



Cerini[®]

CUTTING TOOLS MANUFACTURING



Standard endmills
HPC endmills
Endmills for tempered steels
T-slot cutters

Steel Milling





*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.

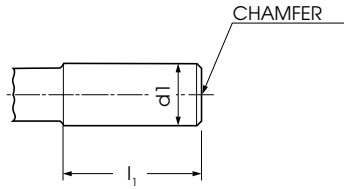
Today, Cerin provides its customers with the benefit of a long experience by offering a complete range of high performance cutters dedicated to the machining of ferrous materials.



COMPANY WITH
QUALITY SYSTEM
CERTIFIED BY DNV GL
= ISO 9001 =

Shank design (for drilling and milling tools) DIN 6535

Straight cylindrical shank - Shape HA

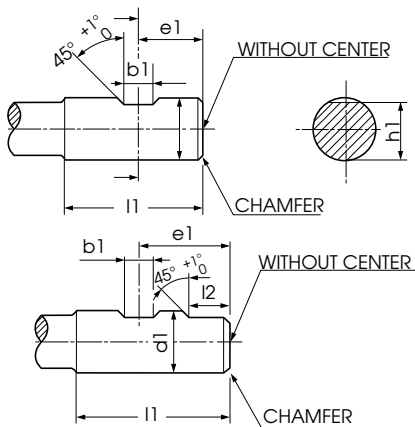


| d_1 | l_1 | d_1 | l_1 | d_1 | l_1 |
|-----------|-------------|-----------|-------------|-----------|-------------|
| h6 | +2/0 | h6 | +2/0 | h6 | +2/0 |
| 2 | 28 | 8 | 36 | 18 | 48 |
| 3 | 28 | 10 | 40 | 20 | 50 |
| 4 | 28 | 12 | 45 | 25 | 56 |
| 5 | 28 | 14 | 45 | 32 | 60 |
| 6 | 36 | 16 | 48 | |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

Cylindrical shank - Shape HB

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

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

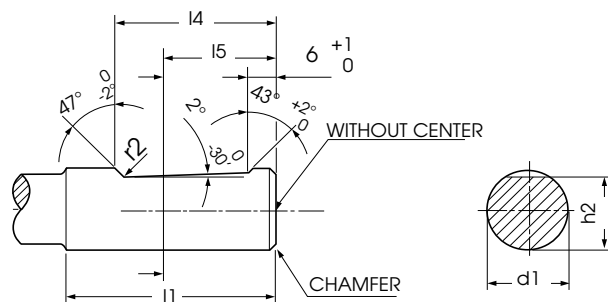


| d_1 | b_1 | e_1 | h_1 | l_1 | l_2 |
|-----------|----------------|-------------|------------|-------------|-------------|
| h6 | +0,05/0 | 0/-1 | h11 | +2/0 | +1/0 |
| 6 | 4,2 | 18 | 5,1 | 36 | |
| 8 | 5,5 | 18 | 6,9 | 36 | |
| 10 | 7 | 20 | 8,5 | 40 | |
| 12 | 8 | 22,5 | 10,4 | 45 | |
| 14 | 8 | 22,5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



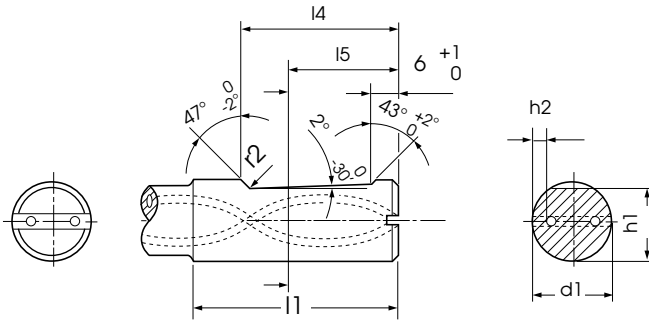
| d_1 | (b_2) | (b_3) | h_2 | (h_3) | l_1 | l_4 | l_5 | r_2 |
|-----------|---------|---------|------------|---------|-------------|-------------|--------------|-------|
| h6 | | | h11 | | +2/0 | 0/-1 | Nominal size | min. |
| 6 | 4,3 | | 5,1 | | 36 | 25 | 18 | 1,2 |
| 8 | 5,5 | | 6,9 | | 36 | 25 | 18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

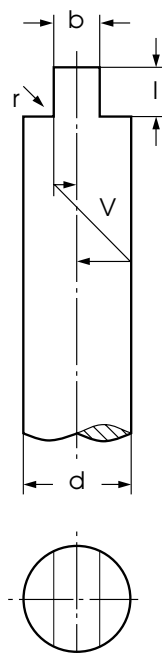
one slope flat - d1 = 6 to 20 mm

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 | $V_{fM} = \frac{V_f \times (D + D_c)}{D}$ |

Steel Milling

| | | Pag |
|---|-----------------------------|-----|
|  | Standard endmills | 7 |
|  | HPC endmills | 21 |
|  | Endmills for tempered steel | 29 |
|  | Deburring endmills | 33 |
|  | T-slot cutters | 36 |





Standard Endmills

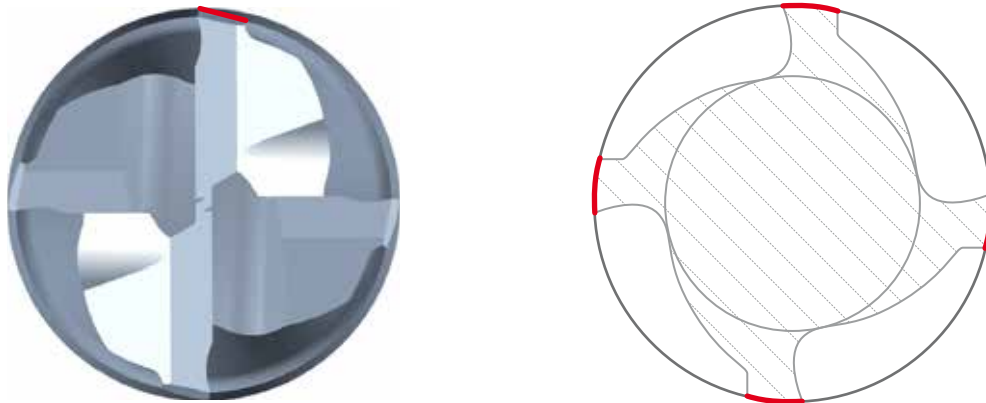


Tools features

Radial relief:

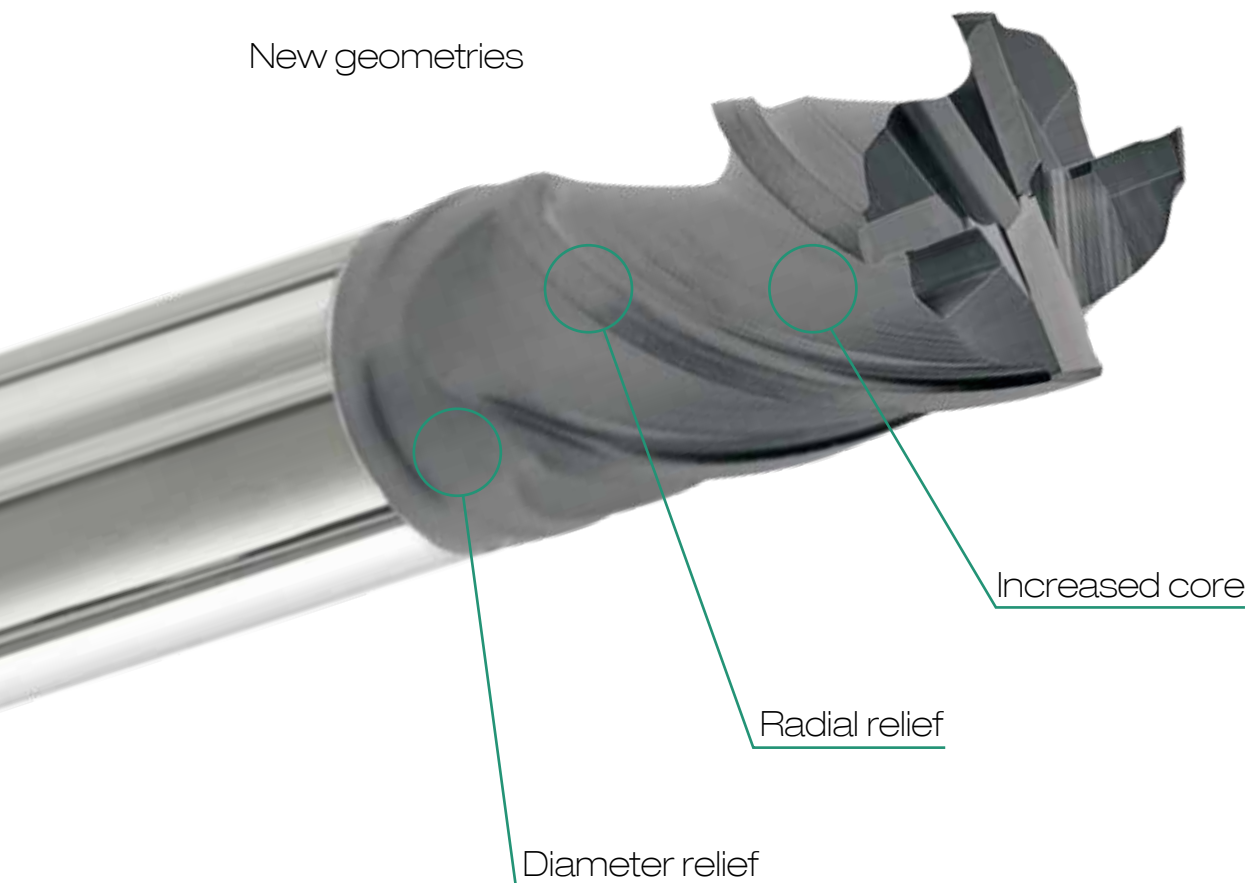
Cutting edge strength suitable for machining medium-hard metals (55 HRC)

Increased core diameter (> 60%) to withstand high bending stresses



TiAlN based coating

New geometries



Test Report

Steel 1.2738

Tool: 64.060061357A

Z=4, Dia. 6, radial relief

Cutting data:

$a_p = 1 \times D$ (6 mm), $a_e = 0,1 \times D$ (0,6 mm)

$V_c = 200$ m/min

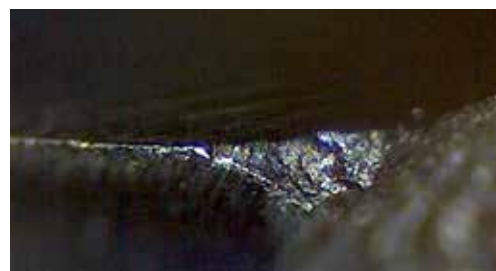
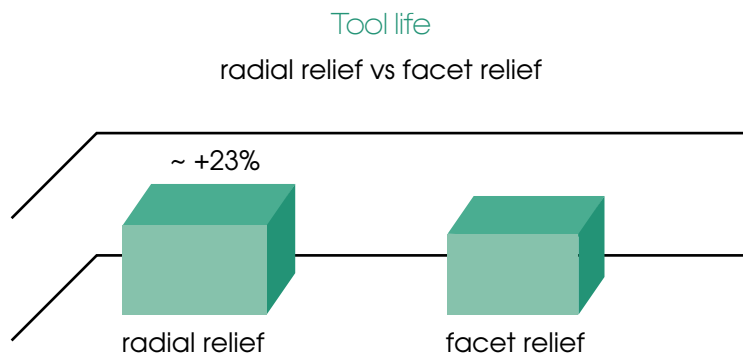
$f_z = 0,1$ mm

Tool life: 340 meters

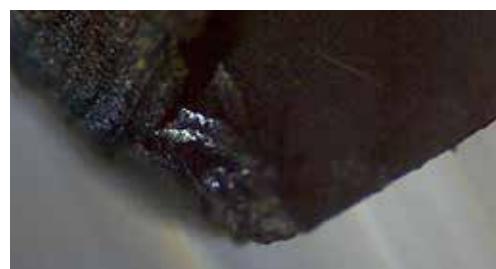


Tempered K110 (1.2379)

Tool: Z=4, radial relief vs facet relief

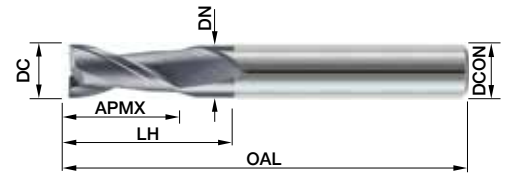


(64.060061357A vs 640W.060061357Y)

