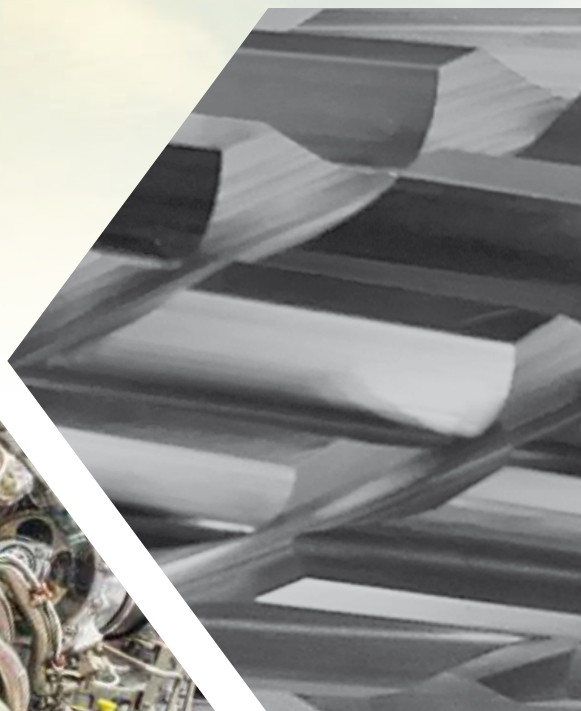


Cerini[®]
CUTTING TOOLS MANUFACTURING



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.

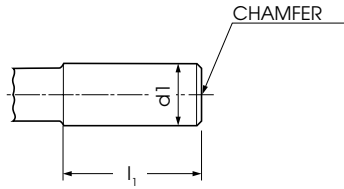
Today, Cerin provides its customers with the benefit of a long experience by offering a complete range of high performance cutters dedicated to the machining of aerospace materials.



COMPANY WITH
QUALITY SYSTEM
CERTIFIED BY DNV
ISO 9001

Shank design (for drilling and milling tools) DIN 6535

Straight cylindrical shank - Shape HA

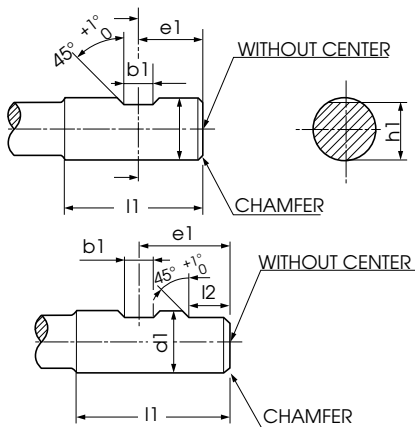


| d_1 | l_1 | d_1 | l_1 | d_1 | l_1 |
|-----------|-------------|-----------|-------------|-----------|-------------|
| h6 | +2/0 | h6 | +2/0 | h6 | +2/0 |
| 2 | 28 | 8 | 36 | 18 | 48 |
| 3 | 28 | 10 | 40 | 20 | 50 |
| 4 | 28 | 12 | 45 | 25 | 56 |
| 5 | 28 | 14 | 45 | 32 | 60 |
| 6 | 36 | 16 | 48 | |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

Cylindrical shank - Shape HB

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

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

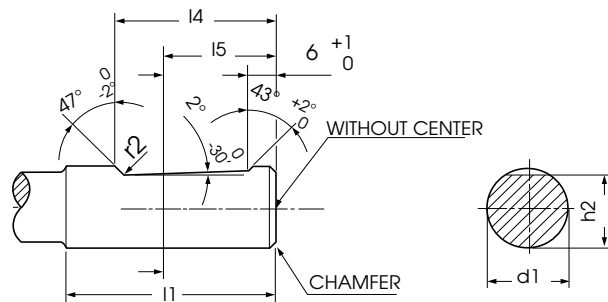


| d_1 | b_1 | e_1 | h_1 | l_1 | l_2 |
|-----------|----------------|-------------|------------|-------------|-------------|
| h6 | +0,05/0 | 0/-1 | h11 | +2/0 | +1/0 |
| 6 | 4,2 | 18 | 5,1 | 36 | |
| 8 | 5,5 | 18 | 6,9 | 36 | |
| 10 | 7 | 20 | 8,5 | 40 | |
| 12 | 8 | 22,5 | 10,4 | 45 | |
| 14 | 8 | 22,5 | 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



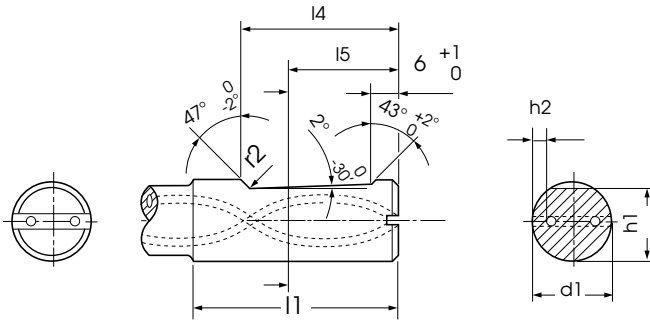
| d_1 | (b_2) | (b_3) | h_2 | (h_3) | l_1 | l_4 | l_5 | r_2 |
|-----------|---------|---------|------------|---------|-------------|-------------|--------------|-------|
| h6 | | | h11 | | +2/0 | 0/-1 | Nominal size | min. |
| 6 | 4,3 | | 5,1 | | 36 | 25 | 18 | 1,2 |
| 8 | 5,5 | | 6,9 | | 36 | 25 | 18 | 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

