

**powerMILL**

**GÜHRING**

UNIVERSAL MILLING CUTTER PROGRAMME

Unique in  
**PRICE AND EFFICIENCY**



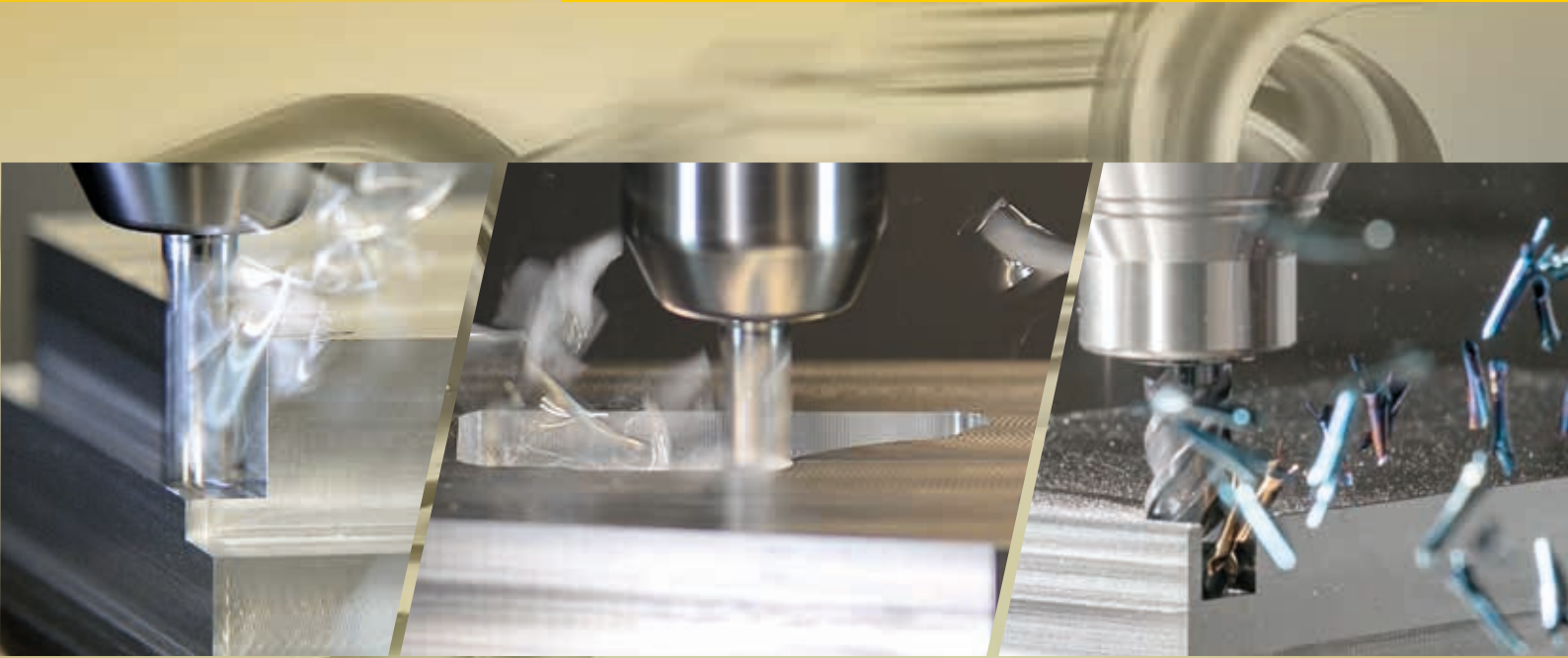
PM07

# **powerMILL**

With the **POWERMILL PROGRAMME** Guhring introduces a complete range of universal milling cutters onto the market that promises optimal performance as an all-rounder at first class prices



Unique in  
**PRICE AND EFFICIENCY**



## Unique in ***PRICE AND EFFICIENCY***

Face cutting geometries of Guhring's established milling cutters were optimised to achieve high metal removal rates and longer tool life when universal milling. Alongside this face cutting correction various milling cutters of the **POWERMILL PROGRAMME** received Guhring's well proven Fire-coating.

Own developed geometries  
for maximum performance!

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Highly-precision ground on  
specially developed machines!

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Best fine grain carbide as tool  
material!