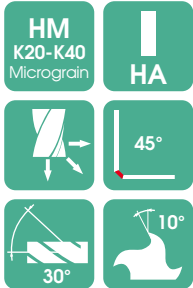


STANDARD MILLING 2 flutes endmill

PVD TiAlN Cer-T
Also available without coating



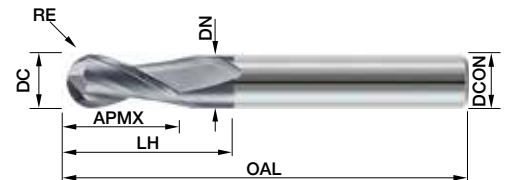
62



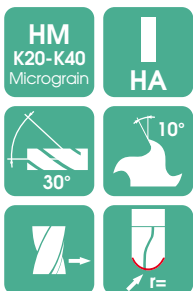
| Cod. | | DC | APMX | LH | OAL | DCON | DN |
|----------------|---------------|-----|------|------|------|------|---------|
| Coated | Uncoated | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,05 |
| 62.020020640A | 62.020020640 | 2 | 6 | 10 | 40 | 2 | 1,9 |
| 62.020060350A | 62.020060350 | 2 | 3 | 6,5 | 50 | 6 | 1,9 |
| 62.030030840A | 62.030030840 | 3 | 8 | 11 | 40 | 3 | 2,9 |
| 62.030060757A | 62.030060757 | 3 | 7 | 10,5 | 57 | 6 | 2,9 |
| 62.040041040A | 62.040041040 | 4 | 10 | 13 | 40 | 4 | 3,9 |
| 62.040060857A | 62.040060857 | 4 | 8 | 11 | 57 | 6 | 3,9 |
| 62.050051250A | 62.050051250 | 5 | 12 | 15 | 50 | 5 | 4,9 |
| 62.060061057A | 62.060061057 | 6 | 10 | 13 | 57 | 6 | 5,9 |
| 62.060061450A | 62.060061450 | 6 | 14 | 17 | 50 | 6 | 5,9 |
| 62.080081663A | 62.080081663 | 8 | 16 | 23 | 63 | 8 | 7,9 |
| 62.100101972A | 62.100101972 | 10 | 19 | 26 | 72 | 10 | 9,8 |
| 62.120122283A | 62.120122283 | 12 | 22 | 30 | 83 | 12 | 11,8 |
| 62.140142283A | 62.140142283 | 14 | 22 | 30 | 83 | 14 | 13,8 |
| 62.160162692A | 62.160162692 | 16 | 26 | 34 | 92 | 16 | 15,8 |
| 62.2002032104A | 62.2002032104 | 20 | 32 | 45 | 104 | 20 | 19,6 |
| 62.2502545120A | 62.2502545120 | 25 | 45 | 58 | 120 | 25 | 24,6 |

STANDARD MILLING 2 flutes ball nose endmill

PVD TiAlN Cer-T
Also available without coating



62R



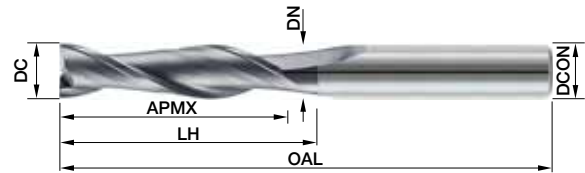
| Cod. | | DC | APMX | LH | OAL | DCON | RE | DN |
|-----------------|----------------|-----|------|------|------|------|---------|---------|
| Coated | Uncoated | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,02 | 0/-0,05 |
| 62R.020020640A | 62R.020020640 | 2 | 6 | 10 | 40 | 2 | 1 | 1,9 |
| 62R.030030840A | 62R.030030840 | 3 | 8 | 11 | 40 | 3 | 1,5 | 2,9 |
| 62R.030060757A | 62R.030060757 | 3 | 7 | 10,5 | 57 | 6 | 1,5 | 2,9 |
| 62R.040041040A | 62R.040041040 | 4 | 10 | 13 | 40 | 4 | 2 | 3,9 |
| 62R.040060857A | 62R.040060857 | 4 | 8 | 11 | 57 | 6 | 2 | 3,9 |
| 62R.050051250A | 62R.050051250 | 5 | 12 | 15 | 50 | 5 | 2,5 | 4,9 |
| 62R.060061057A | 62R.060061057 | 6 | 10 | 13 | 57 | 6 | 3 | 5,9 |
| 62R.060061450A | 62R.060061450 | 6 | 14 | 17 | 50 | 6 | 3 | 5,9 |
| 62R.080081663A | 62R.080081663 | 8 | 16 | 23 | 63 | 8 | 4 | 7,9 |
| 62R.100101972A | 62R.100101972 | 10 | 19 | 26 | 72 | 10 | 5 | 9,8 |
| 62R.120122283A | 62R.120122283 | 12 | 22 | 30 | 83 | 12 | 6 | 11,8 |
| 62R.140142283A | 62R.140142283 | 14 | 22 | 30 | 83 | 14 | 7 | 13,8 |
| 62R.160162692A | 62R.160162692 | 16 | 26 | 34 | 92 | 16 | 8 | 15,8 |
| 62R.2002032104A | 62R.2002032104 | 20 | 32 | 45 | 104 | 20 | 10 | 19,6 |
| 62R.2502545120A | 62R.2502545120 | 25 | 45 | 58 | 120 | 25 | 12,5 | 24,6 |

STANDARD MILLING

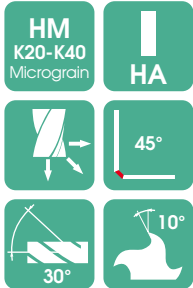
2 flutes long endmill

PVD TiAlN Cer-T

Also available without coating



62L



| Cod. | | DC | APMX | LH | OAL | DCON | DN |
|----------|----------|-----|------|------|------|------|---------|
| Coated | Uncoated | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,05 |
| 62L.030A | 62L.030 | 3 | 18 | 23 | 60 | 3 | 2,9 |
| 62L.040A | 62L.040 | 4 | 20 | 25 | 60 | 4 | 3,9 |
| 62L.050A | 62L.050 | 5 | 25 | 29 | 62 | 5 | 4,9 |
| 62L.060A | 62L.060 | 6 | 30 | 34 | 70 | 6 | 5,9 |
| 62L.080A | 62L.080 | 8 | 35 | 42 | 79 | 8 | 7,9 |
| 62L.100A | 62L.100 | 10 | 40 | 47 | 89 | 10 | 9,8 |
| 62L.120A | 62L.120 | 12 | 50 | 55 | 100 | 12 | 11,8 |
| 62L.140A | 62L.140 | 14 | 58 | 76 | 125 | 14 | 13,8 |
| 62L.160A | 62L.160 | 16 | 58 | 76 | 125 | 16 | 15,8 |
| 62L.200A | 62L.200 | 20 | 60 | 73 | 125 | 20 | 19,6 |

STANDARD MILLING

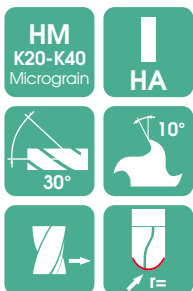
2 flutes ball nose long endmill

PVD TiAlN Cer-T

Also available without coating



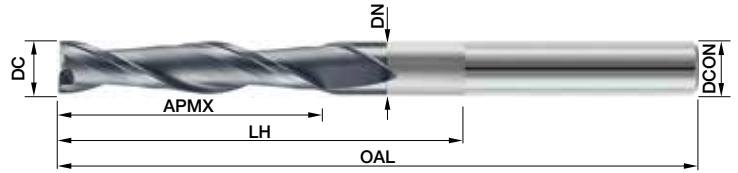
62RL



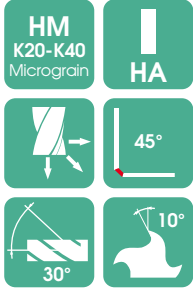
| Cod. | | DC | APMX | LH | OAL | DCON | RE | DN |
|-----------|----------|-----|------|------|------|------|---------|---------|
| Coated | Uncoated | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,02 | 0/-0,05 |
| 62RL.030A | 62RL.030 | 3 | 18 | 23 | 60 | 3 | 1,5 | 2,9 |
| 62RL.040A | 62RL.040 | 4 | 20 | 25 | 60 | 4 | 2 | 3,9 |
| 62RL.050A | 62RL.050 | 5 | 25 | 29 | 62 | 5 | 2,5 | 4,9 |
| 62RL.060A | 62RL.060 | 6 | 30 | 34 | 70 | 6 | 3 | 5,9 |
| 62RL.080A | 62RL.080 | 8 | 35 | 42 | 79 | 8 | 4 | 7,9 |
| 62RL.100A | 62RL.100 | 10 | 40 | 47 | 89 | 10 | 5 | 9,8 |
| 62RL.120A | 62RL.120 | 12 | 50 | 55 | 100 | 12 | 6 | 11,8 |
| 62RL.140A | 62RL.140 | 14 | 58 | 76 | 125 | 14 | 7 | 13,8 |
| 62RL.160A | 62RL.160 | 16 | 58 | 76 | 125 | 16 | 8 | 15,8 |
| 62RL.200A | 62RL.200 | 20 | 60 | 73 | 125 | 20 | 10 | 19,6 |

STANDARD MILLING 2 flutes extra long endmill

PVD TiAlN Cer-T
Also available without coating



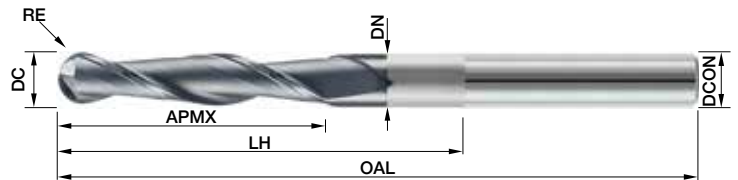
62XL



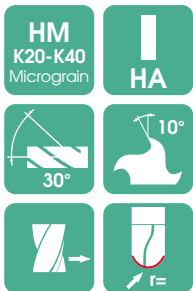
| Cod. | | DC | APMX | LH | OAL | DCON | DN |
|-----------|----------|-----|------|------|------|------|---------|
| Coated | Uncoated | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,05 |
| 62XL.030A | 62XL.030 | 3 | 25 | 37 | 75 | 3 | 2,9 |
| 62XL.040A | 62XL.040 | 4 | 32 | 39 | 75 | 4 | 3,9 |
| 62XL.050A | 62XL.050 | 5 | 38 | 58 | 100 | 5 | 4,9 |
| 62XL.060A | 62XL.060 | 6 | 40 | 60 | 100 | 6 | 5,9 |
| 62XL.080A | 62XL.080 | 8 | 45 | 63 | 100 | 8 | 7,9 |
| 62XL.100A | 62XL.100 | 10 | 50 | 75 | 120 | 10 | 9,8 |
| 62XL.120A | 62XL.120 | 12 | 60 | 100 | 150 | 12 | 11,8 |
| 62XL.140A | 62XL.140 | 14 | 75 | 103 | 150 | 14 | 13,8 |
| 62XL.160A | 62XL.160 | 16 | 75 | 100 | 150 | 16 | 15,8 |
| 62XL.200A | 62XL.200 | 20 | 75 | 98 | 150 | 20 | 19,6 |

STANDARD MILLING 2 flutes ball nose extra long endmill

PVD TiAlN Cer-T
Also available without coating



62RXL



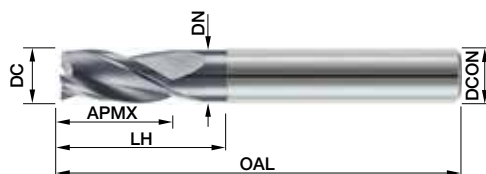
| Cod. | | DC | APMX | LH | OAL | DCON | RE | DN |
|------------|-----------|-----|------|------|------|------|---------|---------|
| Coated | Uncoated | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,02 | 0/-0,05 |
| 62RXL.030A | 62RXL.030 | 3 | 25 | 37 | 75 | 3 | 1,5 | 2,9 |
| 62RXL.040A | 62RXL.040 | 4 | 32 | 39 | 75 | 4 | 2 | 3,9 |
| 62RXL.050A | 62RXL.050 | 5 | 38 | 58 | 100 | 5 | 2,5 | 4,9 |
| 62RXL.060A | 62RXL.060 | 6 | 40 | 60 | 100 | 6 | 3 | 5,9 |
| 62RXL.080A | 62RXL.080 | 8 | 45 | 63 | 100 | 8 | 4 | 7,9 |
| 62RXL.100A | 62RXL.100 | 10 | 50 | 75 | 120 | 10 | 5 | 9,8 |
| 62RXL.120A | 62RXL.120 | 12 | 60 | 100 | 150 | 12 | 6 | 11,8 |
| 62RXL.140A | 62RXL.140 | 14 | 75 | 103 | 150 | 14 | 7 | 13,8 |
| 62RXL.160A | 62RXL.160 | 16 | 75 | 100 | 150 | 16 | 8 | 15,8 |
| 62RXL.200A | 62RXL.200 | 20 | 75 | 98 | 150 | 20 | 10 | 19,6 |