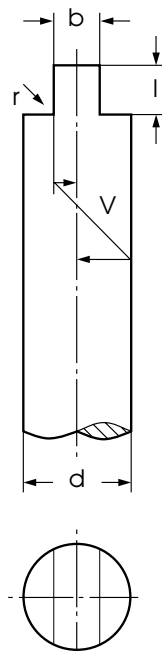
one slope flat - d1 = 6 to 20 mm

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

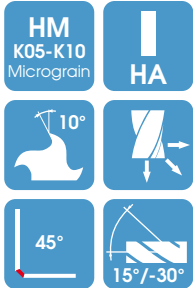
| | | Pag |
|---|----------------------------------|-----|
|  | Endmills for CFRP | 6 |
|  | Endmills for kevlar | 10 |
|  | Endmills for GFRP | 12 |
|  | Endmills for honeycomb materials | 15 |
|  | Drills for CFRP | 18 |
|  | PCD endmills | 21 |
|  | Endmills for titanium and nickel | 24 |
|  | Endmills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

HPC CFRP MILLING HPC right helix endmill

High thickness CVD Diamond
Cer-DM



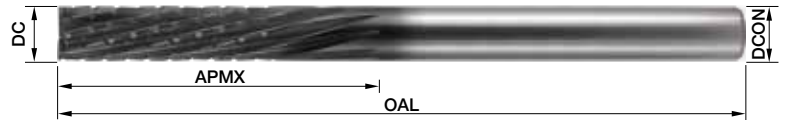
68DX



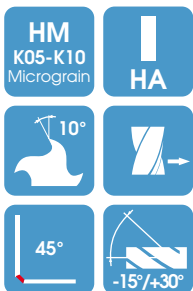
| Cod. | DC | DC TOL. | APMX | OAL | DCON |
|-------------------|----|--------------|------|------|------|
| | | | 0/+2 | 0/+2 | h6 |
| 68DX.040061660DM | 4 | +0,01/-0,03 | 16 | 60 | 6 |
| 68DX.060062060DM | 6 | +0,01/-0,03 | 20 | 60 | 6 |
| 68DX.060063575DM | 6 | +0,01/-0,03 | 35 | 75 | 6 |
| 68DX.080083275DM | 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

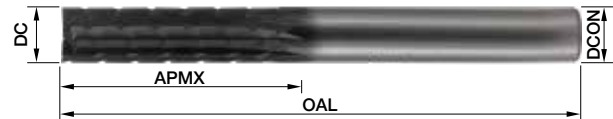


| Cod. | DC | DC TOL. | APMX | OAL | DCON |
|-------------------|----|--------------|------|------|------|
| | | | 0/+2 | 0/+2 | h6 |
| 68SX.040061680DM | 4 | +0,01/-0,03 | 16 | 80 | 6 |
| 68SX.060062080DM | 6 | +0,01/-0,03 | 20 | 80 | 6 |
| 68SX.0600635100DM | 6 | +0,01/-0,03 | 35 | 100 | 6 |
| 68SX.0800832100DM | 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 |

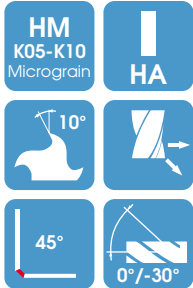
HPC CFRP MILLING

HPC straight flute endmill

High thickness CVD Diamond
Cer-DM



68TD

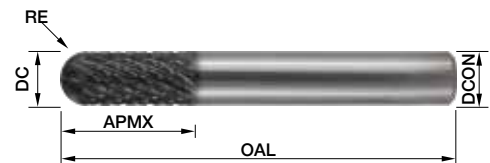


| Cod. | DC | DC TOL. | APMX | OAL | DCON |
|-------------------|----|--------------|------|------|------|
| | | | 0/+2 | 0/+2 | h6 |
| 68TD.040061680DM | 4 | +0,01/-0,03 | 16 | 80 | 6 |
| 68TD.060062080DM | 6 | +0,01/-0,03 | 20 | 80 | 6 |
| 68TD.0600635100DM | 6 | +0,01/-0,03 | 35 | 100 | 6 |
| 68TD.0800832100DM | 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 |

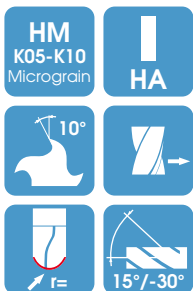
HPC CFRP MILLING

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

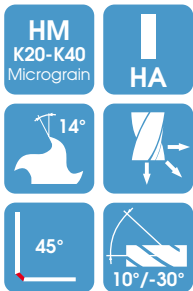
Right helix endmill

CVD Diamond Cer-D

Also available without diamond coating



68SU



| Cod. | | DC | DC TOL. | APMX | OAL | DCON |
|------------------|-----------------|----|--------------|------|-----|------|
| Coated | Uncoated | | | | | |
| 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 |

