	.2401217100	0GDCON503120°D	0C12089714M4	77SUP.2417
	.4401217100	0GD4703120°D	0C12089714M4	77SUP.4417

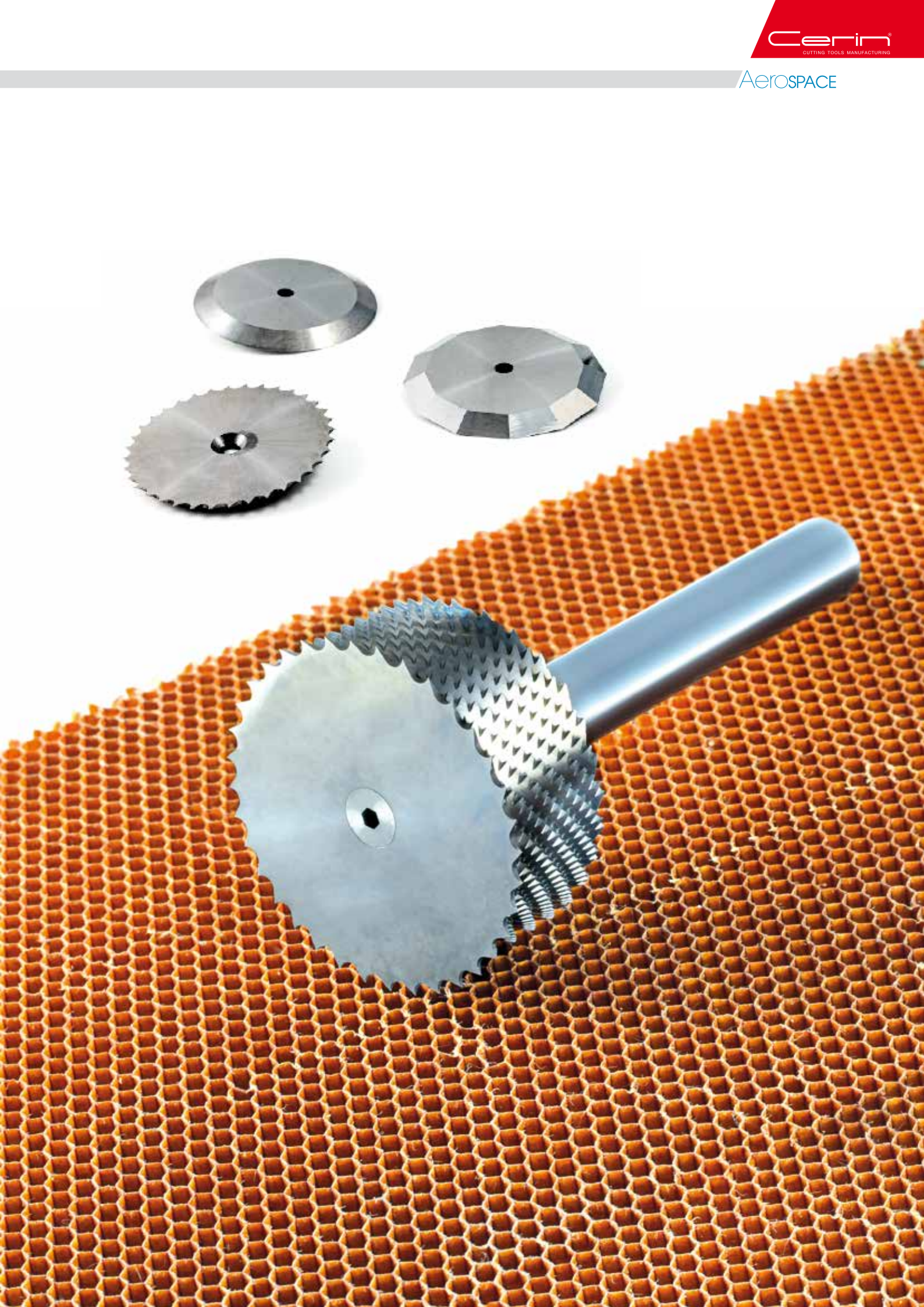


	Item	Plate	Shank	Cutter
77SUP.P.	.120122683	0GD130390°P	0C12078023M4	77SUP.1226
	.2001220100	0GDCON103120°P	0C12089717M4	77SUP.2020
	.2401217100	0GDCON503120°P	0C12089714M4	77SUP.2417
	.4401217100	0GD4703120°P	0C12089714M4	77SUP.4417



Cod.	DC	DC TOL.	APMX	OAL	DCON
			0/+2	0/+2	h6
.120122683	12	e9	26	83	26
.2001220100	20	e9	20	100	20
.2401217100	24	e9	17	100	17
.4401217100	44	e9	17	100	17



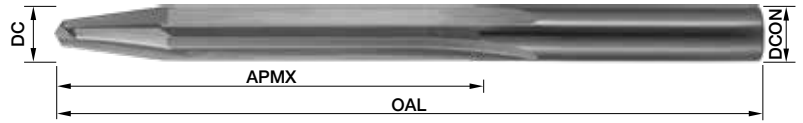


217

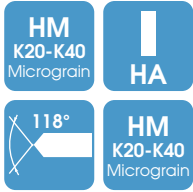
STANDARD CFRP DRILLING

Straight flute Z=4 for manual and CNC drilling

Also available with DLC coating



217

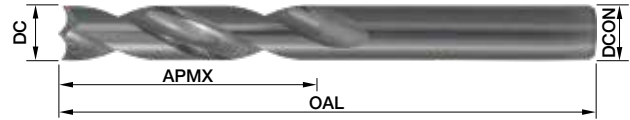


Cod.		DC	DC TOL.	APMX	OAL	DCON
Coated	Uncoated			0/+2	0/+2	H7
217.020DL	217.020	2	H7	50	100	2
217.0248DL	217.0248	2,48	H7	50	100	2,48
217.030DL	217.030	3	H7	50	100	3
217.0317DL	217.0317	3,17	H7	50	100	3,17
217.040DL	217.040	4	H7	50	100	4
217.0421DL	217.0421	4,21	H7	50	100	4,21
217.0482DL	217.0482	4,82	H7	50	100	4,82
217.0505DL	217.0505	5,05	H7	50	100	5,05
217.0553DL	217.0553	5,53	H7	50	100	5,53
217.060DL	217.060	6	H7	50	100	6
217.0635DL	217.0635	6,35	H7	50	100	6,35
217.660DL	217.660	6,6	H7	50	100	6,6
217.070DL	217.070	7	H7	50	100	7
217.0792DL	217.0792	7,92	H7	50	100	7,92
217.080DL	217.080	8	H7	50	100	8
217.0863DL	217.0863	8,63	H7	50	100	8,63
217.090DL	217.090	9	H7	50	100	9
217.100DL	217.100	10	H7	50	100	10
217.120DL	217.120	12	H7	50	100	12