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A complete all-round programme  
with universal material suitability

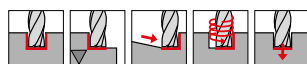
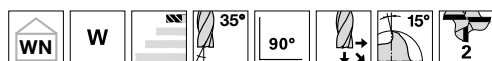
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# ***power*MILL**

| P                         | M | K | N | S | H | Tool illustration | Z | Feed | Shank form | Length | Tool material | Surface | d1/mm          | Article no. | Cutting data page | Page |
|---------------------------|---|---|---|---|---|-------------------|---|------|------------|--------|---------------|---------|----------------|-------------|-------------------|------|
| Al slot drills (2-fluted) |   |   |   |   |   |                   |   |      |            |        |               |         |                |             |                   |      |
|                           |   |   |   |   |   |                   | 2 |      | HA         |        | VHM           |         | 2.000 - 20.000 | 19994       | 32                | 6    |
|                           |   |   |   |   |   |                   | 2 |      | HB         |        | VHM           |         | 2.000 - 20.000 | 19995       | 32                | 6    |
|                           |   |   |   |   |   |                   | 2 |      | HA         |        | VHM           |         | 2.000 - 20.000 | 19996       | 32                | 7    |
|                           |   |   |   |   |   |                   | 2 |      | HB         |        | VHM           |         | 2.000 - 20.000 | 19997       | 32                | 7    |
| Slot drills (3-fluted)    |   |   |   |   |   |                   |   |      |            |        |               |         |                |             |                   |      |
|                           |   |   |   |   |   |                   | 3 |      | HA         |        | VHM           |         | 2.000 - 20.000 | 19992       | 32                | 8    |
|                           |   |   |   |   |   |                   | 3 |      | HB         |        | VHM           |         | 2.000 - 20.000 | 19993       | 32                | 8    |
| Slot drills (2-fluted)    |   |   |   |   |   |                   |   |      |            |        |               |         |                |             |                   |      |
|                           |   |   |   |   |   |                   | 2 |      | HA         |        | VHM           |         | 2.000 - 20.000 | 19988       | 32                | 9    |
|                           |   |   |   |   |   |                   | 2 |      | HB         |        | VHM           |         | 2.000 - 20.000 | 19989       | 32                | 9    |
|                           |   |   |   |   |   |                   | 2 |      | Cyl        |        | VHM           |         | 2.000 - 20.000 | 19962       | 32                | 10   |
|                           |   |   |   |   |   |                   | 2 |      | HA         |        | VHM           |         | 3.000 - 20.000 | 19990       | 32                | 11   |
|                           |   |   |   |   |   |                   | 2 |      | HB         |        | VHM           |         | 3.000 - 20.000 | 19991       | 32                | 11   |
| Slot drills (3-fluted)    |   |   |   |   |   |                   |   |      |            |        |               |         |                |             |                   |      |
|                           |   |   |   |   |   |                   | 3 |      | HA         |        | VHM           |         | 2.000 - 20.000 | 19986       | 32                | 12   |
|                           |   |   |   |   |   |                   | 3 |      | HB         |        | VHM           |         | 2.000 - 20.000 | 19987       | 32                | 12   |
|                           |   |   |   |   |   |                   | 3 |      | HA         |        | VHM           |         | 2.000 - 20.000 | 19982       | 32                | 13   |
|                           |   |   |   |   |   |                   | 3 |      | HB         |        | VHM           |         | 2.000 - 20.000 | 19983       | 32                | 13   |
|                           |   |   |   |   |   |                   | 3 |      | Cyl        |        | VHM           |         | 2.000 - 20.000 | 19963       | 32                | 14   |
|                           |   |   |   |   |   |                   | 3 |      | HA         |        | VHM           |         | 3.000 - 20.000 | 19984       | 32                | 15   |
|                           |   |   |   |   |   |                   | 3 |      | HB         |        | VHM           |         | 3.000 - 20.000 | 19985       | 32                | 15   |
| HPC end mills (4-fluted)  |   |   |   |   |   |                   |   |      |            |        |               |         |                |             |                   |      |
|                           |   |   |   |   |   |                   | 4 |      | HA         |        | VHM           |         | 3.000 - 20.000 | 19980       | 32                | 16   |
|                           |   |   |   |   |   |                   | 4 |      | HB         |        | VHM           |         | 3.000 - 20.000 | 19981       | 32                | 16   |
|                           |   |   |   |   |   |                   | 4 |      | HA         |        | VHM           |         | 3.000 - 20.000 | 19940       | 32                | 17   |