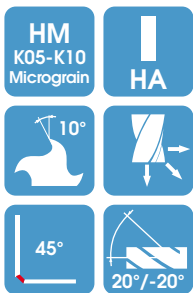


HPC CFRP MILLING HPC Up&Down Cutter

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

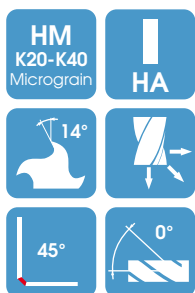


HPC KEVLAR MILLING

HPC 4 flutes cutter Up&Down chip breaker



419TD



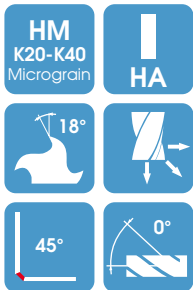
| Cod. | DC | DC TOL. | APMX | OAL | DCON |
|------------------|----|---------|------|------|------|
| | | | 0/+2 | 0/+2 | h6 |
| 419TD.060062060 | 6 | h10 | 20 | 60 | 6 |
| 419TD.060063575 | 6 | h10 | 35 | 75 | 6 |
| 419TD.080083275 | 8 | h10 | 32 | 75 | 8 |
| 419TD.0800840100 | 8 | h10 | 40 | 100 | 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 | DCON |
|-----------------|----|---------|------|------|------|
| | | | 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 |

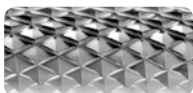
106 F, M, G

GLASS FIBER MILLING

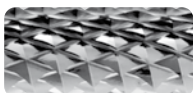
No front cut endmill



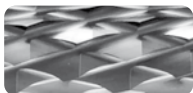
106 F, M, G



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 |



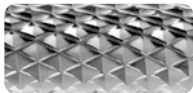
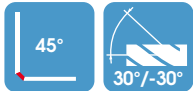
108 F, M, G

GLASS FIBER MILLING

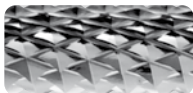
Z=2 front cut endmill



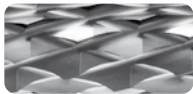
108 F, M, G



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 |

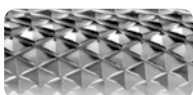
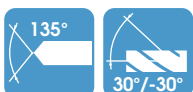


109 F, M, G

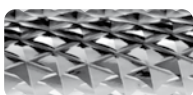
GLASS FIBER MILLING
Z=2 drilling front cut endmill



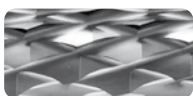
109 F, M, G



F



M



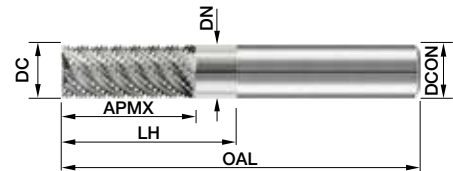
G

| 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 |

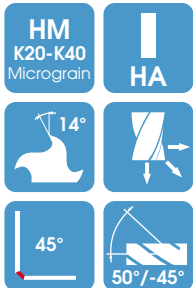


HONEYCOMB MATERIALS MILLING

Multiflute endmill with chipbraker



77SU

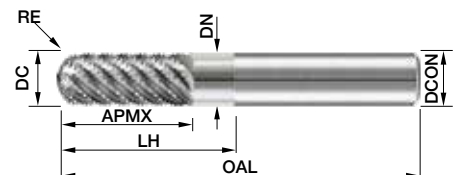


| Cod. | DC | DC TOL. | APMX | LH | OAL | DCON | DN |
|------------------|-----|---------|------|------|------|------|---------|
| | | | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,05 |
| 77SU.060061650 | 6 | e9 | 16 | 16 | 50 | 6 | 6 |
| 77SU.060061650E | 6 | e9 | 16 | 16 | 50 | 6 | 6 |
| 77SU.080081963 | 8 | e9 | 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 |

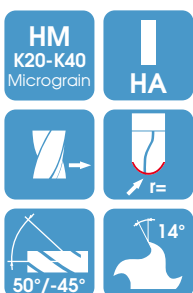
* Vertical machining not allowed

HONEYCOMB MATERIALS MILLING

Ball nose multiflute endmill with chipbraker



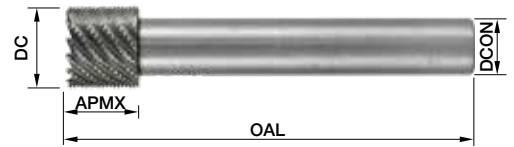
77RSU



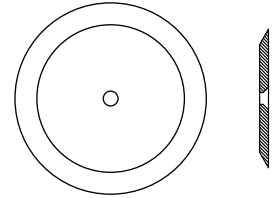
| Cod. | DC | DC TOL. | APMX | LH | OAL | DCON | DN | RE |
|------------------|----|---------|------|------|------|------|---------|---------|
| | | | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,05 | +/-0,05 |
| 77RSU.100102272 | 10 | e9 | 22 | 32 | 72 | 10 | 9,8 | 5 |
| 77RSU.120122683 | 12 | e9 | 26 | 37 | 83 |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

77SUP

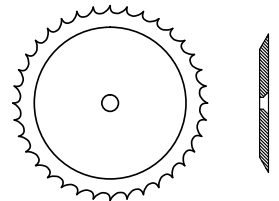
HONEYCOMB MATERIALS MILLING
Assembled multiflute endmill with cutting plate