STANDARD MILLING

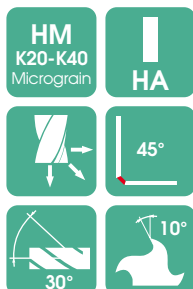
3 flutes endmill

PVD TiAlN Cer-T

Also available without coating



63



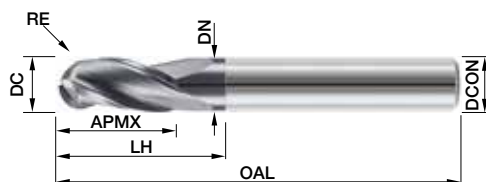
| Cod. | | DC | APMX | LH | OAL | DCON | DN |
|----------------|---------------|-----|------|------|------|------|---------|
| Coated | Uncoated | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,05 |
| 63.020020640A | 63.020020640 | 2 | 6 | 10 | 40 | 2 | 1,9 |
| 63.020060350A | 63.020060350 | 2 | 3 | 6,5 | 50 | 6 | 1,9 |
| 63.030031040A | 63.030031040 | 3 | 10 | 12 | 40 | 3 | 2,9 |
| 63.030060757A | 63.030060757 | 3 | 7 | 10,5 | 57 | 6 | 2,9 |
| 63.040041140A | 63.040041140 | 4 | 11 | 12,5 | 40 | 4 | 3,9 |
| 63.040060857A | 63.040060857 | 4 | 8 | 11 | 57 | 6 | 3,9 |
| 63.050051350A | 63.050051350 | 5 | 13 | 19 | 50 | 5 | 4,9 |
| 63.060061057A | 63.060061057 | 6 | 10 | 19 | 57 | 6 | 5,9 |
| 63.060061650A | 63.060061650 | 6 | 16 | 16 | 50 | 6 | 5,9 |
| 63.080081663A | 63.080081663 | 8 | 16 | 23 | 63 | 8 | 7,9 |
| 63.100101972A | 63.100101972 | 10 | 19 | 26 | 72 | 10 | 9,8 |
| 63.120122283A | 63.120122283 | 12 | 22 | 34 | 83 | 12 | 11,8 |
| 63.140142283A | 63.140142283 | 14 | 22 | 36 | 83 | 14 | 13,8 |
| 63.160162692A | 63.160162692 | 16 | 26 | 42 | 92 | 16 | 15,8 |
| 63.2002032104A | 63.2002032104 | 20 | 32 | 52 | 104 | 20 | 19,6 |
| 63.2502545120A | 63.2502545120 | 25 | 45 | 58 | 120 | 25 | 24,6 |

STANDARD MILLING

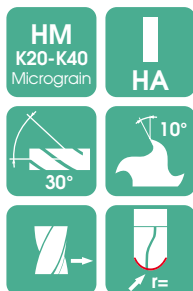
3 flutes ball nose endmill

PVD TiAlN Cer-T

Also available without coating



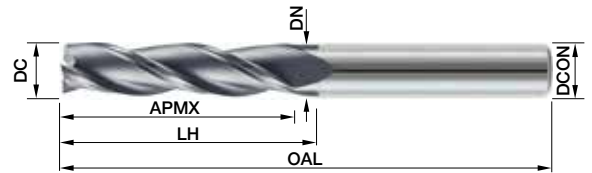
63R



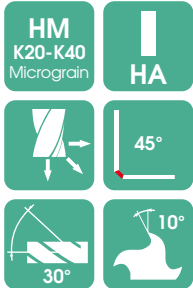
| Cod. | | DC | APMX | LH | OAL | DCON | RE | DN |
|-----------------|----------------|-----|------|------|------|------|---------|---------|
| Coated | Uncoated | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,02 | 0/-0,05 |
| 63R.020020640A | 63R.020020640 | 2 | 6 | 10 | 40 | 2 | 1 | 1,9 |
| 63R.030031040A | 63R.030031040 | 3 | 10 | 12 | 40 | 3 | 1,5 | 2,9 |
| 63R.030060757A | 63R.030060757 | 3 | 7 | 10 | 57 | 6 | 1,5 | 2,9 |
| 63R.040041140A | 63R.040041140 | 4 | 11 | 12,5 | 40 | 4 | 2 | 3,9 |
| 63R.040060857A | 63R.040060857 | 4 | 8 | 11 | 57 | 6 | 2 | 3,9 |
| 63R.050051350A | 63R.050051350 | 5 | 13 | 19 | 50 | 5 | 2,5 | 4,9 |
| 63R.060061057A | 63R.060061057 | 6 | 10 | 19 | 57 | 6 | 3 | 5,9 |
| 63R.060061650A | 63R.060061650 | 6 | 16 | 16 | 50 | 6 | 3 | 5,9 |
| 63R.080081663A | 63R.080081663 | 8 | 16 | 23 | 63 | 8 | 4 | 7,9 |
| 63R.100101972A | 63R.100101972 | 10 | 19 | 26 | 72 | 10 | 5 | 9,8 |
| 63R.120122283A | 63R.120122283 | 12 | 22 | 34 | 83 | 12 | 6 | 11,8 |
| 63R.140142283A | 63R.140142283 | 14 | 22 | 36 | 83 | 14 | 7 | 13,8 |
| 63R.160162692A | 63R.160162692 | 16 | 26 | 42 | 92 | 16 | 8 | 15,8 |
| 63R.2002032104A | 63R.2002032104 | 20 | 32 | 52 | 104 | 20 | 10 | 19,6 |
| 63R.2502545120A | 63R.2502545120 | 25 | 45 | 58 | 120 | 25 | 12,5 | 24,6 |

STANDARD MILLING 3 flutes long endmill

PVD TiAlN Cer-T
Also available without coating



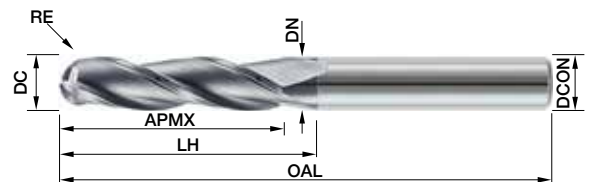
63L



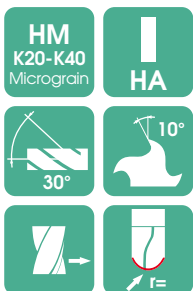
| Cod. | | DC | APMX | LH | OAL | DCON | DN |
|----------|----------|-----|------|------|------|------|---------|
| Coated | Uncoated | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,05 |
| 63L.030A | 63L.030 | 3 | 18 | 23 | 60 | 3 | 2,9 |
| 63L.040A | 63L.040 | 4 | 20 | 25 | 60 | 4 | 3,9 |
| 63L.050A | 63L.050 | 5 | 25 | 29 | 62 | 5 | 4,9 |
| 63L.060A | 63L.060 | 6 | 30 | 34 | 70 | 6 | 5,9 |
| 63L.080A | 63L.080 | 8 | 35 | 42 | 79 | 8 | 7,9 |
| 63L.100A | 63L.100 | 10 | 40 | 47 | 89 | 10 | 9,8 |
| 63L.120A | 63L.120 | 12 | 50 | 55 | 100 | 12 | 11,8 |
| 63L.140A | 63L.140 | 14 | 58 | 76 | 125 | 14 | 13,8 |
| 63L.160A | 63L.160 | 16 | 58 | 76 | 125 | 16 | 15,8 |
| 63L.200A | 63L.200 | 20 | 60 | 73 | 125 | 20 | 19,6 |

STANDARD MILLING 3 flutes ball nose long endmill

PVD TiAlN Cer-T
Also available without coating



63RL

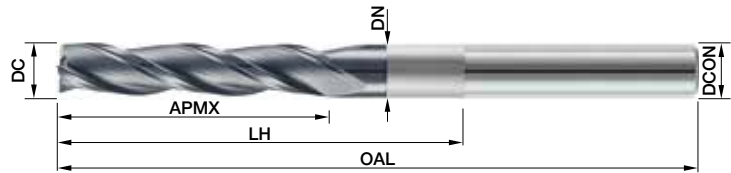


| Cod. | | DC | APMX | LH | OAL | DCON | RE | DN |
|-----------|----------|-----|------|------|------|------|---------|---------|
| Coated | Uncoated | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,02 | 0/-0,05 |
| 63RL.030A | 63RL.030 | 3 | 18 | 23 | 60 | 3 | 1,5 | 2,9 |
| 63RL.040A | 63RL.040 | 4 | 20 | 25 | 60 | 4 | 2 | 3,9 |
| 63RL.050A | 63RL.050 | 5 | 25 | 29 | 62 | 5 | 2,5 | 4,9 |
| 63RL.060A | 63RL.060 | 6 | 30 | 34 | 70 | 6 | 3 | 5,9 |
| 63RL.080A | 63RL.080 | 8 | 35 | 42 | 79 | 8 | 4 | 7,9 |
| 63RL.100A | 63RL.100 | 10 | 40 | 47 | 89 | 10 | 5 | 9,8 |
| 63RL.120A | 63RL.120 | 12 | 50 | 55 | 100 | 12 | 6 | 11,8 |
| 63RL.140A | 63RL.140 | 14 | 58 | 76 | 125 | 14 | 7 | 13,8 |
| 63RL.160A | 63RL.160 | 16 | 58 | 76 | 125 | 16 | 8 | 15,8 |
| 63RL.200A | 63RL.200 | 20 | 60 | 73 | 125 | 20 | 10 | 19,6 |

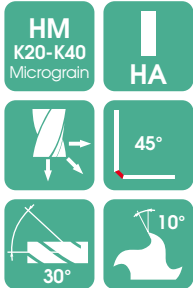
STANDARD MILLING

3 flutes extra long endmill

PVD TiAlN Cer-T
Also available without coating



63XL

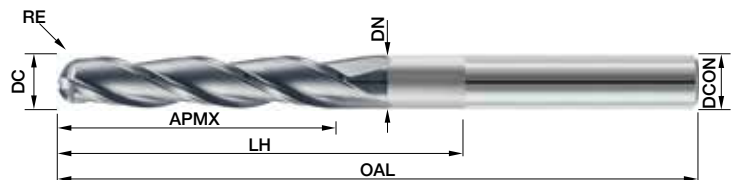


| Cod. | | DC | APMX | LH | OAL | DCON | DN |
|-----------|----------|-----|------|------|------|------|---------|
| Coated | Uncoated | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,05 |
| 63XL.030A | 63XL.030 | 3 | 25 | 37 | 75 | 3 | 2,9 |
| 63XL.040A | 63XL.040 | 4 | 32 | 39 | 75 | 4 | 3,9 |
| 63XL.050A | 63XL.050 | 5 | 38 | 58 | 100 | 5 | 4,9 |
| 63XL.060A | 63XL.060 | 6 | 40 | 60 | 100 | 6 | 5,9 |
| 63XL.080A | 63XL.080 | 8 | 45 | 63 | 100 | 8 | 7,9 |
| 63XL.100A | 63XL.100 | 10 | 50 | 75 | 120 | 10 | 9,8 |
| 63XL.120A | 63XL.120 | 12 | 60 | 100 | 150 | 12 | 11,8 |
| 63XL.140A | 63XL.140 | 14 | 75 | 103 | 150 | 14 | 13,8 |
| 63XL.160A | 63XL.160 | 16 | 75 | 100 | 150 | 16 | 15,8 |
| 63XL.200A | 63XL.200 | 20 | 75 | 98 | 150 | 20 | 19,6 |