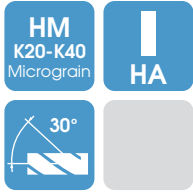


KEVLAR DRILLING

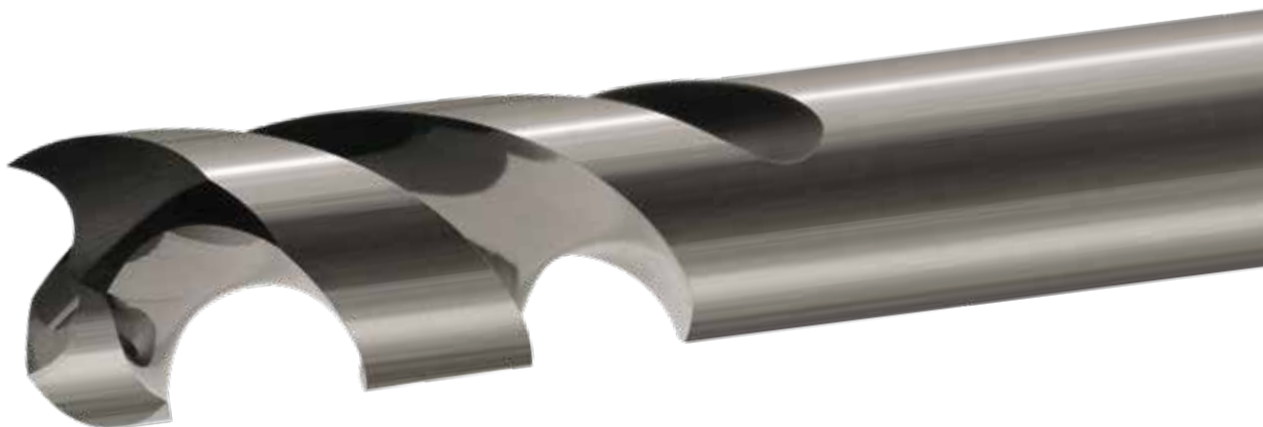
Twist drill for manual and CNC application



118



Cod.	DC	DC TOL.	APMX	OAL	DCON
			0/+2	0/+2	h6
118.030	3	h6	12	40	3
118.0317	3,17	h6	12	40	3,17
118.040	4	h6	18	55	4
118.050	5	h6	26	62	5
118.060	6	h6	28	66	6
118.0635	6,35	h6	31	70	6,35
118.065	6,5	h6	31	70	6,5
118.070	7	h6	34	74	7
118.0793	7,93	h6	37	79	7,93
118.080	8	h6	37	79	8
118.085	8,5	h6	37	79	8,5
118.090	9	h6	40	84	9
118.100	10	h6	48	89	10
118.120	12	h6	50	102	12

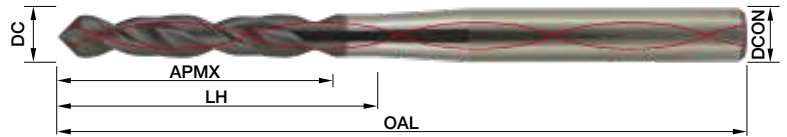


HPC CFRP DRILLING

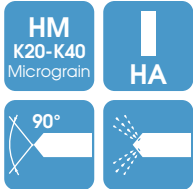
HPC twist drill

CVD Diamond Cer-DA

Internal cooling



165C



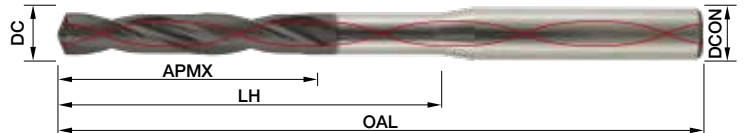
Cod.	DC	DC TOL.	APMX	LH	OAL	DCON
			0/+2	0/+2	0/+2	h6
165C.0248062366DA	2,48	h6	23	66	28	6
165C.030062366DA	3	h6	23	66	28	6
165C.03175062366DA	3,175	h6	23	66	28	6
165C.040062974DA	4	h6	29	74	36	6
165C.04826063682DA	4,826	h6	36	82	44	6
165C.060063582DA	6	h6	35	82	44	6
165C.0635084391DA	6,35	h6	43	91	53	8
165C.0793084391DA	7,93	h6	43	91	53	8
165C.080084391DA	8	h6	43	91	53	8
165C.09521049103DA	9,52	h6	49	103	61	10
165C.1001049103DA	10	h6	49	103	61	10

HPC CFRP DRILLING

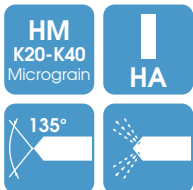
HPC twist drill for CFRP + Ti or CFRP + Al panels

CVD Diamond Cer-DA

Internal cooling



165ST



Cod.	DC	DC TOL.	APMX	LH	OAL	DCON
			0/+2	0/+2	0/+2	h6
165ST.0248062366DA	2,48	h6	23	66	28	6
165ST.030062366DA	3	h6	23	66	28	6
165ST.03175062366DA	3,175	h6	23	66	28	6
165ST.040062974DA	4	h6	29	74	36	6
165ST.04826063682DA	4,826	h6	36	82	44	6
165ST.060063582DA	6	h6	35	82	44	6
165ST.0635084391DA	6,35	h6	43	91	53	8
165ST.0793084391DA	7,93	h6	43	91	53	8
165ST.080084391DA	8	h6	43	91	53	8
165ST.09521049103DA	9,52	h6	49	103	61	10
165ST.1001049103DA	10	h6	49	103	61	10