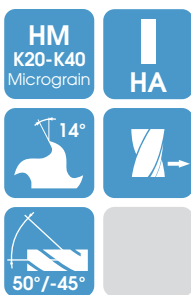
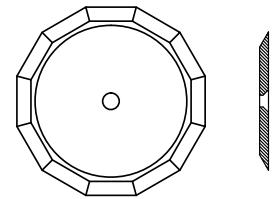
| | Item | Plate | Shank | Cutter |
|----------|-------------|----------------|--------------|------------|
| 77SUP.L. | .120122683 | 0GD130390°L | 0C12078023M4 | 77SUP.1226 |
| | .2001220100 | 0GDCON103120°L | 0C12089717M4 | 77SUP.2020 |
| | .2401217100 | 0GDCON503120°L | 0C12089714M4 | 77SUP.2417 |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

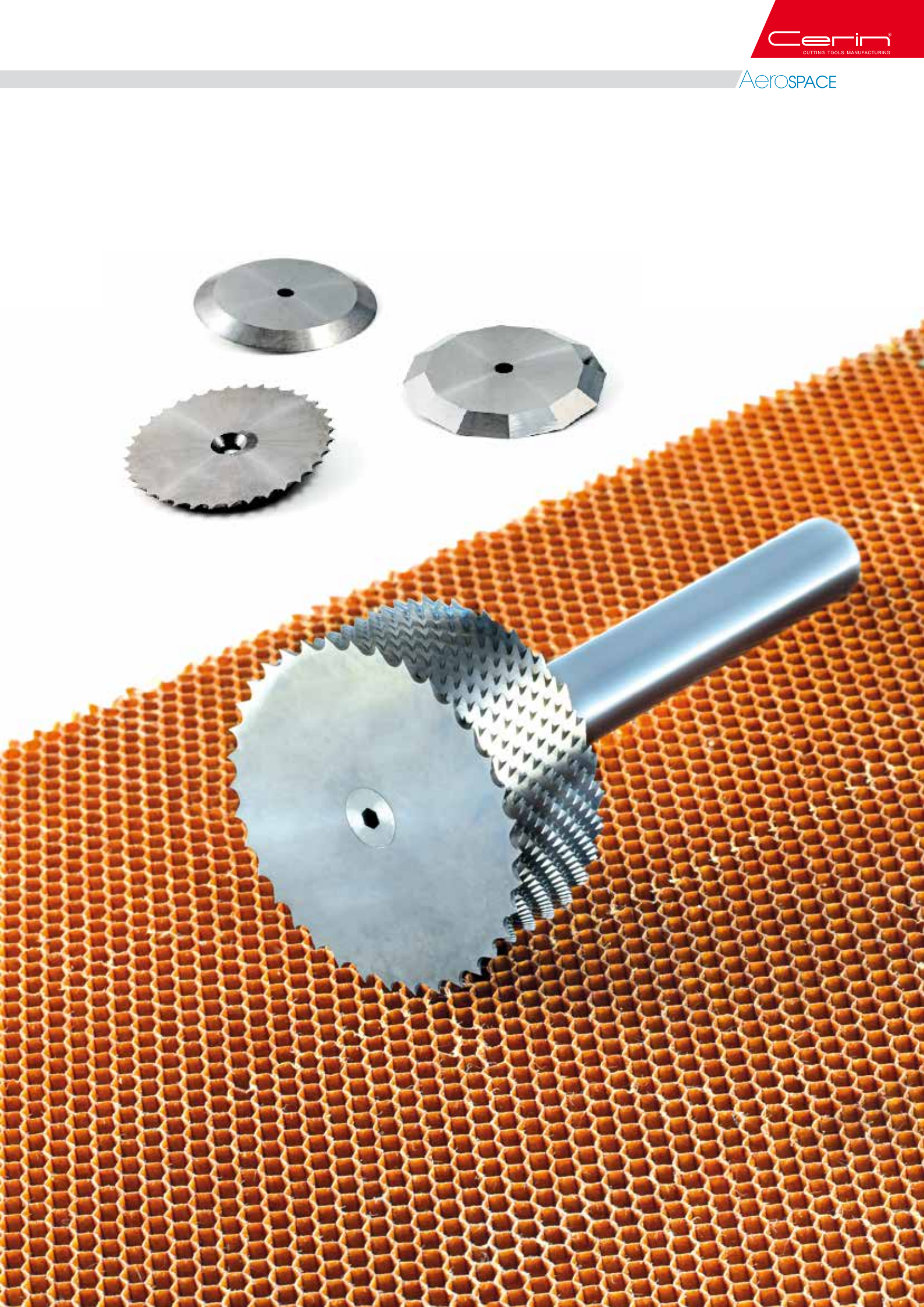


| | Item | Plate | Shank | Cutter |
|----------|-------------|----------------|--------------|------------|
| 77SUP.P. | .120122683 | 0GD130390°P | 0C12078023M4 | 77SUP.1226 |
| | .2001220100 | 0GDCON103120°P | 0C12089717M4 | 77SUP.2020 |
| | .2401217100 | 0GDCON503120°P | 0C12089714M4 | 77SUP.2417 |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