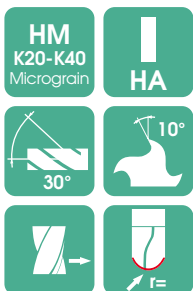
STANDARD MILLING

3 flutes ball nose extra long endmill

PVD TiAlN Cer-T
Also available without coating



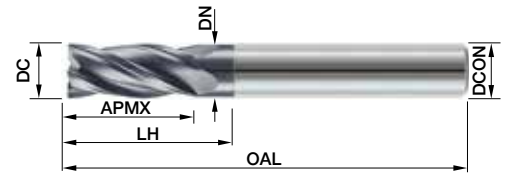
63RXL



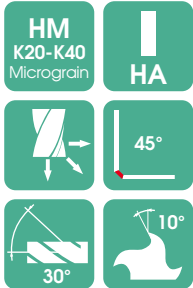
| Cod. | | DC | APMX | LH | OAL | DCON | RE | DN |
|------------|-----------|-----|------|------|------|------|---------|---------|
| Coated | Uncoated | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,02 | 0/-0,05 |
| 63RXL.030A | 63RXL.030 | 3 | 25 | 37 | 75 | 3 | 1,5 | 2,9 |
| 63RXL.040A | 63RXL.040 | 4 | 32 | 39 | 75 | 4 | 2 | 3,9 |
| 63RXL.050A | 63RXL.050 | 5 | 38 | 58 | 100 | 5 | 2,5 | 4,9 |
| 63RXL.060A | 63RXL.060 | 6 | 40 | 60 | 100 | 6 | 3 | 5,9 |
| 63RXL.080A | 63RXL.080 | 8 | 45 | 63 | 100 | 8 | 4 | 7,9 |
| 63RXL.100A | 63RXL.100 | 10 | 50 | 75 | 120 | 10 | 5 | 9,8 |
| 63RXL.120A | 63RXL.120 | 12 | 60 | 100 | 150 | 12 | 6 | 11,8 |
| 63RXL.140A | 63RXL.140 | 14 | 75 | 103 | 150 | 14 | 7 | 13,8 |
| 63RXL.160A | 63RXL.160 | 16 | 75 | 100 | 150 | 16 | 8 | 15,8 |
| 63RXL.200A | 63RXL.200 | 20 | 75 | 98 | 150 | 20 | 10 | 19,6 |

STANDARD MILLING 4 flutes endmill

PVD TiAlN Cer-T
Also available without coating



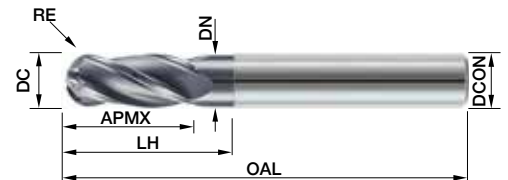
64



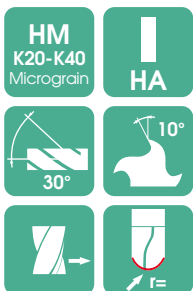
| Cod. | | DC | APMX | LH | OAL | DCON | DN |
|----------------|---------------|-----|------|------|------|------|---------|
| Coated | Uncoated | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,05 |
| 64.020020640A | 64.020020640 | 2 | 6 | 10 | 40 | 2 | 1,9 |
| 64.020060450A | 64.020060450 | 2 | 4 | 7 | 50 | 6 | 1,9 |
| 64.030031040A | 64.030031040 | 3 | 10 | 12 | 40 | 3 | 2,9 |
| 64.030060857A | 64.030060857 | 3 | 8 | 11,5 | 57 | 6 | 2,9 |
| 64.040041140A | 64.040041140 | 4 | 11 | 12,5 | 40 | 4 | 3,9 |
| 64.040061157A | 64.040061157 | 4 | 11 | 13 | 57 | 6 | 3,9 |
| 64.050051350A | 64.050051350 | 5 | 13 | 19 | 50 | 5 | 4,9 |
| 64.060061357A | 64.060061357 | 6 | 13 | 19 | 57 | 6 | 5,9 |
| 64.060061650A | 64.060061650 | 6 | 16 | 16 | 50 | 6 | 5,9 |
| 64.080081963A | 64.080081963 | 8 | 19 | 26 | 63 | 8 | 7,9 |
| 64.100102272A | 64.100102272 | 10 | 22 | 29 | 72 | 10 | 9,8 |
| 64.120122683A | 64.120122683 | 12 | 26 | 37 | 83 | 12 | 11,8 |
| 64.140142683A | 64.140142683 | 14 | 26 | 36 | 83 | 14 | 13,8 |
| 64.160163292A | 64.160163292 | 16 | 32 | 42 | 92 | 16 | 15,8 |
| 64.2002038104A | 64.2002038104 | 20 | 38 | 52 | 104 | 20 | 19,6 |
| 64.2502545120A | 64.2502545120 | 25 | 45 | 63 | 120 | 25 | 24,6 |

STANDARD MILLING 4 flutes ball nose endmill

PVD TiAlN Cer-T
Also available without coating



64R



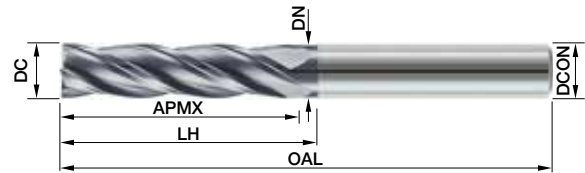
| Cod. | | DC | APMX | LH | OAL | DCON | RE | DN |
|-----------------|----------------|-----|------|------|------|------|---------|---------|
| Coated | Uncoated | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,02 | 0/-0,05 |
| 64R.020020640A | 64R.020020640 | 2 | 6 | 6 | 40 | 2 | 1 | 1,9 |
| 64R.030031040A | 64R.030031040 | 3 | 10 | 12 | 40 | 3 | 1,5 | 2,9 |
| 64R.030060857A | 64R.030060857 | 3 | 8 | 11,5 | 57 | 6 | 2 | 2,9 |
| 64R.040041140A | 64R.040041140 | 4 | 11 | 12,5 | 40 | 4 | 2 | 3,9 |
| 64R.040061157A | 64R.040061157 | 4 | 11 | 13 | 57 | 6 | 2,5 | 3,9 |
| 64R.050051350A | 64R.050051350 | 5 | 13 | 19 | 50 | 5 | 2,5 | 4,9 |
| 64R.060061357A | 64R.060061357 | 6 | 13 | 19 | 57 | 6 | 3 | 5,9 |
| 64R.060061650A | 64R.060061650 | 6 | 16 | 16 | 50 | 6 | 3 | 5,9 |
| 64R.080081963A | 64R.080081963 | 8 | 19 | 26 | 63 | 8 | 4 | 7,9 |
| 64R.100102272A | 64R.100102272 | 10 | 22 | 29 | 72 | 10 | 5 | 9,8 |
| 64R.120122683A | 64R.120122683 | 12 | 26 | 37 | 83 | 12 | 6 | 11,8 |
| 64R.140142683A | 64R.140142683 | 14 | 26 | 36 | 83 | 14 | 7 | 13,8 |
| 64R.160163292A | 64R.160163292 | 16 | 32 | 42 | 92 | 16 | 8 | 15,8 |
| 64R.2002038104A | 64R.2002038104 | 20 | 38 | 52 | 104 | 20 | 10 | 19,6 |
| 64R.2502545120A | 64R.2502545120 | 25 | 45 | 63 | 120 | 25 | 12,5 | 24,6 |

STANDARD MILLING

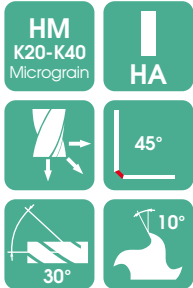
4 flutes long endmill

PVD TiAlN Cer-T

Also available without coating



64L



| Cod. | | DC | APMX | LH | OAL | DCON | DN |
|----------|----------|-----|------|------|------|------|---------|
| Coated | Uncoated | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,05 |
| 64L.030A | 64L.030 | 3 | 18 | 23 | 60 | 3 | 2,9 |
| 64L.040A | 64L.040 | 4 | 20 | 25 | 60 | 4 | 3,9 |
| 64L.050A | 64L.050 | 5 | 25 | 27,5 | 62 | 5 | 4,9 |
| 64L.060A | 64L.060 | 6 | 30 | 34 | 70 | 6 | 5,9 |
| 64L.080A | 64L.080 | 8 | 35 | 42 | 79 | 8 | 7,9 |
| 64L.100A | 64L.100 | 10 | 40 | 47 | 89 | 10 | 9,8 |
| 64L.120A | 64L.120 | 12 | 50 | 55 | 100 | 12 | 11,8 |
| 64L.140A | 64L.140 | 14 | 58 | 76 | 125 | 14 | 13,8 |
| 64L.160A | 64L.160 | 16 | 58 | 76 | 125 | 16 | 15,8 |
| 64L.200A | 64L.200 | 20 | 60 | 73 | 125 | 20 | 19,6 |

STANDARD MILLING

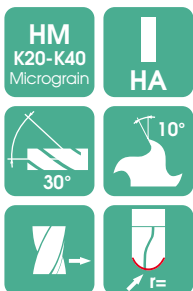
4 flutes ball nose long endmill

PVD TiAlN Cer-T

Also available without coating



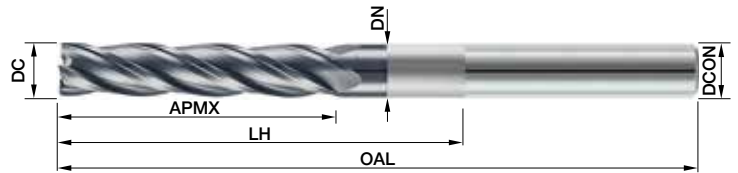
64RL



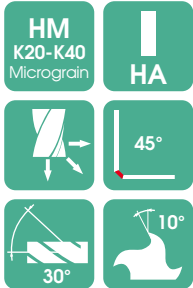
| Cod. | | DC | APMX | LH | OAL | DCON | RE | DN |
|-----------|----------|-----|------|------|------|------|---------|---------|
| Coated | Uncoated | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,02 | 0/-0,05 |
| 64RL.030A | 64RL.030 | 3 | 18 | 23 | 60 | 3 | 1,5 | 2,9 |
| 64RL.040A | 64RL.040 | 4 | 20 | 25 | 60 | 4 | 2 | 3,9 |
| 64RL.050A | 64RL.050 | 5 | 25 | 27,5 | 62 | 5 | 2,5 | 4,9 |
| 64RL.060A | 64RL.060 | 6 | 30 | 34 | 70 | 6 | 3 | 5,9 |
| 64RL.080A | 64RL.080 | 8 | 35 | 42 | 79 | 8 | 4 | 7,9 |
| 64RL.100A | 64RL.100 | 10 | 40 | 47 | 89 | 10 | 5 | 9,8 |
| 64RL.120A | 64RL.120 | 12 | 50 | 55 | 100 | 12 | 6 | 11,8 |
| 64RL.140A | 64RL.140 | 14 | 58 | 76 | 125 | 14 | 7 | 13,8 |
| 64RL.160A | 64RL.160 | 16 | 58 | 76 | 125 | 16 | 8 | 15,8 |
| 64RL.200A | 64RL.200 | 20 | 60 | 73 | 125 | 20 | 10 | 19,6 |

STANDARD MILLING 4 flutes extra long endmill

PVD TiAlN Cer-T
Also available without coating



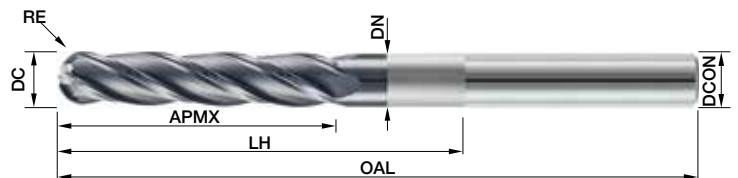
64XL



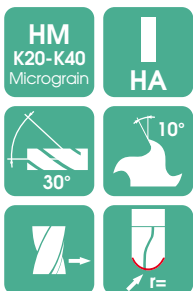
| Cod. | | DC | APMX | LH | OAL | DCON | DN |
|-----------|----------|-----|------|------|------|------|---------|
| Coated | Uncoated | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,05 |
| 64XL.030A | 64XL.030 | 3 | 25 | 37 | 75 | 3 | 2,9 |
| 64XL.040A | 64XL.040 | 4 | 32 | 39 | 75 | 4 | 3,9 |
| 64XL.050A | 64XL.050 | 5 | 38 | 58 | 100 | 5 | 4,9 |
| 64XL.060A | 64XL.060 | 6 | 40 | 60 | 100 | 6 | 5,9 |
| 64XL.080A | 64XL.080 | 8 | 45 | 63 | 100 | 8 | 7,9 |
| 64XL.100A | 64XL.100 | 10 | 50 | 75 | 120 | 10 | 9,8 |
| 64XL.120A | 64XL.120 | 12 | 60 | 100 | 150 | 12 | 11,8 |
| 64XL.140A | 64XL.140 | 14 | 75 | 103 | 150 | 14 | 13,8 |
| 64XL.160A | 64XL.160 | 16 | 75 | 100 | 150 | 16 | 15,8 |
| 64XL.200A | 64XL.200 | 20 | 75 | 98 | 150 | 20 | 19,6 |