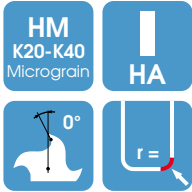
PK

PCD MILLING

Straight flute PCD endmill with torus radius



PK62TDT



Cod.	DC	DC TOL.	APMX	OAL	DCON	RE
			0/+2	0/+2	h6	+/-0,03
PK62TDT.060060660	6	h10	6	60	6	0,5
PK62TDT.0600612100	6	h10	12	100	6	0,5
PK62TDT.080080863	8	h10	8	63	8	0,5
PK62TDT.0800816100	8	h10	16	100	8	0,5
PK62TDT.100101072	10	h10	10	72	10	1
PK62TDT.1001020100	10	h10	20	100	10	1
PK62TDT.120121283	12	h10	12	83	12	1
PK62TDT.1201224100	12	h10	24	100	12	1

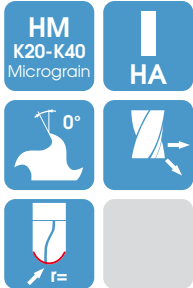


PCD MILLING

Straight flute PCD ball nose endmill



PK62TDR



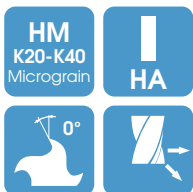
Cod.	DC	DC TOL.	APMX	OAL	DCON	RE
			0/+2	0/+2	h6	+/-0,03
PK62TDR.0600606100	6	h10	6	100	6	3
PK62TDR.0800808100	8	h10	8	100	8	4
PK62TDR.1001010100	10	h10	10	100	10	5
PK62TDR.1201212100	12	h10	12	100	12	6

PCD MILLING

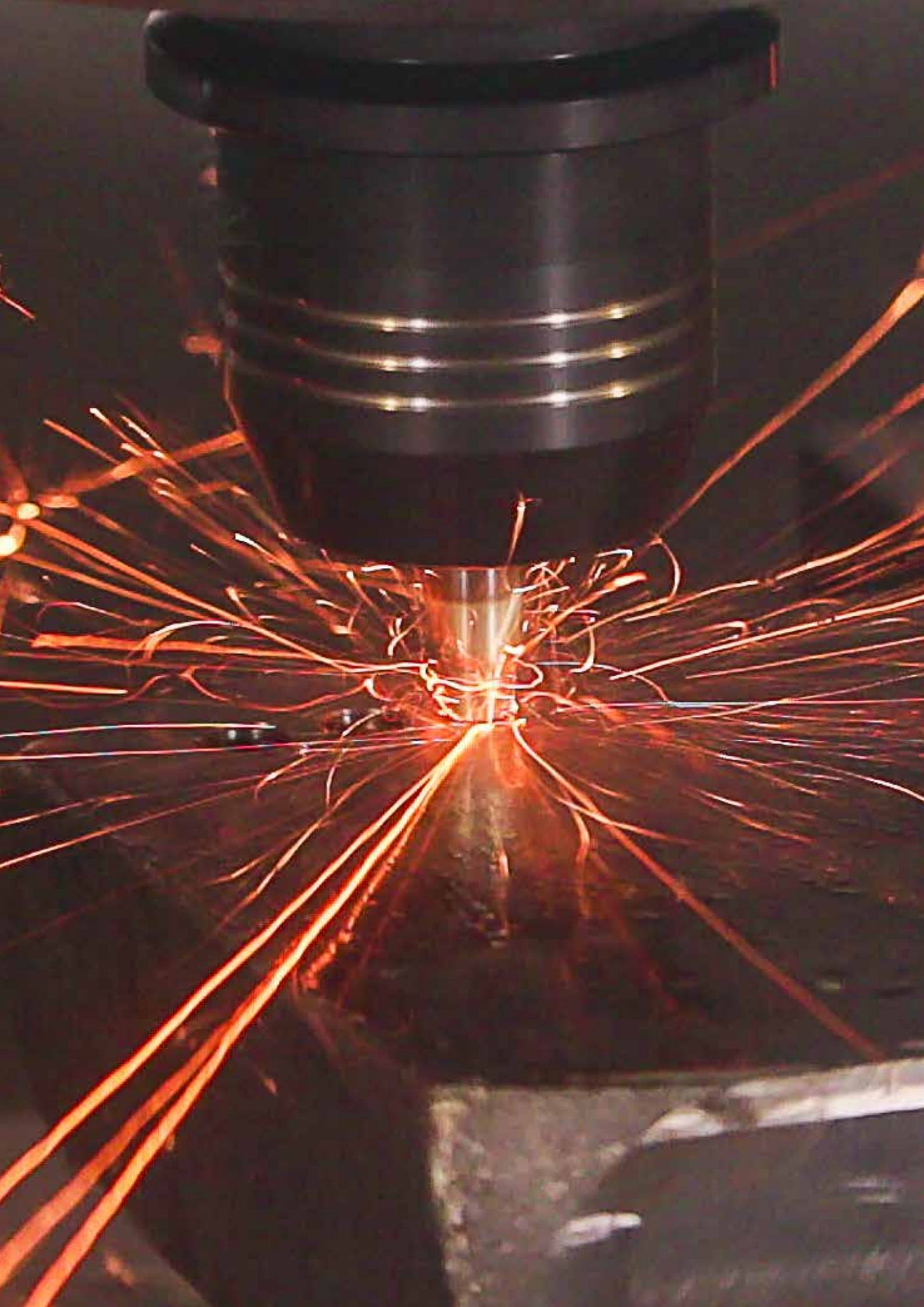
Straight multiflute PCD endmill



PK66TD



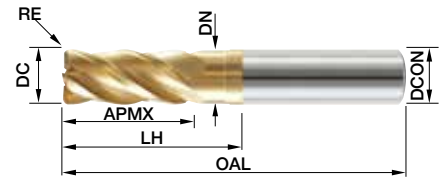
Cod.	DC	DC TOL.	APMX	OAL	DCON
			0/+2	0/+2	h6
PK66TD.080081063	8	h10	10	63	8
PK66TD.100101272	10	h10	12	72	10
PK66TD.120121583	12	h10	15	83	12