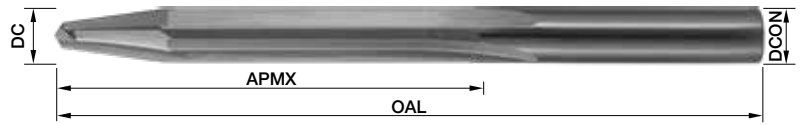


217

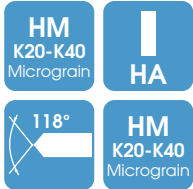
STANDARD CFRP DRILLING

Straight flute Z=4 for manual and CNC drilling

Also available with DLC coating



217

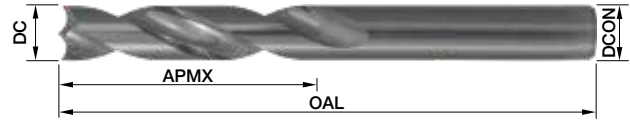


| Cod. | | DC | DC TOL. | APMX | OAL | DCON |
|------------|----------|------|---------|------|------|------|
| Coated | Uncoated | | | 0/+2 | 0/+2 | H7 |
| 217.020DL | 217.020 | 2 | H7 | 50 | 100 | 2 |
| 217.0248DL | 217.0248 | 2,48 | H7 | 50 | 100 | 2,48 |
| 217.030DL | 217.030 | 3 | H7 | 50 | 100 | 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 |

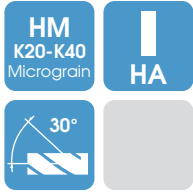


KEVLAR DRILLING

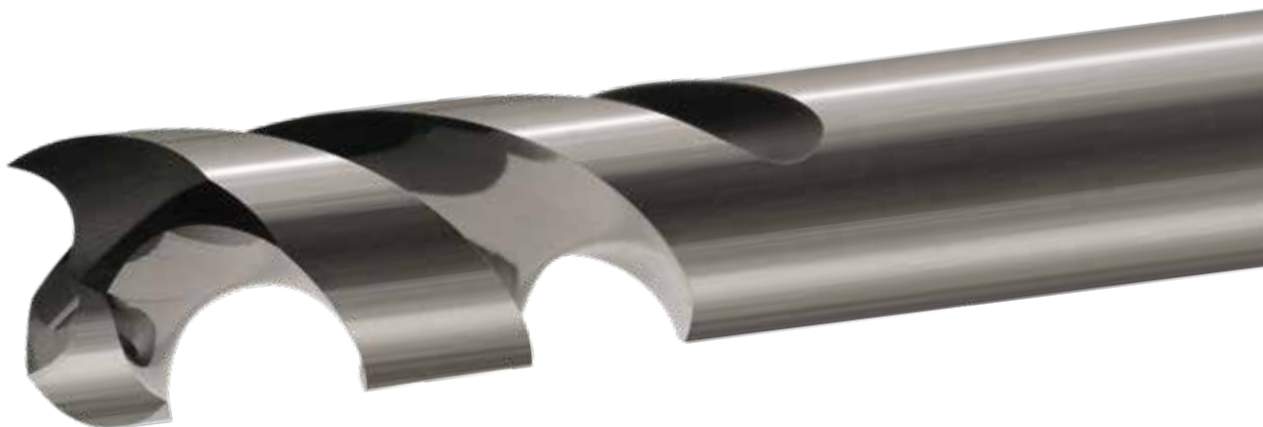
Twist drill for manual and CNC application



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 |

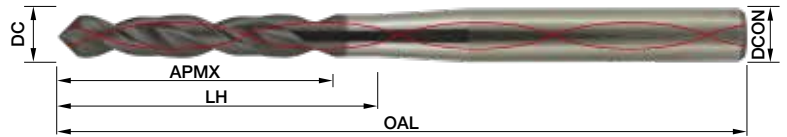


HPC CFRP DRILLING

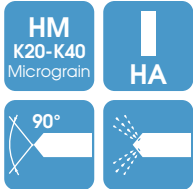
HPC twist drill

CVD Diamond Cer-DA

Internal cooling



165C



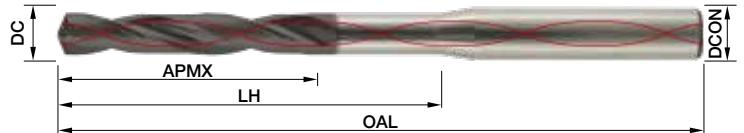
| Cod. | DC | DC TOL. | APMX | LH | OAL | DCON |
|--------------------|-------|---------|------|------|------|------|
| | | | 0/+2 | 0/+2 | 0/+2 | h6 |
| 165C.0248062366DA | 2,48 | h6 | 23 | 66 | 28 | 6 |
| 165C.030062366DA | 3 | h6 | 23 | 66 | 28 | 6 |
| 165C.03175062366DA | 3,175 | h6 | 23 | 66 | 28 | 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

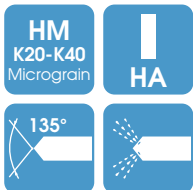
HPC twist drill for CFRP + Ti or CFRP + Al panels