STANDARD MILLING 4 flutes ball nose extra long endmill

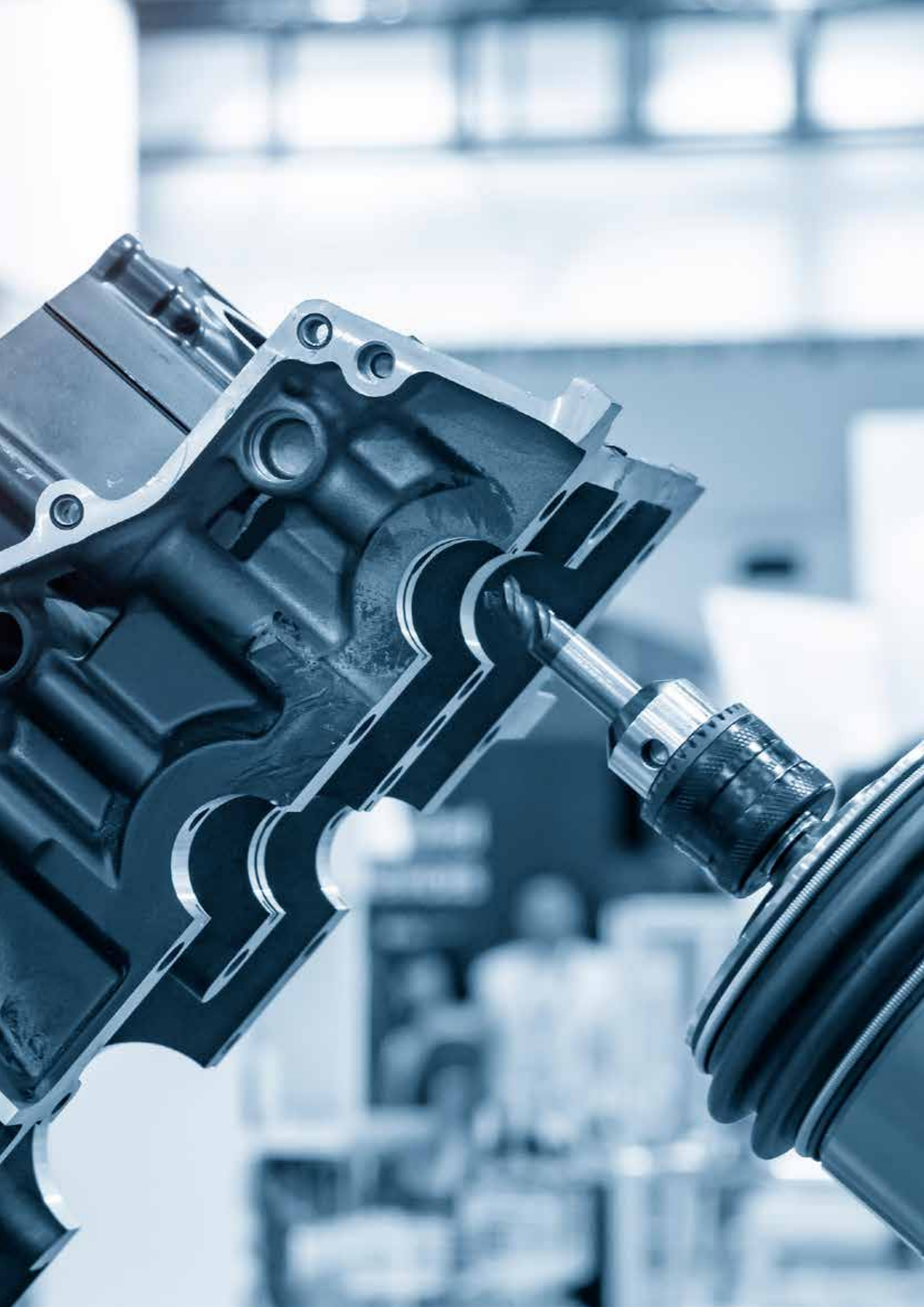
PVD TiAlN Cer-T
Also available without coating



64RXL



| Cod. | | DC | APMX | LH | OAL | DCON | RE | DN |
|------------|-----------|-----|------|------|------|------|---------|---------|
| Coated | Uncoated | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,02 | 0/-0,05 |
| 64RXL.030A | 64RXL.030 | 3 | 25 | 37 | 75 | 3 | 1,5 | 2,9 |
| 64RXL.040A | 64RXL.040 | 4 | 32 | 39 | 75 | 4 | 2 | 3,9 |
| 64RXL.050A | 64RXL.050 | 5 | 38 | 58 | 100 | 5 | 2,5 | 4,9 |
| 64RXL.060A | 64RXL.060 | 6 | 40 | 60 | 100 | 6 | 3 | 5,9 |
| 64RXL.080A | 64RXL.080 | 8 | 45 | 63 | 100 | 8 | 4 | 7,9 |
| 64RXL.100A | 64RXL.100 | 10 | 50 | 75 | 120 | 10 | 5 | 9,8 |
| 64RXL.120A | 64RXL.120 | 12 | 60 | 100 | 150 | 12 | 6 | 11,8 |
| 64RXL.140A | 64RXL.140 | 14 | 75 | 103 | 150 | 14 | 7 | 13,8 |
| 64RXL.160A | 64RXL.160 | 16 | 75 | 100 | 150 | 16 | 8 | 15,8 |
| 64RXL.200A | 64RXL.200 | 20 | 75 | 98 | 150 | 20 | 10 | 19,6 |



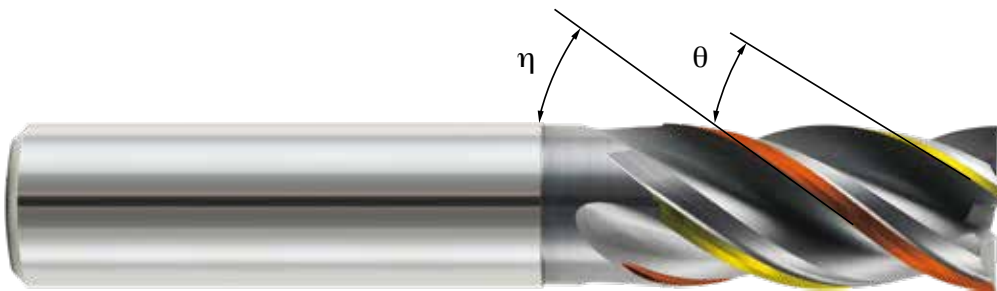
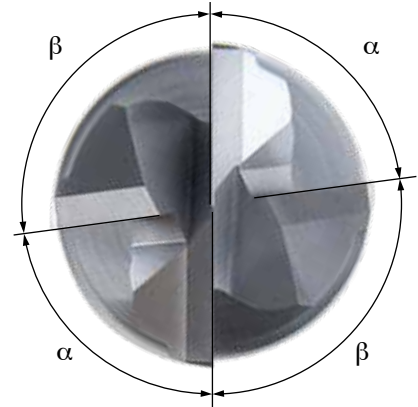


HPC Endmills



Tools features

- ▶ Irregular division and uneven helix;
- ▶ Suitable for high feed and high Material Removal Rate;
- ▶ Vibration free;
- ▶ Roughing and finishing with the same tool;
- ▶ Excellent chips evacuation thanks to flute geometry.



Multilayer AlTiN based coating

Geometries, base material, coatings are specifically developed for a wide range of ferrous materials.



Test Report

AISI 304 stainless steel

Tool: 640.080081963Y

Z=4, Dia. 8, facet relief

Cutting data:

$a_p = 1 \times D$ (8 mm), $a_e = 0,6 \times D$ (4,8 mm)

$V_c = 70$ m/min

$f_z = 0,03$ (up to 0,04)

Tool life: 46 meters

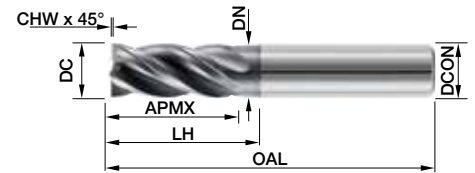
Facet relief sharpness reduces
typical chip sticking



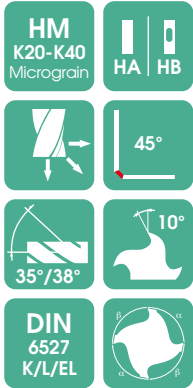
640

HPC STEEL MILLING HPC 4 flutes endmill

PVD TiAlCrN Cer-Y



640

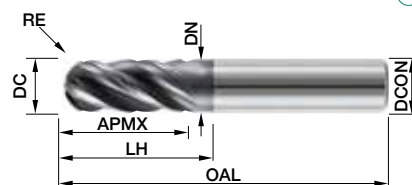


| Cod. | | DC | APMX | LH | OAL | DCON | DN | CHW |
|-----------------|------------------|-----|------|------|------|------|---------|---------|
| HA shank | HB shank | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,05 | +/-0,05 |
| 640.030060550Y | 640W.030060550Y | 3 | 5 | | 50 | 6 | | 0,15 |
| 640.030060857Y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

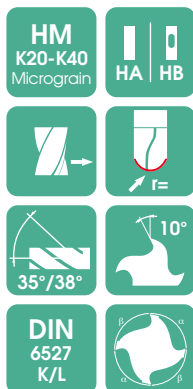
HPC STEEL MILLING

HPC 4 flutes ball nose endmill

PVD TiAlCrN Cer-Y



640R



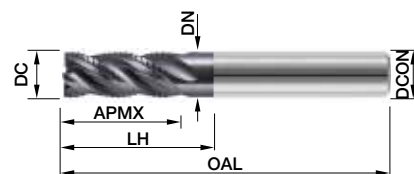
| Cod. | | DC | APMX | LH | OAL | DCON | DN | RE |
|------------------|-------------------|-----|------|------|------|------|---------|---------|
| HA shank | HB shank | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,05 | +/-0,05 |
| 640R.030060550Y | 640WR.030060550Y | 3 | 5 | | 50 | 6 | | 1,5 |
| 640R.030060857Y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



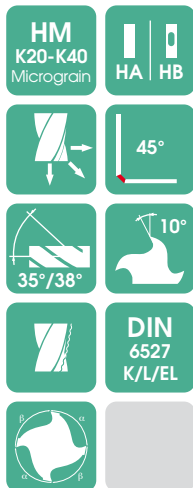
640

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/+2 | 0/+2 | 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 |







Endmill for tempered steel



Tools features

- ▶ Ultrafine micrograin carbide;
- ▶ Coating highly resistant to abrasive wear;
- ▶ h5 shank tolerance to assure tool-spindle precise coupling;
- ▶ Negative cutting angle;
- ▶ Core up to 80% of the diameter to assure stability and vibrations reduction.