| P                                  | M | K | N | S | H | Tool illustration | Z | Feed | Shank form | Length | Tool material | Surface | d1/mm          | Article no. | Cutting data page | Page |
|------------------------------------|---|---|---|---|---|-------------------|---|------|------------|--------|---------------|---------|----------------|-------------|-------------------|------|
| HPC end mills (4-fluted)           |   |   |   |   |   |                   |   |      |            |        |               |         |                |             |                   |      |
| •                                  | • | • | • | • | • |                   |   |      | HB         |        | VHM           | F       | 3.000 - 20.000 | 19941       | 32                | 17   |
| •                                  | • | • | • | • | • |                   |   |      | -HA        |        | VHM           | P       | 3.000 - 20.000 | 19950       | 32                | 18   |
| •                                  | • | • | • | • | • |                   |   |      | -HA        |        | VHM           | P       | 3.000 - 20.000 | 19951       | 32                | 19   |
| End mills (4-fluted)               |   |   |   |   |   |                   |   |      |            |        |               |         |                |             |                   |      |
| •                                  | • | • | • | • | • |                   |   |      | HA         |        | VHM           | F       | 2.000 - 20.000 | 19978       | 32                | 21   |
| •                                  | • | • | • | • | • |                   |   |      | HB         |        | VHM           | F       | 2.000 - 20.000 | 19979       | 32                | 21   |
| •                                  | • | • | • | • | • |                   |   |      | Cyl        |        | VHM           | A       | 2.000 - 20.000 | 19961       | 32                | 22   |
| •                                  | • | • | • | • | • |                   |   |      | HA         |        | VHM           | F       | 3.000 - 20.000 | 19976       | 32                | 23   |
| •                                  | • | • | • | • | • |                   |   |      | HB         |        | VHM           | F       | 3.000 - 20.000 | 19977       | 32                | 23   |
| Multi-tooth end mills (6-fluted)   |   |   |   |   |   |                   |   |      |            |        |               |         |                |             |                   |      |
| •                                  | • | • | • | • | • |                   |   |      | HA         |        | VHM           | F       | 3.000 - 20.000 | 19972       | 32                | 24   |
| •                                  | • | • | • | • | • |                   |   |      | HB         |        | VHM           | F       | 3.000 - 20.000 | 19973       | 32                | 24   |
| •                                  | • | • | • | • | • |                   |   |      | HA         |        | VHM           | F       | 4.000 - 20.000 | 19974       | 32                | 25   |
| •                                  | • | • | • | • | • |                   |   |      | HB         |        | VHM           | F       | 4.000 - 20.000 | 19975       | 32                | 25   |
| Ball nose slot drills (2-fluted)   |   |   |   |   |   |                   |   |      |            |        |               |         |                |             |                   |      |
| •                                  | • | • | • | • | • |                   |   |      | HA         |        | VHM           | F       | 2.000 - 20.000 | 19968       | 32                | 26   |
| •                                  | • | • | • | • | • |                   |   |      | HB         |        | VHM           | F       | 2.000 - 20.000 | 19969       | 32                | 26   |
| •                                  | • | • | • | • | • |                   |   |      | HA         |        | VHM           | F       | 3.000 - 12.000 | 19970       | 32                | 27   |
| •                                  | • | • | • | • | • |                   |   |      | HB         |        | VHM           | F       | 3.000 - 12.000 | 19971       | 32                | 27   |
| Roughing end mills with fine teeth |   |   |   |   |   |                   |   |      |            |        |               |         |                |             |                   |      |
| •                                  | • | • | • | • | • |                   |   |      | HA         |        | VHM           | F       | 4.000 - 20.000 | 19964       | 32                | 28   |
| •                                  | • | • | • | • | • |                   |   |      | HB         |        | VHM           | F       | 4.000 - 20.000 | 19965       | 32                | 28   |
| •                                  | • | • | • | • | • |                   |   |      | HA         |        | VHM           | F       | 5.000 - 25.000 | 19966       | 32                | 29   |
| •                                  | • | • | • | • | • |                   |   |      | HB         |        | VHM           | F       | 5.000 - 25.000 | 19967       | 32                | 29   |

# Al slot drills (2-fluted)



|   |   |
|---|---|
| P |   |
| M |   |
| K |   |
| N | • |
| S |   |
| H |   |

## GÜHRING NAVIGATOR

Cutting data page 32

- centre cutting
- with special drill face

Tool material

Solid carbide

Surface

○

○

Type

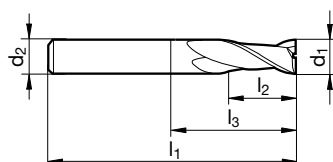
W

W

Shank form

HA

HB



Article no.