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 |

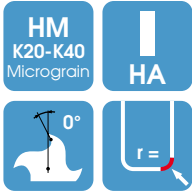
PK

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 |

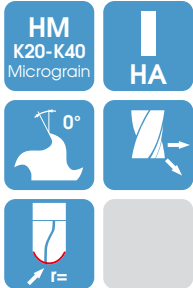


PCD MILLING

Straight flute PCD ball nose endmill



PK62TDR



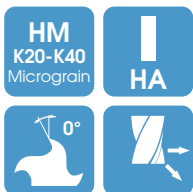
| Cod. | DC | DC TOL. | APMX | OAL | DCON | RE |
|--------------------|----|---------|------|------|------|---------|
| | | | 0/+2 | 0/+2 | h6 | +/-0,03 |
| PK62TDR.0600606100 | 6 | h10 | 6 | 100 | 6 | 3 |
| PK62TDR.0800808100 | 8 | h10 | 8 | 100 | 8 | 4 |
| PK62TDR.1001010100 | 10 | h10 | 10 | 100 |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

PCD MILLING

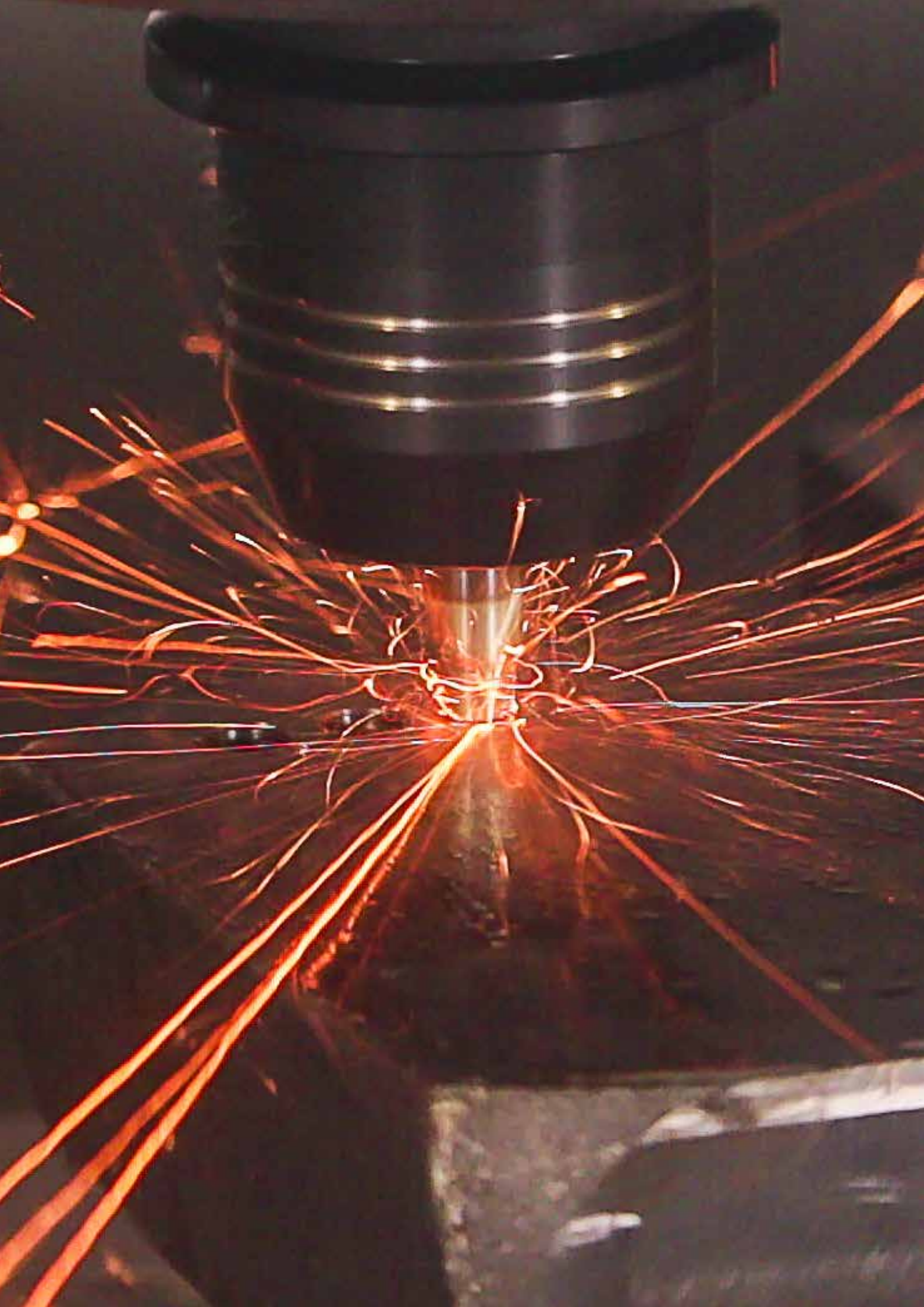
Straight multiflute PCD endmill



PK66TD



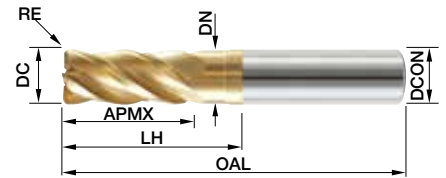
| Cod. | DC | DC TOL. | APMX | OAL | DCON |
|------------------|----|---------|------|------|------|
| | | | 0/+2 | 0/+2 | h6 |
| PK66TD.080081063 | 8 | h10 | 10 | 63 | 8 |
| PK66TD.100101272 | 10 | h10 | 12 | 72 | 10 |
| PK66TD.120121583 | 12 | h10 | 15 | 83 | 12 |