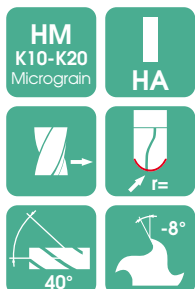
62RHR

TEMPERED STEEL MILLING
2 flutes ball nose endmill

PVD TiAlN/TiSiN Cer-SA



62RHR



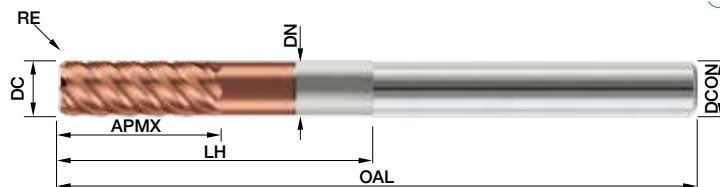
| Cod. | DC | APMX | OAL | LH | DCON | DN | RE |
|--------------------|---------|------|------|------|------|---------|----------|
| | 0/-0,02 | 0/+2 | 0/+2 | 0/+2 | h5 | 0/-0,05 | +/- 0.01 |
| 62RHR.010060257SA | 1 | 2 | 57 | 4 | 6 | 0,9 | 0,5 |
| 62RHR.010060280SA | 1 | 2 | 80 | 7 | 6 | 0,9 | 0,5 |
| 62RHR.015062557SA | 1,5 | 2,5 | 57 | 5,5 | 6 | 1,4 | 0,75 |
| 62RHR.015062580SA | 1,5 | 2,5 | 80 | 10 | 6 | 1,4 | 0,75 |
| 62RHR.020060357SA | 2 | 3 | 57 | 7 | 6 | 1,9 | 1 |
| 62RHR.020060380SA | 2 | 3 | 80 | 13 | 6 | 1,9 | 1 |
| 62RHR.030060457SA | 3 | 4 | 57 | 10 | 6 | 2,8 | 1,5 |
| 62RHR.030060480SA | 3 | 4 | 80 | 19 | 6 | 2,8 | 1,5 |
| 62RHR.040060557SA | 4 | 5 | 57 | 13 | 6 | 3,7 | 2 |
| 62RHR.040060580SA | 4 | 5 | 80 | 25 | 6 | 3,7 | 2 |
| 62RHR.050060657SA | 5 | 6 | 57 | 16 | 6 | 4,6 | 2,5 |
| 62RHR.050060680SA | 5 | 6 | 80 | 31 | 6 | 4,6 | 2,5 |
| 62RHR.060060757SA | 6 | 7 | 57 | 19 | 6 | 5,5 | 3 |
| 62RHR.060060780SA | 6 | 7 | 80 | 37 | 6 | 5,5 | 3 |
| 62RHR.080080963SA | 8 | 9 | 63 | 25 | 8 | 7,4 | 4 |
| 62RHR.0800809100SA | 8 | 9 | 100 | 49 | 8 | 7,4 | 4 |
| 62RHR.100101172SA | 10 | 11 | 72 | 31 | 10 | 9,2 | 5 |
| 62RHR.1001011100SA | 10 | 11 | 100 | 61 | 10 | 9,2 | 5 |
| 62RHR.120121383SA | 12 | 13 | 83 | 37 | 12 | 11 | 6 |
| 62RHR.1201213120SA | 12 | 13 | 120 | 73 | 12 | 11 | 6 |



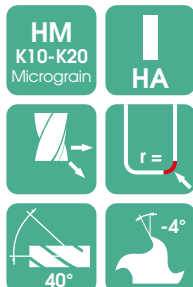
TEMPERED STEEL MILLING

Multiflute torus radius endmill

PVD TiAlN/TiSiN Cer-SA



66THR



| Cod. | DC | APMX | OAL | LH | DCON | DN | RE | ZEFP |
|----------------------|---------|------|------|------|------|---------|----------|------|
| | +/-0,02 | 0/+2 | 0/+2 | 0/+2 | h5 | 0/-0,05 | 0/+0,015 | |
| 66THR.02006035705SA | 2 | 3 | 57 | 7 | 6 | 1,9 | 0,2 | 4 |
| 66THR.02006035710SA | 2 | 3 | 57 | 7 | 6 | 1,9 | 0,4 | 4 |
| 66THR.02006038005SA | 2 | 3 | 80 | 13 | 6 | 1,9 | 0,2 | 4 |
| 66THR.02006038010SA | 2 | 3 | 80 | 13 | 6 | 1,9 | 0,4 | 4 |
| 66THR.03006045705SA | 3 | 4 | 57 | 10 | 6 | 2,8 | 0,3 | 4 |
| 66THR.03006045710SA | 3 | 4 | 57 | 10 | 6 | 2,8 | 0,6 | 4 |
| 66THR.03006048005SA | 3 | 4 | 80 | 19 | 6 | 2,8 | 0,3 | 4 |
| 66THR.03006048010SA | 3 | 4 | 80 | 19 | 6 | 2,8 | 0,6 | 4 |
| 66THR.04006055705SA | 4 | 5 | 57 | 13 | 6 | 3,7 | 0,4 | 4 |
| 66THR.04006055710SA | 4 | 5 | 57 | 13 | 6 | 3,7 | 0,8 | 4 |
| 66THR.04006058005SA | 4 | 5 | 80 | 25 | 6 | 3,7 | 0,4 | 4 |
| 66THR.04006058010SA | 4 | 5 | 80 | 25 | 6 | 3,7 | 0,8 | 4 |
| 66THR.05006065705SA | 5 | 6 | 57 | 16 | 6 | 4,6 | 0,5 | 4 |
| 66THR.05006075710SA | 5 | 6 | 57 | 16 | 6 | 4,6 | 1 | 4 |
| 66THR.05006068005SA | 5 | 6 | 80 | 31 | 6 | 4,6 | 0,5 | 4 |
| 66THR.05006078010SA | 5 | 6 | 80 | 31 | 6 | 4,6 | 1 | 4 |
| 66THR.06006075705SA | 6 | 7 | 57 | 19 | 6 | 5,5 | 0,5 | 6 |
| 66THR.06006075710SA | 6 | 7 | 57 | 19 | 6 | 5,5 | 1 | 6 |
| 66THR.06006078005SA | 6 | 7 | 80 | 37 | 6 | 5,5 | 0,5 | 6 |
| 66THR.06006078010SA | 6 | 7 | 80 | 37 | 6 | 5,5 | 1 | 6 |
| 66THR.08008096305SA | 8 | 9 | 63 | 25 | 8 | 7,4 | 0,5 | 6 |
| 66THR.08008096310SA | 8 | 9 | 63 | 25 | 8 | 7,4 | 1 | 6 |
| 66THR.080080910005SA | 8 | 9 | 100 | 49 | 8 | 7,4 | 0,5 | 6 |
| 66THR.080080910010SA | 8 | 9 | 100 | 49 | 8 | 7,4 | 1 | 6 |
| 66THR.10010117205SA | 10 | 11 | 72 | 31 | 10 | 9,2 | 0,5 | 6 |
| 66THR.10010117210SA | 10 | 11 | 72 | 31 | 10 | 9,2 | 1 | 6 |
| 66THR.100101110005SA | 10 | 11 | 100 | 61 | 10 | 9,2 | 0,5 | 6 |
| 66THR.100101110010SA | 10 | 11 | 100 | 61 | 10 | 9,2 | 1 | 6 |
| 66THR.12012138305SA | 12 | 13 | 83 | 37 | 12 | 11 | 0,5 | 6 |
| 66THR.12012138310SA | 12 | 13 | 83 | 37 | 12 | 11 | 1 | 6 |
| 66THR.120121312005SA | 12 | 13 | 120 | 73 | 12 | 11 | 0,5 | 6 |
| 66THR.120121312010SA | 12 | 13 | 120 | 73 | 12 | 11 | 1 | 6 |



Deburring Endmills



Tools features

- ▶ CNC deburring tool;
- ▶ Negative rake to strengthen cutting edge;
- ▶ Crossed cut to dissipate machining heat;
- ▶ Also available with TiAlN based coating.



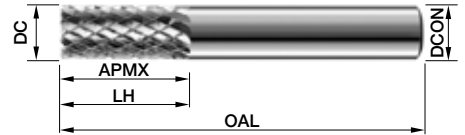
66M

DEBURRING ENDMILLS

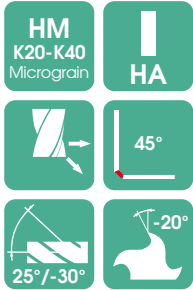
Double cut endmill

PVD TiAlN Cer-T

Also available without coating



66M



| Cod. | | DC | APMX | LH | OAL | DCON |
|----------|----------|-----|------|------|------|------|
| Coated | Uncoated | h10 | 0/+2 | 0/+2 | 0/+2 | h6 |
| 66M.030A | 66M.030 | 3 | 10 | 10 | 40 | 3 |
| 66M.040A | 66M.040 | 4 | 11 | 11 | 40 | 4 |
| 66M.050A | 66M.050 | 5 | 13 | 13 | 50 | 5 |
| 66M.060A | 66M.060 | 6 | 16 | 16 | 50 | 6 |
| 66M.080A | 66M.080 | 8 | 19 | 19 | 63 | 8 |
| 66M.100A | 66M.100 | 10 | 22 | 22 | 72 | 10 |
| 66M.120A | 66M.120 | 12 | 26 | 26 | 83 | 12 |
| 66M.160A | 66M.160 | 16 | 32 | 32 | 92 | 16 |
| 66M.180A | 66M.180 | 18 | 32 | 32 | 92 | 18 |
| 66M.200A | 66M.200 | 20 | 38 | 38 | 104 | 20 |

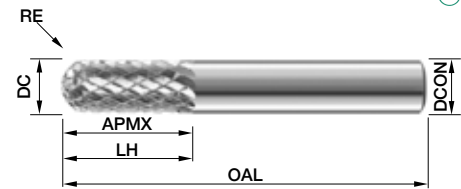


66MR

Steel Milling

DEBURRING ENDMILLS
Ball nose double cut endmill

PVD TiAlN Cer-T
Also available without coating



66MR



| Cod. | | DC | APMX | LH | OAL | DCON | RE |
|-----------|----------|-----|------|------|------|------|---------|
| Coated | Uncoated | h10 | 0/+2 | 0/+2 | 0/+2 | h6 | 0/-0,04 |
| 66MR.030A | 66MR.030 | 3 | 10 | 10 | 40 | 3 | 1,5 |
| 66MR.040A | 66MR.040 | 4 | 11 | 11 | 40 | 4 | 2 |
| 66MR.050A | 66MR.050 | 5 | 13 | 13 | 50 | 5 | 2,5 |
| 66MR.060A | 66MR.060 | 6 | 16 | 16 | 50 | 6 | 3 |
| 66MR.080A | 66MR.080 | 8 | 19 | 19 | 63 | 8 | 4 |
| 66MR.100A | 66MR.100 | 10 | 22 | 22 | 72 | 10 | 5 |
| 66MR.120A | 66MR.120 | 12 | 26 | 26 | 83 | 12 | 6 |
| 66MR.160A | 66MR.160 | 16 | 32 | 32 | 92 | 16 | 8 |
| 66MR.180A | 66MR.180 | 18 | 32 | 32 | 92 | 18 | 9 |
| 66MR.200A | 66MR.200 | 20 | 38 | 38 | 104 | 20 | 10 |





PATENT PENDING

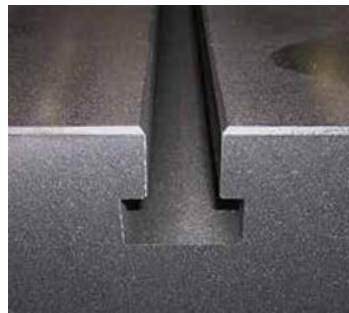
T-slot cutters

Tools features

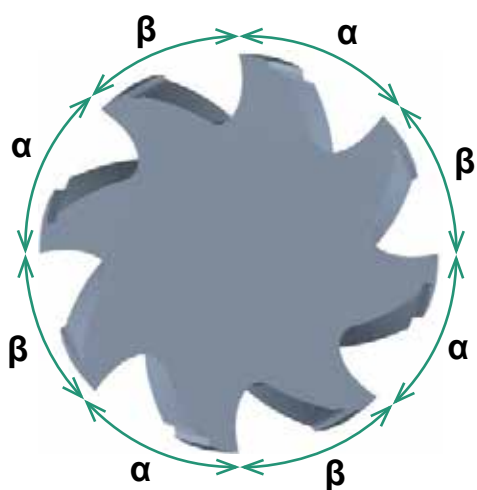
Endmill according to DIN 650 standard



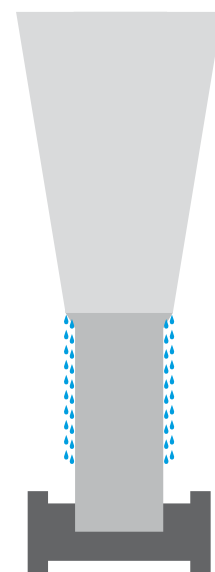
Multilayer AlTiN based coating



Solid carbide head brazing and steel shank allow a combination of performance and tool's economy



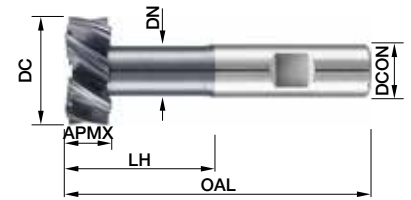
- ▶ Irregular division and uneven helix;
- ▶ Vibration free;
- ▶ Roughing and finishing with the same tool;
- ▶ Excellent chips evacuation thanks to flute geometry.



