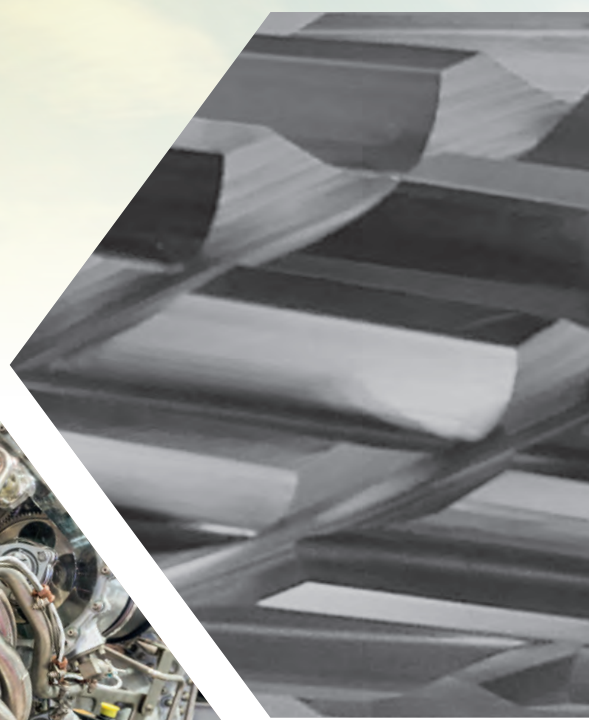
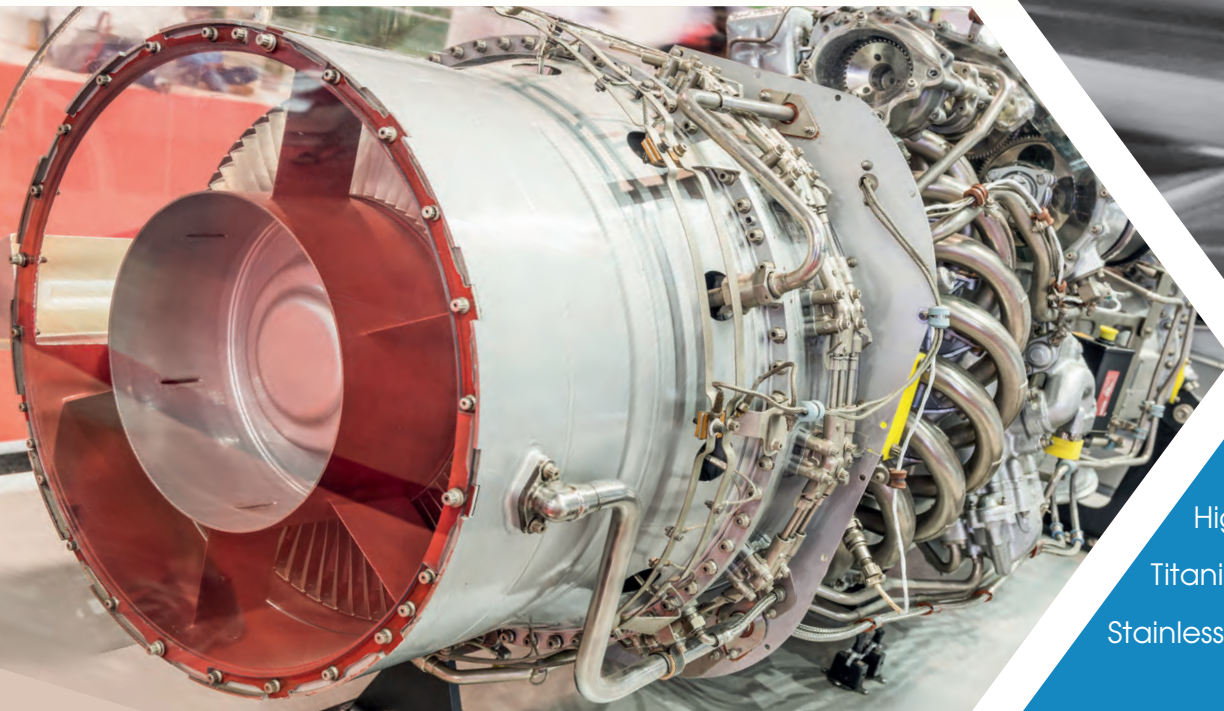


Cerini[®]
CUTTING TOOLS MANUFACTURING



AEROSPACE



Composite Material
High temperature alloys
Titanium alloys
Stainless steel

Complete product range for aerospace industry



MADE IN ITALY



We've been shaping the future for over 45 years

Since 1971 CERIN S.p.A. has supplied the industry with **innovative solid carbide precision cutting tools**.

The engineers and employees have worked to push the limit of innovation allowing us to become one of the world leader in the design and manufacture of solid carbide precision cutting tools thanks to a high technological profile and the ability to offer standard and tailor-made solutions to satisfy the most sophisticated requests of the market. The standard range is one of the widest and most complete.

Our tools are suitable to work any kind of material even newly developed ones.

We are up to the challenge and ready to develop new products and processes to find you a terrific solution

The product range is focused on:

Multiple composite/metal stack panels (CFRP/titanium and CFRP/aluminum) drilling with diamond coated carbide tools;

CFRP and GFRP milling with diamond coated carbide end mills;

Honeycomb panels milling and cut with multi-flute tools;

Nickel-based alloy machining with roughing and finishing cylindrical tools, with and without internal cooling;

HSC end mills for aluminum high material removal;

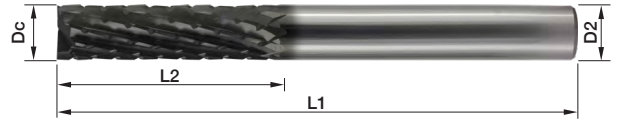
High performance cylindrical end mills with cutting edge preparation for low and high alloy steel.



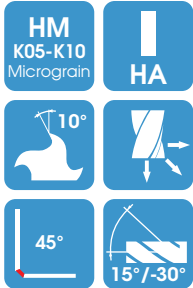
COMPANY WITH
QUALITY SYSTEM
CERTIFIED BY DNV
ISO 9001

ADVANCED CFRP MILLING

Right helix

High thickness CVD Diamond
Cer-DM

68DX



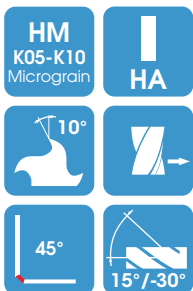
| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|-------------------|----|---------|----|-----|----|
| 68DX.040061660DM | 4 | e9 | 16 | 60 | 6 |
| 68DX.060062060DM | 6 | e9 | 20 | 60 | 6 |
| 68DX.060063575DM | 6 | e9 | 35 | 75 | 6 |
| 68DX.080083275DM | 8 | e9 | 32 | 75 | 8 |
| 68DX.0800840100DM | 8 | e9 | 40 | 100 | 8 |
| 68DX.100103272DM | 10 | e9 | 32 | 72 | 10 |
| 68DX.1001050100DM | 10 | e9 | 50 | 100 | 10 |
| 68DX.120123283DM | 12 | e9 | 32 | 83 | 12 |
| 68DX.1201260120DM | 12 | e9 | 60 | 120 | 12 |

ADVANCED CFRP MILLING

Left helix

High thickness CVD Diamond
Cer-DM

68SX

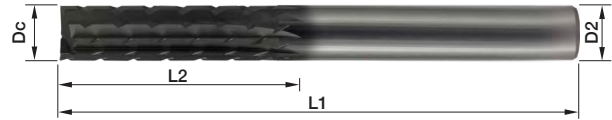


| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|-------------------|----|---------|----|-----|----|
| 68SX.040061680DM | 4 | e9 | 16 | 80 | 6 |
| 68SX.060062080DM | 6 | e9 | 20 | 80 | 6 |
| 68SX.0600635100DM | 6 | e9 | 35 | 100 | 6 |
| 68SX.0800832100DM | 8 | e9 | 32 | 100 | 8 |
| 68SX.0800840120DM | 8 | e9 | 40 | 120 | 8 |
| 68SX.1001032100DM | 10 | e9 | 32 | 100 | 10 |
| 68SX.1001050120DM | 10 | e9 | 50 | 120 | 10 |
| 68SX.1201232100DM | 12 | e9 | 32 | 100 | 12 |
| 68SX.1201260150DM | 12 | e9 | 60 | 150 | 12 |

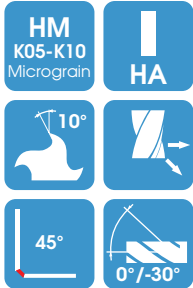
ADVANCED CFRP MILLING

Straight flute

High thickness CVD Diamond
Cer-DM



68TD

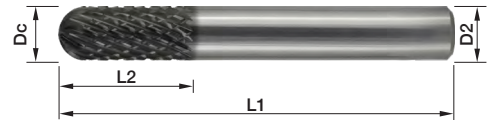


| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|-------------------|----|---------|----|-----|----|
| 68TD.040061680DM | 4 | e9 | 16 | 80 | 6 |
| 68TD.060062080DM | 6 | e9 | 20 | 80 | 6 |
| 68TD.0600635100DM | 6 | e9 | 35 | 100 | 6 |
| 68TD.0800832100DM | 8 | e9 | 32 | 100 | 8 |
| 68TD.0800840120DM | 8 | e9 | 40 | 120 | 8 |
| 68TD.1001032100DM | 10 | e9 | 32 | 100 | 10 |
| 68TD.1001050120DM | 10 | e9 | 50 | 120 | 10 |
| 68TD.1201232100DM | 12 | e9 | 32 | 100 | 12 |
| 68TD.1201260150DM | 12 | e9 | 60 | 150 | 12 |

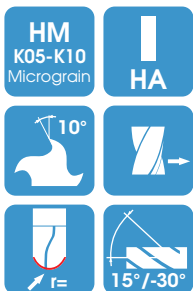
ADVANCED CFRP MILLING

Ball nose right helix

High thickness CVD Diamond
Cer-DM



68RDX



| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|-------------------|----|------------|----|----|----|
| 68RDX.040061960DM | 4 | +0 / -0,02 | 19 | 60 | 6 |
| 68RDX.060062360DM | 6 | +0 / -0,02 | 23 | 60 | 6 |
| 68RDX.080083675DM | 8 | +0 / -0,02 | 36 | 75 | 8 |
| 68RDX.100103772DM | 10 | +0 / -0,02 | 37 | 72 | 10 |
| 68RDX.120123883DM | 12 | +0 / -0,02 | 38 | 83 | 12 |



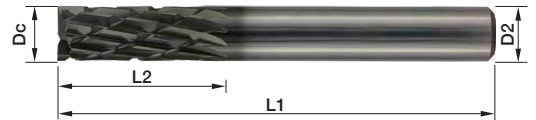


STANDARD CFRP MILLING

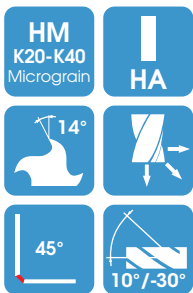
Right helix

CVD Diamond Cer-D

Also available without diamond coating



68SU

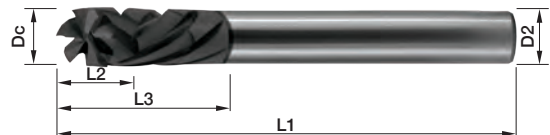


| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|------------------|----|---------|----|-----|----|
| 68SU.050061660D | 5 | e9 | 16 | 60 | 6 |
| 68SU.050062875D | 5 | e9 | 28 | 75 | 6 |
| 68SU.060062060D | 6 | e9 | 20 | 60 | 6 |
| 68SU.060063575D | 6 | e9 | 35 | 75 | 6 |
| 68SU.080082263D | 8 | e9 | 22 | 63 | 8 |
| 68SU.0800840100D | 8 | e9 | 40 | 100 | 8 |
| 68SU.100102572D | 10 | e9 | 25 | 72 | 10 |
| 68SU.1001050100D | 10 | e9 | 50 | 100 | 10 |
| 68SU.120123083D | 12 | e9 | 30 | 83 | 12 |
| 68SU.1201250100D | 12 | e9 | 50 | 100 | 12 |
| 68SU.160163592D | 16 | e9 | 35 | 92 | 16 |
| 68SU.1601660125D | 16 | e9 | 60 | 125 | 16 |

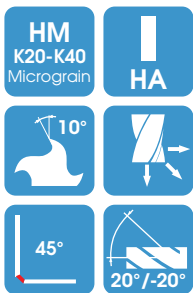


ADVANCED CFRP MILLING Up&Down Cutter

High thickness CVD Diamond
Cer-DM



104PH

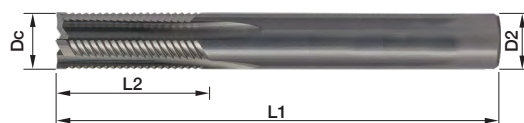


| Cod. | Dc | Dc tol. | L2 | L1 | L3 | D2 |
|--------------------|----|---------|----|-----|------|----|
| 104PH.060061575DM | 6 | h10 | 15 | 75 | 7,5 | 6 |
| 104PH.080082075DM | 8 | h10 | 20 | 75 | 10 | 8 |
| 104PH.1001025100DM | 10 | h10 | 25 | 100 | 12,5 | 10 |
| 104PH.1201230100DM | 12 | h10 | 30 | 100 | 15 | 12 |

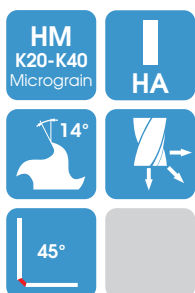
419TD



ADVANCED KEVLAR MILLING
4 Flutes cutter Up&Down chip breaker



419TD



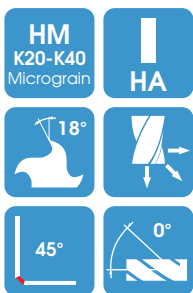
| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|------------------|----|---------|----|-----|----|
| 419TD.060062060 | 6 | h10 | 20 | 60 | 6 |
| 419TD.060063575 | 6 | h10 | 35 | 75 | 6 |
| 419TD.080083275 | 8 | h10 | 32 | 75 | 8 |
| 419TD.0800840100 | 8 | h10 | 40 | 100 | 8 |
| 419TD.100103272 | 10 | h10 | 32 | 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



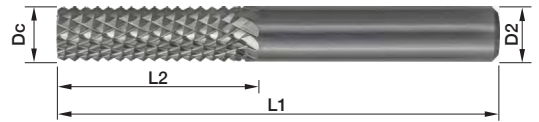
119P



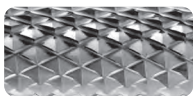
| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|-----------------|----|---------|----|-----|----|
| 119P.030031250 | 3 | h10 | 12 | 50 | 3 |
| 119P.030061875 | 3 | h10 | 18 | 75 | 6 |
| 119P.040041450 | 4 | h10 | 14 | 50 | 4 |
| 119P.040062075 | 4 | h10 | 20 | 75 | 6 |
| 119P.050051650 | 5 | h10 | 16 | 50 | 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

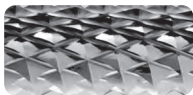
STANDARD GLASS FIBER MILLING
No front cut



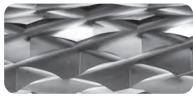
106 F, M, G



F



M



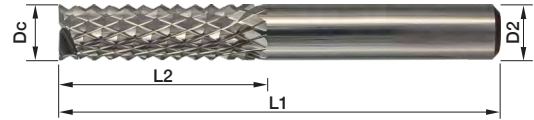
G

| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|-----------------|----|---------|----|-----|----|
| 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 |

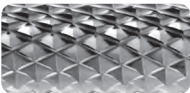


108 F, M, G

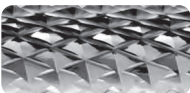
STANDARD GLASS FIBER MILLING
With front cut



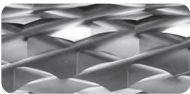
108 F, M, G



F

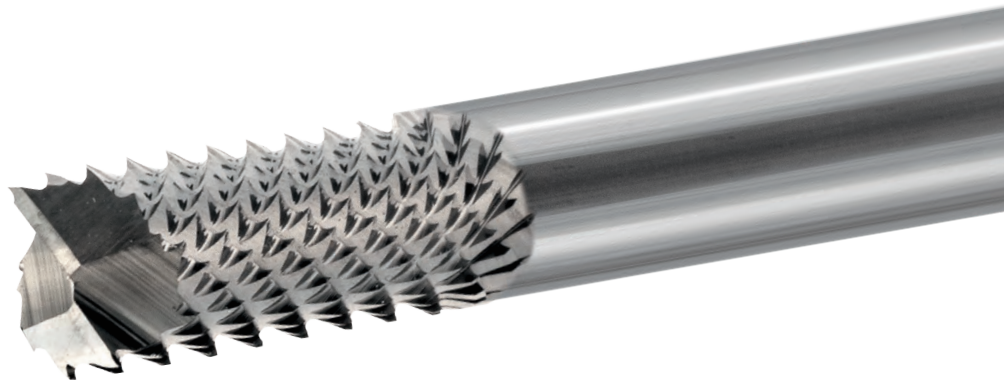


M



G

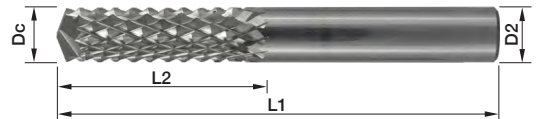
| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|-----------------|----|---------|----|-----|----|
| 108F.020060750 | 2 | e9 | 7 | 50 | 6 |
| 108F.030061250 | 3 | e9 | 12 | 50 | 6 |
| 108F.040062050 | 4 | e9 | 20 | 50 | 6 |
| 108F.060061850 | 6 | e9 | 18 | 50 | 6 |
| 108F.060063575 | 6 | e9 | 35 | 75 | 6 |
| 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 |



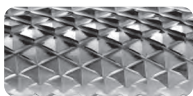
109 F, M, G

STANDARD GLASS FIBER MILLING

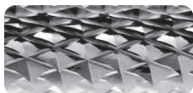
With drill point



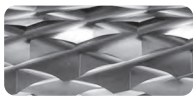
109 F, M, G



F



M



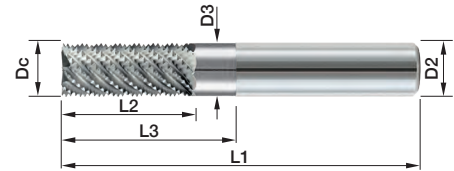
G

| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|-----------------|----|---------|----|-----|----|
| 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 |

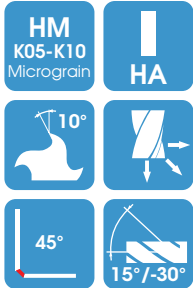


HONEYCOMB MATERIALS

Multiflute with chipbraker



77SU

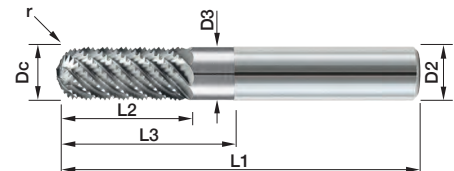


| Cod. | Dc | Dc tol. | L2 | L3 | L1 | D2 | D3 |
|------------------|-----|---------|----|----|-----|----|------|
| 77SU.060061650 | 6 | e9 | 16 | 16 | 50 | 6 | 6 |
| 77SU.060061650E | 6 | e9 | 16 | 16 | 50 | 6 | 6 |
| 77SU.080081963 | 8 | e9 | 19 | 26 | 63 | 8 | 7,9 |
| 77SU.080081963E | 8 | e9 | 19 | 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 |
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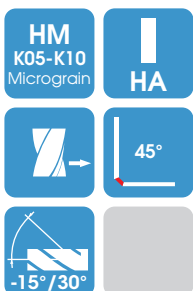
* Vertical machining not allowed

HONEYCOMB MATERIALS

Ballnose multiflute with chipbraker



77RSU

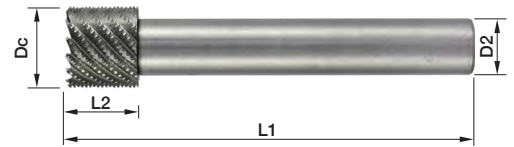


| Cod. | Dc | Dc tol. | L2 | L3 | L1 | D2 | D3 | r |
|------------------|----|---------|----|----|-----|----|------|---|
| 77RSU.100102272 | 10 | e9 | 22 | 32 | 72 | 10 | 9,8 | 5 |
| 77RSU.120122683 | 12 | e9 | 26 | 37 | 83 | 12 | 11,8 | 6 |
| 77RSU.1601217100 | 16 | e9 | 17 | 24 | 100 | 12 | 14 | 8 |

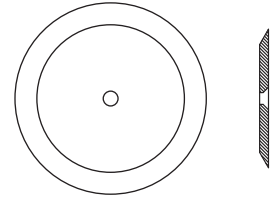
77SUP

HONEYCOMB CUT AND DEBURRING

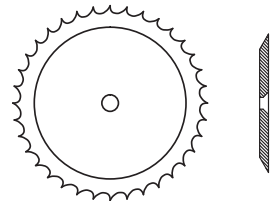
Multiflute with chipbraker



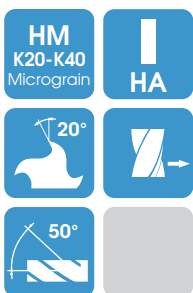
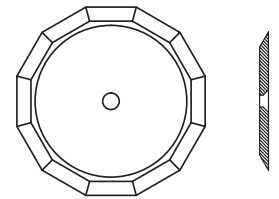
| | Item | Plate | Shank | Cutter |
|----------|-------------|--------------|--------------|------------|
| 77SUP.L. | .120122683 | 0GD130390°L | 0C12078023M4 | 77SUP.1226 |
| | .2001220100 | 0GD2103120°L | 0C12089717M4 | 77SUP.2020 |
| | .2401217100 | 0GD2503120°L | 0C12089714M4 | 77SUP.2417 |
| | .4401217100 | 0GD4703120°L | 0C12089714M4 | 77SUP.4417 |



| | Item | Plate | Shank | Cutter |
|----------|-------------|--------------|--------------|------------|
| 77SUP.D. | .120122683 | 0GD130390°D | 0C12078023M4 | 77SUP.1226 |
| | .2001220100 | 0GD2103120°D | 0C12089717M4 | 77SUP.2020 |
| | .2401217100 | 0GD2503120°D | 0C12089714M4 | 77SUP.2417 |
| | .4401217100 | 0GD4703120°D | 0C12089714M4 | 77SUP.4417 |

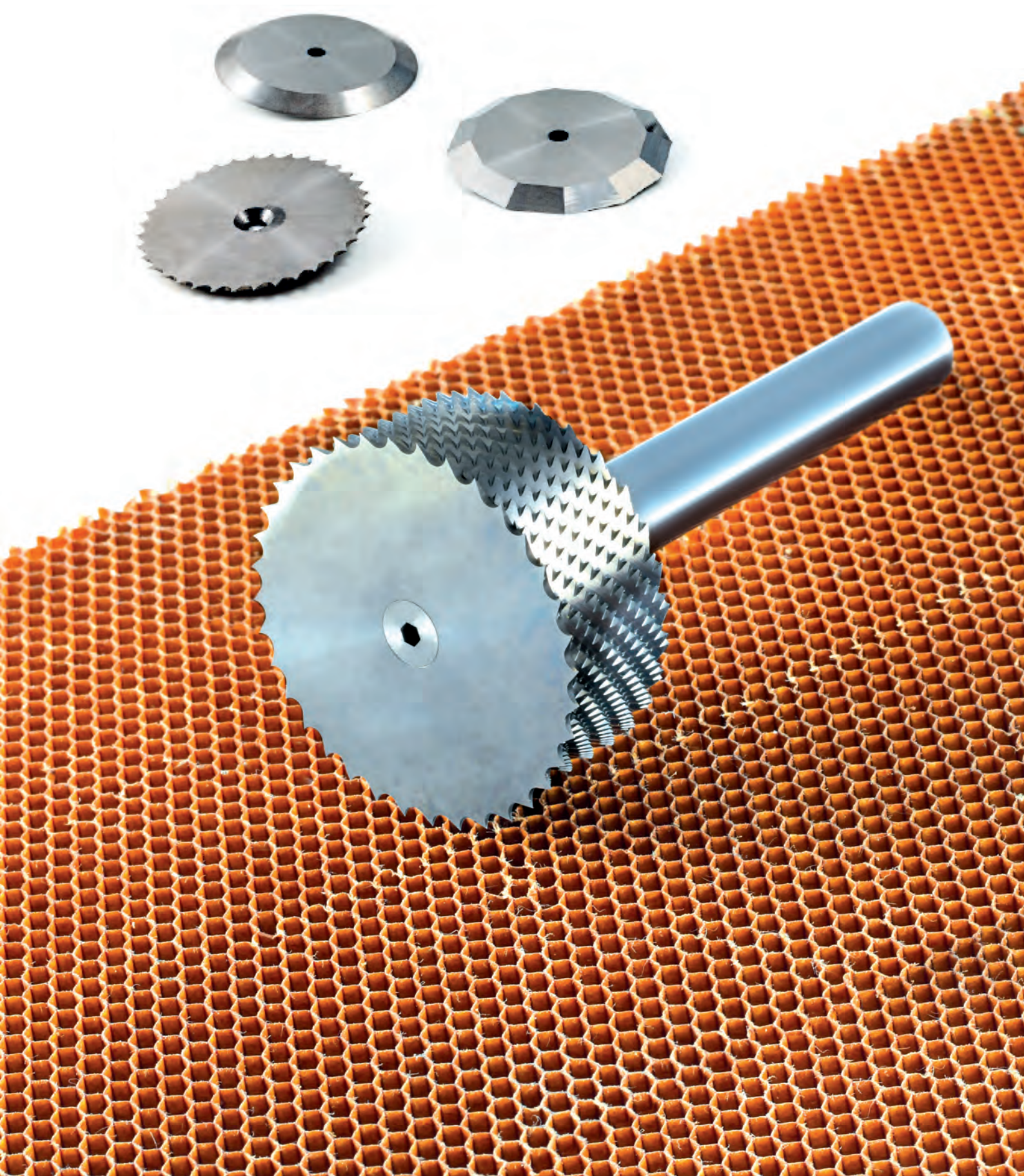


| | Item | Plate | Shank | Cutter |
|----------|-------------|--------------|--------------|------------|
| 77SUP.P. | .120122683 | 0GD130390°P | 0C12078023M4 | 77SUP.1226 |
| | .2001220100 | 0GD2103120°P | 0C12089717M4 | 77SUP.2020 |
| | .2401217100 | 0GD2503120°P | 0C12089714M4 | 77SUP.2417 |
| | .4401217100 | 0GD4703120°P | 0C12089714M4 | 77SUP.4417 |



| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|-------------|----|---------|----|-----|----|
| .120122683 | 12 | e9 | 26 | 83 | 26 |
| .2001220100 | 20 | e9 | 20 | 100 | 20 |
| .2401217100 | 24 | e9 | 17 | 100 | 17 |
| .4401217100 | 44 | e9 | 17 | 100 | 17 |