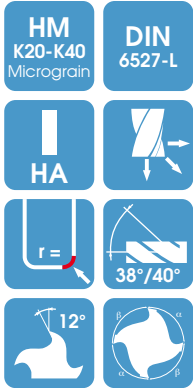
641

TITANIUM MILLING 4 flutes torus radius endmill

PVD Zirconium Cer-Ni



641



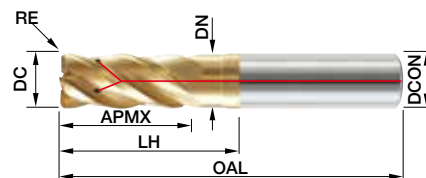
Cod.	DC	DC TOL.	APMX	LH	OAL	DCON	RE	DN
			0/+2	0/+2	0/+2	h6	0/-0,04	0/-0,05
641.030060857R030N	3	h10	8	12	57	6	0,3	2,8
641.040061157R030N	4	h10	11	15	57	6	0,3	3,8
641.050061357R030N	5	h10	13	17	57	6	0,3	4,8
641.060061357R050N	6	h10	13	21	57	6	0,5	5,8
641.060061357R100N	6	h10	13	21	57	6	1	5,8
641.060061357R150N	6	h10	13	21	57	6	1,5	5,8
641.080081963R050N	8	h10	19	27	63	8	0,5	7,6
641.080081963R100N	8	h10	19	27	63	8	1	7,6
641.080081963R150N	8	h10	19	27	63	8	1,5	7,6
641.100102272R050N	10	h10	22	32	72	10	0,5	9,3
641.100102272R100N	10	h10	22	32	72	10	1	9,3
641.100102272R150N	10	h10	22	32	72	10	1,5	9,3
641.120122683R100N	12	h10	26	38	83	12	1	11,3
641.120122683R200N	12	h10	26	38	83	12	2	11,3
641.120122683R300N	12	h10	26	38	83	12	3	11,3
641.160163292R100N	16	h10	32	44	92	16	1	15,3
641.160163292R200N	16	h10	32	44	92	16	2	15,3
641.160163292R400N	16	h10	32	44	92	16	4	15,3
641.2002038104R200N	20	h10	38	54	104	20	2	19,5
641.2002038104R300N	20	h10	38	54	104	20	3	19,5
641.2002038104R500N	20	h10	38	54	104	20	5	19,5



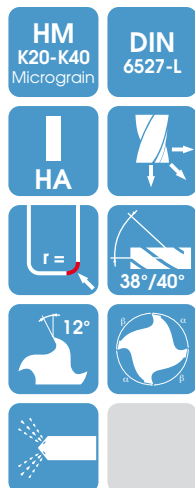
TITANIUM MILLING

4 flutes torus radius endmill with internal coolant

PVD Zirconium Cer-Ni



641F



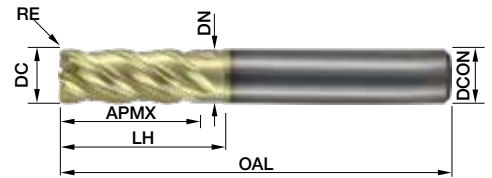
Cod.	DC	DC TOL.	APMX	LH	OAL	DCON	RE	DN
			0/+2	0/+2	0/+2	h6	0/-0,04	0/-0,05
641F.060061357R050N	6	h10	13	21	57	6	0,5	5,8
641F.060061357R100N	6	h10	13	21	57	6	1	5,8
641F.060061357R150N	6	h10	13	21	57	6	1,5	5,8
641F.080081963R050N	8	h10	19	27	63	8	0,5	7,6
641F.080081963R100N	8	h10	19	27	63	8	1	7,6
641F.080081963R150N	8	h10	19	27	63	8	1,5	7,6
641F.100102272R050N	10	h10	22	32	72	10	0,5	9,3
641F.100102272R100N	10	h10	22	32	72	10	1	9,3
641F.100102272R150N	10	h10	22	32	72	10	1,5	9,3
641F.120122683R100N	12	h10	26	38	83	12	1	11,3
641F.120122683R200N	12	h10	26	38	83	12	2	11,3
641F.120122683R300N	12	h10	26	38	83	12	3	11,3
641F.160163292R100N	16	h10	32	44	92	16	1	15,3
641F.160163292R200N	16	h10	32	44	92	16	2	15,3
641F.160163292R400N	16	h10	32	44	92	16	4	15,3
641F.2002038104R200N	20	h10	38	54	104	20	2	19,5
641F.2002038104R300N	20	h10	38	54	104	20	3	19,5
641F.2002038104R500N	20	h10	38	54	104	20	5	19,5



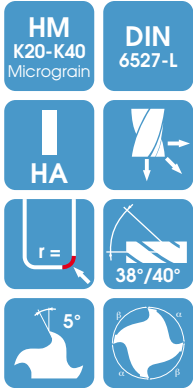
642

Ni & HIGH TEMPERATURE ALLOYS MILLING 4 flutes torus radius endmill

PVD Zirconium Cer-Ni



642



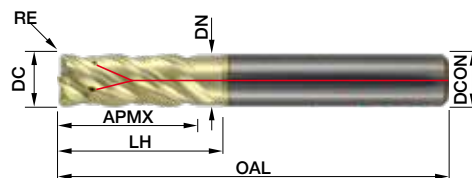
Cod.	DC	DC TOL.	APMX	LH	OAL	DCON	RE	DN
			0/+2	0/+2	0/+2	h6	0/-0,04	0/-0,05
642.030060857R030N	3	h10	8	12	57	6	0,3	2,9
642.040061157R030N	4	h10	11	15	57	6	0,3	3,8
642.050061357R030N	5	h10	13	17	57	6	0,3	4,8
642.060061357R050N	6	h10	13	19	57	6	0,5	5,7
642.060061357R100N	6	h10	13	19	57	6	1	5,7
642.060061357R150N	6	h10	13	19	57	6	1,5	5,7
642.080081963R050N	8	h10	19	25	63	8	0,5	7,7
642.080081963R100N	8	h10	19	25	63	8	1	7,7
642.080081963R150N	8	h10	19	25	63	8	1,5	7,7
642.100102272R050N	10	h10	22	30	72	10	0,5	9,7
642.100102272R100N	10	h10	22	30	72	10	1	9,7
642.100102272R150N	10	h10	22	30	72	10	1,5	9,7
642.120122683R100N	12	h10	26	34	83	12	1	11,5
642.120122683R200N	12	h10	26	34	83	12	2	11,5
642.120122683R300N	12	h10	26	34	83	12	3	11,5
642.160163292R100N	16	h10	32	47	92	16	1	15,5
642.160163292R200N	16	h10	32	47	92	16	2	15,5
642.160163292R400N	16	h10	32	47	92	16	4	15,5
642.2002038104R200N	20	h10	38	53	104	20	2	19,5
642.2002038104R300N	20	h10	38	53	104	20	3	19,5
642.2002038104R500N	20	h10	38	53	104	20	5	19,5