19994

19995

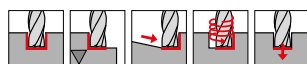
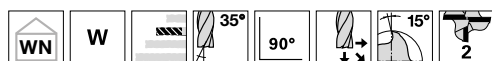
Discount group

206

206

| d1 e8  | d2 h6  | l1     | l2     | l3     | Z | Code no. | Availability |
|--------|--------|--------|--------|--------|---|----------|--------------|
| mm     | mm     | mm     | mm     | mm     |   |          |              |
| 2.000  | 4.000  | 40.000 | 3.000  | 6.400  | 2 | 2.000    | ●            |
| 3.000  | 4.000  | 40.000 | 4.000  | 8.900  | 2 | 3.000    | ●            |
| 4.000  | 6.000  | 50.000 | 5.000  | 10.400 | 2 | 4.000    | ● ●          |
| 5.000  | 6.000  | 50.000 | 6.000  | 12.900 | 2 | 5.000    | ● ●          |
| 6.000  | 6.000  | 50.000 | 7.000  | 14.000 | 2 | 6.000    | ● ●          |
| 8.000  | 8.000  | 58.000 | 9.000  | 22.000 | 2 | 8.000    | ● ●          |
| 10.000 | 10.000 | 66.000 | 11.000 | 26.000 | 2 | 10.000   | ● ●          |
| 12.000 | 12.000 | 73.000 | 12.000 | 28.000 | 2 | 12.000   | ● ●          |
| 14.000 | 14.000 | 75.000 | 14.000 | 30.000 | 2 | 14.000   | ● ●          |
| 16.000 | 16.000 | 82.000 | 16.000 | 34.000 | 2 | 16.000   | ● ●          |
| 18.000 | 18.000 | 84.000 | 18.000 | 36.000 | 2 | 18.000   | ● ●          |
| 20.000 | 20.000 | 92.000 | 20.000 | 42.000 | 2 | 20.000   | ● ●          |

## Al slot drills (2-fluted)



|   |   |
|---|---|
| P |   |
| M |   |
| K |   |
| N | • |
| S |   |
| H |   |

**GÜHRING** NAVIGATOR

Cutting data page 32

- centre cutting
- with special drill face

Tool material

Solid carbide

Surface

○

○

Type

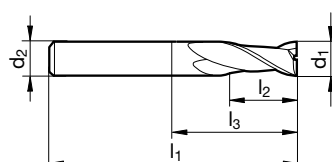
W

W

Shank form

HA

HB



Article no.

19996

19997

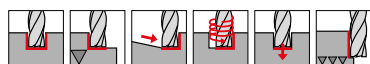
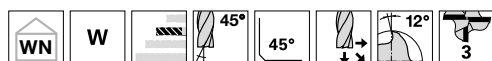
Discount group

206

206

| d1 e8  | d2 h6  | l1      | l2     | l3     | Z | Code no. | Availability |
|--------|--------|---------|--------|--------|---|----------|--------------|
| mm     | mm     | mm      | mm     | mm     |   |          |              |
| 2.000  | 4.000  | 40.000  | 7.000  | 10.400 | 2 | 2.000    | ●            |
| 3.000  | 4.000  | 50.000  | 9.000  | 13.900 | 2 | 3.000    | ●            |
| 4.000  | 6.000  | 57.000  | 11.000 | 16.400 | 2 | 4.000    | ● ●          |
| 5.000  | 6.000  | 57.000  | 13.000 | 19.900 | 2 | 5.000    | ● ●          |
| 6.000  | 6.000  | 57.000  | 13.000 | 21.000 | 2 | 6.000    | ● ●          |
| 8.000  | 8.000  | 63.000  | 19.000 | 28.000 | 2 | 8.000    | ● ●          |
| 10.000 | 10.000 | 72.000  | 22.000 | 33.000 | 2 | 10.000   | ● ●          |
| 12.000 | 12.000 | 83.000  | 26.000 | 40.000 | 2 | 12.000   | ● ●          |
| 14.000 | 14.000 | 83.000  | 26.000 | 41.000 | 2 | 14.000   | ● ●          |
| 16.000 | 16.000 | 92.000  | 32.000 | 49.000 | 2 | 16.000   | ● ●          |
| 18.000 | 18.000 | 92.000  | 32.000 | 50.000 | 2 | 18.000   | ● ●          |
| 20.000 | 20.000 | 104.000 | 38.000 | 58.000 | 2 | 20.000   | ● ●          |