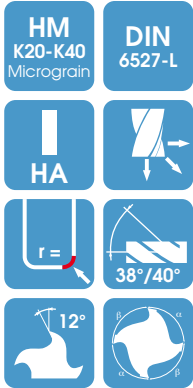
641

TITANIUM MILLING 4 flutes torus radius endmill

PVD Zirconium Cer-Ni



641



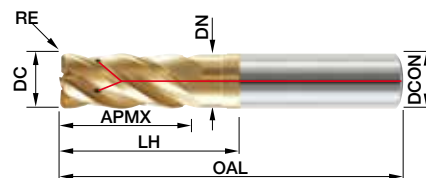
| Cod. | DC | DC TOL. | APMX | LH | OAL | DCON | RE | DN |
|---------------------|----|---------|------|------|------|------|---------|---------|
| | | | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,04 | 0/-0,05 |
| 641.030060857R030N | 3 | h10 | 8 | 12 | 57 | 6 | 0,3 | 2,8 |
| 641.040061157R030N | 4 | h10 | 11 | 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 |



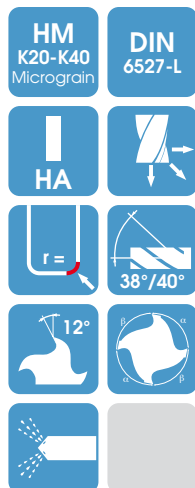
TITANIUM MILLING

4 flutes torus radius endmill with internal coolant

PVD Zirconium Cer-Ni



641F



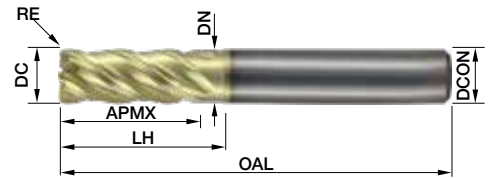
| Cod. | DC | DC TOL. | APMX | LH | OAL | DCON | RE | DN |
|----------------------|----|---------|------|------|------|------|---------|---------|
| | | | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,04 | 0/-0,05 |
| 641F.060061357R050N | 6 | h10 | 13 | 21 | 57 | 6 | 0,5 | 5,8 |
| 641F.060061357R100N | 6 | h10 | 13 | 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 |



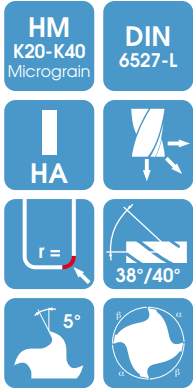
642

Ni & HIGH TEMPERATURE ALLOYS MILLING 4 flutes torus radius endmill

PVD Zirconium Cer-Ni



642



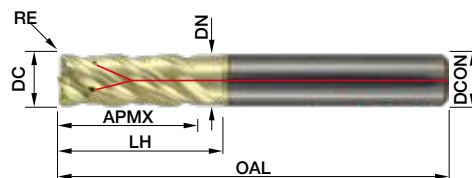
| Cod. | DC | DC TOL. | APMX | LH | OAL | DCON | RE | DN |
|---------------------|----|---------|------|------|------|------|---------|---------|
| | | | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,04 | 0/-0,05 |
| 642.030060857R030N | 3 | h10 | 8 | 12 | 57 | 6 | 0,3 | 2,9 |
| 642.040061157R030N | 4 | h10 | 11 | 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 |



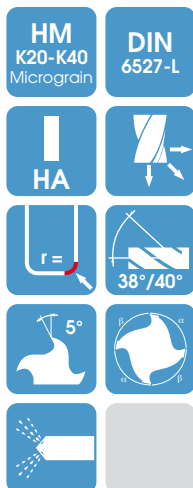
Ni & HIGH TEMPERATURE ALLOYS MILLING

4 flutes torus radius endmill with internal coolant

PVD Zirconium Cer-Ni



642F



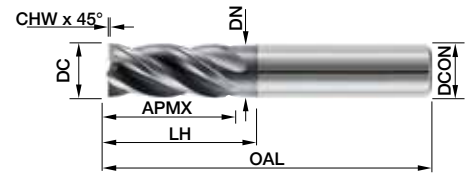
| Cod. | DC | DC TOL. | APMX | LH | OAL | DCON | RE | DN |
|----------------------|----|---------|------|------|------|------|---------|---------|
| | | | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,04 | 0/-0,05 |
| 642F.060061357R050N | 6 | h10 | 13 | 19 | 57 | 6 | 0,5 | 5,7 |
| 642F.060061357R100N | 6 | h10 | 13 | 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 |