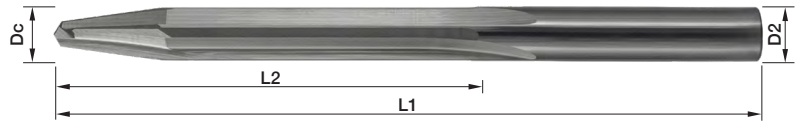


217

STANDARD CFRP DRILLING

Straight flute for manual drilling

Also available with DLC coating



217

HM
K20-K40
Micrograin

I
HA

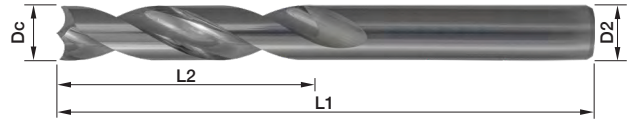


| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|----------|------|---------|----|-----|------|
| 217.020 | 2 | H7 | 50 | 100 | 2 |
| 217.0248 | 2,48 | H7 | 50 | 100 | 2,48 |
| 217.030 | 3 | H7 | 50 | 100 | 3 |
| 217.0317 | 3,17 | H7 | 50 | 100 | 3,17 |
| 217.040 | 4 | H7 | 50 | 100 | 4 |
| 217.0421 | 4,21 | H7 | 50 | 100 | 4,21 |
| 217.0482 | 4,82 | H7 | 50 | 100 | 4,82 |
| 217.0505 | 5,05 | H7 | 50 | 100 | 5,05 |
| 217.0553 | 5,53 | H7 | 50 | 100 | 5,53 |
| 217.060 | 6 | H7 | 50 | 100 | 6 |
| 217.0635 | 6,35 | H7 | 50 | 100 | 6,35 |
| 217.660 | 6,6 | H7 | 50 | 100 | 6,6 |
| 217.070 | 7 | H7 | 50 | 100 | 7 |
| 217.0792 | 7,92 | H7 | 50 | 100 | 7,92 |
| 217.080 | 8 | H7 | 50 | 100 | 8 |
| 217.0863 | 8,63 | H7 | 50 | 100 | 8,63 |
| 217.090 | 9 | H7 | 50 | 100 | 9 |
| 217.100 | 10 | H7 | 50 | 100 | 10 |
| 217.120 | 12 | H7 | 50 | 100 | 12 |



STANDARD KEVLAR DRILLING

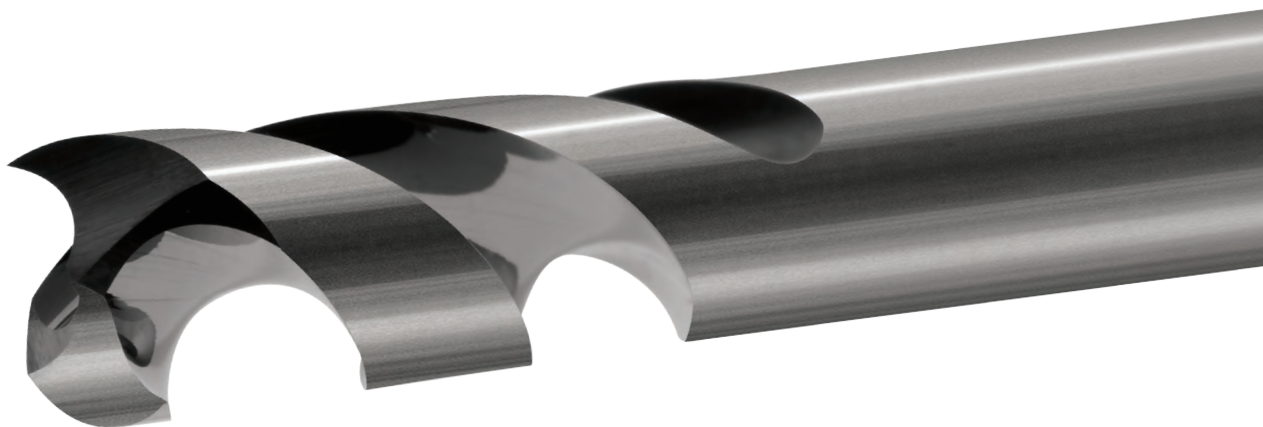
Twist drill for manual and CNC application



118

HM
K20-K40
MicrograinI
HA

| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|----------|------|---------|----|-----|------|
| 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 |



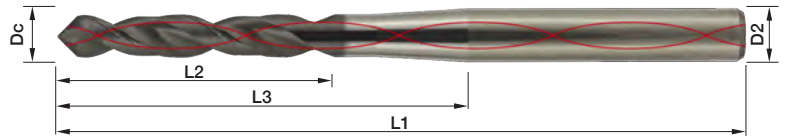
165C

ADVANCED CFRP DRILLING

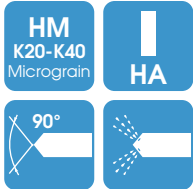
Twist drill for CNC application on CFRP

CVD Diamond Cer-DA

Internal cooling



165C



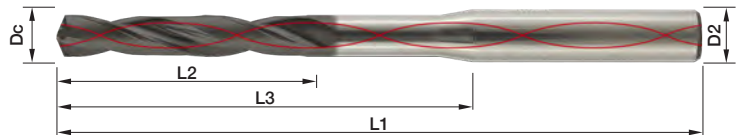
| Cod. | Dc | Dc tol. | L2 | L1 | L3 | D2 |
|--------------------|-------|---------|----|----|-----|----|
| 165C.0248062366DA | 2,48 | h6 | 23 | 28 | 66 | 6 |
| 165C.030062366DA | 3 | h6 | 23 | 28 | 66 | 6 |
| 165C.03175062366DA | 3,175 | h6 | 23 | 28 | 66 | 6 |
| 165C.040062974DA | 4 | h6 | 29 | 36 | 74 | 6 |
| 165C.04826063682DA | 4,826 | h6 | 36 | 44 | 82 | 6 |
| 165C.060063582DA | 6 | h6 | 35 | 44 | 82 | 6 |
| 165C.0635084391DA | 6,35 | h6 | 43 | 53 | 91 | 8 |
| 165C.0793084391DA | 7,93 | h6 | 43 | 53 | 91 | 8 |
| 165C.080084391DA | 8 | h6 | 43 | 53 | 91 | 8 |
| 165C.09521049103DA | 9,52 | h6 | 49 | 61 | 103 | 10 |
| 165C.1001049103DA | 10 | h6 | 49 | 61 | 103 | 10 |

ADVANCED CFRP DRILLING

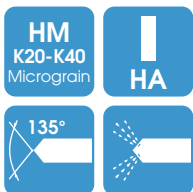
Twist drill for CNC application on CFRP + Ti or CFRP + Al

CVD Diamond Cer-DA

Internal cooling



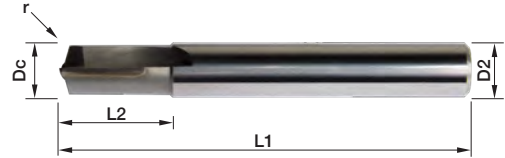
165ST



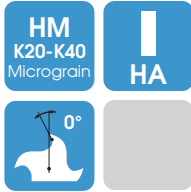
| Cod. | Dc | Dc tol. | L2 | L1 | L3 | D2 |
|---------------------|-------|---------|----|----|-----|----|
| 165ST.0248062366DA | 2,48 | h6 | 23 | 28 | 66 | 6 |
| 165ST.030062366DA | 3 | h6 | 23 | 28 | 66 | 6 |
| 165ST.03175062366DA | 3,175 | h6 | 23 | 28 | 66 | 6 |
| 165ST.040062974DA | 4 | h6 | 29 | 36 | 74 | 6 |
| 165ST.04826063682DA | 4,826 | h6 | 36 | 44 | 82 | 6 |
| 165ST.060063582DA | 6 | h6 | 35 | 44 | 82 | 6 |
| 165ST.0635084391DA | 6,35 | h6 | 43 | 53 | 91 | 8 |
| 165ST.0793084391DA | 7,93 | h6 | 43 | 53 | 91 | 8 |
| 165ST.080084391DA | 8 | h6 | 43 | 53 | 91 | 8 |
| 165ST.09521049103DA | 9,52 | h6 | 49 | 61 | 103 | 10 |
| 165ST.1001049103DA | 10 | h6 | 49 | 61 | 103 | 10 |

PKD MILLING

Straight flute PCD endmill with torus radius



PK62TDT



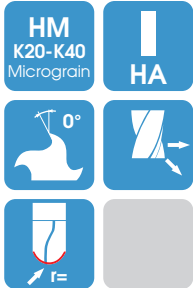
| Cod. | Dc | Dc fol. | L2 | L1 | D2 | r |
|--------------------|----|---------|----|-----|----|-----|
| PK62TDT.060060660 | 6 | h10 | 6 | 60 | 6 | 0,5 |
| PK62TDT.0600612100 | 6 | h10 | 12 | 100 | 6 | 0,5 |
| PK62TDT.080080863 | 8 | h10 | 8 | 63 | 8 | 0,5 |
| PK62TDT.0800816100 | 8 | h10 | 16 | 100 | 8 | 0,5 |
| PK62TDT.100101072 | 10 | h10 | 10 | 72 | 10 | 1 |
| PK62TDT.1001020100 | 10 | h10 | 20 | 100 | 10 | 1 |
| PK.62TDT120121283 | 12 | h10 | 12 | 83 | 12 | 1 |
| PK.62TDT1201224100 | 12 | h10 | 24 | 100 | 12 | 1 |



PKD MILLING
Straight flute PCD ball nose



PK62TDR

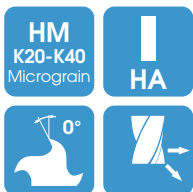


| Cod. | Dc | Dc tol. | L2 | L1 | D2 | r |
|--------------------|----|---------|----|-----|----|---|
| PK62TDR.0600606100 | 6 | h10 | 6 | 100 | 6 | 3 |
| PK62TDR.0800808100 | 8 | h10 | 8 | 100 | 8 | 4 |
| PK62TDR.1001010100 | 10 | h10 | 10 | 100 | 10 | 5 |
| PK62TDR.1201212100 | 12 | h10 | 12 | 100 | 12 | 6 |

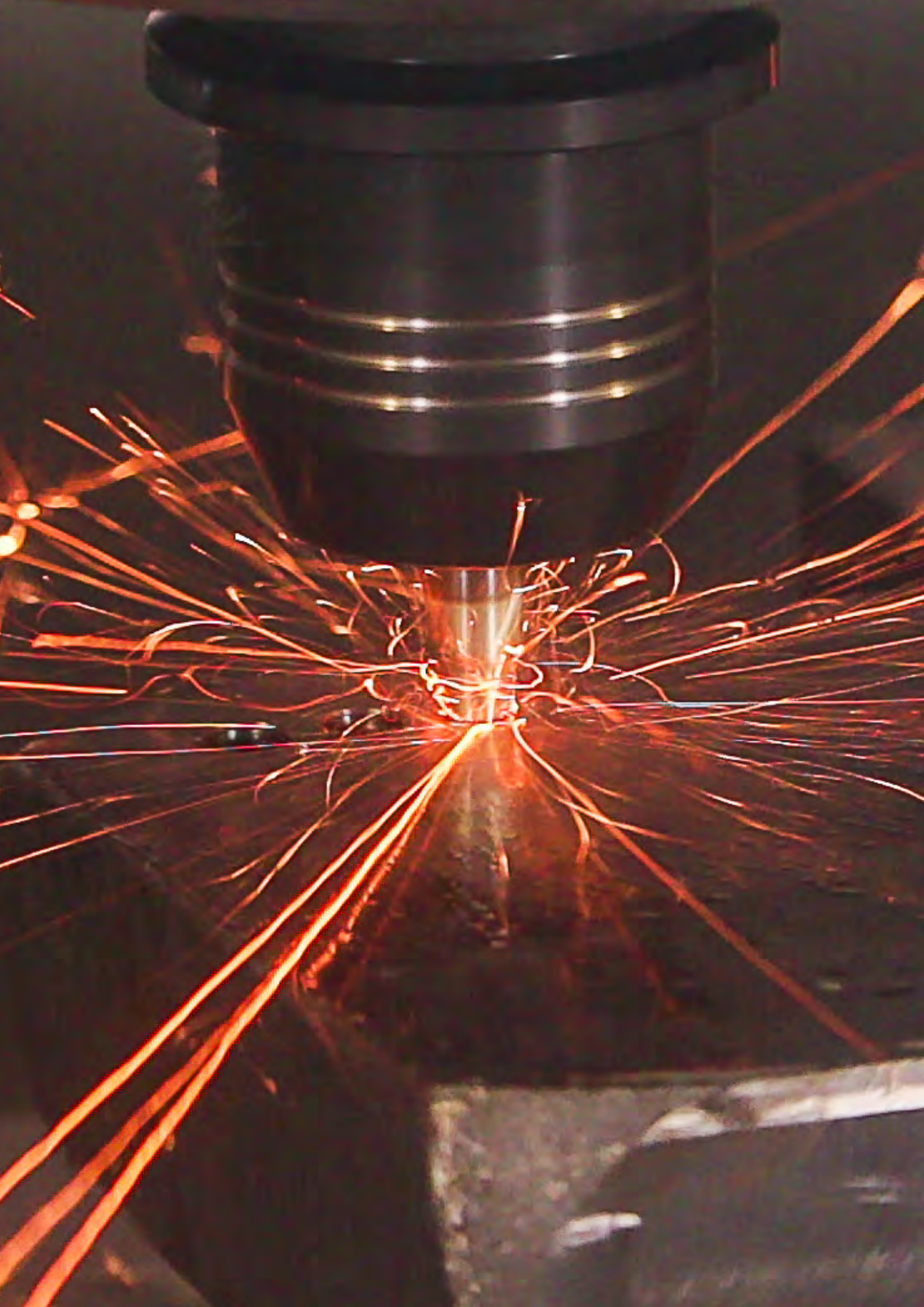
PKD MILLING
Straight multiflute PCD



PK66TD

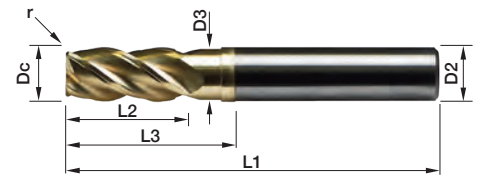


| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|------------------|----|---------|----|----|----|
| PK66TD.080081063 | 8 | h10 | 10 | 63 | 8 |
| PK66TD.100101272 | 10 | h10 | 12 | 72 | 10 |
| PK66TD.120121583 | 12 | h10 | 15 | 83 | 12 |

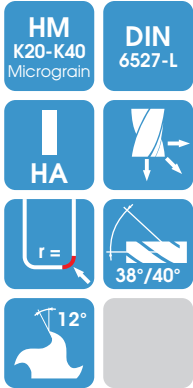


641

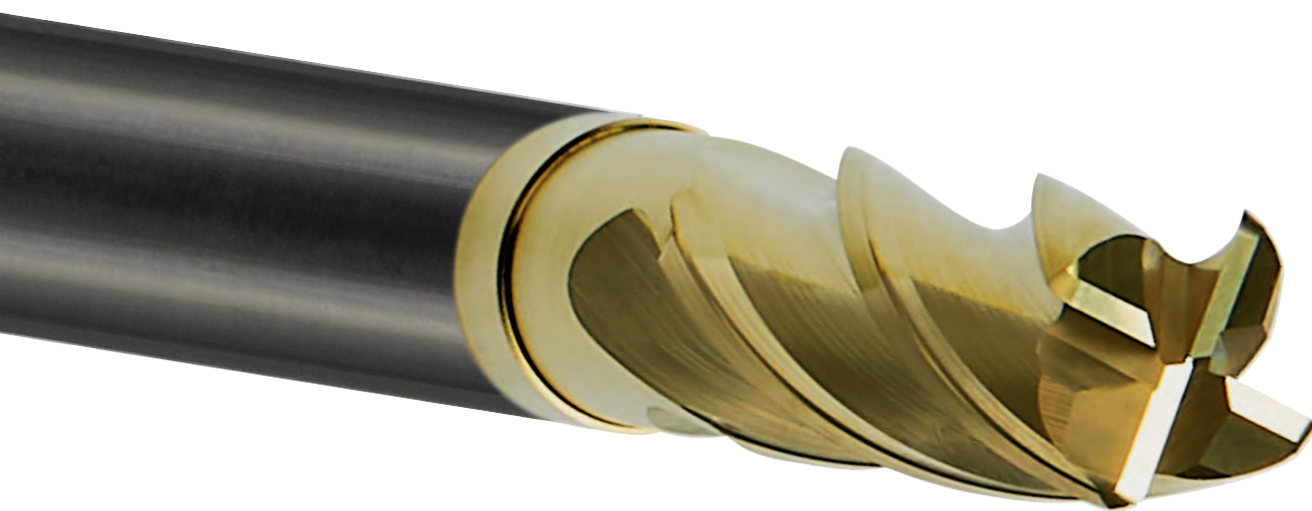
TITANIUM MILLING
4 flutes torus radius



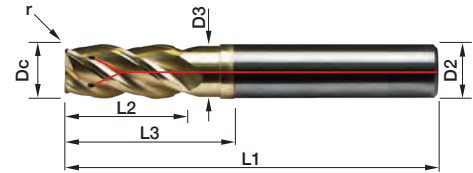
641



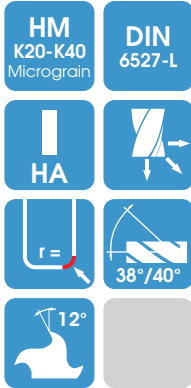
| Cod. | Dc | Dc tol. | L2 | L3 | L1 | D2 | r | D3 |
|---------------------|----|---------|----|----|-----|----|-----|------|
| 641.030060857R030N | 3 | h10 | 8 | 12 | 57 | 6 | 0,3 | 2,8 |
| 641.040061157R030N | 4 | h10 | 11 | 15 | 57 | 6 | 0,3 | 3,8 |
| 641.050061357R030N | 5 | h10 | 13 | 17 | 57 | 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 |



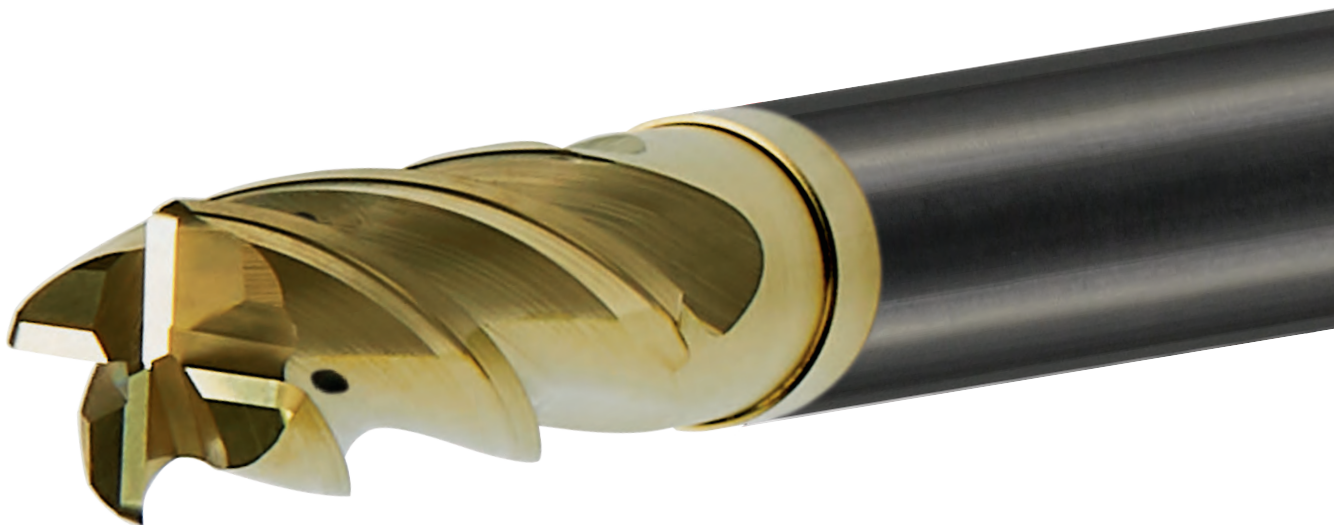
TITANIUM MILLING
4 flutes torus radius



641F

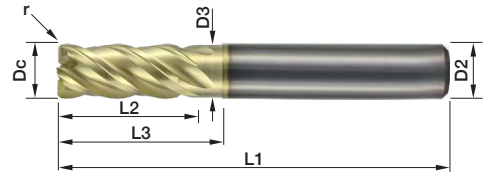


| Cod. | Dc | Dc fol. | L2 | L3 | L1 | D2 | r | D3 |
|----------------------|----|---------|----|----|-----|----|-----|------|
| 641F.060061357R050N | 6 | h10 | 13 | 21 | 57 | 6 | 0,5 | 5,8 |
| 641F.060061357R100N | 6 | h10 | 13 | 21 | 57 | 6 | 1 | 5,8 |
| 641F.060061357R150N | 6 | h10 | 13 | 21 | 57 | 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 |

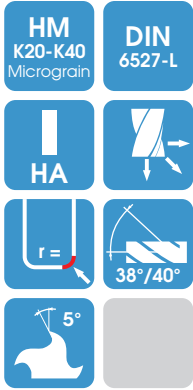


642

Ni & HIGH TEMPERATURE ALLOYS MILLING
4 flutes torus radius



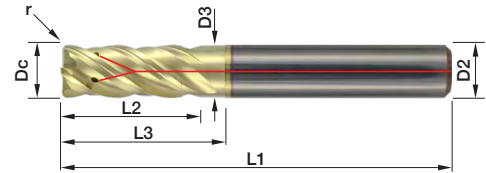
642



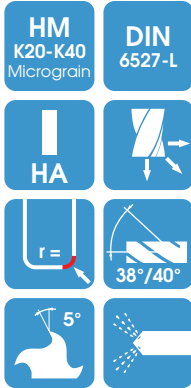
| Cod. | Dc | Dc tol. | L2 | L3 | L1 | D2 | r | D3 |
|---------------------|----|---------|----|----|-----|----|-----|------|
| 642.030060857R030N | 3 | h10 | 8 | 12 | 57 | 6 | 0,3 | 2,9 |
| 642.040061157R030N | 4 | h10 | 11 | 15 | 57 | 6 | 0,3 | 3,8 |
| 642.050061357R030N | 5 | h10 | 13 | 17 | 57 | 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 with internal coolant



642F



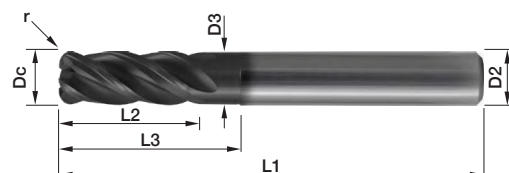
| Cod. | Dc | Dc tol. | L2 | L3 | L1 | D2 | r | D3 |
|----------------------|----|---------|----|----|-----|----|-----|------|
| 642F.060061357R050N | 6 | h10 | 13 | 19 | 57 | 6 | 0,5 | 5,7 |
| 642F.060061357R100N | 6 | h10 | 13 | 19 | 57 | 6 | 1 | 5,7 |
| 642F.060061357R150N | 6 | h10 | 13 | 19 | 57 | 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 |