## Slot drills (3-fluted)



|   |   |
|---|---|
| P |   |
| M | ○ |
| K |   |
| N | ● |
| S | ○ |
| H |   |

**GÜHRING** NAVIGATOR

Cutting data page 32

- high-performance slot drill with a quick helix for an especially smooth cutting operation
- centre cutting
- with special drill face

Tool material

Solid carbide

Surface

○

○

Type

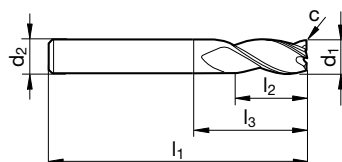
W

W

Shank form

HA

HB



Article no.

19992

19993

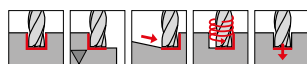
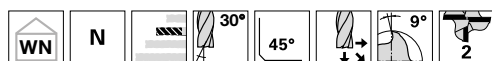
Discount group

206

206

| d1 e8  | d2 h6  | l1      | l2     | l3     | c        | Z | Code no. | Availability |
|--------|--------|---------|--------|--------|----------|---|----------|--------------|
| mm     | mm     | mm      | mm     | mm     | mm x 45° |   |          |              |
| 2.000  | 4.000  | 50.000  | 6.000  | 8.900  | 0.030    | 3 | 2.000    | ●            |
| 3.000  | 6.000  | 57.000  | 8.000  | 11.900 | 0.050    | 3 | 3.000    | ● ●          |
| 4.000  | 6.000  | 57.000  | 11.000 | 14.900 | 0.060    | 3 | 4.000    | ● ●          |
| 5.000  | 6.000  | 57.000  | 13.000 | 18.400 | 0.080    | 3 | 5.000    | ● ●          |
| 6.000  | 6.000  | 57.000  | 13.000 | 21.000 | 0.090    | 3 | 6.000    | ● ●          |
| 8.000  | 8.000  | 63.000  | 19.000 | 27.000 | 0.120    | 3 | 8.000    | ● ●          |
| 10.000 | 10.000 | 72.000  | 22.000 | 32.000 | 0.150    | 3 | 10.000   | ● ●          |
| 12.000 | 12.000 | 83.000  | 26.000 | 38.000 | 0.180    | 3 | 12.000   | ● ●          |
| 14.000 | 14.000 | 83.000  | 26.000 | 38.000 | 0.210    | 3 | 14.000   | ● ●          |
| 16.000 | 16.000 | 92.000  | 32.000 | 44.000 | 0.190    | 3 | 16.000   | ● ●          |
| 20.000 | 20.000 | 104.000 | 38.000 | 54.000 | 0.240    | 3 | 20.000   | ● ●          |

## Slot drills (2-fluted)

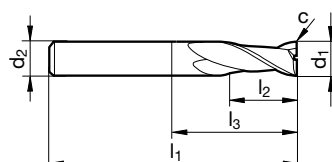


|   |   |                                                                                                       |
|---|---|-------------------------------------------------------------------------------------------------------|
| P | • | <b>GÜHRING</b> NAVIGATOR                                                                              |
| M | • |                                                                                                       |
| K | • |                                                                                                       |
| N | ○ |                                                                                                       |
| S | • |                                                                                                       |
| H |   | <ul style="list-style-type: none"> <li>• centre cutting</li> <li>• with special drill face</li> </ul> |