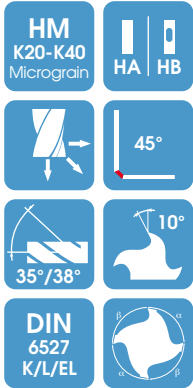
640

HPC STEEL MILLING HPC 4 flutes endmill

PVD TiAlCrN Cer-Y



640

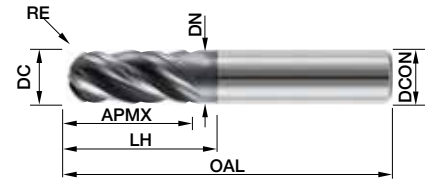


| Cod. | | DC | APMX | LH | OAL | DCON | DN | CHW |
|-----------------|------------------|-----|------|------|------|------|---------|---------|
| HA shank | HB shank | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,05 | +/-0,05 |
| 640.030060550Y | 640W.030060550Y | 3 | 5 | | 50 | 6 | | 0,15 |
| 640.030060857Y | 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 |

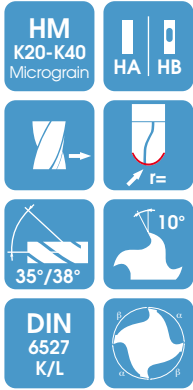
HPC STEEL MILLING

HPC ball nose 4 flutes endmill

PVD TiAlCrN Cer-Y



640R



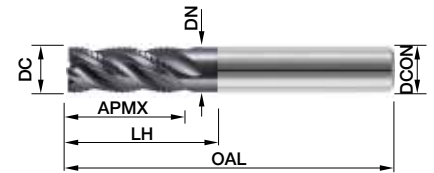
| Cod. | | DC | APMX | LH | OAL | DCON | DN | RE |
|------------------|-------------------|-----|------|------|------|------|---------|---------|
| HA shank | HB shank | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,05 | +/-0,05 |
| 640R.030060550Y | 640WR.030060550Y | 3 | 5 | | 50 | 6 | | 1,5 |
| 640R.030060857Y | 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 |



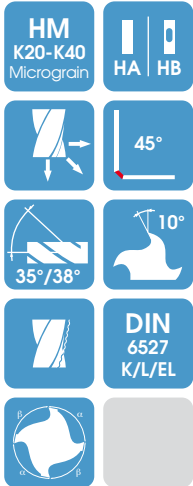
640

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

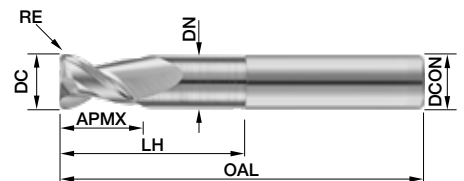


ALUMINUM FINISHING

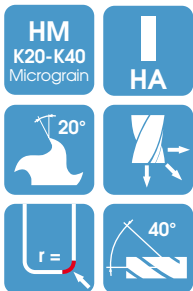
2 flutes torus radius endmill

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 |

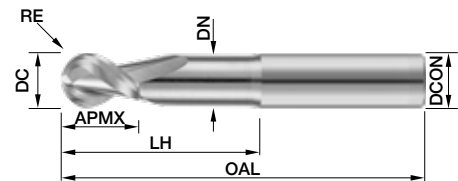


ALUMINUM FINISHING

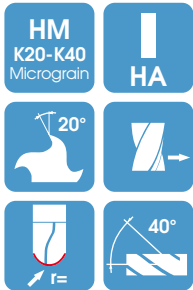
2 flutes ball nose endmill

PVD TiB2 Cer-Al

Also available without coating



102RC/RCL



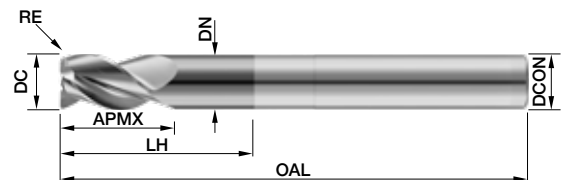
| Cod. | | DC | DC TOL. | APMX | LH | OAL | DCON | RE | DN |
|-----------------|----------------|----|---------------|------|------|------|------|-----|---------|
| Coated | Uncoated | | | 0/+2 | 0/+2 | 0/+2 | h6 | f8 | 0/-0,05 |
| 102RC.020-40°G | 102RC.020-40° | 2 | -0,012/-0,040 | 4 | 6 | 57 | 6 | 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 |



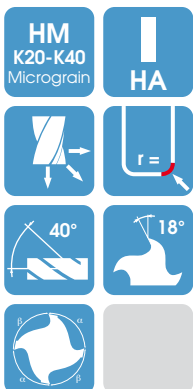
ALUMINUM HIGH REMOVAL MILLING

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] | | |
| 68DX/68SX 68TD/68RDX** 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 | | Aramid fiber/Kevlar | 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 | N | Thermoplastics | | | Delrin, Hostalen | 200 |
| | | Duroplastic | | | Ferrozelf, Bakelit | 200 |
| | | Carbon fiber | | | CFC - CFK | 120 |
| | | Fiber reinforced plastics | | | GFK* | 200 |
| 118 | N | 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 | S | Pure titanium | < 900 | 3,7025 | Ti99,8 |
| Titanium alloys | | | < 700 | 3,7114 | TiAl5Sn2 | 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 |

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

| | 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 | 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 |
| | | | | | | | | fz [mm] | | | fz [mm] | | | | | |
| 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 | |
| 642(F) | 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 | |
| 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



Cerini[®]
CUTTING TOOLS MANUFACTURING

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