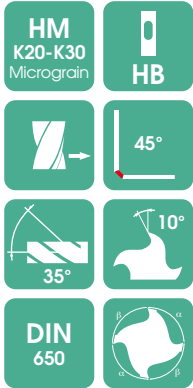
Collects or bushings with slots for improved intake of cooling lubricant are highly recommended

T-SLOT CUTTER Z6/Z10 right helix endmill

PVD TiAlCrN Cer-Y



78



| Cod. | DC | APMX | APMX TOL. | LH | OAL | DCON | DN | ZEFP |
|-----------------|------|------|---------------|------|------|------|---------|------|
| | e8 | | | 0/+2 | 0/+2 | h6 | 0/+0,05 | |
| 78.110100453,5Y | 11 | 4 | -0,105/-0,030 | 10,5 | 53,5 | 10 | 4 | 6 |
| 78.125100657Y | 12,5 | 6 | -0,105/-0,030 | 13 | 57 | 10 | 5 | 6 |
| 78.160100862Y | 16 | 8 | -0,130/-0,040 | 18 | 62 | 10 | 7 | 6 |
| 78.180120870Y | 18 | 8 | -0,130/-0,040 | 21 | 70 | 12 | 8 | 6 |
| 78.190120971Y | 19 | 9 | -0,130/-0,040 | 22 | 71 | 12 | 8 | 6 |
| 78.210120974Y | 21 | 9 | -0,130/-0,040 | 25 | 74 | 12 | 10 | 6 |
| 78.220121075Y | 22 | 10 | -0,130/-0,040 | 26 | 75 | 12 | 10 | 6 |
| 78.250161182Y | 25 | 11 | -0,160/-0,050 | 28 | 82 | 16 | 12 | 8 |
| 78.280161285Y | 28 | 12 | -0,160/-0,050 | 32 | 85 | 16 | 13 | 8 |
| 78.320161490Y | 32 | 14 | -0,160/-0,050 | 36 | 90 | 25 | 15 | 8 |
| 78.3602516103Y | 36 | 16 | -0,160/-0,050 | 42 | 103 | 25 | 17 | 8 |
| 78.4002518108Y | 40 | 18 | -0,160/-0,050 | 49 | 108 | 25 | 19 | 10 |





Milling - Working parameters

| Tool | ISO | Material | Streght [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 | ap | | | fz | | |
| | | | | | | | | | | | | 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 |
| 62(R)* 63(R)* | P | General construction steel | < 800 | 1,0037 | S137-2 | 200 | 160 | 1,0 | 0,5 | 0,012 | 0,009 | 0,007 | 0,020 | 0,015 | 0,011 | 0,023 | |
| | | Automatic steel | < 800 | 1,0719 | 9SMnPb28 | 210 | 170 | 1,0 | 0,5 | 0,012 | 0,009 | 0,007 | 0,020 | 0,015 | 0,011 | 0,023 | |
| | | Unalloyed case hardened steel | < 800 | 1,0401 | C15 | 180 | 140 | 1,0 | 0,5 | 0,010 | 0,008 | 0,006 | 0,014 | 0,011 | 0,008 | 0,023 | |
| | | Alloyed case hardened steel | < 1000 | 1,7331 | 16MnCr5 (EC80) | 160 | 130 | 1,0 | 0,5 | 0,009 | 0,007 | 0,005 | 0,010 | 0,008 | 0,005 | 0,023 | |
| | | Unalloyed annealed steel | < 850 | 1,0503 | C45 | 150 | 135 | 1,0 | 0,5 | 0,010 | 0,008 | 0,006 | 0,014 | 0,011 | 0,008 | 0,023 | |
| | | Unalloyed annealed steel | < 1000 | 1,0601 | C60 | 160 | 130 | 1,0 | 0,5 | 0,011 | 0,008 | 0,006 | 0,015 | 0,011 | 0,008 | 0,023 | |
| | | Alloyed annealed steel | < 800 | 1,5131 | 50MnS14 | 160 | 130 | 1,0 | 0,5 | 0,011 | 0,008 | 0,006 | 0,015 | 0,011 | 0,008 | 0,023 | |
| | | Alloyed annealed steel | < 1300 | 1,5755 | 31NiCr14 | 140 | 115 | 1,0 | 0,5 | 0,009 | 0,007 | 0,005 | 0,010 | 0,008 | 0,005 | 0,023 | |
| | | Cast steel | < 850 | 0,9650 | G-X260Cr27 | 140 | 110 | 1,0 | 0,5 | 0,011 | 0,008 | 0,006 | 0,015 | 0,011 | 0,008 | 0,023 | |
| | | Nitriding steel | < 1000 | 1,8504 | 34CrA16 | 160 | 130 | 1,0 | 0,5 | 0,011 | 0,008 | 0,006 | 0,015 | 0,011 | 0,008 | 0,023 | |
| | | Nitriding steel | < 1200 | 1,8515 | 31CrMo12 | 140 | 115 | 1,0 | 0,5 | 0,008 | 0,006 | 0,004 | 0,010 | 0,008 | 0,005 | 0,017 | |
| | | Bearing steel | < 1200 | 1,3505 | 100Cr6 (W3) | 160 | 130 | 1,0 | 0,5 | 0,011 | 0,008 | 0,006 | 0,015 | 0,011 | 0,008 | 0,023 | |
| | | Tool steel (cold working) | < 1300 | 1,2312 | 40CrMnMoS8 6 | 150 | 120 | 1,0 | 0,5 | 0,010 | 0,008 | 0,006 | 0,014 | 0,011 | 0,008 | 0,023 | |
| | Tool steel (hot working) | < 1300 | 1,2343 | X38CrMoV 51 | 130 | 100 | 1,0 | 0,5 | 0,010 | 0,008 | 0,006 | 0,014 | 0,011 | 0,008 | 0,023 | | |
| | M | Sulphured stainless steel | < 850 | 1,4305 | X8CrNiS18-9 | 110 | 90 | 1,0 | 0,5 | 0,007 | 0,005 | 0,004 | 0,010 | 0,008 | 0,005 | 0,015 | |
| | | Ferritic stainless steel | < 750 | 1,4510 | X3CrTi17 | 100 | 80 | 1,0 | 0,5 | 0,007 | 0,005 | 0,004 | 0,010 | 0,008 | 0,005 | 0,015 | |
| | | Martensitic stainless steel | < 900 | 1,4034 | X46Cr13 | 85 | 70 | 1,0 | 0,5 | 0,007 | 0,005 | 0,004 | 0,010 | 0,008 | 0,005 | 0,015 | |
| | | Ferritic martensitic stainless steel | < 1100 | 1,4313 | X3CrN113.4 | 100 | 80 | 1,0 | 0,5 | 0,007 | 0,005 | 0,004 | 0,010 | 0,008 | 0,005 | 0,015 | |
| | | Austenitic/ferritic martensitic stainless steel | < 850 | 1,4460 | X8CrNiMo27 5 | 100 | 80 | 1,0 | 0,5 | 0,007 | 0,005 | 0,004 | 0,010 | 0,008 | 0,005 | 0,015 | |
| | Austenitic stainless steel | < 750 | 1,4301 | X5CrNi18-10 | 100 | 80 | 1,0 | 0,5 | 0,007 | 0,005 | 0,004 | 0,010 | 0,008 | 0,005 | 0,015 | | |
| | K | Lamellar graphite cast iron | 100-350 | 0,6010 | GG10 | 170 | 135 | 1,0 | 0,5 | 0,014 | 0,011 | 0,008 | 0,020 | 0,015 | 0,011 | 0,029 | |
| | | Grey graphite cast iron | 300-1000 | 0,6030 | GG30 | 140 | 110 | 1,0 | 0,5 | 0,012 | 0,009 | 0,007 | 0,015 | 0,011 | 0,008 | 0,029 | |
| | | Spheroidal cast iron | 300-500 | 0,7040 | GGG40 | 160 | 130 | 1,0 | 0,5 | 0,011 | 0,008 | 0,006 | 0,015 | 0,011 | 0,008 | 0,023 | |
| | | Spheroidal cast iron | 550-800 | 0,7060 | GGG60 | 130 | 100 | 1,0 | 0,5 | 0,011 | 0,008 | 0,006 | 0,015 | 0,011 | 0,008 | 0,023 | |
| | | Tempered white cast iron | 350-450 | 0,8035 | GTW35 | 150 | 120 | 1,0 | 0,5 | 0,011 | 0,008 | 0,006 | 0,015 | 0,011 | 0,008 | 0,023 | |
| | | Tempered white cast iron | 500-650 | 0,8055 | GTW55 | 140 | 110 | 1,0 | 0,5 | 0,011 | 0,008 | 0,006 | 0,015 | 0,011 | 0,008 | 0,023 | |
| | | Tempered black cast iron | 350-450 | 0,8135 | GTS35 | 150 | 120 | 1,0 | 0,5 | 0,011 | 0,008 | 0,006 | 0,015 | 0,011 | 0,008 | 0,023 | |
| | Tempered black cast iron | 500-700 | 0,8155 | GTS55 | 135 | 110 | 1,0 | 0,5 | 0,011 | 0,008 | 0,006 | 0,015 | 0,011 | 0,008 | 0,023 | | |

* Ball nose end mills: calculate n[rpm] as per Tab.K pag. 46

Milling - Working parameters

| | | | | | | | | DC = 1 mm |
|--------|-----|--------------------------|----------------|---------------|--------------|------------|-------------|-------------------|
| | | | | | | | | ae max = 0,1 x DC |
| Tool | ISO | Material | Hardness [HRC] | N. | Designation | Vc [m/min] | ap max x DC | fz [mm] |
| 62RHR* | P | Unalloyed annealed steel | | 1,0503 | C45 | 120 | 0,1 | 0,002 |
| | | Annealed tool steel | 59-61 | 1.2080 (K100) | X210Cr12 | 70 | 0,1 | 0,002 |
| | | Annealed tool steel | 60-62 | 1.2379 (K110) | X155CrVMo121 | 70 | 0,1 | 0,002 |
| | | Anneal steel | 58-60 | 1.2842 | 90MnVCr8 | 70 | 0,1 | 0,003 |
| | | Annealed stainless steel | 52-54 | 12083 | X40Cr14 | 100 | 0,1 | 0,002 |

* Ball nose end mills: calculate n [rpm] as per Tab.K pag. 46

| | | | | | | | | DC = 2 mm |
|-------|-----|--------------------------|----------------|---------------|--------------|------------|-------------|-------------------|
| | | | | | | | | ae max = 0,1 x DC |
| Tool | ISO | Material | Hardness [HRC] | N. | Designation | Vc [m/min] | ap max x DC | fz [mm] |
| 66THR | P | Unalloyed annealed steel | | 1,0503 | C45 | 120 | 0,1 | 0,004 |
| | | Annealed tool steel | 59-61 | 1.2080 (K100) | X210Cr12 | 70 | 0,1 | 0,005 |
| | | Annealed tool steel | 60-62 | 1.2379 (K110) | X155CrVMo121 | 70 | 0,1 | 0,005 |
| | | Anneal steel | 58-60 | 1.2842 | 90MnVCr8 | 70 | 0,1 | 0,006 |
| | | Annealed stainless steel | 52-54 | 12083 | X40Cr14 | 100 | 0,1 | 0,004 |