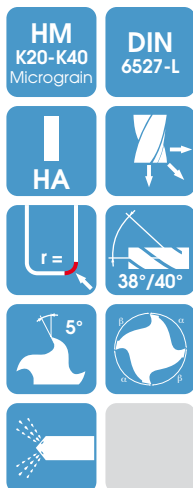
Ni & HIGH TEMPERATURE ALLOYS MILLING

4 flutes torus radius endmill with internal coolant

PVD Zirconium Cer-Ni



642F



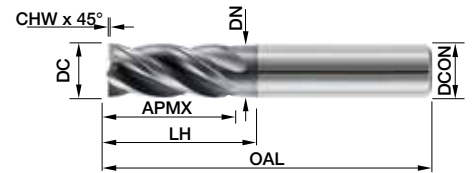
Cod.	DC	DC TOL.	APMX	LH	OAL	DCON	RE	DN
			0/+2	0/+2	0/+2	h6	0/-0,04	0/-0,05
642F.060061357R050N	6	h10	13	19	57	6	0,5	5,7
642F.060061357R100N	6	h10	13	19	57	6	1	5,7
642F.060061357R150N	6	h10	13	19	57	6	1,5	5,7
642F.080081963R050N	8	h10	19	25	63	8	0,5	7,7
642F.080081963R100N	8	h10	19	25	63	8	1	7,7
642F.080081963R200N	8	h10	19	25	63	8	1,5	7,7
642F.100102272R050N	10	h10	22	30	72	10	0,5	9,7
642F.100102272R100N	10	h10	22	30	72	10	1	9,7
642F.100102272R250N	10	h10	22	30	72	10	1,5	9,7
642F.120122683R100N	12	h10	26	34	83	12	1	11,5
642F.120122683R200N	12	h10	26	34	83	12	2	11,5
642F.120122683R300N	12	h10	26	34	83	12	3	11,5
642F.160163292R100N	16	h10	32	47	92	16	1	15,5
642F.160163292R200N	16	h10	32	47	92	16	2	15,5
642F.160163292R400N	16	h10	32	47	92	16	4	15,5
642F.2002038104R200N	20	h10	38	53	104	20	2	19,5
642F.2002038104R300N	20	h10	38	53	104	20	3	19,5
642F.2002038104R500N	20	h10	38	53	104	20	5	19,5



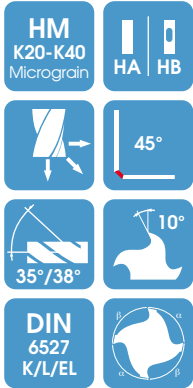
640

HPC STEEL MILLING HPC 4 flutes endmill

PVD TiAlCrN Cer-Y



640

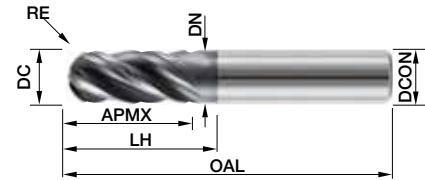


Cod.		DC	APMX	LH	OAL	DCON	DN	CHW
HA shank	HB shank	h10	0/+2	0/+2	0/+2	h6	0/-0,05	+/-0,05
640.030060550Y	640W.030060550Y	3	5		50	6		0,15
640.030060857Y	640W.030060857Y	3	8	12	57	6	2,8	0,15
640.030060870Y	640W.030060870Y	3	8	15	70	6	2,8	0,15
640.040060854Y	640W.040060854Y	4	8		54	6		0,15
640.040061157Y	640W.040061157Y	4	11	15	57	6	3,8	0,15
640.040061170Y	640W.040061170Y	4	11	20	70	6	3,8	0,15
640.050060954Y	640W.050060954Y	5	9		54	6		0,15
640.050061357Y	640W.050061357Y	5	13	17	57	6	4,8	0,15
640.050061370Y	640W.050061370Y	5	13	25	70	6	4,8	0,15
640.060061054Y	640W.060061054Y	6	10		54	6		0,15
640.060061357Y	640W.060061357Y	6	13	21	57	6	5,8	0,15
640.060061370Y	640W.060061370Y	6	13	30	70	6	5,8	0,15
640.080081258Y	640W.080081258Y	8	12		58	8		0,25
640.080081963Y	640W.080081963Y	8	19	27	63	8	7,7	0,25
640.080081980Y	640W.080081980Y	8	19	40	80	8	7,7	0,25
640.100101466Y	640W.100101466Y	10	14		66	10		0,25
640.100102272Y	640W.100102272Y	10	22	32	72	10	9,7	0,25
640.100102294Y	640W.100102294Y	10	22	50	94	10	9,7	0,25
640.120121673Y	640W.120121673Y	12	16		73	12		0,35
640.120122683Y	640W.120122683Y	12	26	38	83	12	11,6	0,35
640.1201226109Y	640W.1201226109Y	12	26	64	109	12	11,6	0,35
640.160162282Y	640W.160162282Y	16	22		82	16		0,35
640.160163292Y	640W.160163292Y	16	32	44	92	16	15,5	0,35
640.1601632132Y	640W.1601632132Y	16	32	80	132	16	15,5	0,35
640.200202692Y	640W.200202692Y	20	26		92	20		0,35
640.2002038104Y	640W.2002038104Y	20	38	54	104	20	19,5	0,35
640.2002038154Y	640W.2002038154Y	20	38	100	154	20	19,5	0,35