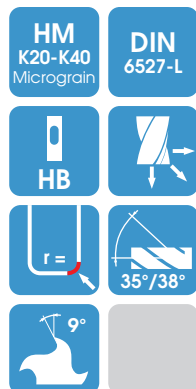
640WT

STAINLESS STEEL MILLING

4 flutes with corner radius and rounded cutting edges

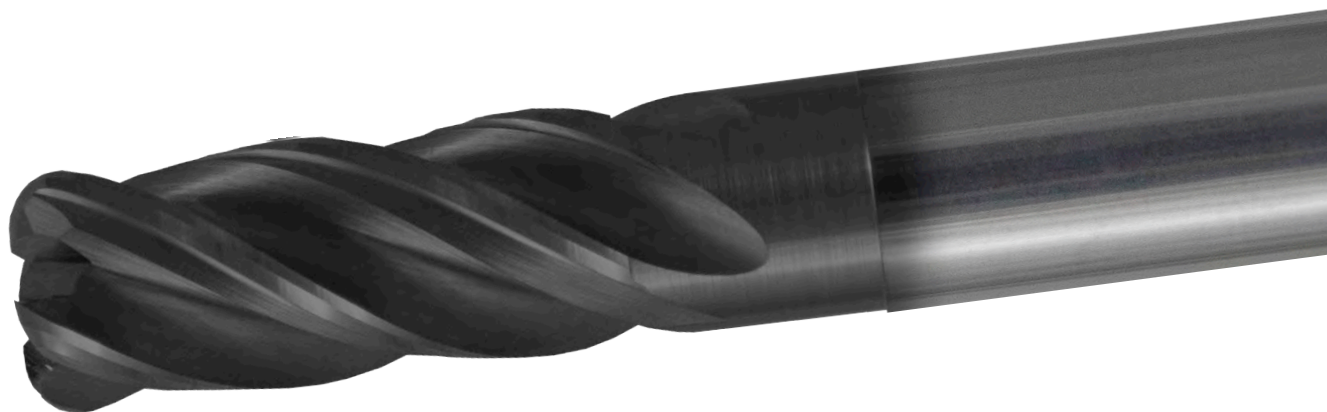


640WT



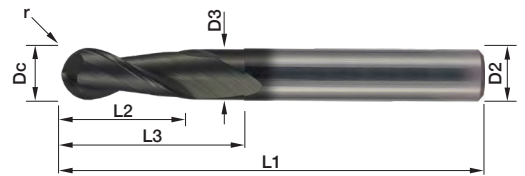
| Cod. | Dc | Dc tol. | L2 | L3 | L1 | D2 | r | D3 |
|--------------------|----|---------|----|----|----|----|-----|------|
| 640WT.03006085701Y | 3 | h10 | 8 | 12 | 57 | 6 | 0,1 | 2,8 |
| 640WT.03006085703Y | 3 | h10 | 8 | 12 | 57 | 6 | 0,3 | 2,8 |
| 640WT.03006085705Y | 3 | h10 | 8 | 12 | 57 | 6 | 0,5 | 2,8 |
| 640WT.03006085710Y | 3 | h10 | 8 | 12 | 57 | 6 | 1 | 2,8 |
| 640WT.04006115701Y | 4 | h10 | 11 | 15 | 57 | 6 | 0,1 | 3,8 |
| 640WT.04006115703Y | 4 | h10 | 11 | 15 | 57 | 6 | 0,3 | 3,8 |
| 640WT.04006115705Y | 4 | h10 | 11 | 15 | 57 | 6 | 0,5 | 3,8 |
| 640WT.04006115710Y | 4 | h10 | 11 | 15 | 57 | 6 | 1 | 3,8 |
| 640WT.05006135701Y | 5 | h10 | 13 | 17 | 57 | 6 | 0,1 | 4,8 |
| 640WT.05006135703Y | 5 | h10 | 13 | 17 | 57 | 6 | 0,3 | 4,8 |
| 640WT.05006135705Y | 5 | h10 | 13 | 17 | 57 | 6 | 0,5 | 4,8 |
| 640WT.05006135710Y | 5 | h10 | 13 | 17 | 57 | 6 | 1 | 4,8 |
| 640WT.06006135701Y | 6 | h10 | 13 | 21 | 57 | 6 | 0,1 | 5,8 |
| 640WT.06006135703Y | 6 | h10 | 13 | 21 | 57 | 6 | 0,3 | 5,8 |
| 640WT.06006135705Y | 6 | h10 | 13 | 21 | 57 | 6 | 0,5 | 5,8 |
| 640WT.06006135710Y | 6 | h10 | 13 | 21 | 57 | 6 | 1 | 5,8 |
| 640WT.06006135715Y | 6 | h10 | 13 | 21 | 57 | 6 | 1,5 | 5,8 |
| 640WT.06006135720Y | 6 | h10 | 13 | 21 | 57 | 6 | 2 | 5,8 |
| 640WT.08008196301Y | 8 | h10 | 19 | 27 | 63 | 8 | 0,1 | 7,7 |
| 640WT.08008196303Y | 8 | h10 | 19 | 27 | 63 | 8 | 0,3 | 7,7 |
| 640WT.08008196305Y | 8 | h10 | 19 | 27 | 63 | 8 | 0,5 | 7,7 |
| 640WT.08008196310Y | 8 | h10 | 19 | 27 | 63 | 8 | 1 | 7,7 |
| 640WT.08008196315Y | 8 | h10 | 19 | 27 | 63 | 8 | 1,5 | 7,7 |
| 640WT.08008196316Y | 8 | h10 | 19 | 27 | 63 | 8 | 1,6 | 7,7 |
| 640WT.08008196320Y | 8 | h10 | 19 | 27 | 63 | 8 | 2 | 7,7 |
| 640WT.10010227201Y | 10 | h10 | 22 | 32 | 72 | 10 | 0,1 | 9,7 |
| 640WT.10010227203Y | 10 | h10 | 22 | 32 | 72 | 10 | 0,3 | 9,7 |
| 640WT.10010227205Y | 10 | h10 | 22 | 32 | 72 | 10 | 0,5 | 9,7 |
| 640WT.10010227210Y | 10 | h10 | 22 | 32 | 72 | 10 | 1 | 9,7 |
| 640WT.10010227215Y | 10 | h10 | 22 | 32 | 72 | 10 | 1,5 | 9,7 |
| 640WT.10010227216Y | 10 | h10 | 22 | 32 | 72 | 10 | 1,6 | 9,7 |
| 640WT.10010227220Y | 10 | h10 | 22 | 32 | 72 | 10 | 2 | 9,7 |
| 640WT.12012268301Y | 12 | h10 | 26 | 38 | 83 | 12 | 0,1 | 11,6 |
| 640WT.12012268303Y | 12 | h10 | 26 | 38 | 83 | 12 | 0,3 | 11,6 |
| 640WT.12012268305Y | 12 | h10 | 26 | 38 | 83 | 12 | 0,5 | 11,6 |
| 640WT.12012268310Y | 12 | h10 | 26 | 38 | 83 | 12 | 1 | 11,6 |
| 640WT.12012268315Y | 12 | h10 | 26 | 38 | 83 | 12 | 1,5 | 11,6 |
| 640WT.12012268316Y | 12 | h10 | 26 | 38 | 83 | 12 | 1,6 | 11,6 |
| 640WT.12012268320Y | 12 | h10 | 26 | 38 | 83 | 12 | 2 | 11,6 |
| 640WT.12012268330Y | 12 | h10 | 26 | 38 | 83 | 12 | 3 | 11,6 |
| 640WT.16016329201Y | 16 | h10 | 32 | 44 | 92 | 16 | 0,1 | 15,5 |
| 640WT.16016329203Y | 16 | h10 | 32 | 44 | 92 | 16 | 0,3 | 15,5 |
| 640WT.16016329205Y | 16 | h10 | 32 | 44 | 92 | 16 | 0,5 | 15,5 |
| 640WT.16016329210Y | 16 | h10 | 32 | 44 | 92 | 16 | 1 | 15,5 |
| 640WT.16016329215Y | 16 | h10 | 32 | 44 | 92 | 16 | 1,5 | 15,5 |

| Cod. | Dc | Dc fol. | L2 | L3 | L1 | D2 | r | D3 |
|---------------------|----|---------|----|----|-----|----|-----|------|
| 640WT.16016329216Y | 16 | h10 | 32 | 44 | 92 | 16 | 1,6 | 15,5 |
| 640WT.16016329220Y | 16 | h10 | 32 | 44 | 92 | 16 | 2 | 15,5 |
| 640WT.16016329230Y | 16 | h10 | 32 | 44 | 92 | 16 | 3 | 15,5 |
| 640WT.16016329240Y | 16 | h10 | 32 | 44 | 92 | 16 | 4 | 15,5 |
| 640WT.200203810401Y | 20 | h10 | 38 | 54 | 104 | 20 | 0,1 | 19,5 |
| 640WT.200203810403Y | 20 | h10 | 38 | 54 | 104 | 20 | 0,3 | 19,5 |
| 640WT.200203810405Y | 20 | h10 | 38 | 54 | 104 | 20 | 0,5 | 19,5 |
| 640WT.200203810410Y | 20 | h10 | 38 | 54 | 104 | 20 | 1 | 19,5 |
| 640WT.200203810415Y | 20 | h10 | 38 | 54 | 104 | 20 | 1,5 | 19,5 |
| 640WT.200203810416Y | 20 | h10 | 38 | 54 | 104 | 20 | 1,6 | 19,5 |
| 640WT.200203810420Y | 20 | h10 | 38 | 54 | 104 | 20 | 2 | 19,5 |
| 640WT.200203810430Y | 20 | h10 | 38 | 54 | 104 | 20 | 3 | 19,5 |
| 640WT.200203810440Y | 20 | h10 | 38 | 54 | 104 | 20 | 4 | 19,5 |

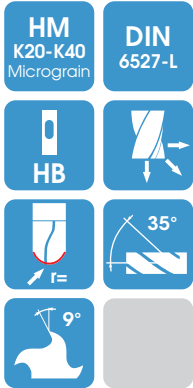


620WR

STAINLESS STEEL MILLING
2 flutes ball nose



620WR

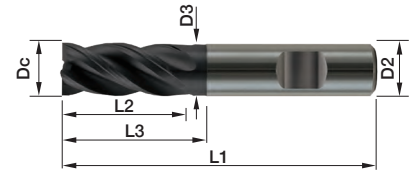


| Cod. | Dc | Dc tol. | L2 | L3 | L1 | D2 | r | D3 |
|-------------------|----|---------|----|----|-----|----|-----|------|
| 620WR.030060550Y | 3 | h10 | 5 | - | 50 | 6 | 1,5 | - |
| 620WR.030060857Y | 3 | h10 | 8 | 12 | 57 | 6 | 1,5 | 2,8 |
| 620WR.040060854Y | 4 | h10 | 8 | - | 54 | 6 | 2 | - |
| 620WR.040061157Y | 4 | h10 | 11 | 15 | 57 | 6 | 2 | 3,8 |
| 620WR.050060954Y | 5 | h10 | 9 | - | 54 | 6 | 2,5 | - |
| 620WR.050061357Y | 5 | h10 | 13 | 17 | 57 | 6 | 2,5 | 4,8 |
| 620WR.060061054Y | 6 | h10 | 10 | - | 54 | 6 | 3 | - |
| 620WR.060061357Y | 6 | h10 | 13 | 8 | 57 | 6 | 3 | 5,8 |
| 620WR.080081258Y | 8 | h10 | 12 | - | 58 | 8 | 4 | - |
| 620WR.080081963Y | 8 | h10 | 19 | 27 | 63 | 8 | 4 | 7,7 |
| 620WR.100101466Y | 10 | h10 | 14 | - | 66 | 10 | 5 | - |
| 620WR.100102272Y | 10 | h10 | 22 | 10 | 72 | 10 | 5 | 9,7 |
| 620WR.120121673Y | 12 | h10 | 16 | - | 73 | 12 | 6 | - |
| 620WR.120122683Y | 12 | h10 | 26 | 38 | 83 | 12 | 6 | 11,6 |
| 620WR.160162282Y | 16 | h10 | 22 | - | 82 | 16 | 8 | - |
| 620WR.160163292Y | 16 | h10 | 32 | 44 | 92 | 16 | 8 | 15,5 |
| 620WR.200202692Y | 20 | h10 | 26 | - | 92 | 20 | 10 | - |
| 620WR.2002038104Y | 20 | h10 | 38 | 54 | 104 | 20 | 10 | 19,5 |

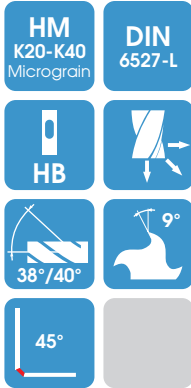


STAINLESS STEEL MILLING

4 flutes with point corner and sharp cutting edges

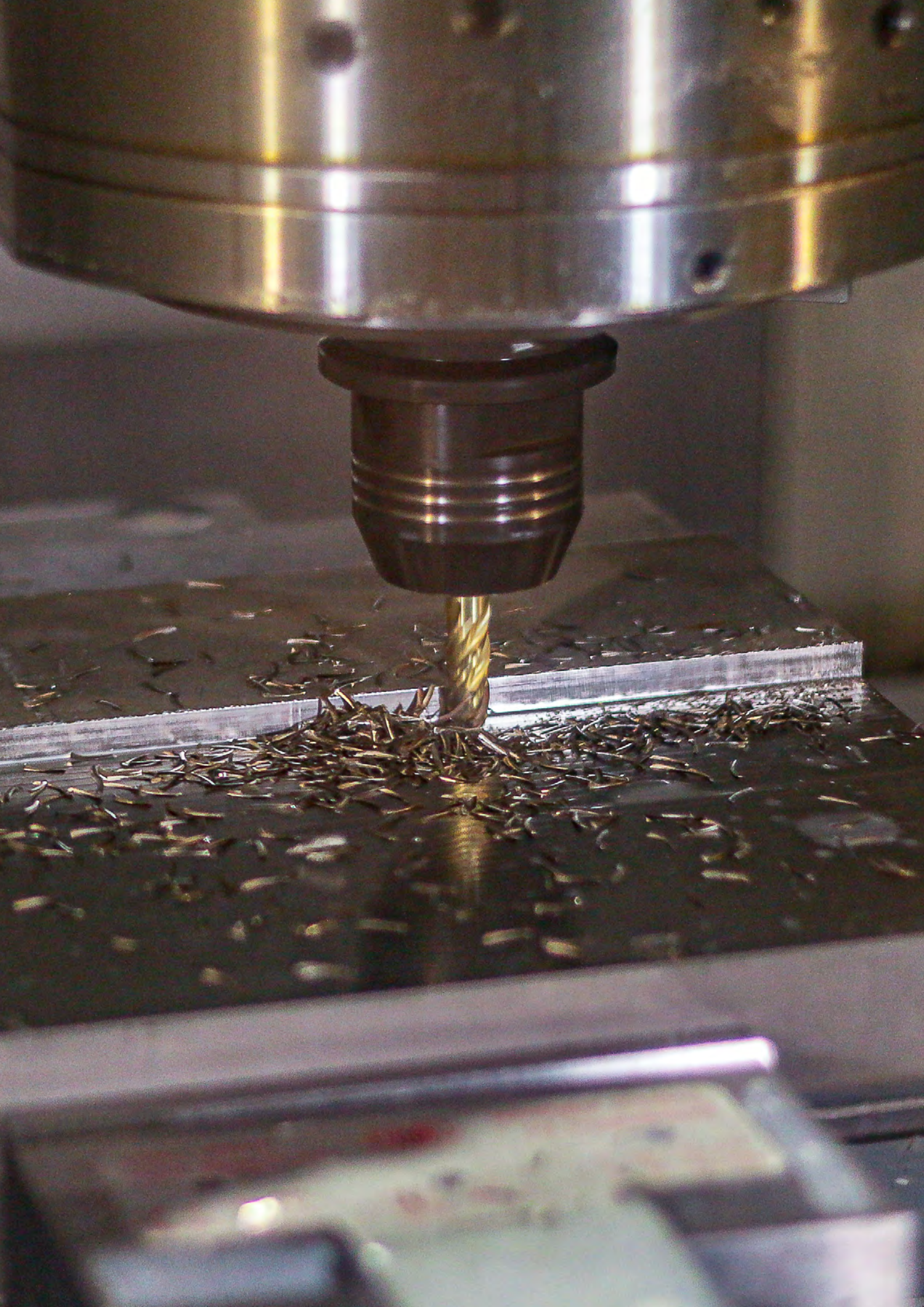


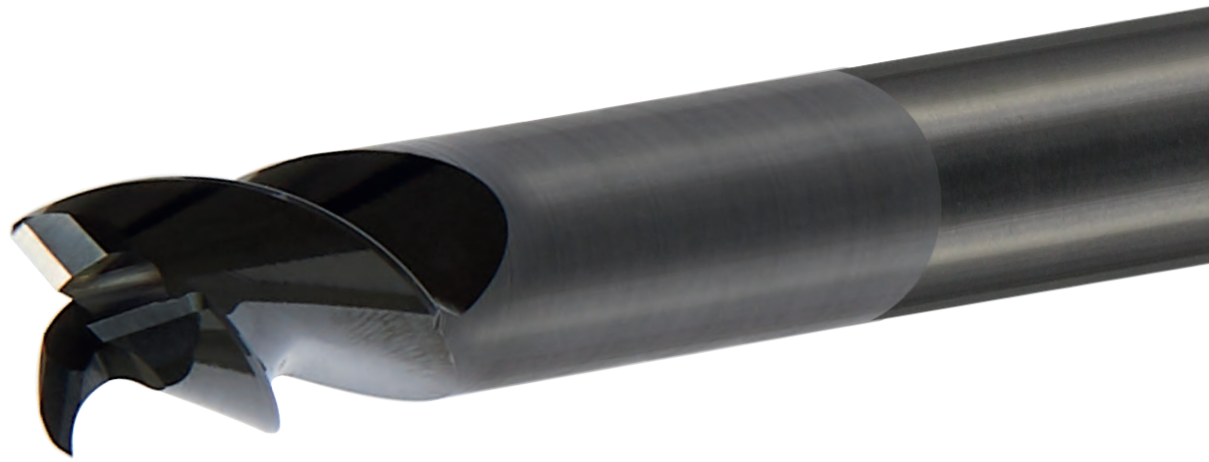
640WS



| Cod. | Dc | Dc tol. | L2 | L3 | L1 | D2 | D3 |
|-------------------|----|---------|----|-----|-----|----|------|
| 640WS.030060550Y | 3 | h10 | 5 | - | 50 | 6 | - |
| 640WS.030060857Y | 3 | h10 | 8 | 12 | 57 | 6 | 2,8 |
| 640WS.030060870Y | 3 | h10 | 8 | 15 | 70 | 6 | 2,8 |
| 640WS.040060854Y | 4 | h10 | 8 | - | 54 | 6 | - |
| 640WS.040061157Y | 4 | h10 | 11 | 15 | 57 | 6 | 3,8 |
| 640WS.040061170Y | 4 | h10 | 11 | 20 | 70 | 6 | 3,8 |
| 640WS.050060954Y | 5 | h10 | 9 | - | 54 | 6 | - |
| 640WS.050061357Y | 5 | h10 | 13 | 17 | 57 | 6 | 4,8 |
| 640WS.050061370Y | 5 | h10 | 13 | 25 | 70 | 6 | 4,8 |
| 640WS.060061054Y | 6 | h10 | 10 | - | 54 | 6 | - |
| 640WS.060061357Y | 6 | h10 | 13 | 8 | 57 | 6 | 5,8 |
| 640WS.060061370Y | 6 | h10 | 13 | 30 | 70 | 6 | 5,8 |
| 640WS.080081258Y | 8 | h10 | 12 | - | 58 | 8 | - |
| 640WS.080081963Y | 8 | h10 | 19 | 27 | 63 | 8 | 7,7 |
| 640WS.080081980Y | 8 | h10 | 19 | 40 | 80 | 8 | 7,7 |
| 640WS.100101466Y | 10 | h10 | 14 | - | 66 | 10 | - |
| 640WS.100102272Y | 10 | h10 | 22 | 32 | 72 | 10 | 9,7 |
| 640WS.100102294Y | 10 | h10 | 22 | 28 | 94 | 10 | 9,7 |
| 640WS.120121673Y | 12 | h10 | 16 | - | 73 | 12 | - |
| 640WS.1201226109Y | 12 | h10 | 26 | 64 | 109 | 12 | 11,6 |
| 640WS.120122683Y | 12 | h10 | 26 | 38 | 83 | 12 | 11,6 |
| 640WS.160162282Y | 16 | h10 | 22 | - | 82 | 16 | - |
| 640WS.1601632132Y | 16 | h10 | 32 | 80 | 132 | 16 | 15,5 |
| 640WS.160163292Y | 16 | h10 | 32 | 44 | 92 | 16 | 15,5 |
| 640WS.200202692Y | 20 | h10 | 26 | - | 92 | 20 | - |
| 640WS.2002038104Y | 20 | h10 | 38 | 54 | 104 | 20 | 19,5 |
| 640WS.2002038154Y | 20 | h10 | 38 | 100 | 154 | 20 | 19,5 |

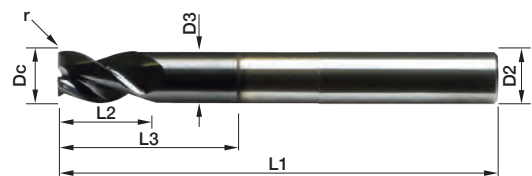




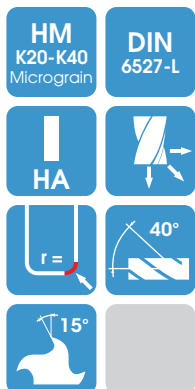


ALUMINUM HIGH REMOVAL MILLING

3 flutes torus radius



303

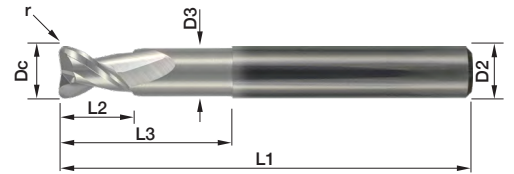


| Cod. | Dc | L2 | L3 | L1 | D2 | r | D3 |
|---------------------|----|----|-----|-----|----|-----|------|
| 303.040060657R02DL | 4 | 6 | 12 | 57 | 6 | 0,2 | 3,9 |
| 303.040060670R02DL | 4 | 6 | 20 | 70 | 6 | 0,2 | 3,9 |
| 303.060060957R03DL | 6 | 9 | 18 | 57 | 6 | 0,3 | 5,8 |
| 303.060060970R03DL | 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 |

102TC/TCL



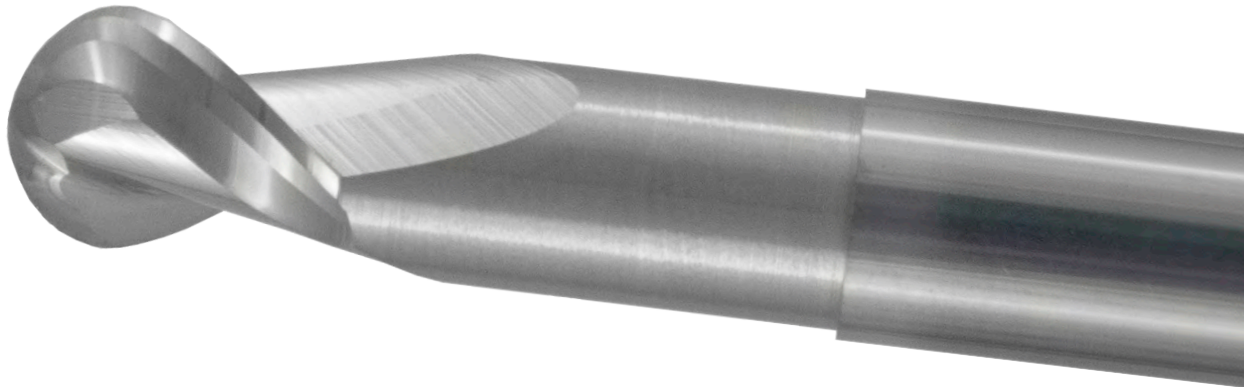
ALUMINUM FINISHING
2 flutes torus radius