| | | | | | | | | DC = 3 mm | | | DC = 4 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 |
| Tool | ISO | Material | Streght [MPa] | N. | Designation | Vc [m/min] | ap max x DC | fz [mm] | | | fz [mm] | | | |
| 66M(R)* | P | General construction steel | < 800 | 1,0037 | S137-2 | 200 | 1,0 | 0,014 | 0,011 | 0,008 | 0,016 | 0,013 | 0,009 | 0,025 |
| | | Automatic steel | < 800 | 1,0719 | 9SMnPb28 | 210 | 1,0 | 0,014 | 0,011 | 0,008 | 0,016 | 0,013 | 0,009 | 0,025 |
| | | Unalloyed case hardened steel | < 800 | 1,0401 | C15 | 180 | 1,0 | 0,010 | 0,008 | 0,005 | 0,016 | 0,013 | 0,009 | 0,025 |
| | | Alloyed case hardened steel | < 1000 | 1,7331 | 16MnCr5 (EC80) | 160 | 1,0 | 0,007 | 0,005 | 0,004 | 0,016 | 0,013 | 0,009 | 0,025 |
| | | Unalloyed annealed steel | < 850 | 1,0503 | C45 | 170 | 1,0 | 0,010 | 0,008 | 0,005 | 0,016 | 0,013 | 0,009 | 0,025 |
| | | Unalloyed annealed steel | < 1000 | 1,0601 | C60 | 160 | 1,0 | 0,010 | 0,008 | 0,006 | 0,016 | 0,013 | 0,009 | 0,025 |
| | | Alloyed annealed steel | < 800 | 1,5131 | 50MnS14 | 160 | 1,0 | 0,010 | 0,008 | 0,006 | 0,016 | 0,013 | 0,009 | 0,025 |
| | | Alloyed annealed steel | < 1300 | 1,5755 | 31NiCr14 | 140 | 1,0 | 0,007 | 0,005 | 0,004 | 0,016 | 0,013 | 0,009 | 0,025 |
| | | Cast steel | < 850 | 0,9650 | G-X260Cr27 | 140 | 1,0 | 0,010 | 0,008 | 0,006 | 0,016 | 0,013 | 0,009 | 0,025 |
| | | Nitriding steel | < 1000 | 1,8504 | 34CrA16 | 160 | 1,0 | 0,010 | 0,008 | 0,006 | 0,016 | 0,013 | 0,009 | 0,025 |
| | | Nitriding steel | < 1200 | 1,8515 | 31CrMo12 | 140 | 1,0 | 0,007 | 0,005 | 0,004 | 0,012 | 0,009 | 0,007 | 0,018 |
| | | Bearing steel | < 1200 | 1,3505 | 100Cr6 (W3) | 160 | 1,0 | 0,010 | 0,008 | 0,006 | 0,016 | 0,013 | 0,009 | 0,025 |
| | Tool steel (cold working) | < 1300 | 1,2312 | 40CrMnMoS8 6 | 150 | 1,0 | 0,010 | 0,008 | 0,005 | 0,016 | 0,013 | 0,009 | 0,025 | |
| | Tool steel (hot working) | < 1300 | 1,2343 | X38CrMoV 51 | 130 | 1,0 | 0,010 | 0,008 | 0,005 | 0,016 | 0,013 | 0,009 | 0,025 | |
| | M | Sulphured stainless steel | < 850 | 1,4305 | X8CrNiS18-9 | 110 | 1,0 | 0,007 | 0,005 | 0,004 | 0,010 | 0,008 | 0,006 | 0,015 |
| | | Ferritic stainless steel | < 750 | 1,4510 | X3CrTi17 | 100 | 1,0 | 0,007 | 0,005 | 0,004 | 0,010 | 0,008 | 0,006 | 0,015 |
| | | Martensitic stainless steel | < 900 | 1,4034 | X46Cr13 | 85 | 1,0 | 0,007 | 0,005 | 0,004 | 0,010 | 0,008 | 0,006 | 0,015 |
| | | Ferritic martensitic stainless steel | < 1100 | 1,4313 | X3CrNi113.4 | 100 | 1,0 | 0,007 | 0,005 | 0,004 | 0,010 | 0,008 | 0,006 | 0,015 |
| | | Austenitic/ferritic martensitic stainless steel | < 850 | 1,4460 | X8CrNiMo27 5 | 100 | 1,0 | 0,007 | 0,005 | 0,004 | 0,010 | 0,008 | 0,006 | 0,015 |
| | | Austenitic stainless steel | < 750 | 1,4301 | X5CrNi18-10 | 100 | 1,0 | 0,007 | 0,005 | 0,004 | 0,010 | 0,008 | 0,006 | 0,015 |
| | K | Lamellar graphite cast iron | 100-350 | 0,6010 | GG10 | 170 | 1,0 | 0,014 | 0,011 | 0,008 | 0,020 | 0,016 | 0,011 | 0,029 |
| | | Grey graphite cast iron | 300-1000 | 0,6030 | GG30 | 140 | 1,0 | 0,010 | 0,008 | 0,006 | 0,020 | 0,016 | 0,011 | 0,029 |
| | | Spheroidal cast iron | 300-500 | 0,7040 | GGG40 | 160 | 1,0 | 0,010 | 0,008 | 0,006 | 0,016 | 0,013 | 0,009 | 0,025 |
| | | Spheroidal cast iron | 550-800 | 0,7060 | GGG60 | 130 | 1,0 | 0,010 | 0,008 | 0,006 | 0,016 | 0,013 | 0,009 | 0,025 |
| Tempered white cast iron | | 350-450 | 0,8035 | GTW35 | 150 | 1,0 | 0,010 | 0,008 | 0,006 | 0,016 | 0,013 | 0,009 | 0,025 | |
| Tempered white cast iron | | 500-650 | 0,8055 | GTW55 | 140 | 1,0 | 0,010 | 0,008 | 0,006 | 0,016 | 0,013 | 0,009 | 0,025 | |
| Tempered black cast iron | | 350-450 | 0,8135 | GTS35 | 150 | 1,0 | 0,010 | 0,008 | 0,006 | 0,016 | 0,013 | 0,009 | 0,025 | |
| Tempered black cast iron | | 500-700 | 0,8155 | GTS55 | 135 | 1,0 | 0,010 | 0,008 | 0,006 | 0,016 | 0,013 | 0,009 | 0,025 | |

* Ball nose end mills: calculate n [rpm] as per Tab.K pag. 46

Milling - Working parameters

| Tool | ISO | Material | Streght [MPa] | N. | Designation | Vc [m/min] | DC = 11 mm | DC = 12,5 mm | DC = 16 mm |
|------|---------------------------|---|---------------|--------------|----------------|------------|------------|--------------|------------|
| | | | | | | | fz [mm] | fz [mm] | fz [mm] |
| 78° | P | General construction steel | < 800 | 1,0037 | Sf37-2 | 80 | 0,015 | 0,018 | 0,021 |
| | | Automatic steel | < 800 | 1,0719 | 9SMnPb28 | 84 | 0,015 | 0,018 | 0,021 |
| | | Unalloyed case hardened steel | < 800 | 1,0401 | C15 | 72 | 0,015 | 0,018 | 0,021 |
| | | Alloyed case hardened steel | < 1000 | 1,7331 | 16MnCr5 (EC80) | 64 | 0,015 | 0,018 | 0,021 |
| | | Unalloyed annealed steel | < 850 | 1,0503 | C45 | 68 | 0,015 | 0,018 | 0,021 |
| | | Unalloyed annealed steel | < 1000 | 1,0601 | C60 | 64 | 0,015 | 0,018 | 0,021 |
| | | Alloyed annealed steel | < 800 | 1,5131 | 50MnS14 | 64 | 0,015 | 0,018 | 0,021 |
| | | Alloyed annealed steel | < 1300 | 1,5755 | 31NiCr14 | 56 | 0,015 | 0,018 | 0,021 |
| | | Cast steel | < 850 | 0,9650 | G-X260Cr27 | 56 | 0,015 | 0,018 | 0,021 |
| | | Nitriding steel | < 1000 | 1,8504 | 34CrA16 | 64 | 0,015 | 0,018 | 0,021 |
| | | Nitriding steel | < 1200 | 1,8515 | 31CrMo12 | 56 | 0,011 | 0,014 | 0,016 |
| | | Bearing steel | < 1200 | 1,3505 | 100Cr6 (W3) | 64 | 0,015 | 0,018 | 0,021 |
| | Tool steel (cold working) | < 1300 | 1,2312 | 40CrMnMoS8 6 | 60 | 0,015 | 0,018 | 0,021 | |
| | Tool steel (hot working) | < 1300 | 1,2343 | X38CrMoV 51 | 60 | 0,015 | 0,018 | 0,021 | |
| | M | Sulphured stainless steel | < 850 | 1,4305 | X8CrNiS18-9 | 44 | 0,010 | 0,012 | 0,014 |
| | | Ferritic stainless steel | < 750 | 1,451 | X3CrTi17 | 40 | 0,010 | 0,012 | 0,014 |
| | | Martensitic stainless steel | < 900 | 1,4034 | X46Cr13 | 34 | 0,015 | 0,018 | 0,021 |
| | | Ferritic martensitic stainless steel | < 1100 | 1,4313 | X3CrNi13.4 | 40 | 0,015 | 0,018 | 0,021 |
| | | Austenitic/ferritic martensitic stainless steel | < 850 | 1,446 | X8CrNiMo27 5 | 40 | 0,015 | 0,018 | 0,021 |
| | | Austenitic stainless steel | < 750 | 1,4301 | X5CrNi18-10 | 40 | 0,015 | 0,018 | 0,021 |
| | K | Lamellar graphite cast iron | 100-350 | 0,601 | GG10 | 68 | 0,028 | 0,034 | 0,040 |
| | | Grey graphite cast iron | 300-1000 | 0,603 | GG30 | 56 | 0,028 | 0,034 | 0,040 |
| | | Spheroidal cast iron | 300-500 | 0,704 | GGG40 | 64 | 0,012 | 0,014 | 0,017 |
| | | Spheroidal cast iron | 550-800 | 0,706 | GGG60 | 52 | 0,012 | 0,014 | 0,017 |
| | | Tempered white cast iron | 350-450 | 0,8035 | GTW35 | 60 | 0,015 | 0,018 | 0,021 |
| | | Tempered white cast iron | 500-650 | 0,8055 | GTW55 | 56 | 0,015 | 0,018 | 0,021 |
| | | Tempered black cast iron | 350-450 | 0,8135 | GTS35 | 60 | 0,015 | 0,018 | 0,021 |
| | | Tempered black cast iron | 500-700 | 0,8155 | GTS55 | 54 | 0,015 | 0,018 | 0,021 |

* Reduce fz by 50% while approaching the workpiece

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 = 18 mm | DC = 19 mm | DC = 21 mm | DC = 22 mm | DC = 25 mm | DC = 28 mm | DC = 32 mm | DC = 36 mm | DC = 40 mm |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| fz [mm] | fz [mm] | fz [mm] | fz [mm] | fz [mm] | fz [mm] | fz [mm] | fz [mm] | fz [mm] |
| 0,025 | 0,028 | 0,030 | 0,030 | 0,030 | 0,035 | 0,040 | 0,045 | 0,045 |
| 0,025 | 0,028 | 0,030 | 0,030 | 0,030 | 0,035 | 0,040 | 0,045 | 0,045 |
| 0,025 | 0,028 | 0,030 | 0,030 | 0,030 | 0,035 | 0,040 | 0,045 | 0,045 |
| 0,025 | 0,028 | 0,030 | 0,030 | 0,030 | 0,035 | 0,040 | 0,045 | 0,045 |
| 0,025 | 0,028 | 0,030 | 0,030 | 0,030 | 0,035 | 0,040 | 0,045 | 0,045 |
| 0,025 | 0,028 | 0,030 | 0,030 | 0,030 | 0,035 | 0,040 | 0,045 | 0,045 |
| 0,025 | 0,028 | 0,030 | 0,030 | 0,030 | 0,035 | 0,040 | 0,045 | 0,045 |
| 0,025 | 0,028 | 0,030 | 0,030 | 0,030 | 0,035 | 0,040 | 0,045 | 0,045 |
| 0,025 | 0,028 | 0,030 | 0,030 | 0,030 | 0,035 | 0,040 | 0,045 | 0,045 |
| 0,019 | 0,021 | 0,023 | 0,023 | 0,023 | 0,026 | 0,030 | 0,034 | 0,034 |
| 0,025 | 0,028 | 0,030 | 0,030 | 0,030 | 0,035 | 0,040 | 0,045 | 0,045 |
| 0,025 | 0,028 | 0,030 | 0,030 | 0,030 | 0,035 | 0,040 | 0,045 | 0,045 |
| 0,025 | 0,028 | 0,030 | 0,030 | 0,030 | 0,035 | 0,040 | 0,045 | 0,045 |
| 0,017 | 0,019 | 0,020 | 0,020 | 0,020 | 0,023 | 0,027 | 0,030 | 0,030 |
| 0,017 | 0,019 | 0,020 | 0,020 | 0,020 | 0,023 | 0,027 | 0,030 | 0,030 |
| 0,025 | 0,028 | 0,030 | 0,030 | 0,030 | 0,035 | 0,040 | 0,045 | 0,045 |
| 0,025 | 0,028 | 0,030 | 0,030 | 0,030 | 0,035 | 0,040 | 0,045 | 0,045 |
| 0,025 | 0,028 | 0,030 | 0,030 | 0,030 | 0,035 | 0,040 | 0,045 | 0,045 |
| 0,025 | 0,028 | 0,030 | 0,030 | 0,030 | 0,035 | 0,040 | 0,045 | 0,045 |
| 0,047 | 0,053 | 0,056 | 0,056 | 0,056 | 0,066 | 0,075 | 0,085 | 0,085 |
| 0,047 | 0,053 | 0,056 | 0,056 | 0,056 | 0,066 | 0,075 | 0,085 | 0,085 |
| 0,020 | 0,022 | 0,024 | 0,024 | 0,024 | 0,028 | 0,032 | 0,036 | 0,036 |
| 0,020 | 0,022 | 0,024 | 0,024 | 0,024 | 0,028 | 0,032 | 0,036 | 0,036 |
| 0,025 | 0,028 | 0,030 | 0,030 | 0,030 | 0,035 | 0,040 | 0,045 | 0,045 |
| 0,025 | 0,028 | 0,030 | 0,030 | 0,030 | 0,035 | 0,040 | 0,045 | 0,045 |
| 0,025 | 0,028 | 0,030 | 0,030 | 0,030 | 0,035 | 0,040 | 0,045 | 0,045 |
| 0,025 | 0,028 | 0,030 | 0,030 | 0,030 | 0,035 | 0,040 | 0,045 | 0,045 |

Steel Milling



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