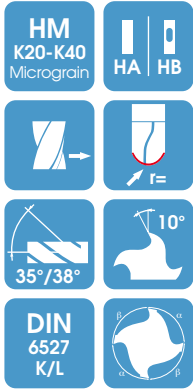
HPC STEEL MILLING

HPC ball nose 4 flutes endmill

PVD TiAlCrN Cer-Y



640R



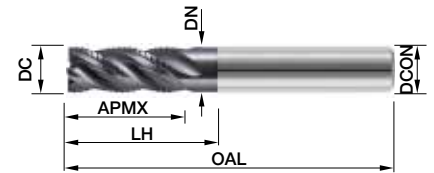
Cod.		DC	APMX	LH	OAL	DCON	DN	RE
HA shank	HB shank	h10	0/+2	0/+2	0/+2	h6	0/-0,05	+/-0,05
640R.030060550Y	640WR.030060550Y	3	5		50	6		1,5
640R.030060857Y	640WR.030060857Y	3	8	12	57	6	2,8	1,5
640R.040060854Y	640WR.040060854Y	4	8		54	6		2
640R.040061157Y	640WR.040061157Y	4	11	15	57	6	3,8	2
640R.050060954Y	640WR.050060954Y	5	9		54	6		2,5
640R.050061357Y	640WR.050061357Y	5	13	17	57	6	4,8	2,5
640R.060061054Y	640WR.060061054Y	6	10		54	6		3
640R.060061357Y	640WR.060061357Y	6	13	21	57	6	5,8	3
640R.080081258Y	640WR.080081258Y	8	12		58	8		4
640R.080081963Y	640WR.080081963Y	8	19	27	63	8	7,7	4
640R.100101466Y	640WR.100101466Y	10	14		66	10		5
640R.100102272Y	640WR.100102272Y	10	22	32	72	10	9,7	5
640R.120121673Y	640WR.120121673Y	12	16		73	12		6
640R.120122683Y	640WR.120122683Y	12	26	38	83	12	11,6	6
640R.160162282Y	640WR.160162282Y	16	22		82	16		8
640R.160163292Y	640WR.160163292Y	16	32	44	92	16	15,5	8
640R.200202692Y	640WR.200202692Y	20	26		92	20		10
640R.2002038104Y	640WR.2002038104Y	20	38	54	104	20	19,5	10



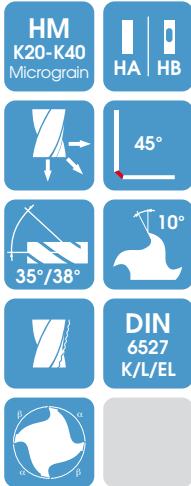
640

HPC STEEL MILLING HPC 4 flutes roughing endmill

PVD TiAlCrN Cer-Y



640SP



Cod.		DC	APMX	LH	OAL	DCON	DN
HA shank	HB shank	h10	0/+1	0/+1	0/+2	h6	0/-0,05
640SP.030060550Y	640WSP.030060550Y	3	5		50	6	
640SP.030060857Y	640WSP.030060857Y	3	8	12	57	6	2,8
640SP.030060870Y	640WSP.030060870Y	3	8	15	70	6	2,8
640SP.040060854Y	640WSP.040060854Y	4	8		54	6	
640SP.040061157Y	640WSP.040061157Y	4	11	15	57	6	3,8
640SP.040061170Y	640WSP.040061170Y	4	11	20	70	6	3,8
640SP.050060954Y	640WSP.050060954Y	5	9		54	6	
640SP.050061357Y	640WSP.050061357Y	5	13	17	57	6	4,8
640SP.050061370Y	640WSP.050061370Y	5	13	25	70	6	4,8
640SP.060061054Y	640WSP.060061054Y	6	10		54	6	
640SP.060061357Y	640WSP.060061357Y	6	13	21	57	6	5,8
640SP.060061370Y	640WSP.060061370Y	6	13	30	70	6	5,8
640SP.080081258Y	640WSP.080081258Y	8	12		58	8	
640SP.080081963Y	640WSP.080081963Y	8	19	27	63	8	7,7
640SP.080081980Y	640WSP.080081980Y	8	19	40	80	8	7,7
640SP.100101466Y	640WSP.100101466Y	10	14		66	10	
640SP.100102272Y	640WSP.100102272Y	10	22	32	72	10	9,7
640SP.100102294Y	640WSP.100102294Y	10	22	50	94	10	9,7
640SP.120121673Y	640WSP.120121673Y	12	16		73	12	
640SP.120122683Y	640WSP.120122683Y	12	26	38	83	12	11,6
640SP.1201226109Y	640WSP.1201226109Y	12	26	64	109	12	11,6
640SP.160162282Y	640WSP.160162282Y	16	22		82	16	
640SP.160163292Y	640WSP.160163292Y	16	32	44	92	16	15,5
640SP.1601632132Y	640WSP.1601632132Y	16	32	80	132	16	15,5
640SP.200202692Y	640WSP.200202692Y	20	26		92	20	
640SP.2002038104Y	640WSP.2002038104Y	20	38	54	104	20	19,5
640SP.2002038154Y	640WSP.2002038154Y	20	38	100	154	20	19,5





102TC/TCL

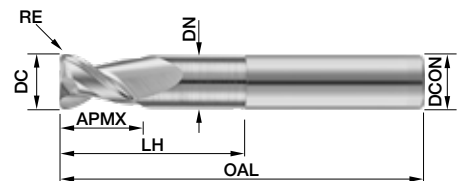


ALUMINUM FINISHING

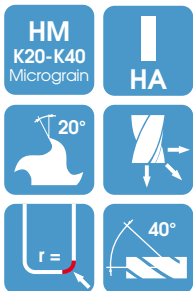
2 flutes torus radius endmill

PVD TiB2 Cer-Al

Also available without 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°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

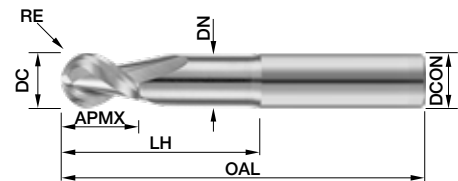


ALUMINUM FINISHING

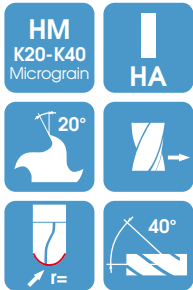
2 flutes ball nose endmill

PVD TiB2 Cer-Al

Also available without coating



102RC/RCL



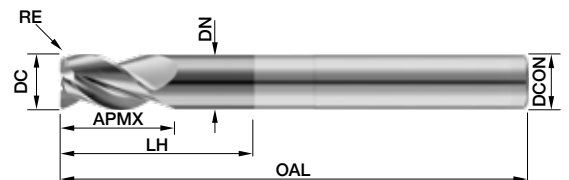
Cod.		DC	DC TOL.	APMX	LH	OAL	DCON	RE	DN
Coated	Uncoated			0/+2	0/+2	0/+2	h6	f8	0/-0,05
102RC.020-40°G	102RC.020-40°	2	-0,012/-0,040	4	6	57	6	1	1,8
102RC.030-40°G	102RC.030-40°	3	-0,012/-0,040	5	9	57	6	1,5	2,8
102RCL.030-40°G	102RCL.030-40°	3	-0,012/-0,040	6	50	100	6	1,5	2,8
102RC.040-40°G	102RC.040-40°	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