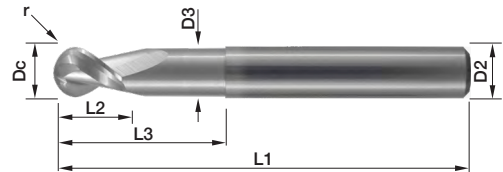
102TC/TCL



| Cod. | Dc | Dc tol. | L2 | L3 | L1 | D2 | r | D3 |
|-----------------|----|---------|----|-----|-----|----|-----|-----|
| 102TC.020-40°G | 2 | h10 | 4 | 6 | 57 | 6 | 0,5 | 1,8 |
| 102TC.030-40°G | 3 | h10 | 5 | 9 | 57 | 6 | 0,5 | 2,8 |
| 102TC.040-40°G | 4 | h10 | 6 | 12 | 57 | 6 | 0,5 | 3,7 |
| 102TC.050-40°G | 5 | h10 | 7 | 15 | 57 | 6 | 0,5 | 4,6 |
| 102TC.060-40°G | 6 | h10 | 8 | 20 | 57 | 6 | 1 | 5,5 |
| 102TC.080-40°G | 8 | h10 | 10 | 26 | 63 | 8 | 1 | 7,4 |
| 102TC.100-40°G | 10 | h10 | 12 | 31 | 72 | 10 | 1,5 | 9,2 |
| 102TC.120-40°G | 12 | h10 | 14 | 37 | 83 | 12 | 1,5 | 11 |
| 102TC.140-40°G | 14 | h10 | 16 | 41 | 83 | 14 | 2 | 13 |
| 102TC.160-40°G | 16 | h10 | 18 | 43 | 92 | 16 | 2 | 15 |
| 102TC.200-40°G | 20 | h10 | 22 | 53 | 104 | 20 | 2,5 | 19 |
| 102TCL.030-40°G | 3 | h10 | 6 | 50 | 100 | 6 | 0,5 | 2,8 |
| 102TCL.040-40°G | 4 | h10 | 8 | 50 | 100 | 6 | 0,5 | 3,7 |
| 102TCL.050-40°G | 5 | h10 | 10 | 50 | 100 | 6 | 0,5 | 4,6 |
| 102TCL.060-40°G | 6 | h10 | 12 | 50 | 100 | 6 | 1 | 5,5 |
| 102TCL.080-40°G | 8 | h10 | 16 | 50 | 100 | 8 | 1 | 7,4 |
| 102TCL.100-40°G | 10 | h10 | 20 | 70 | 120 | 10 | 1,5 | 9,2 |
| 102TCL.120-40°G | 12 | h10 | 24 | 100 | 150 | 12 | 1,5 | 11 |
| 102TCL.140-40°G | 14 | h10 | 28 | 100 | 150 | 14 | 2 | 13 |
| 102TCL.160-40°G | 16 | h10 | 32 | 100 | 150 | 16 | 2 | 15 |
| 102TCL.200-40°G | 20 | h10 | 40 | 100 | 150 | 20 | 2,5 | 19 |



ALUMINUM FINISHING
2 flutes ball nose



102RC/RCL

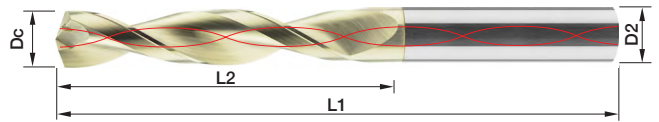


| Cod. | Dc | Dc tol. | L2 | L3 | L1 | D2 | r | D3 |
|-----------------|----|---------|----|-----|-----|----|-----|-----|
| 102RC.020-40°G | 2 | h10 | 4 | 6 | 57 | 6 | 1 | 1,8 |
| 102RC.030-40°G | 3 | h10 | 5 | 9 | 57 | 6 | 1,5 | 2,8 |
| 102RC.040-40°G | 4 | h10 | 6 | 12 | 57 | 6 | 2 | 3,7 |
| 102RC.050-40°G | 5 | h10 | 7 | 15 | 57 | 6 | 2,5 | 4,6 |
| 102RC.060-40°G | 6 | h10 | 8 | 20 | 57 | 6 | 3 | 5,5 |
| 102RC.080-40°G | 8 | h10 | 10 | 26 | 63 | 8 | 4 | 7,4 |
| 102RC.100-40°G | 10 | h10 | 12 | 31 | 72 | 10 | 5 | 9,2 |
| 102RC.120-40°G | 12 | h10 | 14 | 37 | 83 | 12 | 6 | 11 |
| 102RC.140-40°G | 14 | h10 | 16 | 41 | 83 | 14 | 7 | 13 |
| 102RC.160-40°G | 16 | h10 | 18 | 43 | 92 | 16 | 8 | 15 |
| 102RC.200-40°G | 20 | h10 | 22 | 53 | 104 | 20 | 10 | 19 |
| 102RCL.030-40°G | 3 | h10 | 6 | 50 | 100 | 6 | 1,5 | 2,8 |
| 102RCL.040-40°G | 4 | h10 | 8 | 50 | 100 | 6 | 2 | 3,7 |
| 102RCL.050-40°G | 5 | h10 | 10 | 50 | 100 | 6 | 2,5 | 4,6 |
| 102RCL.060-40°G | 6 | h10 | 12 | 50 | 100 | 6 | 3 | 5,5 |
| 102RCL.080-40°G | 8 | h10 | 16 | 50 | 100 | 8 | 4 | 7,4 |
| 102RCL.100-40°G | 10 | h10 | 20 | 70 | 120 | 10 | 5 | 9,2 |
| 102RCL.120-40°G | 12 | h10 | 24 | 100 | 150 | 12 | 6 | 11 |
| 102RCL.140-40°G | 14 | h10 | 28 | 100 | 150 | 14 | 7 | 13 |
| 102RCL.160-40°G | 16 | h10 | 32 | 100 | 150 | 16 | 8 | 15 |
| 102RCL.200-40°G | 20 | h10 | 40 | 100 | 150 | 20 | 10 | 19 |

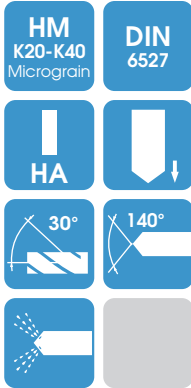
165

ALUMINUM DRILLING

Twist drill with internal coolant



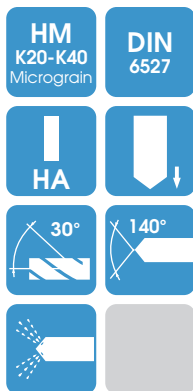
165



| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|----------------|-----|---------|----|----|----|
| 165.030062866N | 3 | m7 | 28 | 66 | 6 |
| 165.031062866N | 3,1 | m7 | 28 | 66 | 6 |
| 165.032062866N | 3,2 | m7 | 28 | 66 | 6 |
| 165.033062866N | 3,3 | m7 | 28 | 66 | 6 |
| 165.034062866N | 3,4 | m7 | 28 | 66 | 6 |
| 165.035062866N | 3,5 | m7 | 28 | 66 | 6 |
| 165.036062866N | 3,6 | m7 | 28 | 66 | 6 |
| 165.037062866N | 3,7 | m7 | 28 | 66 | 6 |
| 165.038063674N | 3,8 | m7 | 36 | 74 | 6 |
| 165.039063674N | 3,9 | m7 | 36 | 74 | 6 |
| 165.040063674N | 4 | m7 | 36 | 74 | 6 |
| 165.041063674N | 4,1 | m7 | 36 | 74 | 6 |
| 165.042063674N | 4,2 | m7 | 36 | 74 | 6 |
| 165.043063674N | 4,3 | m7 | 36 | 74 | 6 |
| 165.044063674N | 4,4 | m7 | 36 | 74 | 6 |
| 165.045063674N | 4,5 | m7 | 36 | 74 | 6 |
| 165.046063674N | 4,6 | m7 | 36 | 74 | 6 |
| 165.047063674N | 4,7 | m7 | 36 | 74 | 6 |
| 165.048064482N | 4,8 | m7 | 44 | 82 | 6 |
| 165.049064482N | 4,9 | m7 | 44 | 82 | 6 |
| 165.050064482N | 5 | m7 | 44 | 82 | 6 |
| 165.051064482N | 5,1 | m7 | 44 | 82 | 6 |
| 165.052064482N | 5,2 | m7 | 44 | 82 | 6 |
| 165.053064482N | 5,3 | m7 | 44 | 82 | 6 |
| 165.054064482N | 5,4 | m7 | 44 | 82 | 6 |
| 165.055064482N | 5,5 | m7 | 44 | 82 | 6 |
| 165.056064482N | 5,6 | m7 | 44 | 82 | 6 |



| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|------------------|------|---------|-----|-----|----|
| 165.057064482N | 5,7 | m7 | 44 | 82 | 6 |
| 165.058064482N | 5,8 | m7 | 44 | 82 | 6 |
| 165.059064482N | 5,9 | m7 | 44 | 82 | 6 |
| 165.060064482N | 6 | m7 | 44 | 82 | 6 |
| 165.061085391N | 6,1 | m7 | 53 | 91 | 8 |
| 165.062085391N | 6,2 | m7 | 53 | 91 | 8 |
| 165.063085391N | 6,3 | m7 | 53 | 91 | 8 |
| 165.064085391N | 6,4 | m7 | 53 | 91 | 8 |
| 165.065085391N | 6,5 | m7 | 53 | 91 | 8 |
| 165.066085391N | 6,6 | m7 | 53 | 91 | 8 |
| 165.1001061103N | 10 | m7 | 61 | 103 | 10 |
| 165.1011271118N | 10,1 | m7 | 71 | 118 | 12 |
| 165.1021271118N | 10,2 | m7 | 71 | 118 | 12 |
| 165.1031271118N | 10,3 | m7 | 71 | 118 | 12 |
| 165.1041271118N | 10,4 | m7 | 71 | 118 | 12 |
| 165.1051271118N | 10,5 | m7 | 71 | 118 | 12 |
| 165.1061271118N | 10,6 | m7 | 71 | 118 | 12 |
| 165.1071271118N | 10,7 | m7 | 71 | 118 | 12 |
| 165.1081271118N | 10,8 | m7 | 71 | 118 | 12 |
| 165.1091271118N | 10,9 | m7 | 71 | 118 | 12 |
| 165.1101271118N | 11 | m7 | 71 | 118 | 12 |
| 165.1111271118N | 11,1 | m7 | 71 | 118 | 12 |
| 165.1121271118N | 11,2 | m7 | 71 | 118 | 12 |
| 165.1131271118N | 11,3 | m7 | 71 | 118 | 12 |
| 165.1141271118N | 11,4 | m7 | 71 | 118 | 12 |
| 165.1151271118N | 11,5 | m7 | 71 | 118 | 12 |
| 165.1161271118N | 11,6 | m7 | 71 | 118 | 12 |
| 165.1171271118N | 11,7 | m7 | 71 | 118 | 12 |
| 165.1181271118N | 11,8 | m7 | 71 | 118 | 12 |
| 165.1191271118N | 11,9 | m7 | 71 | 118 | 12 |
| 165.1201271118N | 12 | m7 | 71 | 118 | 12 |
| 165.1221477124N | 12,2 | m7 | 77 | 124 | 14 |
| 165.1231477124N | 12,3 | m7 | 77 | 124 | 14 |
| 165.1251477124N | 12,5 | m7 | 77 | 124 | 14 |
| 165.1281477124N | 12,8 | m7 | 77 | 124 | 14 |
| 165.1301477124N | 13 | m7 | 77 | 124 | 14 |
| 165.1351477124N | 13,5 | m7 | 77 | 124 | 14 |
| 165.1381477124N | 13,8 | m7 | 77 | 124 | 14 |
| 165.1401477124N | 14 | m7 | 77 | 124 | 14 |
| 165.1451683133N | 14,5 | m7 | 83 | 133 | 16 |
| 165.1481683133N | 14,8 | m7 | 83 | 133 | 16 |
| 165.1501683133N | 15 | m7 | 83 | 133 | 16 |
| 165.1551683133N | 15,5 | m7 | 83 | 133 | 16 |
| 165.1581683133N | 15,8 | m7 | 83 | 133 | 16 |
| 165.1601683133N | 16 | m7 | 83 | 133 | 16 |
| 165.1651893143N | 16,5 | m7 | 93 | 143 | 18 |
| 165.1681893143N | 16,8 | m7 | 93 | 143 | 18 |
| 165.1701893143N | 17 | m7 | 93 | 143 | 18 |
| 165.1751893143N | 17,5 | m7 | 93 | 143 | 18 |
| 165.1781893143N | 17,8 | m7 | 93 | 143 | 18 |
| 165.1801893143N | 18 | m7 | 93 | 143 | 18 |
| 165.18520101153N | 18,5 | m7 | 101 | 153 | 20 |
| 165.19020101153N | 19 | m7 | 101 | 153 | 20 |

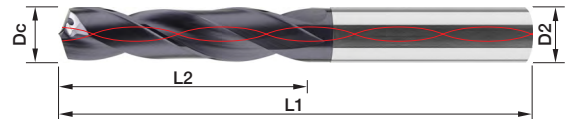


| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|------------------|------|---------|-----|-----|----|
| 165.19520101153N | 19,5 | m7 | 101 | 153 | 20 |
| 165.20020101153N | 20 | m7 | 101 | 153 | 20 |
| 165.067085391N | 6,7 | m7 | 53 | 91 | 8 |
| 165.068085391N | 6,8 | m7 | 53 | 91 | 8 |
| 165.069085391N | 6,9 | m7 | 53 | 91 | 8 |
| 165.070085391N | 7 | m7 | 53 | 91 | 8 |
| 165.071085391N | 7,1 | m7 | 53 | 91 | 8 |
| 165.072085391N | 7,2 | m7 | 53 | 91 | 8 |
| 165.073085391N | 7,3 | m7 | 53 | 91 | 8 |
| 165.074085391N | 7,4 | m7 | 53 | 91 | 8 |
| 165.075085391N | 7,5 | m7 | 53 | 91 | 8 |
| 165.076085391N | 7,6 | m7 | 53 | 91 | 8 |
| 165.077085391N | 7,7 | m7 | 53 | 91 | 8 |
| 165.078085391N | 7,8 | m7 | 53 | 91 | 8 |
| 165.079085391N | 7,9 | m7 | 53 | 91 | 8 |
| 165.080085391N | 8 | m7 | 53 | 91 | 8 |
| 165.0811061103N | 8,1 | m7 | 61 | 103 | 10 |
| 165.0821061103N | 8,2 | m7 | 61 | 103 | 10 |
| 165.0831061103N | 8,3 | m7 | 61 | 103 | 10 |
| 165.0841061103N | 8,4 | m7 | 61 | 103 | 10 |
| 165.0851061103N | 8,5 | m7 | 61 | 103 | 10 |
| 165.0861061103N | 8,6 | m7 | 61 | 103 | 10 |
| 165.0871061103N | 8,7 | m7 | 61 | 103 | 10 |
| 165.0881061103N | 8,8 | m7 | 61 | 103 | 10 |
| 165.0891061103N | 8,9 | m7 | 61 | 103 | 10 |
| 165.0901061103N | 9 | m7 | 61 | 103 | 10 |
| 165.0911061103N | 9,1 | m7 | 61 | 103 | 10 |
| 165.0921061103N | 9,2 | m7 | 61 | 103 | 10 |
| 165.0931061103N | 9,3 | m7 | 61 | 103 | 10 |
| 165.0941061103N | 9,4 | m7 | 61 | 103 | 10 |
| 165.0951061103N | 9,5 | m7 | 61 | 103 | 10 |
| 165.0961061103N | 9,6 | m7 | 61 | 103 | 10 |
| 165.0971061103N | 9,7 | m7 | 61 | 103 | 10 |
| 165.0981061103N | 9,8 | m7 | 61 | 103 | 10 |
| 165.0991061103N | 9,9 | m7 | 61 | 103 | 10 |

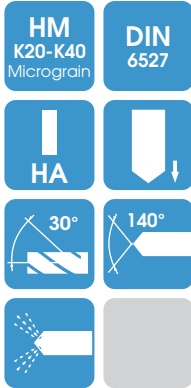
178 3XD

STEEL DRILLING

Twist drill with internal coolant



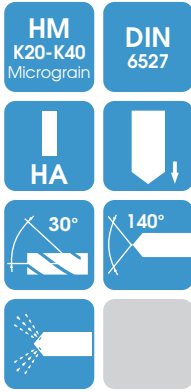
178



| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
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| 178.031062062F | 3,1 | m7 | 20 | 62 | 6 |
| 178.032062062F | 3,2 | m7 | 20 | 62 | 6 |
| 178.033062062F | 3,3 | m7 | 20 | 62 | 6 |
| 178.034062062F | 3,4 | m7 | 20 | 62 | 6 |
| 178.035062062F | 3,5 | m7 | 20 | 62 | 6 |
| 178.036062062F | 3,6 | m7 | 20 | 62 | 6 |
| 178.037062062F | 3,7 | m7 | 20 | 62 | 6 |
| 178.038062466F | 3,8 | m7 | 24 | 66 | 6 |
| 178.039062466F | 3,9 | m7 | 24 | 66 | 6 |
| 178.040062466F | 4 | m7 | 24 | 66 | 6 |
| 178.041062466F | 4,1 | m7 | 24 | 66 | 6 |
| 178.042062466F | 4,2 | m7 | 24 | 66 | 6 |
| 178.043062466F | 4,3 | m7 | 24 | 66 | 6 |
| 178.044062466F | 4,4 | m7 | 24 | 66 | 6 |
| 178.045062466F | 4,5 | m7 | 24 | 66 | 6 |
| 178.046062466F | 4,6 | m7 | 24 | 66 | 6 |
| 178.047062466F | 4,7 | m7 | 24 | 66 | 6 |
| 178.048062866F | 4,8 | m7 | 28 | 66 | 6 |
| 178.049062866F | 4,9 | m7 | 28 | 66 | 6 |
| 178.050062866F | 5 | m7 | 28 | 66 | 6 |
| 178.051062866F | 5,1 | m7 | 28 | 66 | 6 |
| 178.052062866F | 5,2 | m7 | 28 | 66 | 6 |
| 178.053062866F | 5,3 | m7 | 28 | 66 | 6 |
| 178.054062866F | 5,4 | m7 | 28 | 66 | 6 |
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| 178.056062866F | 5,6 | m7 | 28 | 66 | 6 |



178 3XD



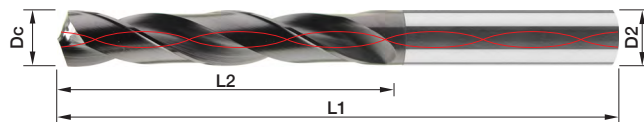
| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|-----------------|------|---------|----|-----|----|
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| 178.058062866F | 5,8 | m7 | 28 | 66 | 6 |
| 178.059062866F | 5,9 | m7 | 28 | 66 | 6 |
| 178.060062866F | 6 | m7 | 28 | 66 | 6 |
| 178.061083479F | 6,1 | m7 | 34 | 79 | 8 |
| 178.062083479F | 6,2 | m7 | 34 | 79 | 8 |
| 178.063083479F | 6,3 | m7 | 34 | 79 | 8 |
| 178.064083479F | 6,4 | m7 | 34 | 79 | 8 |
| 178.065083479F | 6,5 | m7 | 34 | 79 | 8 |
| 178.066083479F | 6,6 | m7 | 34 | 79 | 8 |
| 178.067083479F | 6,7 | m7 | 34 | 79 | 8 |
| 178.068083479F | 6,8 | m7 | 34 | 79 | 8 |
| 178.069083479F | 6,9 | m7 | 34 | 79 | 8 |
| 178.070083479F | 7 | m7 | 34 | 79 | 8 |
| 178.071084179F | 7,1 | m7 | 41 | 79 | 8 |
| 178.072084179F | 7,2 | m7 | 41 | 79 | 8 |
| 178.073084179F | 7,3 | m7 | 41 | 79 | 8 |
| 178.074084179F | 7,4 | m7 | 41 | 79 | 8 |
| 178.075084179F | 7,5 | m7 | 41 | 79 | 8 |
| 178.076084179F | 7,6 | m7 | 41 | 79 | 8 |
| 178.077084179F | 7,7 | m7 | 41 | 79 | 8 |
| 178.078084179F | 7,8 | m7 | 41 | 79 | 8 |
| 178.079084179F | 7,9 | m7 | 41 | 79 | 8 |
| 178.080084179F | 8 | m7 | 41 | 79 | 8 |
| 178.081104189F | 8,1 | m7 | 41 | 89 | 10 |
| 178.082104789F | 8,2 | m7 | 47 | 89 | 10 |
| 178.083104789F | 8,3 | m7 | 47 | 89 | 10 |
| 178.084104789F | 8,4 | m7 | 47 | 89 | 10 |
| 178.085104789F | 8,5 | m7 | 47 | 89 | 10 |
| 178.086104789F | 8,6 | m7 | 47 | 89 | 10 |
| 178.087104789F | 8,7 | m7 | 47 | 89 | 10 |
| 178.088104789F | 8,8 | m7 | 47 | 89 | 10 |
| 178.089104789F | 8,9 | m7 | 47 | 89 | 10 |
| 178.090104789F | 9 | m7 | 47 | 89 | 10 |
| 178.091104789F | 9,1 | m7 | 47 | 89 | 10 |
| 178.092104789F | 9,2 | m7 | 47 | 89 | 10 |
| 178.093104789F | 9,3 | m7 | 47 | 89 | 10 |
| 178.094104789F | 9,4 | m7 | 47 | 89 | 10 |
| 178.095104789F | 9,5 | m7 | 47 | 89 | 10 |
| 178.096104789F | 9,6 | m7 | 47 | 89 | 10 |
| 178.097104789F | 9,7 | m7 | 47 | 89 | 10 |
| 178.098104789F | 9,8 | m7 | 47 | 89 | 10 |
| 178.099104789F | 9,9 | m7 | 47 | 89 | 10 |
| 178.100104789F | 10 | m7 | 47 | 89 | 10 |
| 178.1011255102F | 10,1 | m7 | 55 | 102 | 12 |
| 178.1021255102F | 10,2 | m7 | 55 | 102 | 12 |
| 178.1031255102F | 10,3 | m7 | 55 | 102 | 12 |
| 178.1041255102F | 10,4 | m7 | 55 | 102 | 12 |
| 178.1051255102F | 10,5 | m7 | 55 | 102 | 12 |
| 178.1061255102F | 10,6 | m7 | 55 | 102 | 12 |
| 178.1071255102F | 10,7 | m7 | 55 | 102 | 12 |
| 178.1081255102F | 10,8 | m7 | 55 | 102 | 12 |
| 178.1091255102F | 10,9 | m7 | 55 | 102 | 12 |

| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|-----------------|------|---------|----|-----|----|
| 178.1101255102F | 11 | m7 | 55 | 102 | 12 |
| 178.1111255102F | 11,1 | m7 | 55 | 102 | 12 |
| 178.1121255102F | 11,2 | m7 | 55 | 102 | 12 |
| 178.1131255102F | 11,3 | m7 | 55 | 102 | 12 |
| 178.1141255102F | 11,4 | m7 | 55 | 102 | 12 |
| 178.1151255102F | 11,5 | m7 | 55 | 102 | 12 |
| 178.1161255102F | 11,6 | m7 | 55 | 102 | 12 |
| 178.1171255102F | 11,7 | m7 | 55 | 102 | 12 |
| 178.1181255102F | 11,8 | m7 | 55 | 102 | 12 |
| 178.1191255102F | 11,9 | m7 | 55 | 102 | 12 |
| 178.1201255102F | 12 | m7 | 55 | 102 | 12 |
| 178.1231460107F | 12,3 | m7 | 60 | 107 | 14 |
| 178.1251460107F | 12,5 | m7 | 60 | 107 | 14 |
| 178.1281460107F | 12,8 | m7 | 60 | 107 | 14 |
| 178.1301460107F | 13 | m7 | 60 | 107 | 14 |
| 178.1351460107F | 13,5 | m7 | 60 | 107 | 14 |
| 178.1381460107F | 13,8 | m7 | 60 | 107 | 14 |
| 178.1401460107F | 14 | m7 | 60 | 107 | 14 |
| 178.1451665115F | 14,5 | m7 | 65 | 115 | 16 |
| 178.1481665115F | 14,8 | m7 | 65 | 115 | 16 |
| 178.1501665115F | 15 | m7 | 65 | 115 | 16 |
| 178.1551665115F | 15,5 | m7 | 65 | 115 | 16 |
| 178.1581665115F | 15,8 | m7 | 65 | 115 | 16 |
| 178.1601665115F | 16 | m7 | 65 | 115 | 16 |
| 178.1651873123F | 16,5 | m7 | 73 | 123 | 18 |
| 178.1681873123F | 16,8 | m7 | 73 | 123 | 18 |
| 178.1701873123F | 17 | m7 | 73 | 123 | 18 |
| 178.1751873123F | 17,5 | m7 | 73 | 123 | 18 |
| 178.1781873123F | 17,8 | m7 | 73 | 123 | 18 |
| 178.1801873123F | 18 | m7 | 73 | 123 | 18 |
| 178.1852079131F | 18,5 | m7 | 79 | 131 | 20 |
| 178.1902079131F | 19 | m7 | 79 | 131 | 20 |
| 178.1952079131F | 19,5 | m7 | 79 | 131 | 20 |
| 178.2002079131F | 20 | m7 | 79 | 131 | 20 |