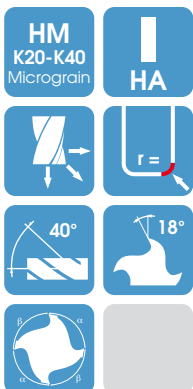
ALUMINUM HIGH REMOVAL MILLING

3 flutes torus radius endmill

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



Composites Milling - Working Parameters

Tool	ISO	Material	Short version	Long version	ap max x DC	DC = 2 mm			DC = 3 mm			DC = 4 mm			DC = 5 mm			DC = 6 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	
						f* [mm]			f* [mm]			f* [mm]			f* [mm]			f* [mm]		
			Vc [m/min]																	
68DX/68SX 68TD/68RD** 68SU/104PH PK62TD PK62TDR** PK66TD	N	Thermosets	150	120	1,0							0,167	0,125	0,050	0,208	0,156	0,063	0,250	0,188	
		Carbon fiber CFRP / CFC	120	100	1,0								0,167	0,125	0,050	0,208	0,156	0,063	0,250	0,188
119P		Aramid fiber/Kevlar	150	120	1,0				0,158	0,095	0,047	0,210	0,126	0,063	0,263	0,158	0,079	0,315	0,189	
419TD			300	200	1,0													0,220	0,132	
77SU/77RSU** 77SUP		Honeycomb/Nomex	1000			1,0													0,002	0,002
106/108/109 (F,M,G)		Thermosets	150	120	1,0	0,067	0,050	0,020	0,100	0,075	0,030	0,133	0,100	0,040					0,200	0,150
	Glass fiber GFRP / GFK	250	200	1,0	0,067	0,050	0,020	0,100	0,075	0,030	0,133	0,100	0,040					0,200	0,150	

* f in mm per turn

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

Composites Milling - Working Parameters

Tool	ISO	Material	Strenght [MPa]	N.	Designation	Vc [m/min]
165C 217		Thermoplastics			Delrin, Hostalen	200
		Duroplastic			Ferrozelf, Bakelit	200
		Carbon fiber			CFC - CFK	120
		Fiber reinforced plastics			GFK*	200
118		Thermoplastics			Delrin, Hostalen	150
		Aramid fiber / Kevlar				150
165ST	N	Aluminum (unalloyed, low alloy)	< 350	3,0255	A199,5	200
		Aluminum alloy Si<0,5%	< 500	3,0515	AlMni	160
		Aluminum alloy 0,5%<Si<10%	< 400	3,2152	GD-AIS16Cu4	160
		Aluminum alloy 10%<Si<15%	< 400	3,2381	G-AISI10Mg	150
		Aluminum alloy Si>15%	< 400		G-AISI17Cu4	150
		Copper (unalloyed, low alloy)	< 350	2,0060	E-Cu57	90
		Cast copper alloys	< 700	2,0240	CuZn15	90
		Special copper alloys	< 200 HE	2,0916	CuAl5	70
		Special copper alloys	< 300 HB	2,0978	CuAl11Ni6Fe5	70
		Special copper alloys	> 300 HE	2,1247	Cu3e2F1 25	70
		Short chipping brass, bronze, cast bronze	< 600	2,0360	CuZn40 (Ms60)	70
		Long chipping brass	< 600	2,0335	CuZn36 (Ms63)	70
		S		Pure titanium	< 900	3,7025
Titanium alloys	< 700			3,7114	TiA15Sn2	20
Titanium alloys	< 1200			3,7164	TiAl5V4	15

* f in mm per turn

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

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

	DC = 8 mm			DC = 10 mm			DC = 12 mm			DC = 14 mm			DC = 16 mm			DC = 20 mm			DC = 24 mm			DC = 44 mm			
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	
	f* [mm]			f* [mm]			f* [mm]			f* [mm]			f* [mm]			f* [mm]			f* [mm]			f* [mm]			
0,075	0,333	0,250	0,100	0,417	0,313	0,125	0,500	0,375	0,150				0,667	0,500	0,200										
0,075	0,333	0,250	0,100	0,410	0,310	0,125	0,500	0,375	0,150				0,667	0,500	0,200										
0,095	0,420	0,252	0,126	0,525	0,315	0,158	0,630	0,378	0,189				0,840	0,504	0,252	1,050	0,630	0,315							
0,066	0,293	0,176	0,088	0,367	0,220	0,110	0,440	0,264	0,132																
0,001	0,003	0,002	0,001	0,003	0,003	0,001	0,004	0,003	0,001	0,005	0,004	0,001	0,005	0,004	0,002	0,007	0,005	0,002	0,008	0,006	0,002	0,015	0,011	0,004	
0,060	0,267	0,200	0,080	0,333	0,250	0,100	0,400	0,300	0,120																
0,060	0,267	0,200	0,080	0,333	0,250	0,100	0,400	0,300	0,120																

DC = 2 ÷ 2,9	DC = 3 ÷ 5,9	DC = 6 ÷ 8,9	DC = 9 ÷ 12
f* [mm]	f* [mm]	f* [mm]	f* [mm]
0,035	0,050	0,070	0,090
0,035	0,050	0,070	0,090
0,035	0,050	0,070	0,090
0,035	0,050	0,070	0,090
0,045	0,060	0,080	0,100
0,045	0,060	0,080	0,100
0,150	0,200	0,300	0,380
0,150	0,200	0,300	0,380
0,150	0,200	0,300	0,380
0,150	0,200	0,300	0,380
0,150	0,200	0,300	0,380
0,100	0,150	0,200	0,250
0,100	0,150	0,200	0,250
0,100	0,150	0,200	0,250
0,100	0,150	0,200	0,250
0,100	0,150	0,200	0,250
0,100	0,150	0,200	0,250
0,100	0,150	0,200	0,250
0,025	0,030	0,040	0,048
0,025	0,030	0,040	0,048
0,025	0,030	0,040	0,048