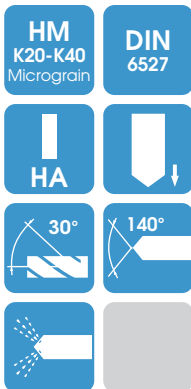
178 5XD

STEEL DRILLING

Twist drill with internal coolant



178

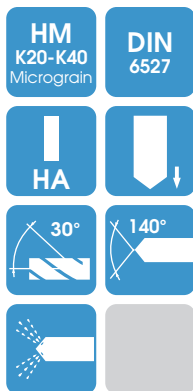


| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|----------------|-----|---------|----|----|----|
| 178.030062866F | 3 | m7 | 28 | 66 | 6 |
| 178.031062866F | 3,1 | m7 | 28 | 66 | 6 |
| 178.032062866F | 3,2 | m7 | 28 | 66 | 6 |
| 178.033062866F | 3,3 | m7 | 28 | 66 | 6 |
| 178.034062866F | 3,4 | m7 | 28 | 66 | 6 |
| 178.035062866F | 3,5 | m7 | 28 | 66 | 6 |
| 178.036062866F | 3,6 | m7 | 28 | 66 | 6 |
| 178.037062866F | 3,7 | m7 | 28 | 66 | 6 |
| 178.038063674F | 3,8 | m7 | 36 | 74 | 6 |
| 178.039063674F | 3,9 | m7 | 36 | 74 | 6 |
| 178.040063674F | 4 | m7 | 36 | 74 | 6 |
| 178.041063674F | 4,1 | m7 | 36 | 74 | 6 |
| 178.042063674F | 4,2 | m7 | 36 | 74 | 6 |
| 178.043063674F | 4,3 | m7 | 36 | 74 | 6 |
| 178.044063674F | 4,4 | m7 | 36 | 74 | 6 |
| 178.045063674F | 4,5 | m7 | 36 | 74 | 6 |
| 178.046063674F | 4,6 | m7 | 36 | 74 | 6 |
| 178.047063674F | 4,7 | m7 | 36 | 74 | 6 |
| 178.048064482F | 4,8 | m7 | 44 | 82 | 6 |
| 178.049064482F | 4,9 | m7 | 44 | 82 | 6 |
| 178.050064482F | 5 | m7 | 44 | 82 | 6 |
| 178.051064482F | 5,1 | m7 | 44 | 82 | 6 |
| 178.052064482F | 5,2 | m7 | 44 | 82 | 6 |
| 178.053064482F | 5,3 | m7 | 44 | 82 | 6 |
| 178.054064482F | 5,4 | m7 | 44 | 82 | 6 |
| 178.055064482F | 5,5 | m7 | 44 | 82 | 6 |
| 178.056064482F | 5,6 | m7 | 44 | 82 | 6 |



| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|-----------------|------|---------|----|-----|----|
| 178.057064482F | 5,7 | m7 | 44 | 82 | 6 |
| 178.058064482F | 5,8 | m7 | 44 | 82 | 6 |
| 178.059064482F | 5,9 | m7 | 44 | 82 | 6 |
| 178.060064482F | 6 | m7 | 44 | 82 | 6 |
| 178.061085391F | 6,1 | m7 | 53 | 91 | 8 |
| 178.062085391F | 6,2 | m7 | 53 | 91 | 8 |
| 178.063085391F | 6,3 | m7 | 53 | 91 | 8 |
| 178.064085391F | 6,4 | m7 | 53 | 91 | 8 |
| 178.065085391F | 6,5 | m7 | 53 | 91 | 8 |
| 178.066085391F | 6,6 | m7 | 53 | 91 | 8 |
| 178.067085391F | 6,7 | m7 | 53 | 91 | 8 |
| 178.068085391F | 6,8 | m7 | 53 | 91 | 8 |
| 178.069085391F | 6,9 | m7 | 53 | 91 | 8 |
| 178.070085391F | 7 | m7 | 53 | 91 | 8 |
| 178.071085391F | 7,1 | m7 | 53 | 91 | 8 |
| 178.072085391F | 7,2 | m7 | 53 | 91 | 8 |
| 178.073085391F | 7,3 | m7 | 53 | 91 | 8 |
| 178.074085391F | 7,4 | m7 | 53 | 91 | 8 |
| 178.075085391F | 7,5 | m7 | 53 | 91 | 8 |
| 178.076085391F | 7,6 | m7 | 53 | 91 | 8 |
| 178.077085391F | 7,7 | m7 | 53 | 91 | 8 |
| 178.078085391F | 7,8 | m7 | 53 | 91 | 8 |
| 178.079085391F | 7,9 | m7 | 53 | 91 | 8 |
| 178.080085391F | 8 | m7 | 53 | 91 | 8 |
| 178.0811061103F | 8,1 | m7 | 61 | 103 | 10 |
| 178.0821061103F | 8,2 | m7 | 61 | 103 | 10 |
| 178.0831061103F | 8,3 | m7 | 61 | 103 | 10 |
| 178.0841061103F | 8,4 | m7 | 61 | 103 | 10 |
| 178.0851061103F | 8,5 | m7 | 61 | 103 | 10 |
| 178.0861061103F | 8,6 | m7 | 61 | 103 | 10 |
| 178.0871061103F | 8,7 | m7 | 61 | 103 | 10 |
| 178.0881061103F | 8,8 | m7 | 61 | 103 | 10 |
| 178.0891061103F | 8,9 | m7 | 61 | 103 | 10 |
| 178.0901061103F | 9 | m7 | 61 | 103 | 10 |
| 178.0911061103F | 9,1 | m7 | 61 | 103 | 10 |
| 178.0921061103F | 9,2 | m7 | 61 | 103 | 10 |
| 178.0931061103F | 9,3 | m7 | 61 | 103 | 10 |
| 178.0941061103F | 9,4 | m7 | 61 | 103 | 10 |
| 178.0951061103F | 9,5 | m7 | 61 | 103 | 10 |
| 178.0961061103F | 9,6 | m7 | 61 | 103 | 10 |
| 178.0971061103F | 9,7 | m7 | 61 | 103 | 10 |
| 178.0981061103F | 9,8 | m7 | 61 | 103 | 10 |
| 178.0991061103F | 9,9 | m7 | 61 | 103 | 10 |
| 178.1001061103F | 10 | m7 | 61 | 103 | 10 |
| 178.1011271118F | 10,1 | m7 | 71 | 118 | 12 |
| 178.1021271118F | 10,2 | m7 | 71 | 118 | 12 |
| 178.1031271118F | 10,3 | m7 | 71 | 118 | 12 |
| 178.1041271118F | 10,4 | m7 | 71 | 118 | 12 |
| 178.1051271118F | 10,5 | m7 | 71 | 118 | 12 |
| 178.1061271118F | 10,6 | m7 | 71 | 118 | 12 |
| 178.1071271118F | 10,7 | m7 | 71 | 118 | 12 |
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178 5XD

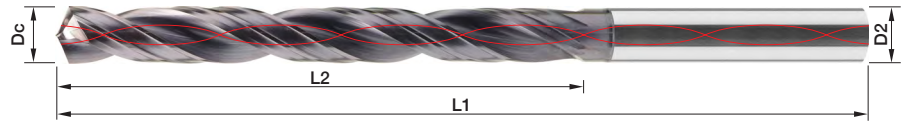


| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
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| 178.1121271118F | 11,2 | m7 | 71 | 118 | 12 |
| 178.1131271118F | 11,3 | m7 | 71 | 118 | 12 |
| 178.1141271118F | 11,4 | m7 | 71 | 118 | 12 |
| 178.1151271118F | 11,5 | m7 | 71 | 118 | 12 |
| 178.1161271118F | 11,6 | m7 | 71 | 118 | 12 |
| 178.1171271118F | 11,7 | m7 | 71 | 118 | 12 |
| 178.1181271118F | 11,8 | m7 | 71 | 118 | 12 |
| 178.1191271118F | 11,9 | m7 | 71 | 118 | 12 |
| 178.1201271118F | 12 | m7 | 71 | 118 | 12 |
| 178.1221477124F | 12,2 | m7 | 77 | 124 | 14 |
| 178.1231477124F | 12,3 | m7 | 77 | 124 | 14 |
| 178.1251477124F | 12,5 | m7 | 77 | 124 | 14 |
| 178.1281477124F | 12,8 | m7 | 77 | 124 | 14 |
| 178.1301477124F | 13 | m7 | 77 | 124 | 14 |
| 178.1351477124F | 13,5 | m7 | 77 | 124 | 14 |
| 178.1381477124F | 13,8 | m7 | 77 | 124 | 14 |
| 178.1401477124F | 14 | m7 | 77 | 124 | 14 |
| 178.1451683133F | 14,5 | m7 | 83 | 133 | 16 |
| 178.1481683133F | 14,8 | m7 | 83 | 133 | 16 |
| 178.1501683133F | 15 | m7 | 83 | 133 | 16 |
| 178.1551683133F | 15,5 | m7 | 83 | 133 | 16 |
| 178.1581683133F | 15,8 | m7 | 83 | 133 | 16 |
| 178.1601683133F | 16 | m7 | 83 | 133 | 16 |
| 178.1651893143F | 16,5 | m7 | 93 | 143 | 18 |
| 178.1681893143F | 16,8 | m7 | 93 | 143 | 18 |
| 178.1701893143F | 17 | m7 | 93 | 143 | 18 |
| 178.1751893143F | 17,5 | m7 | 93 | 143 | 18 |
| 178.1781893143F | 17,8 | m7 | 93 | 143 | 18 |
| 178.1801893143F | 18 | m7 | 93 | 143 | 18 |
| 178.18520101153F | 18,5 | m7 | 101 | 153 | 20 |
| 178.19020101153F | 19 | m7 | 101 | 153 | 20 |
| 178.19520101153F | 19,5 | m7 | 101 | 153 | 20 |
| 178.20020101153F | 20 | m7 | 101 | 153 | 20 |

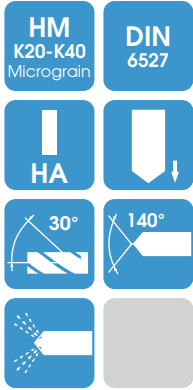
178 8XD

STEEL DRILLING

Twist drill with internal coolant



178



| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|----------------|-----|---------|----|----|----|
| 178.030063472F | 3 | m7 | 34 | 72 | 6 |
| 178.031063472F | 3,1 | m7 | 34 | 72 | 6 |
| 178.032063472F | 3,2 | m7 | 34 | 72 | 6 |
| 178.033063472F | 3,3 | m7 | 34 | 72 | 6 |
| 178.034063472F | 3,4 | m7 | 34 | 72 | 6 |
| 178.035063472F | 3,5 | m7 | 34 | 72 | 6 |
| 178.036063472F | 3,6 | m7 | 34 | 72 | 6 |
| 178.037063472F | 3,7 | m7 | 34 | 72 | 6 |
| 178.038064386F | 3,8 | m7 | 43 | 86 | 6 |
| 178.039064386F | 3,9 | m7 | 43 | 86 | 6 |
| 178.040064386F | 4 | m7 | 43 | 86 | 6 |
| 178.041064386F | 4,1 | m7 | 43 | 86 | 6 |
| 178.042064386F | 4,2 | m7 | 43 | 86 | 6 |
| 178.043064386F | 4,3 | m7 | 43 | 86 | 6 |
| 178.044064386F | 4,4 | m7 | 43 | 86 | 6 |
| 178.045064386F | 4,5 | m7 | 43 | 86 | 6 |
| 178.046064386F | 4,6 | m7 | 43 | 86 | 6 |
| 178.047065795F | 4,7 | m7 | 57 | 95 | 6 |
| 178.048065795F | 4,8 | m7 | 57 | 95 | 6 |
| 178.049065795F | 4,9 | m7 | 57 | 95 | 6 |
| 178.050065795F | 5 | m7 | 57 | 95 | 6 |
| 178.051065795F | 5,1 | m7 | 57 | 95 | 6 |
| 178.052065795F | 5,2 | m7 | 57 | 95 | 6 |
| 178.053065795F | 5,3 | m7 | 57 | 95 | 6 |
| 178.054065795F | 5,4 | m7 | 57 | 95 | 6 |
| 178.055065795F | 5,5 | m7 | 57 | 95 | 6 |
| 178.056065795F | 5,6 | m7 | 57 | 95 | 6 |



178 8XD

HM
K20-K40
Micrograin

DIN
6527



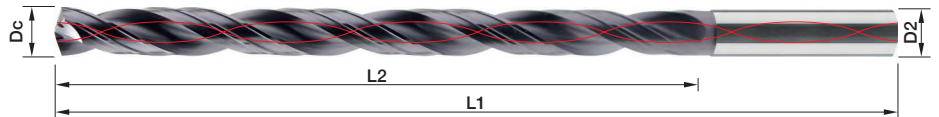
| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|------------------|------|---------|-----|-----|----|
| 178.057065795F | 5,7 | m7 | 57 | 95 | 6 |
| 178.058065795F | 5,8 | m7 | 57 | 95 | 6 |
| 178.059065795F | 5,9 | m7 | 57 | 95 | 6 |
| 178.060065795F | 6 | m7 | 57 | 95 | 6 |
| 178.0610876114F | 6,1 | m7 | 76 | 114 | 8 |
| 178.0620876114F | 6,2 | m7 | 76 | 114 | 8 |
| 178.0630876114F | 6,3 | m7 | 76 | 114 | 8 |
| 178.0640876114F | 6,4 | m7 | 76 | 114 | 8 |
| 178.0650876114F | 6,5 | m7 | 76 | 114 | 8 |
| 178.0660876114F | 6,6 | m7 | 76 | 114 | 8 |
| 178.0670876114F | 6,7 | m7 | 76 | 114 | 8 |
| 178.0680876114F | 6,8 | m7 | 76 | 114 | 8 |
| 178.0690876114F | 6,9 | m7 | 76 | 114 | 8 |
| 178.0700876114F | 7 | m7 | 76 | 114 | 8 |
| 178.0710876114F | 7,1 | m7 | 76 | 114 | 8 |
| 178.0720876114F | 7,2 | m7 | 76 | 114 | 8 |
| 178.0730876114F | 7,3 | m7 | 76 | 114 | 8 |
| 178.0740876114F | 7,4 | m7 | 76 | 114 | 8 |
| 178.0750876114F | 7,5 | m7 | 76 | 114 | 8 |
| 178.0760876114F | 7,6 | m7 | 76 | 114 | 8 |
| 178.0770876114F | 7,7 | m7 | 76 | 114 | 8 |
| 178.0780876114F | 7,8 | m7 | 76 | 114 | 8 |
| 178.0790876114F | 7,9 | m7 | 76 | 114 | 8 |
| 178.0800876114F | 8 | m7 | 76 | 114 | 8 |
| 178.0811095142F | 8,1 | m7 | 95 | 142 | 10 |
| 178.0821095142F | 8,2 | m7 | 95 | 142 | 10 |
| 178.0831095142F | 8,3 | m7 | 95 | 142 | 10 |
| 178.0841095142F | 8,4 | m7 | 95 | 142 | 10 |
| 178.0851095142F | 8,5 | m7 | 95 | 142 | 10 |
| 178.0861095142F | 8,6 | m7 | 95 | 142 | 10 |
| 178.0871095142F | 8,7 | m7 | 95 | 142 | 10 |
| 178.0881095142F | 8,8 | m7 | 95 | 142 | 10 |
| 178.0891095142F | 8,9 | m7 | 95 | 142 | 10 |
| 178.0901095142F | 9 | m7 | 95 | 142 | 10 |
| 178.0911095142F | 9,1 | m7 | 95 | 142 | 10 |
| 178.0921095142F | 9,2 | m7 | 95 | 142 | 10 |
| 178.0931095142F | 9,3 | m7 | 95 | 142 | 10 |
| 178.0941095142F | 9,4 | m7 | 95 | 142 | 10 |
| 178.0951095142F | 9,5 | m7 | 95 | 142 | 10 |
| 178.0961095142F | 9,6 | m7 | 95 | 142 | 10 |
| 178.0971095142F | 9,7 | m7 | 95 | 142 | 10 |
| 178.0981095142F | 9,8 | m7 | 95 | 142 | 10 |
| 178.0991095142F | 9,9 | m7 | 95 | 142 | 10 |
| 178.1001095142F | 10 | m7 | 95 | 142 | 10 |
| 178.10112114162F | 10,1 | m7 | 114 | 162 | 12 |
| 178.10212114162F | 10,2 | m7 | 114 | 162 | 12 |
| 178.10312114162F | 10,3 | m7 | 114 | 162 | 12 |
| 178.10412114162F | 10,4 | m7 | 114 | 162 | 12 |
| 178.10512114162F | 10,5 | m7 | 114 | 162 | 12 |
| 178.10612114162F | 10,6 | m7 | 114 | 162 | 12 |
| 178.10712114162F | 10,7 | m7 | 114 | 162 | 12 |
| 178.10812114162F | 10,8 | m7 | 114 | 162 | 12 |
| 178.10912114162F | 10,9 | m7 | 114 | 162 | 12 |

| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|------------------|------|---------|-----|-----|----|
| 178.11012114162F | 11 | m7 | 114 | 162 | 12 |
| 178.11112114162F | 11,1 | m7 | 114 | 162 | 12 |
| 178.11212114162F | 11,2 | m7 | 114 | 162 | 12 |
| 178.11312114162F | 11,3 | m7 | 114 | 162 | 12 |
| 178.11412114162F | 11,4 | m7 | 114 | 162 | 12 |
| 178.11512114162F | 11,5 | m7 | 114 | 162 | 12 |
| 178.11612114162F | 11,6 | m7 | 114 | 162 | 12 |
| 178.11712114162F | 11,7 | m7 | 114 | 162 | 12 |
| 178.11812114162F | 11,8 | m7 | 114 | 162 | 12 |
| 178.11912114162F | 11,9 | m7 | 114 | 162 | 12 |
| 178.12012114162F | 12 | m7 | 114 | 162 | 12 |
| 178.12514133178F | 12,5 | m7 | 133 | 178 | 14 |
| 178.12814133178F | 12,8 | m7 | 133 | 178 | 14 |
| 178.13014133178F | 13 | m7 | 133 | 178 | 14 |
| 178.13514133178F | 13,5 | m7 | 133 | 178 | 14 |
| 178.14014133178F | 14 | m7 | 133 | 178 | 14 |
| 178.14516152203F | 14,5 | m7 | 152 | 203 | 16 |
| 178.15016152203F | 15 | m7 | 152 | 203 | 16 |
| 178.15516152203F | 15,5 | m7 | 152 | 203 | 16 |
| 178.16016152203F | 16 | m7 | 152 | 203 | 16 |
| 178.16518171222F | 16,5 | m7 | 171 | 222 | 18 |
| 178.17018171222F | 17 | m7 | 171 | 222 | 18 |
| 178.17518171222F | 17,5 | m7 | 171 | 222 | 18 |
| 178.18018171222F | 18 | m7 | 171 | 222 | 18 |
| 178.18520190243F | 18,5 | m7 | 190 | 243 | 20 |
| 178.19020190243F | 19 | m7 | 190 | 243 | 20 |
| 178.20020190243F | 20 | m7 | 190 | 243 | 20 |

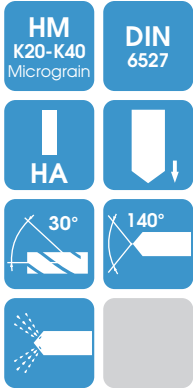
178 12XD

STEEL DRILLING

Twist drill with internal coolant



178



| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|-----------------|-----|---------|----|-----|----|
| 178.010031555F | 1 | h7 | 15 | 55 | 3 |
| 178.011032355F | 1,1 | h7 | 23 | 55 | 3 |
| 178.012032355F | 1,2 | h7 | 23 | 55 | 3 |
| 178.013032355F | 1,3 | h7 | 23 | 55 | 3 |
| 178.014032355F | 1,4 | h7 | 23 | 55 | 3 |
| 178.015033065F | 1,5 | h7 | 30 | 65 | 3 |
| 178.016032965F | 1,6 | h7 | 29 | 65 | 3 |
| 178.017032965F | 1,7 | h7 | 29 | 65 | 3 |
| 178.018033065F | 1,8 | h7 | 30 | 65 | 3 |
| 178.019033065F | 1,9 | h7 | 30 | 65 | 3 |
| 178.020033065F | 2 | h7 | 30 | 65 | 3 |
| 178.021033874F | 2,1 | h7 | 38 | 74 | 3 |
| 178.022033874F | 2,2 | h7 | 38 | 74 | 3 |
| 178.023033874F | 2,3 | h7 | 38 | 74 | 3 |
| 178.024033874F | 2,4 | h7 | 38 | 74 | 3 |
| 178.025034481F | 2,5 | h7 | 44 | 81 | 3 |
| 178.026034481F | 2,6 | h7 | 44 | 81 | 3 |
| 178.027034481F | 2,7 | h7 | 44 | 81 | 3 |
| 178.028034481F | 2,8 | h7 | 44 | 81 | 3 |
| 178.029034481F | 2,9 | h7 | 44 | 81 | 3 |
| 178.030065492F | 3 | h7 | 54 | 92 | 6 |
| 178.031065492F | 3,1 | h7 | 54 | 92 | 6 |
| 178.032065492F | 3,2 | h7 | 54 | 92 | 6 |
| 178.033065492F | 3,3 | h7 | 54 | 92 | 6 |
| 178.034065492F | 3,4 | h7 | 54 | 92 | 6 |
| 178.035065492F | 3,5 | h7 | 54 | 92 | 6 |
| 178.036065492F | 3,6 | h7 | 54 | 92 | 6 |
| 178.037065492F | 3,7 | h7 | 54 | 92 | 6 |
| 178.0380664102F | 3,8 | h7 | 64 | 102 | 6 |



| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|------------------|-----|---------|-----|-----|----|
| 178.0390664102F | 3,9 | h7 | 64 | 102 | 6 |
| 178.0400664102F | 4 | h7 | 64 | 102 | 6 |
| 178.0410664102F | 4,1 | h7 | 64 | 102 | 6 |
| 178.0420664102F | 4,2 | h7 | 64 | 102 | 6 |
| 178.0430664102F | 4,3 | h7 | 64 | 102 | 6 |
| 178.0440664102F | 4,4 | h7 | 64 | 102 | 6 |
| 178.0450664102F | 4,5 | h7 | 64 | 102 | 6 |
| 178.0460664102F | 4,6 | h7 | 64 | 102 | 6 |
| 178.0470664102F | 4,7 | h7 | 64 | 102 | 6 |
| 178.0480678118F | 4,8 | h7 | 78 | 118 | 6 |
| 178.0490678118F | 4,9 | h7 | 78 | 118 | 6 |
| 178.0500678118F | 5 | h7 | 78 | 118 | 6 |
| 178.0510678118F | 5,1 | h7 | 78 | 118 | 6 |
| 178.0520678118F | 5,2 | h7 | 78 | 118 | 6 |
| 178.0530678118F | 5,3 | h7 | 78 | 118 | 6 |
| 178.0540678118F | 5,4 | h7 | 78 | 118 | 6 |
| 178.0550678118F | 5,5 | h7 | 78 | 118 | 6 |
| 178.0560678118F | 5,6 | h7 | 78 | 118 | 6 |
| 178.0570678118F | 5,7 | h7 | 78 | 118 | 6 |
| 178.0580678118F | 5,8 | h7 | 78 | 118 | 6 |
| 178.0590678118F | 5,9 | h7 | 78 | 118 | 6 |
| 178.0600678118F | 6 | h7 | 78 | 118 | 6 |
| 178.0610878146F | 6,1 | h7 | 78 | 146 | 8 |
| 178.0620878146F | 6,2 | h7 | 78 | 146 | 8 |
| 178.0630878146F | 6,3 | h7 | 78 | 146 | 8 |
| 178.0640878146F | 6,4 | h7 | 78 | 146 | 8 |
| 178.06508108146F | 6,5 | h7 | 108 | 146 | 8 |
| 178.0660878146F | 6,6 | h7 | 78 | 146 | 8 |
| 178.0670878146F | 6,7 | h7 | 78 | 146 | 8 |
| 178.06808108146F | 6,8 | h7 | 108 | 146 | 8 |
| 178.0690878146F | 6,9 | h7 | 78 | 146 | 8 |
| 178.07008108146F | 7 | h7 | 108 | 146 | 8 |
| 178.0710878146F | 7,1 | h7 | 78 | 146 | 8 |
| 178.0720878146F | 7,2 | h7 | 78 | 146 | 8 |
| 178.0730878146F | 7,3 | h7 | 78 | 146 | 8 |
| 178.0740878146F | 7,4 | h7 | 78 | 146 | 8 |
| 178.07508108146F | 7,5 | h7 | 108 | 146 | 8 |
| 178.0760878146F | 7,6 | h7 | 78 | 146 | 8 |
| 178.0770878146F | 7,7 | h7 | 78 | 146 | 8 |
| 178.07808108146F | 7,8 | h7 | 108 | 146 | 8 |
| 178.0790878146F | 7,9 | h7 | 78 | 146 | 8 |
| 178.08008108146F | 8 | h7 | 108 | 146 | 8 |
| 178.08110120162F | 8,1 | h7 | 120 | 162 | 10 |
| 178.08210120162F | 8,2 | h7 | 120 | 162 | 10 |
| 178.08310120162F | 8,3 | h7 | 120 | 162 | 10 |
| 178.08410120162F | 8,4 | h7 | 120 | 162 | 10 |
| 178.08510120162F | 8,5 | h7 | 120 | 162 | 10 |
| 178.08610120162F | 8,6 | h7 | 120 | 162 | 10 |
| 178.08710120162F | 8,7 | h7 | 120 | 162 | 10 |
| 178.08810120162F | 8,8 | h7 | 120 | 162 | 10 |
| 178.08910120162F | 8,9 | h7 | 120 | 162 | 10 |
| 178.09010120162F | 9 | h7 | 120 | 162 | 10 |
| 178.09110120162F | 9,1 | h7 | 120 | 162 | 10 |

178 12XD

HM
K20-K40
Micrograin

DIN
6527

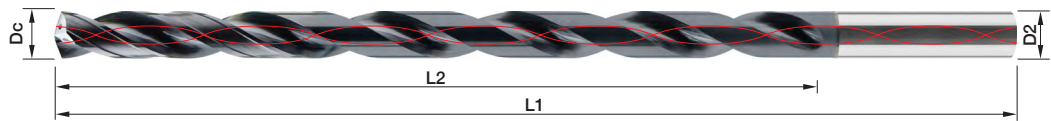


| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|------------------|------|---------|-----|-----|----|
| 178.09210120162F | 9,2 | h7 | 120 | 162 | 10 |
| 178.09310120162F | 9,3 | h7 | 120 | 162 | 10 |
| 178.09410120162F | 9,4 | h7 | 120 | 162 | 10 |
| 178.09510120162F | 9,5 | h7 | 120 | 162 | 10 |
| 178.09610120162F | 9,6 | h7 | 120 | 162 | 10 |
| 178.09710120162F | 9,7 | h7 | 120 | 162 | 10 |
| 178.09810120162F | 9,8 | h7 | 120 | 162 | 10 |
| 178.09910120162F | 9,9 | h7 | 120 | 162 | 10 |
| 178.10010120162F | 10 | h7 | 120 | 162 | 10 |
| 178.10112156204F | 10,1 | h7 | 156 | 204 | 12 |
| 178.10212156204F | 10,2 | h7 | 156 | 204 | 12 |
| 178.10312156204F | 10,3 | h7 | 156 | 204 | 12 |
| 178.10412156204F | 10,4 | h7 | 156 | 204 | 12 |
| 178.10512156204F | 10,5 | h7 | 156 | 204 | 12 |
| 178.10612156204F | 10,6 | h7 | 156 | 204 | 12 |
| 178.10712156204F | 10,7 | h7 | 156 | 204 | 12 |
| 178.10812156204F | 10,8 | h7 | 156 | 204 | 12 |
| 178.10912156204F | 10,9 | h7 | 156 | 204 | 12 |
| 178.11012156204F | 11 | h7 | 156 | 204 | 12 |
| 178.11112156204F | 11,1 | h7 | 156 | 204 | 12 |
| 178.11212156204F | 11,2 | h7 | 156 | 204 | 12 |
| 178.11312156204F | 11,3 | h7 | 156 | 204 | 12 |
| 178.11412156204F | 11,4 | h7 | 156 | 204 | 12 |
| 178.11512156204F | 11,5 | h7 | 156 | 204 | 12 |
| 178.11612156204F | 11,6 | h7 | 156 | 204 | 12 |
| 178.11712156204F | 11,7 | h7 | 156 | 204 | 12 |
| 178.11812156204F | 11,8 | h7 | 156 | 204 | 12 |
| 178.11912156204F | 11,9 | h7 | 156 | 204 | 12 |
| 178.12012156204F | 12 | h7 | 156 | 204 | 12 |
| 178.12514182230F | 12,5 | h7 | 182 | 230 | 14 |
| 178.12814182230F | 12,8 | h7 | 182 | 230 | 14 |
| 178.13014182230F | 13 | h7 | 182 | 230 | 14 |
| 178.13514182230F | 13,5 | h7 | 182 | 230 | 14 |
| 178.13814182230F | 13,8 | h7 | 182 | 230 | 14 |
| 178.14014182230F | 14 | h7 | 182 | 230 | 14 |
| 178.14516208260F | 14,5 | h7 | 208 | 260 | 16 |
| 178.14816208260F | 14,8 | h7 | 208 | 260 | 16 |
| 178.15016208260F | 15 | h7 | 208 | 260 | 16 |
| 178.15516208260F | 15,5 | h7 | 208 | 260 | 16 |
| 178.15816208260F | 15,8 | h7 | 208 | 260 | 16 |
| 178.16016208260F | 16 | h7 | 208 | 260 | 16 |
| 178.16518234285F | 16,5 | h7 | 234 | 285 | 18 |
| 178.16818234285F | 16,8 | h7 | 234 | 285 | 18 |
| 178.17018234285F | 17 | h7 | 234 | 285 | 18 |
| 178.17518234285F | 17,5 | h7 | 234 | 285 | 18 |
| 178.17818234285F | 17,8 | h7 | 234 | 285 | 18 |
| 178.18018234285F | 18 | h7 | 234 | 285 | 18 |
| 178.18520258310F | 18,5 | h7 | 258 | 310 | 20 |
| 178.18820258310F | 18,8 | h7 | 258 | 310 | 20 |
| 178.19020258310F | 19 | h7 | 258 | 310 | 20 |
| 178.19520258310F | 19,5 | h7 | 258 | 310 | 20 |
| 178.19820258310F | 19,8 | h7 | 258 | 310 | 20 |
| 178.20020258310F | 20 | h7 | 258 | 310 | 20 |

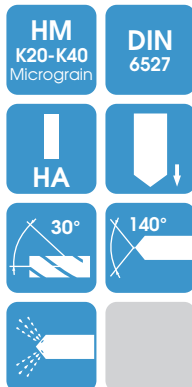
178 15XD

STEEL DRILLING

Twist drill with internal coolant



178



| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|-----------------|-----|---------|----|-----|----|
| 178.010031860F | 1 | h7 | 18 | 60 | 3 |
| 178.011032060F | 1,1 | h7 | 20 | 60 | 3 |
| 178.012032460F | 1,2 | h7 | 24 | 60 | 3 |
| 178.013032460F | 1,3 | h7 | 24 | 60 | 3 |
| 178.014032760F | 1,4 | h7 | 27 | 60 | 3 |
| 178.015032760F | 1,5 | h7 | 27 | 60 | 3 |
| 178.016033065F | 1,6 | h7 | 30 | 65 | 3 |
| 178.017033065F | 1,7 | h7 | 30 | 65 | 3 |
| 178.018033565F | 1,8 | h7 | 35 | 65 | 3 |
| 178.019033565F | 1,9 | h7 | 35 | 65 | 3 |
| 178.020043565F | 2 | h7 | 35 | 65 | 4 |
| 178.021044075F | 2,1 | h7 | 40 | 75 | 4 |
| 178.022044075F | 2,2 | h7 | 40 | 75 | 4 |
| 178.023044075F | 2,3 | h7 | 40 | 75 | 4 |
| 178.024044575F | 2,4 | h7 | 45 | 75 | 4 |
| 178.025044575F | 2,5 | h7 | 45 | 75 | 4 |
| 178.026044880F | 2,6 | h7 | 48 | 80 | 4 |
| 178.027044880F | 2,7 | h7 | 48 | 80 | 4 |
| 178.028045080F | 2,8 | h7 | 50 | 80 | 4 |
| 178.029045080F | 2,9 | h7 | 50 | 80 | 4 |
| 178.0300655100F | 3 | h7 | 55 | 100 | 6 |
| 178.0310655100F | 3,1 | h7 | 55 | 100 | 6 |
| 178.0320660100F | 3,2 | h7 | 60 | 100 | 6 |
| 178.0330660100F | 3,3 | h7 | 60 | 100 | 6 |
| 178.0340660100F | 3,4 | h7 | 60 | 100 | 6 |



178 12XD

HM
K20-K40
Micrograin

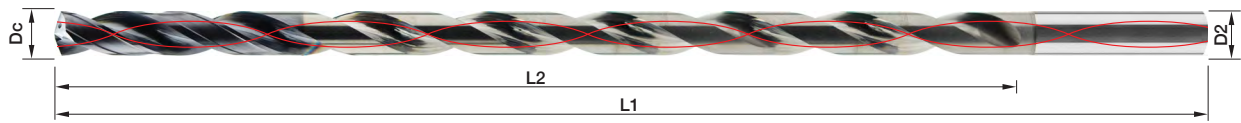
DIN
6527



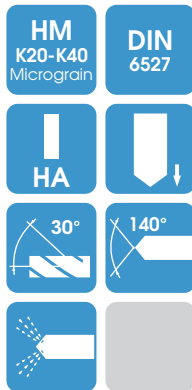
| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|------------------|------|---------|------|-----|----|
| 178.0350665100F | 3,5 | h7 | 65 | 100 | 6 |
| 178.0360665108F | 3,6 | h7 | 65 | 108 | 6 |
| 178.0370670108F | 3,7 | h7 | 70 | 108 | 6 |
| 178.0380670108F | 3,8 | h7 | 70 | 108 | 6 |
| 178.03906702108F | 3,9 | h7 | 70,2 | 108 | 6 |
| 178.0400675115F | 4 | h7 | 75 | 115 | 6 |
| 178.0410675115F | 4,1 | h7 | 75 | 115 | 6 |
| 178.0420675115F | 4,2 | h7 | 75 | 115 | 6 |
| 178.0430680115F | 4,3 | h7 | 80 | 115 | 6 |
| 178.0440680115F | 4,4 | h7 | 80 | 115 | 6 |
| 178.0450680115F | 4,5 | h7 | 80 | 115 | 6 |
| 178.0460685130F | 4,6 | h7 | 85 | 130 | 6 |
| 178.04706846130F | 4,7 | h7 | 84,6 | 130 | 6 |
| 178.0480690130F | 4,8 | h7 | 90 | 130 | 6 |
| 178.0490690130F | 4,9 | h7 | 90 | 130 | 6 |
| 178.0500690130F | 5 | h7 | 90 | 130 | 6 |
| 178.0510695130F | 5,1 | h7 | 95 | 130 | 6 |
| 178.0520695130F | 5,2 | h7 | 95 | 130 | 6 |
| 178.05306954130F | 5,3 | h7 | 95,4 | 130 | 6 |
| 178.0540695130F | 5,4 | h7 | 95 | 130 | 6 |
| 178.05506100145F | 5,5 | h7 | 100 | 145 | 6 |
| 178.05606100145F | 5,6 | h7 | 100 | 145 | 6 |
| 178.05706100145F | 5,7 | h7 | 100 | 145 | 6 |
| 178.05806100145F | 5,8 | h7 | 100 | 145 | 6 |
| 178.05906100145F | 5,9 | h7 | 100 | 145 | 6 |
| 178.06006100145F | 6 | h7 | 100 | 145 | 6 |
| 178.06108104145F | 6,1 | h7 | 104 | 145 | 8 |
| 178.06208104145F | 6,2 | h7 | 104 | 145 | 8 |
| 178.06308104145F | 6,3 | h7 | 104 | 145 | 8 |
| 178.06408104145F | 6,4 | h7 | 104 | 145 | 8 |
| 178.06508118160F | 6,5 | h7 | 118 | 160 | 8 |
| 178.06608118160F | 6,6 | h7 | 118 | 160 | 8 |
| 178.06708128170F | 6,7 | h7 | 128 | 170 | 8 |
| 178.06808128170F | 6,8 | h7 | 128 | 170 | 8 |
| 178.06908128170F | 6,9 | h7 | 128 | 170 | 8 |
| 178.07008128170F | 7 | h7 | 128 | 170 | 8 |
| 178.07508128170F | 7,5 | h7 | 128 | 170 | 8 |
| 178.07808138180F | 7,8 | h7 | 138 | 180 | 8 |
| 178.08008138180F | 8 | h7 | 138 | 180 | 8 |
| 178.08510152198F | 8,5 | h7 | 152 | 198 | 10 |
| 178.08810162208F | 8,8 | h7 | 162 | 208 | 10 |
| 178.09010162208F | 9 | h7 | 162 | 208 | 10 |
| 178.09510162208F | 9,5 | h7 | 162 | 208 | 10 |
| 178.09810162208F | 9,8 | h7 | 162 | 208 | 10 |
| 178.10010172218F | 10 | h7 | 172 | 218 | 10 |
| 178.10212184235F | 10,2 | h7 | 184 | 235 | 12 |
| 178.10512194245F | 10,5 | h7 | 194 | 245 | 12 |
| 178.10812194245F | 10,8 | h7 | 194 | 245 | 12 |
| 178.11012194245F | 11 | h7 | 194 | 245 | 12 |
| 178.11212194245F | 11,2 | h7 | 194 | 245 | 12 |
| 178.11512194245F | 11,5 | h7 | 194 | 245 | 12 |
| 178.11812204255F | 11,8 | h7 | 204 | 255 | 12 |
| 178.12012204255F | 12 | h7 | 204 | 255 | 12 |

STEEL DRILLING

Twist drill with internal coolant



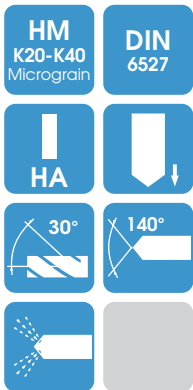
178



| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|------------------|-----|---------|-----|-----|----|
| 178.020044595F | 2 | h7 | 45 | 95 | 4 |
| 178.021045095F | 2,1 | h7 | 50 | 95 | 4 |
| 178.022045095F | 2,2 | h7 | 50 | 95 | 4 |
| 178.023045595F | 2,3 | h7 | 55 | 95 | 4 |
| 178.024045595F | 2,4 | h7 | 55 | 95 | 4 |
| 178.0250460108F | 2,5 | h7 | 60 | 108 | 4 |
| 178.0260460108F | 2,6 | h7 | 60 | 108 | 4 |
| 178.0270465108F | 2,7 | h7 | 65 | 108 | 4 |
| 178.0280465108F | 2,8 | h7 | 65 | 108 | 4 |
| 178.0290468112F | 2,9 | h7 | 68 | 112 | 4 |
| 178.0300668112F | 3 | h7 | 68 | 112 | 6 |
| 178.0320675120F | 3,2 | h7 | 75 | 120 | 6 |
| 178.0330675120F | 3,3 | h7 | 75 | 120 | 6 |
| 178.0350680130F | 3,5 | h7 | 80 | 130 | 6 |
| 178.0380690140F | 3,8 | h7 | 90 | 140 | 6 |
| 178.0400695140F | 4 | h7 | 95 | 140 | 6 |
| 178.0420695140F | 4,2 | h7 | 95 | 140 | 6 |
| 178.04506110160F | 4,5 | h7 | 110 | 160 | 6 |
| 178.04606110160F | 4,6 | h7 | 110 | 160 | 6 |
| 178.04806115160F | 4,8 | h7 | 115 | 160 | 6 |
| 178.05006115160F | 5 | h7 | 115 | 160 | 6 |
| 178.05506140185F | 5,5 | h7 | 140 | 185 | 6 |
| 178.05806140185F | 5,8 | h7 | 140 | 185 | 6 |
| 178.06006140185F | 6 | h7 | 140 | 185 | 6 |
| 178.06508147190F | 6,5 | h7 | 147 | 190 | 8 |



178 20XD

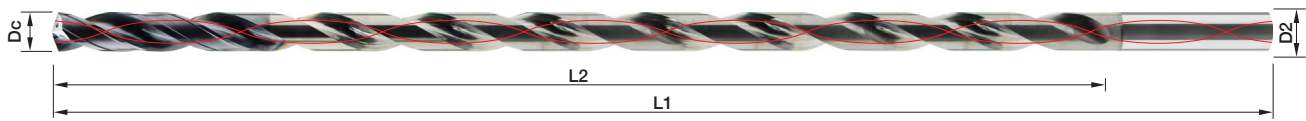


| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|------------------|------|---------|-----|-----|----|
| 178.06808157200F | 6,8 | h7 | 157 | 200 | 8 |
| 178.07008167210F | 7 | h7 | 167 | 210 | 8 |
| 178.07508167210F | 7,5 | h7 | 167 | 210 | 8 |
| 178.07808187230F | 7,8 | h7 | 187 | 230 | 8 |
| 178.08008187230F | 8 | h7 | 187 | 230 | 8 |
| 178.08510193240F | 8,5 | h7 | 193 | 240 | 10 |
| 178.08810213260F | 8,8 | h7 | 213 | 260 | 10 |
| 178.09010213260F | 9 | h7 | 213 | 260 | 10 |
| 178.09810233280F | 9,8 | h7 | 233 | 280 | 10 |
| 178.10010233280F | 10 | h7 | 233 | 280 | 10 |
| 178.10212238290F | 10,2 | h7 | 238 | 290 | 12 |
| 178.10812263315F | 10,8 | h7 | 263 | 315 | 12 |
| 178.11812263315F | 11,8 | h7 | 263 | 315 | 12 |
| 178.12012263315F | 12 | h7 | 263 | 315 | 12 |

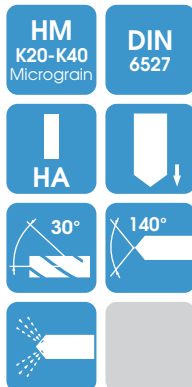
178 25XD

STEEL DRILLING

Twist drill with internal coolant



178



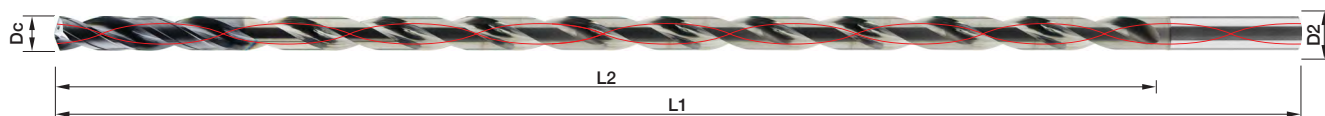
| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|------------------|------|---------|-----|-----|----|
| 178.0300685130F | 3 | h7 | 85 | 130 | 6 |
| 178.0320695140F | 3,2 | h7 | 95 | 140 | 6 |
| 178.0330695140F | 3,3 | h7 | 95 | 140 | 6 |
| 178.03506100150F | 3,5 | h7 | 100 | 150 | 6 |
| 178.03806105150F | 3,8 | h7 | 105 | 150 | 6 |
| 178.04006110160F | 4 | h7 | 110 | 160 | 6 |
| 178.04206120170F | 4,2 | h7 | 120 | 170 | 6 |
| 178.04506130180F | 4,5 | h7 | 130 | 180 | 6 |
| 178.04806140190F | 4,8 | h7 | 140 | 190 | 6 |
| 178.05006140190F | 5 | h7 | 140 | 190 | 6 |
| 178.05506160210F | 5,5 | h7 | 160 | 210 | 6 |
| 178.05806160210F | 5,8 | h7 | 160 | 210 | 6 |
| 178.06006170220F | 6 | h7 | 170 | 220 | 6 |
| 178.06508188230F | 6,5 | h7 | 188 | 230 | 8 |
| 178.06808188230F | 6,8 | h7 | 188 | 230 | 8 |
| 178.07008198240F | 7 | h7 | 198 | 240 | 8 |
| 178.07508211250F | 7,5 | h7 | 211 | 250 | 8 |
| 178.07808221260F | 7,8 | h7 | 221 | 260 | 8 |
| 178.08008221260F | 8 | h7 | 221 | 260 | 8 |
| 178.08510234280F | 8,5 | h7 | 234 | 280 | 10 |
| 178.08810244290F | 8,8 | h7 | 244 | 290 | 10 |
| 178.09010244290F | 9 | h7 | 244 | 290 | 10 |
| 178.09510264310F | 9,5 | h7 | 264 | 310 | 10 |
| 178.09810264310F | 9,8 | h7 | 264 | 310 | 10 |
| 178.10010264310F | 10 | h7 | 264 | 310 | 10 |
| 178.10212289340F | 10,2 | h7 | 289 | 340 | 12 |
| 178.10812299350F | 10,8 | h7 | 299 | 350 | 12 |
| 178.11812324375F | 11,8 | h7 | 324 | 375 | 12 |
| 178.12012324375F | 12 | h7 | 324 | 375 | 12 |



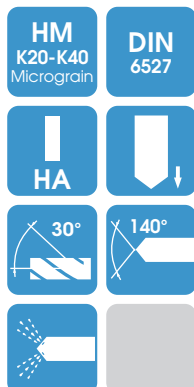
178 30XD

STEEL DRILLING

Twist drill with internal coolant



178



| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|------------------|-----|---------|-----|-----|----|
| 178.0200465105F | 2 | h7 | 65 | 105 | 4 |
| 178.0220475115F | 2.2 | h7 | 75 | 115 | 4 |
| 178.0230475115F | 2.3 | h7 | 75 | 115 | 4 |
| 178.0240485130F | 2.4 | h7 | 85 | 130 | 4 |
| 178.0250485130F | 2.5 | h7 | 85 | 130 | 4 |
| 178.0270495140F | 2.7 | h7 | 95 | 140 | 4 |
| 178.0280495140F | 2.8 | h7 | 95 | 140 | 4 |
| 178.0290495140F | 2.9 | h7 | 95 | 140 | 4 |
| 178.03006105150F | 3 | h7 | 105 | 150 | 6 |
| 178.03206105150F | 3.2 | h7 | 105 | 150 | 6 |
| 178.03306115160F | 3.3 | h7 | 115 | 160 | 6 |
| 178.03506115160F | 3.5 | h7 | 115 | 160 | 6 |
| 178.03806125175F | 3.8 | h7 | 125 | 175 | 6 |
| 178.04006135185F | 4 | h7 | 135 | 185 | 6 |
| 178.04206135185F | 4.2 | h7 | 135 | 185 | 6 |
| 178.04506145195F | 4.5 | h7 | 145 | 195 | 6 |
| 178.04606155205F | 4.6 | h7 | 155 | 205 | 6 |



| Cod. | Dc | Dc tol. | L2 | L1 | D2 |
|------------------|-----|---------|-----|-----|----|
| 178.04806165210F | 4,8 | h7 | 165 | 210 | 6 |
| 178.05006165210F | 5 | h7 | 165 | 210 | 6 |
| 178.05506180240F | 5,5 | h7 | 180 | 240 | 6 |
| 178.05806190240F | 5,8 | h7 | 190 | 240 | 6 |
| 178.06006190240F | 6 | h7 | 190 | 240 | 6 |
| 178.06508219260F | 6,5 | h7 | 219 | 260 | 8 |
| 178.06808219260F | 6,8 | h7 | 219 | 260 | 8 |
| 178.07008229270F | 7 | h7 | 229 | 270 | 8 |
| 178.07508249290F | 7,5 | h7 | 249 | 290 | 8 |
| 178.07808259300F | 7,8 | h7 | 259 | 300 | 8 |
| 178.08008265305F | 8 | h7 | 265 | 305 | 8 |
| 178.08510276320F | 8,5 | h7 | 276 | 320 | 10 |
| 178.08810296340F | 8,8 | h7 | 296 | 340 | 10 |
| 178.09010296340F | 9 | h7 | 296 | 340 | 10 |
| 178.09510316360F | 9,5 | h7 | 316 | 360 | 10 |
| 178.09810336380F | 9,8 | h7 | 336 | 380 | 10 |
| 178.10010336380F | 10 | h7 | 336 | 380 | 10 |

Composites Milling Working Parameters

| | | Short | Long | ap x D1 | ø 3 | | | ø 4 | | | ø 5 | | | ø 6 | | | |
|---|---------------------------|-------|------|---------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | | | | | ae 0,1-0,2 x d1 | ae 0,3-0,4 x d1 | ae 0,6-1,0 x d1 | ae 0,1-0,2 x d1 | ae 0,3-0,4 x d1 | ae 0,6-1,0 x d1 | ae 0,1-0,2 x d1 | ae 0,3-0,4 x d1 | ae 0,6-1,0 x d1 | ae 0,1-0,2 x d1 | ae 0,3-0,4 x d1 | ae 0,6-1,0 x d1 | ae 0,1-0,2 x d1 |
| | | | | | vc | vc | | mm/U | mm/U | mm/U | mm/U | mm/U | mm/U | mm/U | mm/U | mm/U | mm/U |
| Type | Material | m/mm | m/mm | | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | |
| 68DX / 68SX / 68TD / 68RDX / 68SU | Thermoplastics | 120 | 100 | 1.0 | | | | 0,167 | 0,125 | 0,050 | | | | 0,250 | 0,188 | 0,075 | 0,333 |
| | Carbon fiber CFRP/ CFC | 120 | 100 | 1.0 | | | | 0,167 | 0,125 | 0,050 | | | | 0,250 | 0,188 | 0,075 | 0,333 |
| 119P | Aramid fiber Kevlar | 150 | 120 | 1.0 | | | | | | | | | | 0,315 | 0,189 | 0,095 | 0,420 |
| 419TD 119P | | 300 | 200 | 1.0 | | | | | | | | | | 0,220 | 0,132 | 0,066 | 0,293 |
| 77SUP P/D 77RSU | Honeycomb/Nomex | 1000 | | 1.0 | | | | | | | | | | | | | |
| 106 / 108 / 109 * | Thermoplastics | 150 | 120 | 1.0 | 0,100 | 0,075 | 0,030 | 0,133 | 0,100 | 0,040 | | | | 0,200 | 0,150 | 0,060 | 0,267 |
| | Glass fiber GFRP / GFK | 250 | 200 | 1.0 | 0,100 | 0,075 | 0,030 | 0,133 | 0,100 | 0,040 | | | | 0,200 | 0,150 | 0,060 | 0,267 |