Milling Working Parameters

Tool	ISO	Material	Strenght [MPa]	N.	Designation	Vc [m/min]	ap max x DC	DC = 2 mm			DC = 3 mm						
								Short/long version	Extralong version	Short/long version	Extralong version	fz [mm]			fz [mm]		
												ae 0,10x DC	ae 0,30x DC	ae 0,6-1,0x DC	ae 0,10x DC	ae 0,30x DC	ae 0,6-1,0x DC
640 640R* 640SP	P	General construction steel	< 800	1,0037	St37-2	200	160	1,0	0,5			0,024	0,019	0,014	0,029		
		Automatic steel	< 800	1,0719	9SMnPb28	210	170	1,0	0,5			0,024	0,019	0,014	0,029		
		Unalloyed case hardened steel	< 800	1,0401	C15	180	140	1,0	0,5			0,017	0,013	0,010	0,029		
		Alloyed case hardened steel	< 1000	1,7331	16MnCr5 (EC80)	160	130	1,0	0,5			0,012	0,009	0,007	0,029		
		Unalloyed annealed steel	< 850	1,0503	C45	170	135	1,0	0,5			0,017	0,013	0,010	0,029		
		Unalloyed annealed steel	< 1000	1,0601	C60	160	130	1,0	0,5			0,018	0,014	0,010	0,029		
		Alloyed annealed steel	< 800	1,5131	50MnS14	160	130	1,0	0,5			0,018	0,014	0,010	0,029		
		Alloyed annealed steel	< 1300	1,5755	31NiCr14	140	115	1,0	0,5			0,012	0,009	0,007	0,029		
		Cast steel	< 850	0,9650	G-X260Cr27	140	110	1,0	0,5			0,018	0,014	0,010	0,029		
		Nitriding steel	< 1000	1,8504	34CrA16	160	130	1,0	0,5			0,018	0,014	0,010	0,029		
		Nitriding steel	< 1200	1,8515	31CrMo12	140	115	1,0	0,5			0,012	0,009	0,007	0,022		
		Bearing steel	< 1200	1,3505	100Cr6 (W3)	160	130	1,0	0,5			0,018	0,014	0,010	0,029		
	Tool steel (cold working)	< 1300	1,2312	40CrMnMoS8 6	150	120	1,0	0,5			0,017	0,013	0,010	0,029			
	Tool steel (hot working)	< 1300	1,2343	X38CrMoV 51	130	100	1,0	0,5			0,017	0,013	0,010	0,029			
	M	Sulphured stainless steel	< 850	1,4305	X8CrNiS18-9	110	90	1,0	0,5			0,012	0,009	0,007	0,018		
		Ferritic stainless steel	< 750	1,4510	X3CrTi17	100	80	1,0	0,5			0,012	0,009	0,007	0,018		
		Martensitic stainless steel	< 900	1,4034	X46Cr13	85	70	1,0	0,5			0,012	0,009	0,007	0,018		
		Ferritic martensitic stainless steel	< 1100	1,4313	X3CrNi113.4	100	80	1,0	0,5			0,012	0,009	0,007	0,018		
Austenitic/ferritic martensitic stainless steel		< 850	1,4460	X8CrNiMo27 5	100	80	1,0	0,5			0,012	0,009	0,007	0,018			
Austenitic stainless steel	< 750	1,4301	X5CrNi18-10	100	80	1,0	0,5			0,012	0,009	0,007	0,018				
642(F)	M	Heat resistant steel	< 1100	1,4747	X80CrNiS120	26	20	1,0			0,00915987	0,007	0,005	0,015266451			
640 640R* 640SP	K	Lamellar graphite cast iron	100-350	0,6010	GG10	170	135	1,0	0,5			0,024	0,019	0,014	0,036		
		Grey graphite cast iron	300-1000	0,6030	GG30	140	110	1,0	0,5			0,018	0,014	0,010	0,036		
		Spheroidal cast iron	300-500	0,7040	GGG40	160	130	1,0	0,5			0,018	0,014	0,010	0,029		
		Spheroidal cast iron	550-800	0,7060	GGG60	130	100	1,0	0,5			0,018	0,014	0,010	0,029		
		Tempered white cast iron	350-450	0,8035	GTW35	150	120	1,0	0,5			0,018	0,014	0,010	0,029		
		Tempered white cast iron	500-650	0,8055	GTW55	140	110	1,0	0,5			0,018	0,014	0,010	0,029		
		Tempered black cast iron	350-450	0,8135	GTS35	150	120	1,0	0,5			0,018	0,014	0,010	0,029		
Tempered black cast iron	500-700	0,8155	GTS55	135	110	1,0	0,5			0,018	0,014	0,010	0,029				
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-AISi16Cu4	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-AISi10Mg	150	120	0,5		0,049	0,036	0,015	0,058	0,044	0,018	0,070	
		Aluminum alloy Si>15%	< 400		G-AISi17Cu4												
303	N	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-AISi16Cu4	500	400	1,0							0,140		
		Aluminum alloy 10%<Si<15%	< 400	3,2381	G-AISi10Mg	300	240	1,0							0,070		
		Aluminum alloy Si>15%	< 400		G-AISi17Cu4												
642(F)	S	Pure nickel		1,3911	RNi24							0,011	0,008	0,006	0,015		
		Nickel alloy		1,3912	Ni36 (Invar)								0,011	0,008	0,006	0,015	
		Nickel alloy	< 850	2,4360	S-NiCu 30 Fe	25	20	0,5					0,011	0,008	0,006	0,015	
		Nickel-chromium alloys		2,4886	SG-NiMo16Cr16W	25	20	0,5					0,011	0,008	0,006	0,015	
		Nickel-cobalt alloys	< 1300	2,4632	NiCr20Co18Ti	25	20	0,5					0,011	0,008	0,006	0,015	
		Nickel-cobalt alloys	< 1300	2,4634	NiCo20Cr15, MoAlTi	25	20	0,5					0,011	0,008	0,006	0,015	
		Heat resistant alloys	< 1300		Hardox 400	25	20	0,5					0,011	0,008	0,006	0,015	
Nickel-chromium-cobalt alloys	< 1400	2,4806	SG-NiCr20Nb, Inconel 82	25	20	0,5					0,011	0,008	0,006	0,015			
641(F)		Pure titanium	< 900	3,7025	Ti99.8	135	110	1,0				0,021	0,017	0,012	0,031		
		Titanium alloys	< 700	3,7114	TiA15Sn2	45	45	1,0				0,007	0,009	0,023	0,009		
		Titanium alloys	< 1200	3,7164	TiA5V4	45	45	1,0				0,007	0,009	0,023	0,009		

* Ball nose end mills: calculate n[rpm] as per Tab.K pag. 36

AEROSPACE



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