Composites Drilling Working Parameters

| Type | ISO | Materials | Strength (N/mm ²) | Material Number |
|-----------------|-----|--|----------------------------------|-----------------|
| 165C | N | Thermoplastics | | |
| | | Duroplastics | | |
| | | Carbon fiber | | |
| | | Fibre-reinforced plastics | | |
| 118 | N | Thermoplastics | | |
| | | Aramid fiber/Kevlar | | |
| 165ST | N | Aluminium (non alloyed, low alloyed) | < 350 N/mm ² | 3.0255 |
| | | Aluminium alloys < 0.5% Si | < 500 N/mm ² | 3.0515 |
| | | Aluminium alloy 0.5-10% Si | < 400 N/mm ² | 3.2152 |
| | | Aluminium alloys 10-15% Si | < 400 N/mm ² | 3.2381 |
| | | Aluminum alloys > 15% Si | < 400 N/mm ² | |
| | | Copper (non alloyed, low alloyed) | < 350 N/mm ² | 2.0060 |
| | | Copper wrought alloys | < 700 N/mm ² | 2.0240 |
| | | Special copper alloys | < 200 HE | 2.0916 |
| | | Special copper alloys | < 300 HB | 2.0978 |
| | | Special copper alloys | > 300 HE | 2.1247 |
| | | Short-chipping brass, bronze, red bronze | < 600 N/mm ² | 2.0360 |
| | | Long-chipping brass | < 600 N/mm ² | 2.0335 |
| | S | Pure titanium | < 900 N/mm ² | 3.7025 |
| | | Titanium alloys | < 700 N/mm ² | 3.7114 |
| Titanium alloys | | < 1200 N/mm ² | 3.7164 | |

| ø 8 | | ø 10 | | | ø 12 | | | ø 16 | | | ø 20 | | | ø 24 | | | ø 44 | | | Emulsion | Compressed Air | Minimum quantity lubrication |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------|----------------|------------------------------|
| ae 0,3-0,4 x d1 | ae 0,6-1,0 x d1 | ae 0,1-0,2 x d1 | ae 0,3-0,4 x d1 | ae 0,6-1,0 x d1 | ae 0,1-0,2 x d1 | ae 0,3-0,4 x d1 | ae 0,6-1,0 x d1 | ae 0,1-0,2 x d1 | ae 0,3-0,4 x d1 | ae 0,6-1,0 x d1 | ae 0,1-0,2 x d1 | ae 0,3-0,4 x d1 | ae 0,6-1,0 x d1 | ae 0,1-0,2 x d1 | ae 0,3-0,4 x d1 | ae 0,6-1,0 x d1 | ae 0,1-0,2 x d1 | ae 0,3-0,4 x d1 | ae 0,6-1,0 x d1 | | | |
| mm/U | mm/U | mm/U | mm/U | mm/U | mm/U | mm/U | mm/U | mm/U | mm/U | mm/U | mm/U | mm/U | mm/U | mm/U | mm/U | mm/U | mm/U | mm/U | mm/U | | | |
| mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | | | |
| 0,250 | 0,100 | 0,410 | 0,310 | 0,125 | 0,500 | 0,375 | 0,150 | | | | | | | | | | | | | | | |
| 0,250 | 0,100 | 0,410 | 0,310 | 0,125 | 0,500 | 0,375 | 0,150 | | | | | | | | | | | | | | | |
| 0,252 | 0,126 | 0,525 | 0,315 | 0,158 | 0,630 | 0,378 | 0,189 | | | | | | | | | | | | | | | |
| 0,176 | 0,088 | 0,367 | 0,220 | 0,110 | 0,440 | 0,264 | 0,132 | | | | | | | | | | | | | | | |
| | | | | | 0,004 | 0,003 | 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 | | | |
| 0,200 | 0,080 | 0,333 | 0,250 | 0,100 | 0,400 | 0,300 | 0,120 | | | | | | | | | | | | | | | |
| 0,200 | 0,080 | 0,333 | 0,250 | 0,100 | 0,400 | 0,300 | 0,120 | | | | | | | | | | | | | | | |

| Material designation | Vc m/min | ø 2 - ø 2,9 | ø 3 - ø 5,9 | ø 6 - ø 8,9 | ø 9 - ø 11,9 |
|----------------------|-------------|-------------|-------------|-------------|--------------|
| | | mm / U | mm / U | mm / U | mm / U |
| Delrin, Hostalen | 200 | 0,035 | 0,050 | 0,070 | 0,090 |
| Ferrozelf, Bakelit | 200 | 0,035 | 0,050 | 0,070 | 0,090 |
| CFC - CFK | 120 | 0,035 | 0,050 | 0,070 | 0,090 |
| GFK* | 200 | 0,035 | 0,050 | 0,070 | 0,090 |
| Delrin, Hostalen | 150 | 0,045 | 0,060 | 0,080 | 0,100 |
| | 150 | 0,045 | 0,060 | 0,080 | 0,100 |
| A199,5 | 200 | 0,150 | 0,200 | 0,300 | 0,380 |
| AlMni | 160 | 0,150 | 0,200 | 0,300 | 0,380 |
| GD-AISI16Cu4 | 160 | 0,150 | 0,200 | 0,300 | 0,380 |
| G-AISI10Mg | 150 | 0,150 | 0,200 | 0,300 | 0,380 |
| G-AISI17Cu4 | 150 | 0,150 | 0,200 | 0,300 | 0,380 |
| E-Cu57 | 90 | 0,100 | 0,150 | 0,200 | 0,250 |
| CuZn15 | 90 | 0,100 | 0,150 | 0,200 | 0,250 |
| CuAl5 | 70 | 0,100 | 0,150 | 0,200 | 0,250 |
| CuAl11Ni6Fe5 | 70 | 0,100 | 0,150 | 0,200 | 0,250 |
| Cu13e2F1 25 | 70 | 0,100 | 0,150 | 0,200 | 0,250 |
| CuZn40 (Ms60) | 70 | 0,100 | 0,150 | 0,200 | 0,250 |
| CuZn36 (Ms63) | 70 | 0,100 | 0,150 | 0,200 | 0,250 |
| Ti99,8 | 25 | 0,025 | 0,030 | 0,040 | 0,048 |
| TiA15Sn2 | 20 | 0,025 | 0,030 | 0,040 | 0,048 |
| TiA15V4 | 15 | 0,025 | 0,030 | 0,040 | 0,048 |

Metal Milling Working Parameters

| | | | | | | Short | Long | apxD1 | Ø 3 | | | Ø 4 | | |
|-------------------------|--------------------------|--|----------------------------------|--------------------|-------------------------|-------|-------|-------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | | | | | | | | | ae 0,1-0,2 x d1 | ae 0,3-0,4 x d1 | ae 0,6-1,0 x d1 | ae 0,1-0,2 x d1 | ae 0,3-0,4 x d1 | ae 0,6-1,0 x d1 |
| | | | | | | | | | vc | vc | | fz | fz | fz |
| Code | ISO | Material | Strength (N/mm ²) | Material Number | Material designation | m/min | m/min | | mm | mm | mm | mm | mm | mm |
| 640WV | P | General construction steel | < 800 N/mm ² | 1.0037 | St37-2 | 200 | 160 | 1,0 | 0,024 | 0,019 | 0,014 | 0,029 | 0,022 | 0,016 |
| | | Free cutting steel | < 800 N/mm ² | 1.0719 | 9SMnPb28 | 210 | 170 | 1,0 | 0,024 | 0,019 | 0,014 | 0,029 | 0,022 | 0,016 |
| | | Hardened steel, non alloyed | < 800 N/mm ² | 1.0401 | C15 | 180 | 140 | 1,0 | 0,017 | 0,013 | 0,010 | 0,029 | 0,022 | 0,016 |
| | | Alloyed hardened steel | < 1000 N/mm ² | 1.7331 | 16MnCr5 (EC80) | 160 | 130 | 1,0 | 0,012 | 0,009 | 0,007 | 0,029 | 0,022 | 0,016 |
| | | Tempering steel, unalloyed | < 850 N/mm ² | 1.0503 | C45 | 170 | 135 | 1,0 | 0,017 | 0,013 | 0,010 | 0,029 | 0,022 | 0,016 |
| | | Tempering steel, unalloyed | < 1000 N/mm ² | 1.0601 | C60 | 160 | 130 | 1,0 | 0,018 | 0,014 | 0,010 | 0,029 | 0,022 | 0,016 |
| | | Tempering steel, alloyed | < 800 N/mm ² | 1.5131 | 50MnS14 | 160 | 130 | 1,0 | 0,018 | 0,014 | 0,010 | 0,029 | 0,022 | 0,016 |
| | | Tempering steel, alloyed | < 1300 N/mm ² | 1.5755 | 31 NiCr14 | 140 | 115 | 1,0 | 0,012 | 0,009 | 0,007 | 0,029 | 0,022 | 0,016 |
| | | Steel castings | < 850 N/mm ² | 0.9650 | G-X260Cr27 | 140 | 110 | 1,0 | 0,018 | 0,014 | 0,010 | 0,029 | 0,022 | 0,016 |
| | | Nitriding steel | < 1000 N/mm ² | 1.8504 | 34CrA16 | 160 | 130 | 1,0 | 0,018 | 0,014 | 0,010 | 0,029 | 0,022 | 0,016 |
| | | Nitriding steel | < 1200 N/mm ² | 1.8515 | 31Cr1V1o12 | 140 | 115 | 1,0 | 0,012 | 0,009 | 0,007 | 0,022 | 0,017 | 0,012 |
| | | Roller bearing steel | < 1200 N/mm ² | 1.3505 | 100Cr6 (W3) | 160 | 130 | 1,0 | 0,018 | 0,014 | 0,010 | 0,029 | 0,022 | 0,016 |
| | | Spring steel | < 1200 N/mm ² | 1.5026 | 55Si7 | | | 1,0 | | | | | | |
| | | High-speed steel | < 1300 N/mm ² | 1.3344 | S 6-5-3 | | | 1,0 | | | | | | |
| Cold working tool steel | < 1300 N/mm ² | 1.2312 | 40CrMnMoS8 6 | 150 | 120 | 1,0 | 0,017 | 0,013 | 0,010 | 0,029 | 0,022 | 0,016 | | |
| Hot working tool steel | < 1300 N/mm ² | 1.2343 | X38CrMoV 51 | 130 | 100 | 1,0 | 0,017 | 0,013 | 0,010 | 0,029 | 0,022 | 0,016 | | |
| 640W | M | Cast steel and sulphured stainless steel | < 850 N/mm ² | 1.4305 | X8CrNiS18 9 | 110 | 90 | 1,0 | 0,012 | 0,009 | 0,007 | 0,018 | 0,014 | 0,010 |
| | | Stainless steel, ferritic | < 750 N/mm ² | 1.4510 | X3CrTi17 | 100 | 80 | 1,0 | 0,012 | 0,009 | 0,007 | 0,018 | 0,014 | 0,010 |
| | | Stainless steel, martensitic | < 900 N/mm ² | 1.4034 | X46Cr13 | 85 | 70 | 1,0 | 0,012 | 0,009 | 0,007 | 0,018 | 0,014 | 0,010 |
| | | Stainless steel, ferritic / martensitic | < 1100 N/mm ² | 1.4313 | X3CrNi13.4 | 100 | 80 | 1,0 | 0,0122 | 0,009 | 0,007 | 0,0183 | 0,014 | 0,010 |
| | | Stainless steel, austenitic / ferritic | < 850 N/mm ² | 1.4460 | X8CrNiMo27 5 | 100 | 80 | 1,0 | 0,012 | 0,009 | 0,007 | 0,018 | 0,014 | 0,010 |
| | | Stainless steel, austenitic | < 750 N/mm ² | 1.4301 | X5CrNi18-10 | 100 | 80 | 1,0 | 0,012 | 0,009 | 0,007 | 0,018 | 0,014 | 0,010 |
| 642 / 642F | M | Heat resistant steel | < 1100 N/mm ² | 1.4747 | X80CrNiS120 | 26 | 20 | 1,0 | 0,0092 | 0,007 | 0,005 | 0,0153 | 0,012 | 0,009 |
| 640WV | K | Grey cast iron with lamellar graphite | 100-350 N/mm ² | 0.6010 | GG10 | 170 | 135 | 1,0 | 0,024 | 0,019 | 0,014 | 0,036 | 0,028 | 0,020 |
| | | Grey cast iron with lamellar graphite | 300-1000 N/mm ² | 0.6030 | GG30 | 140 | 110 | 1,0 | 0,018 | 0,014 | 0,010 | 0,036 | 0,028 | 0,020 |
| | | Gray cast iron with spheroidal graphite | 300-500 N/mm ² | 0.7040 | G GG40 | 160 | 130 | 1,0 | 0,018 | 0,014 | 0,010 | 0,029 | 0,022 | 0,016 |
| | | Gray cast iron with spheroidal graphite | 550-800 N/mm ² | 0.7060 | G GG60 | 130 | 100 | 1,0 | 0,018 | 0,014 | 0,010 | 0,029 | 0,022 | 0,016 |
| | | White malleable cast iron | 350-450 N/mm ² | 0.8035 | GTW35 | 150 | 120 | 1,0 | 0,018 | 0,014 | 0,010 | 0,029 | 0,022 | 0,016 |
| | | White malleable cast iron | 500-650 N/mm ² | 0.8055 | GTW55 | 140 | 110 | 1,0 | 0,018 | 0,014 | 0,010 | 0,029 | 0,022 | 0,016 |
| | | Black malleable cast iron | 350-450 N/mm ² | 0.8135 | GTS35 | 150 | 120 | 1,0 | 0,018 | 0,014 | 0,010 | 0,029 | 0,022 | 0,016 |
| | | Black malleable cast iron | 500-700 N/mm ² | 0.8155 | GTS55 | 135 | 110 | 1,0 | 0,018 | 0,014 | 0,010 | 0,029 | 0,022 | 0,016 |
| 102TC / 102TCL | N | Aluminium (non alloyed, low alloyed) | < 350 N/mm ² | 3.0255 | A199,5 | 300 | 240 | | - | - | - | 0,070 | 0,053 | 0,021 |
| | | Aluminium alloys < 0.5% Si | < 500 N/mm ² | 3.0515 | AlMn | 300 | 240 | | - | - | - | 0,070 | 0,053 | 0,021 |
| | | Aluminium alloy 0,5-10% Si | < 400 N/mm ² | 3.2152 | GD-AlSi16Cu4 | 300 | 240 | | - | - | - | 0,070 | 0,053 | 0,021 |
| | | Aluminium alloys 10-15% Si | < 400 N/mm ² | 3.2381 | G-AlSi10Mg | 150 | 120 | | - | - | - | 0,035 | 0,026 | 0,011 |
| | | Aluminum alloys > 15% Si | < 400 N/mm ² | | G-AlSi17Cu4 | | | | | | | | | |
| 303 | N | Aluminium (non alloyed, low alloyed) | < 350 N/mm ² | 3.0255 | A199,5 | 500 | 400 | | - | - | - | 0,140 | 0,105 | 0,042 |
| | | Aluminium alloys < 0.5% Si | < 500 N/mm ² | 3.0515 | AlMn | 500 | 400 | | - | - | - | 0,140 | 0,105 | 0,042 |
| | | Aluminium alloy 0,5-10% Si | < 400 N/mm ² | 3.2152 | GD-AlSi16Cu4 | 500 | 400 | | - | - | - | 0,140 | 0,105 | 0,042 |
| | | Aluminium alloys 10-15% Si | < 400 N/mm ² | 3.2381 | G-AlSi10Mg | 300 | 240 | | - | - | - | 0,070 | 0,053 | 0,021 |
| | | Aluminum alloys > 15% Si | < 400 N/mm ² | | G-AlSi17Cu4 | | | | - | - | - | | | |
| 642 / 642F | S | Pure nickel | | 1.3911 | RNi24 | | | | | | | | | |
| | | Nickel alloys | | 1.3912 | Ni36 (Invar) | | | | | | | | | |
| | | Nickel alloys | < 850 N/mm ² | 2.4360 | S-NiCu 30 Fe | 25 | 20 | 0,5 | 0,011 | 0,008 | 0,006 | 0,015 | 0,012 | 0,009 |
| | | Nickel-chromium alloys | | 2.4886 | SG-NiMo16Cr16W | 25 | 20 | 0,5 | 0,011 | 0,008 | 0,006 | 0,015 | 0,012 | 0,009 |
| | | Nickel alloys | < 1300 N/mm ² | 2.4632 | NiCr20Co18Ti | 25 | 20 | 0,5 | 0,011 | 0,008 | 0,006 | 0,015 | 0,012 | 0,009 |
| | | Cobalt Chrome Alloys | < 1300 N/mm ² | 2.4634 | NiCo20Cr15, MoAlTi | 25 | 20 | 0,5 | 0,011 | 0,008 | 0,006 | 0,015 | 0,012 | 0,009 |
| | | Heat resistant alloys | < 1300 N/mm ² | | Hardox 400 | 25 | 20 | 0,5 | 0,011 | 0,008 | 0,006 | 0,015 | 0,012 | 0,009 |
| | | Nickel-cobalt-chromium alloys | < 1400 N/mm ² | 2.4806 | SG-NiCr20Nb, Inconel 82 | 25 | 20 | 0,5 | 0,011 | 0,008 | 0,006 | 0,015 | 0,012 | 0,009 |
| 641 / 641F | | Pure titanium | < 900 N/mm ² | 3.7025 | Ti99,8 | 135 | 110 | 1,0 | 0,021 | 0,017 | 0,012 | 0,031 | 0,024 | 0,017 |
| | | Titanium alloys | < 700 N/mm ² | 3.7114 | TiAl5Sn2 | 45 | 45 | 1,0 | 0,007 | 0,009 | 0,023 | 0,009 | 0,012 | 0,031 |
| | | Titanium alloys | < 1200 N/mm ² | 3.7164 | TiAl5V4 | 45 | 45 | 1,0 | 0,007 | 0,009 | 0,023 | 0,009 | 0,012 | 0,031 |

Drills Up to 12xD

| Type | ISO | Material | Strength (N/mm ²) | Material Number | Material designation | Vc m/ min | Vc m/ min | Vc m/ min | Vc m/ min | ø 1 - ø 2,9 | | | | | | |
|------|-----------------|--|--|--------------------------|-------------------------|----------------|-----------|-----------|-----------|-------------|--------|--------|--------|--------|--------|--------|
| | | | | | | | | | | 3xD | 5xD | 8xD | 12xD | 3xD | 5xD | 8xD |
| | | | | | | | | | | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U |
| P | | General construction steel | < 800 N/mm ² | 1,0037 | St37-2 | 210 | 200 | 170 | 80 | | | | | | | |
| | | Free cutting steel | < 800 N/mm ² | 1,0719 | 9SMnPb28 | 210 | 200 | 170 | 80 | | | | | | | |
| | | Hardened steel, non alloyed | < 800 N/mm ² | 1,0401 | C15 | 210 | 200 | 170 | 80 | | | | | | | |
| | | Alloyed hardened steel | < 1000 N/mm ² | 1,7331 | 16MnCr5 (EC80) | 120 | 110 | 70 | 60 | | | | | | | |
| | | Tempering steel, unalloyed | < 850 N/mm ² | 1,0503 | C45 | 130 | 120 | 90 | 70 | | | | | | | |
| | | Tempering steel, unalloyed | < 1000 N/mm ² | 1,0601 | C60 | 120 | 110 | 70 | 60 | | | | | | | |
| | | Tempering steel, alloyed | < 800 N/mm ² | 1,5131 | 50MnS14 | 210 | 200 | 170 | 80 | | | | | | | |
| | | Tempering steel, alloyed | < 1300 N/mm ² | 1,5755 | 31 NiCr14 | | | | | | | | | | | |
| | | Steel castings | < 850 N/mm ² | 0,9650 | G-X260Cr27 | 130 | 120 | 90 | 70 | | | | | | | |
| | | Nitriding steel | < 1000 N/mm ² | 1,8504 | 34CrA16 | 120 | 110 | 70 | 60 | | | | | | | |
| | | Nitriding steel | < 1200 N/mm ² | 1,8515 | 31CrV1o12 | | | | | | | | | | | |
| | | Roller bearing steel | < 1200 N/mm ² | 1,3505 | 100Cr6 (W3) | | | | | | | | | | | |
| | | Spring steel | < 1200 N/mm ² | 1,5026 | 55Si7 | | | | | | | | | | | |
| | | High-speed steel | < 1300 N/mm ² | 1,3344 | S 6-5-3 | | | | | | | | | | | |
| | | Cold working tool steel | < 1300 N/mm ² | 1,2312 | 40CrMnMoS8 6 | | | | | | | | | | | |
| | | Hot working tool steel | < 1300 N/mm ² | 1,2343 | X38CrMoV 51 | | | | | | | | | | | |
| | M | | Cast steel and sulphured stainless steel | < 850 N/mm ² | 1,4305 | X8CrNiS18 9 | 70 | 60 | 50 | 30 | | | | | | |
| | | Stainless steel, ferritic | < 750 N/mm ² | 1,4510 | X3CrTi17 | 90 | 80 | 70 | 45 | | | | | | | |
| | | Stainless steel, martensitic | < 900 N/mm ² | 1,4034 | X46Cr13 | 70 | 60 | 50 | 30 | | | | | | | |
| | | Stainless steel, ferritic / martensitic | < 1100 N/mm ² | 1,4313 | X3CrNi13.4 | 70 | 60 | 50 | 30 | | | | | | | |
| | | Stainless steel, austenitic / ferritic | < 850 N/mm ² | 1,4460 | X8CrNiMo27 5 | 70 | 60 | 50 | 30 | | | | | | | |
| | | Stainless steel, austenitic | < 750 N/mm ² | 1,4301 | X5CrNi18-10 | 70 | 60 | 50 | 30 | | | | | | | |
| M | | Heat resistant steel | < 1100 N/mm ² | 1,4747 | X80CrNiS120 | 55 | 45 | 40 | | | | | | | | |
| K | | Grey cast iron with lamellar graphite | 100-350 N/mm ² | 0,6010 | GG10 | 130 | 120 | 90 | 60 | | | | | | | |
| | | Grey cast iron with lamellar graphite | 300-1000 N/mm ² | 0,6030 | GG30 | 130 | 120 | 90 | 60 | | | | | | | |
| | | Gray cast iron with spheroidal graphite | 300-500 N/mm ² | 0,7040 | GGG40 | 90 | 80 | 80 | 60 | | | | | | | |
| | | Gray cast iron with spheroidal graphite | 550-800 N/mm ² | 0,7060 | GGG60 | 90 | 80 | 80 | 60 | | | | | | | |
| | | White malleable cast iron | 350-450 N/mm ² | 0,8035 | GTW35 | | | | | | | | | | | |
| | | White malleable cast iron | 500-650 N/mm ² | 0,8055 | GTW55 | | | | | | | | | | | |
| | | Black malleable cast iron | 350-450 N/mm ² | 0,8135 | GTS35 | | | | | | | | | | | |
| | | Black malleable cast iron | 500-700 N/mm ² | 0,8155 | GTS55 | | | | | | | | | | | |
| N | | Aluminium (non alloyed, low alloyed) | < 350 N/mm ² | 3,0255 | A199,5 | 250 | 240,0 | 230,0 | 140,0 | | | | | | | |
| | | Aluminium alloys < 0.5% Si | < 500 N/mm ² | 3,0515 | AlMn1 | 230 | 220,0 | 210,0 | 160,0 | | | | | | | |
| | | Aluminium alloy 0,5-10% Si | < 400 N/mm ² | 3,2152 | GD-AlSi16Cu4 | 230 | 220,0 | 210,0 | 160,0 | | | | | | | |
| | | Aluminium alloys 10-15% Si | < 400 N/mm ² | 3,2381 | G-AlSi10Mg | 210 | 200,0 | 170,0 | 120,0 | | | | | | | |
| | | Aluminium alloys > 15% Si | < 400 N/mm ² | | G-AlSi17Cu4 | 210 | 200,0 | 170,0 | 120,0 | | | | | | | |
| | | Copper (non alloyed, low alloyed) | < 350 N/mm ² | 2,0060 | E-Cu57 | 160 | 150,0 | 120,0 | 80,0 | | | | | | | |
| | | Copper wrought alloys | < 700 N/mm ² | 2,0240 | CuZn15 | 160 | 150,0 | 120,0 | 80,0 | | | | | | | |
| | | Special copper alloys | < 200 HE | 2,0916 | CuAl5 | 160 | 150,0 | 120,0 | 80,0 | | | | | | | |
| | | Special copper alloys | < 300 HB | 2,0978 | CuAl11Ni6Fe5 | 160 | 150,0 | 120,0 | 80,0 | | | | | | | |
| | | Special copper alloys | > 300 HE | 2,1247 | Cu3e2F1 25 | 160 | 150,0 | 120,0 | 80,0 | | | | | | | |
| | | Short-chipping brass, bronze, red bronze | < 600 N/mm ² | 2,0360 | CuZn40 (Ms60) | 160 | 150,0 | 120,0 | 80,0 | | | | | | | |
| | | Long-chipping brass | < 600 N/mm ² | 2,0335 | CuZn36 (Ms63) | 160 | 150,0 | 120,0 | 80,0 | | | | | | | |
| | | Thermoplastics | | | Delrin, Hostalen | | | | | | | | | | | |
| | | Duroplastics | | | Ferrozelf, Bakelit | | | | | | | | | | | |
| | | Fibre-reinforced plastics | | | GFK* | | | | | | | | | | | |
| | | Magnesium and magnesium alloys | < 850 N/mm ² | 3,5200 | M2, MgMn2 | | | | | | | | | | | |
| | | Graphite | | | C8000, R8500X | | | | | | | | | | | |
| | | Tungsten and tungsten alloys | | | W-NiFe (Densimet W) | | | | | | | | | | | |
| | | Molybdenum and molybdenum alloys | | | Mo , Mo-50Re | | | | | | | | | | | |
| | | Aluminium alloys > 15% Si | < 400 N/mm ² | | G-AlSi17Cu4 | | | | | | | | | | | |
| | S | | Pure nickel | | 1,3911 | RNi24 | | | | | | | | | | |
| | | | Nickel alloys | | 1,3912 | Ni36 (Invar) | 55,000 | 45,000 | 40,000 | | | | | | | |
| | | | Nickel alloys | < 850 N/mm ² | 2,4360 | S-NiCu 30 Fe | 55,000 | 45,000 | 40,000 | | | | | | | |
| | | | Nickel-chromium alloys | | 2,4886 | SG-NiMo16Cr16W | 55,000 | 45,000 | 40,000 | | | | | | | |
| | | | Nickel alloys | < 1300 N/mm ² | 2,4632 | NiCr20Co18Ti | 55,000 | 45,000 | 40,000 | | | | | | | |
| | | Cobalt Chrome Alloys | < 1300 N/mm ² | 2,4634 | NiCo20Cr15, MoAlTi | 55,000 | 45,000 | 40,000 | | | | | | | | |
| | | Heat resistant alloys | < 1300 N/mm ² | | Hardox 400 | 55,000 | 45,000 | 40,000 | | | | | | | | |
| | | Nickel-cobalt-chromium alloys | < 1400 N/mm ² | 2,4806 | SG-NiCr20Nb, Inconel 82 | 55,000 | 45,000 | 40,000 | | | | | | | | |
| | | Pure titanium | < 900 N/mm ² | 3,7025 | Ti99,8 | | | | | | | | | | | |
| | | Titanium alloys | < 700 N/mm ² | 3,7114 | TI A15Sn2 | | | | | | | | | | | |
| | Titanium alloys | < 1200 N/mm ² | 3,7164 | TI A15V4 | | | | | | | | | | | | |

Drills Up to 30xD

| | | | | | | 15xD | | | | | | | |
|---------------------------|------------------------|--|-------------------------------|-----------------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|--|
| Type | ISO | Material | Strength (N/mm ²) | Material Number | Material designation | (Ø1 - Ø1.9) - Vc m/min | (Ø2 - Ø2.9) - Vc m/min | (Ø3 - Ø3.9) - Vc m/min | (Ø4 - Ø4.9) - Vc m/min | (Ø5 - Ø5.9) - Vc m/min | (Ø6 - Ø7.9) - Vc m/min | (Ø8 - Ø9.9) - Vc m/min | |
| 178 | P | General construction steel | < 800 N/mm ² | 1,0037 | St37-2 | 59 | 68 | 86 | 95 | 95 | 104 | 104 | |
| | | Free cutting steel | < 800 N/mm ² | 1,0719 | 9SMnPb28 | 59 | 68 | 86 | 95 | 95 | 104 | 104 | |
| | | Hardened steel, non alloyed | < 800 N/mm ² | 1,0401 | C15 | 59 | 68 | 86 | 95 | 95 | 104 | 104 | |
| | | Alloyed hardened steel | < 1000 N/mm ² | 1,7331 | 16MnCr5 (EC80) | 52 | 60 | 76 | 84 | 84 | 92 | 92 | |
| | | Tempering steel, unalloyed | < 850 N/mm ² | 1,0503 | C45 | 55 | 64 | 81 | 89 | 89 | 98 | 98 | |
| | | Tempering steel, unalloyed | < 1000 N/mm ² | 1,0601 | C60 | 52 | 60 | 76 | 84 | 84 | 92 | 92 | |
| | | Tempering steel, alloyed | < 800 N/mm ² | 1,5131 | 50MnS14 | 59 | 68 | 86 | 95 | 95 | 104 | 104 | |
| | | Tempering steel, alloyed | < 1300 N/mm ² | 1,5755 | 31 NiCr14 | | | | | | | | |
| | | Steel castings | < 850 N/mm ² | 0,9650 | G-X260Cr27 | 55 | 64 | 81 | 89 | 89 | 98 | 98 | |
| | | Nitriding steel | < 1000 N/mm ² | 1,8504 | 34CrA16 | 52 | 60 | 76 | 84 | 84 | 92 | 92 | |
| | | Nitriding steel | < 1200 N/mm ² | 1,8515 | 31CrV1o12 | | | | | | | | |
| | | Roller bearing steel | < 1200 N/mm ² | 1,3505 | 100Cr6 (W3) | | | | | | | | |
| | | Spring steel | < 1200 N/mm ² | 1,5026 | 55Si7 | | | | | | | | |
| | | High-speed steel | < 1300 N/mm ² | 1,3344 | S 6-5-3 | 49 | 56 | 71 | 79 | 79 | 86 | 86 | |
| | | Cold working tool steel | < 1300 N/mm ² | 1,2312 | 40CrMnMoS8 6 | | | | | | | | |
| | Hot working tool steel | < 1300 N/mm ² | 1,2343 | X38CrMoV 51 | | | | | | | | | |
| | M | Cast steel and sulphured stainless steel | < 850 N/mm ² | 1,4305 | X8CrNiS18 9 | | | | | | | | |
| | | Stainless steel, ferritic | < 750 N/mm ² | 1,4510 | X3CrTi17 | 33 | 38 | 48 | 53 | 53 | 58 | 58 | |
| | | Stainless steel, martensitic | < 900 N/mm ² | 1,4034 | X46Cr13 | | | | | | | | |
| | | Stainless steel, ferritic / martensitic | < 1100 N/mm ² | 1,4313 | X3CrNi113.4 | | | | | | | | |
| | | Stainless steel, austenitic / ferritic | < 850 N/mm ² | 1,4460 | X8CrNiMo27 5 | | | | | | | | |
| | | Stainless steel, austenitic | < 750 N/mm ² | 1,4301 | X5CrNi18-10 | 33 | 38 | 48 | 53 | 53 | 58 | 58 | |
| | M | Heat resistant steel | < 1100 N/mm ² | 1,4747 | X80CrNiS120 | | | | | | | | |
| | K | Grey cast iron with lamellar graphite | 100-350 N/mm ² | 0,6010 | GG10 | 59 | 68 | 86 | 95 | 95 | 104 | 104 | |
| | | Grey cast iron with lamellar graphite | 300-1000 N/mm ² | 0,6030 | GG30 | 59 | 68 | 86 | 95 | 95 | 104 | 104 | |
| | | Gray cast iron with spheroidal graphite | 300-500 N/mm ² | 0,7040 | GGG40 | 46 | 53 | 67 | 74 | 74 | 81 | 81 | |
| | | Gray cast iron with spheroidal graphite | 550-800 N/mm ² | 0,7060 | GGG60 | 46 | 53 | 67 | 74 | 74 | 81 | 81 | |
| | | White malleable cast iron | 350-450 N/mm ² | 0,8035 | GTW35 | | | | | | | | |
| White malleable cast iron | | 500-650 N/mm ² | 0,8055 | GTW55 | | | | | | | | | |
| Black malleable cast iron | | 350-450 N/mm ² | 0,8135 | GTS35 | | | | | | | | | |
| Black malleable cast iron | | 500-700 N/mm ² | 0,8155 | GTS55 | | | | | | | | | |

| Ø10 - Ø12 - Vc m/min | 20xD | | | | | | | | 25xD | | | | | | | | 30xD | | | | | | | |
|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| | Ø1 - Ø1.9 - Vc m/min | Ø2 - Ø2.9 - Vc m/min | Ø3 - Ø3.9 - Vc m/min | Ø4 - Ø4.9 - Vc m/min | Ø5 - Ø5.9 - Vc m/min | Ø6 - Ø7.9 - Vc m/min | Ø8 - Ø9.9 - Vc m/min | Ø10 - Ø12 - Vc m/min | Ø1 - Ø1.9 - Vc m/min | Ø2 - Ø2.9 - Vc m/min | Ø3 - Ø3.9 - Vc m/min | Ø4 - Ø4.9 - Vc m/min | Ø5 - Ø5.9 - Vc m/min | Ø6 - Ø7.9 - Vc m/min | Ø8 - Ø9.9 - Vc m/min | Ø10 - Ø12 - Vc m/min | Ø1 - Ø1.9 - Vc m/min | Ø2 - Ø2.9 - Vc m/min | Ø3 - Ø3.9 - Vc m/min | Ø4 - Ø4.9 - Vc m/min | Ø5 - Ø5.9 - Vc m/min | Ø6 - Ø7.9 - Vc m/min | Ø8 - Ø9.9 - Vc m/min | Ø10 - Ø12 - Vc m/min |
| 104 | | 63 | 81 | 90 | 90 | 99 | 99 | 99 | | | 77 | 86 | 86 | 95 | 95 | 95 | | 54 | 72 | 81 | 81 | 90 | 90 | |
| 104 | | 63 | 81 | 90 | 90 | 99 | 99 | 99 | | | 77 | 86 | 86 | 95 | 95 | 95 | | 54 | 72 | 81 | 81 | 90 | 90 | |
| 104 | | 63 | 81 | 90 | 90 | 99 | 99 | 99 | | | 77 | 86 | 86 | 95 | 95 | 95 | | 54 | 72 | 81 | 81 | 90 | 90 | |
| 92 | | 56 | 72 | 80 | 80 | 80 | 88 | 88 | | | 68 | 76 | 76 | 84 | 84 | 84 | | 48 | 64 | 72 | 72 | 80 | 80 | |
| 98 | | 60 | 77 | 85 | 85 | 94 | 94 | 94 | | | 72 | 81 | 81 | 89 | 89 | 89 | | 51 | 68 | 77 | 77 | 85 | 85 | |
| 92 | | 56 | 72 | 80 | 80 | 80 | 88 | 88 | | | 68 | 76 | 76 | 84 | 84 | 84 | | 48 | 64 | 72 | 72 | 80 | 80 | |
| 104 | | 63 | 81 | 90 | 90 | 99 | 99 | 99 | | | 77 | 86 | 86 | 95 | 95 | 95 | | 54 | 72 | 81 | 81 | 90 | 90 | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| 98 | | 60 | 77 | 85 | 85 | 94 | 94 | 94 | | | 72 | 81 | 81 | 89 | 89 | 89 | | 51 | 68 | 77 | 77 | 85 | 85 | |
| 92 | | 56 | 72 | 80 | 80 | 80 | 88 | 88 | | | 68 | 76 | 76 | 84 | 84 | 84 | | 48 | 64 | 72 | 72 | 80 | 80 | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| 86 | | 53 | 68 | 75 | 75 | 83 | 83 | 83 | | | 64 | 71 | 71 | 79 | 79 | 79 | | 45 | 60 | 68 | 68 | 75 | 75 | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
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| 58 | | 35 | 45 | 50 | 50 | 55 | 55 | 55 | | | 43 | 48 | 48 | 53 | 53 | 53 | | 30 | 40 | 45 | 45 | 50 | 50 | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
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| 58 | | 35 | 45 | 50 | 50 | 55 | 55 | 55 | | | 43 | 48 | 48 | 53 | 53 | 53 | | 30 | 40 | 45 | 45 | 50 | 50 | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| 104 | | 63 | 81 | 90 | 90 | 99 | 99 | 99 | | | 77 | 86 | 86 | 95 | 95 | 95 | | 54 | 72 | 81 | 81 | 90 | 90 | |
| 104 | | 63 | 81 | 90 | 90 | 99 | 99 | 99 | | | 77 | 86 | 86 | 95 | 95 | 95 | | 54 | 72 | 81 | 81 | 90 | 90 | |
| 81 | | 49 | 63 | 70 | 70 | 77 | 77 | 77 | | | 60 | 67 | 67 | 74 | 74 | 74 | | 42 | 56 | 63 | 63 | 70 | 70 | |
| 81 | | 49 | 63 | 70 | 70 | 77 | 77 | 77 | | | 60 | 67 | 67 | 74 | 74 | 74 | | 42 | 56 | 63 | 63 | 70 | 70 | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |

Drills Up to 30xD

| Type | ISO | Material | Strength (N/mm ²) | Material Number | Material designation | ø 1 - ø 1,9 | | | | ø 2 - ø 2,9 | | |
|---------------------------|------------------------|--|-------------------------------|-----------------|----------------------|-------------|--------|--------|--------|-------------|--------|--------|
| | | | | | | 15xD | 20xD | 25xD | 30xD | 15xD | 20xD | 25xD |
| | | | | | | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U |
| 178 | P | General construction steel | < 800 N/mm ² | 1.0037 | St37-2 | 0,017 | | | | 0,050 | 0,050 | |
| | | Free cutting steel | < 800 N/mm ² | 1.0719 | 9SMnPb28 | 0,017 | | | | 0,050 | 0,050 | |
| | | Hardened steel, non alloyed | < 800 N/mm ² | 1.0401 | C15 | 0,017 | | | | 0,050 | 0,050 | |
| | | Alloyed hardened steel | < 1000 N/mm ² | 1.7331 | 16MnCr5 (EC80) | 0,015 | | | | 0,045 | 0,045 | |
| | | Tempering steel, unalloyed | < 850 N/mm ² | 1.0503 | C45 | 0,016 | | | | 0,047 | 0,047 | |
| | | Tempering steel, unalloyed | < 1000 N/mm ² | 1.0601 | C60 | 0,015 | | | | 0,045 | 0,045 | |
| | | Tempering steel, alloyed | < 800 N/mm ² | 1.5131 | 50MnS14 | 0,017 | | | | 0,050 | 0,050 | |
| | | Tempering steel, alloyed | < 1300 N/mm ² | 1.5755 | 31 NiCr14 | | | | | | | |
| | | Steel castings | < 850 N/mm ² | 0.9650 | G-X260Cr27 | 0,016 | | | | 0,047 | 0,047 | |
| | | Nitriding steel | < 1000 N/mm ² | 1.8504 | 34CrA16 | 0,015 | | | | 0,045 | 0,045 | |
| | | Nitriding steel | < 1200 N/mm ² | 1.8515 | 31CrV1o12 | | | | | | | |
| | | Roller bearing steel | < 1200 N/mm ² | 1.3505 | 100Cr6 (W3) | | | | | | | |
| | | Spring steel | < 1200 N/mm ² | 1.5026 | 55Si7 | | | | | | | |
| | | High-speed steel | < 1300 N/mm ² | 1.3344 | S 6-5-3 | 0,015 | | | | 0,045 | 0,045 | |
| | | Cold working tool steel | < 1300 N/mm ² | 1.2312 | 40CrMnMoS8 6 | | | | | | | |
| | Hot working tool steel | < 1300 N/mm ² | 1.2343 | X38CrMoV 51 | | | | | | | | |
| | M | Cast steel and sulphured stainless steel | < 850 N/mm ² | 1.4305 | X8CrNiS18 9 | | | | | | | |
| | | Stainless steel, ferritic | < 750 N/mm ² | 1.4510 | X3CrTi17 | 0,010 | | | | 0,025 | 0,025 | |
| | | Stainless steel, martensitic | < 900 N/mm ² | 1.4034 | X46Cr13 | | | | | | | |
| | | Stainless steel, ferritic / martensitic | <1100 N/mm ² | 1.4313 | X3CrNi113.4 | | | | | | | |
| | | Stainless steel, austenitic / ferritic | < 850 N/mm ² | 1.4460 | X8CrNiMo27 5 | | | | | | | |
| | | Stainless steel, austenitic | < 750 N/mm ² | 1.4301 | X5CrNi18-10 | 0,010 | | | | 0,025 | 0,025 | |
| | M | Heat resistant steel | < 1100 N/mm ² | 1.4747 | X80CrNiS120 | | | | | | | |
| | K | Grey cast iron with lamellar graphite | 100-350 N/mm ² | 0.6010 | GG10 | 0,017 | | | | 0,050 | 0,050 | |
| | | Grey cast iron with lamellar graphite | 300-1000 N/mm ² | 0.6030 | GG30 | 0,017 | | | | 0,050 | 0,050 | |
| | | Gray cast iron with spheroidal graphite | 300-500 N/mm ² | 0.7040 | GGG40 | 0,013 | | | | 0,035 | 0,035 | |
| | | Gray cast iron with spheroidal graphite | 550-800 N/mm ² | 0.7060 | GGG60 | 0,013 | | | | 0,035 | 0,035 | |
| | | White malleable cast iron | 350-450 N/mm ² | 0.8035 | GTW35 | | | | | | | |
| White malleable cast iron | | 500-650 N/mm ² | 0.8055 | GTW55 | | | | | | | | |
| Black malleable cast iron | | 350-450 N/mm ² | 0.8135 | GTS35 | | | | | | | | |
| Black malleable cast iron | | 500-700 N/mm ² | 0.8155 | GTS55 | | | | | | | | |

| | ø 3 - ø 3,9 | | | | ø 4 - ø 4,9 | | | | ø 5 - ø 5,9 | | | | ø 6 - ø 7,9 | | | | ø 8 - ø 9,9 | | | | ø 10 - ø 12 | | | |
|--------|-------------|--------|--------|--------|-------------|--------|--------|--------|-------------|--------|--------|--------|-------------|--------|--------|--------|-------------|--------|--------|--------|-------------|--------|--------|--------|
| 30xD | 15xD | 20xD | 25xD | 30xD | 15xD | 20xD | 25xD | 30xD | 15xD | 20xD | 25xD | 30xD | 15xD | 20xD | 25xD | 30xD | 15xD | 20xD | 25xD | 30xD | 15xD | 20xD | 25xD | 30xD |
| mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U | mm / U |
| 0,050 | 0,120 | 0,120 | 0,120 | | 0,160 | 0,160 | 0,160 | 0,160 | 0,190 | 0,190 | 0,160 | 0,160 | 0,220 | 0,220 | 0,220 | 0,220 | 0,280 | 0,280 | 0,280 | 0,280 | 0,350 | 0,350 | 0,350 | 0,350 |
| 0,050 | 0,120 | 0,120 | 0,120 | | 0,160 | 0,160 | 0,160 | 0,160 | 0,190 | 0,190 | 0,160 | 0,160 | 0,220 | 0,220 | 0,220 | 0,220 | 0,280 | 0,280 | 0,280 | 0,280 | 0,350 | 0,350 | 0,350 | 0,350 |
| 0,050 | 0,120 | 0,120 | 0,120 | | 0,160 | 0,160 | 0,160 | 0,160 | 0,190 | 0,190 | 0,160 | 0,160 | 0,220 | 0,220 | 0,220 | 0,220 | 0,280 | 0,280 | 0,280 | 0,280 | 0,350 | 0,350 | 0,350 | 0,350 |
| 0,045 | 0,110 | 0,110 | 0,110 | | 0,140 | 0,140 | 0,140 | 0,140 | 0,170 | 0,170 | 0,140 | 0,140 | 0,200 | 0,200 | 0,200 | 0,200 | 0,250 | 0,250 | 0,250 | 0,250 | 0,320 | 0,320 | 0,320 | 0,320 |
| 0,047 | 0,110 | 0,110 | 0,110 | | 0,150 | 0,150 | 0,150 | 0,150 | 0,180 | 0,180 | 0,150 | 0,150 | 0,210 | 0,210 | 0,210 | 0,210 | 0,260 | 0,260 | 0,260 | 0,260 | 0,330 | 0,330 | 0,330 | 0,330 |
| 0,045 | 0,110 | 0,110 | 0,110 | | 0,140 | 0,140 | 0,140 | 0,140 | 0,170 | 0,170 | 0,140 | 0,140 | 0,200 | 0,200 | 0,200 | 0,200 | 0,250 | 0,250 | 0,250 | 0,250 | 0,320 | 0,320 | 0,320 | 0,320 |
| 0,050 | 0,120 | 0,120 | 0,120 | | 0,160 | 0,160 | 0,160 | 0,160 | 0,190 | 0,190 | 0,160 | 0,160 | 0,220 | 0,220 | 0,220 | 0,220 | 0,280 | 0,280 | 0,280 | 0,280 | 0,350 | 0,350 | 0,350 | 0,350 |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| 0,047 | 0,110 | 0,110 | 0,110 | | 0,150 | 0,150 | 0,150 | 0,150 | 0,180 | 0,180 | 0,150 | 0,150 | 0,210 | 0,210 | 0,210 | 0,210 | 0,260 | 0,260 | 0,260 | 0,260 | 0,330 | 0,330 | 0,330 | 0,330 |
| 0,045 | 0,110 | 0,110 | 0,110 | | 0,140 | 0,140 | 0,140 | 0,140 | 0,170 | 0,170 | 0,140 | 0,140 | 0,200 | 0,200 | 0,200 | 0,200 | 0,250 | 0,250 | 0,250 | 0,250 | 0,320 | 0,320 | 0,320 | 0,320 |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| 0,045 | 0,110 | 0,110 | 0,110 | | 0,140 | 0,140 | 0,140 | 0,140 | 0,140 | 0,140 | 0,140 | 0,140 | 0,200 | 0,200 | 0,200 | 0,200 | 0,250 | 0,250 | 0,250 | 0,250 | 0,320 | 0,320 | 0,320 | 0,320 |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| 0,025 | 0,050 | 0,050 | 0,050 | | 0,080 | 0,080 | 0,080 | 0,080 | 0,080 | 0,080 | 0,080 | 0,080 | 0,120 | 0,120 | 0,120 | 0,120 | 0,150 | 0,150 | 0,150 | 0,150 | 0,180 | 0,180 | 0,180 | 0,180 |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| 0,025 | 0,050 | 0,050 | 0,050 | | 0,080 | 0,080 | 0,080 | 0,080 | 0,080 | 0,080 | 0,080 | 0,080 | 0,120 | 0,120 | 0,120 | 0,120 | 0,150 | 0,150 | 0,150 | 0,150 | 0,180 | 0,180 | 0,180 | 0,180 |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| 0,050 | 0,120 | 0,120 | 0,120 | | 0,160 | 0,160 | 0,160 | 0,160 | 0,160 | 0,160 | 0,160 | 0,160 | 0,220 | 0,220 | 0,220 | 0,220 | 0,280 | 0,280 | 0,280 | 0,280 | 0,350 | 0,350 | 0,350 | 0,350 |
| 0,050 | 0,120 | 0,120 | 0,120 | | 0,160 | 0,160 | 0,160 | 0,160 | 0,160 | 0,160 | 0,160 | 0,160 | 0,220 | 0,220 | 0,220 | 0,220 | 0,280 | 0,280 | 0,280 | 0,280 | 0,350 | 0,350 | 0,350 | 0,350 |
| 0,035 | 0,100 | 0,100 | 0,100 | | 0,130 | 0,130 | 0,130 | 0,130 | 0,130 | 0,130 | 0,130 | 0,130 | 0,180 | 0,180 | 0,180 | 0,180 | 0,220 | 0,220 | 0,220 | 0,220 | 0,280 | 0,280 | 0,280 | 0,280 |
| 0,035 | 0,100 | 0,100 | 0,100 | | 0,130 | 0,130 | 0,130 | 0,130 | 0,130 | 0,130 | 0,130 | 0,130 | 0,180 | 0,180 | 0,180 | 0,180 | 0,220 | 0,220 | 0,220 | 0,220 | 0,280 | 0,280 | 0,280 | 0,280 |
| | | | | | | | | | | | | | | | | | | | | | | | | |
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