Cutting data page 32

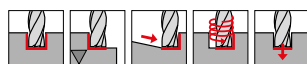
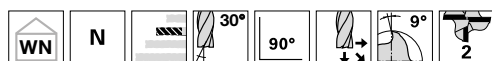
Tool material **Solid carbide**

|            |          |          |
|------------|----------|----------|
| Surface    | <b>F</b> | <b>F</b> |
| Type       | N        | N        |
| Shank form | HA       | HB       |



| Article no.    |        |         |        |        |          |   |          | 19988        | 19989 |
|----------------|--------|---------|--------|--------|----------|---|----------|--------------|-------|
| Discount group |        |         |        |        |          |   |          | 206          | 206   |
| d1 e8          | d2 h6  | l1      | l2     | l3     | c        | Z | Code no. | Availability |       |
| mm             | mm     | mm      | mm     | mm     | mm x 45° |   |          |              |       |
| 2.000          | 4.000  | 40.000  | 6.000  | 9.000  | 0.020    | 2 | 2.000    | •            |       |
| 3.000          | 4.000  | 50.000  | 8.000  | 12.500 | 0.030    | 2 | 3.000    | •            |       |
| 4.000          | 6.000  | 50.000  | 11.000 | 16.400 | 0.040    | 2 | 4.000    | •            | •     |
| 5.000          | 6.000  | 50.000  | 13.000 | 19.900 | 0.050    | 2 | 5.000    | •            | •     |
| 6.000          | 6.000  | 50.000  | 13.000 | 20.000 | 0.060    | 2 | 6.000    | •            | •     |
| 7.000          | 8.000  | 60.000  | 16.000 | 23.000 | 0.070    | 2 | 7.000    | •            | •     |
| 8.000          | 8.000  | 60.000  | 19.000 | 27.000 | 0.080    | 2 | 8.000    | •            | •     |
| 9.000          | 10.000 | 70.000  | 19.000 | 29.000 | 0.090    | 2 | 9.000    | •            | •     |
| 10.000         | 10.000 | 70.000  | 22.000 | 30.000 | 0.100    | 2 | 10.000   | •            | •     |
| 11.000         | 12.000 | 75.000  | 22.000 | 29.000 | 0.110    | 2 | 11.000   | •            | •     |
| 12.000         | 12.000 | 75.000  | 26.000 | 39.000 | 0.120    | 2 | 12.000   | •            | •     |
| 14.000         | 14.000 | 75.000  | 26.000 | 40.000 | 0.140    | 2 | 14.000   | •            | •     |
| 16.000         | 16.000 | 75.000  | 26.000 | 43.000 | 0.160    | 2 | 16.000   | •            | •     |
| 18.000         | 18.000 | 100.000 | 32.000 | 52.000 | 0.180    | 2 | 18.000   | •            | •     |
| 20.000         | 20.000 | 100.000 | 32.000 | 50.000 | 0.200    | 2 | 20.000   | •            | •     |

## Slot drills (2-fluted)

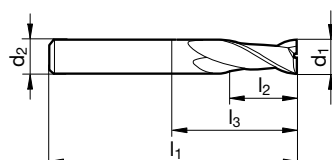


|                  |   |                                                  |
|------------------|---|--------------------------------------------------|
| P                | • | <b>GÜHRING NAVIGATOR</b><br>Cutting data page 32 |
| M                | • |                                                  |
| K                | • |                                                  |
| N                | ○ |                                                  |
| S                | • |                                                  |
| H                |   |                                                  |
| • centre cutting |   |                                                  |

Tool material **Solid carbide**

Surface **A**

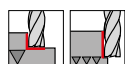
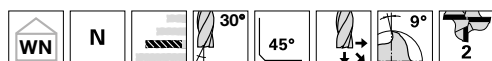
Type **N**

Shank form **cyl.**

Article no. **19962**

Discount group **206**

| d1 h8<br>mm | d2 h6<br>mm | l1<br>mm | l2<br>mm | l3<br>mm | Z | Code no. | Availability |
|-------------|-------------|----------|----------|----------|---|----------|--------------|
| 2.000       | 4.000       | 40.000   | 6.000    | 9.400    | 2 | 2.000    | •            |
| 3.000       | 6.000       | 45.000   | 8.000    | 12.900   | 2 | 3.000    | •            |
| 4.000       | 6.000       | 45.000   | 11.000   | 16.400   | 2 | 4.000    | •            |
| 5.000       | 6.000       | 50.000   | 13.000   | 19.900   | 2 | 5.000    | •            |
| 6.000       | 6.000       | 50.000   | 13.000   | 20.000   | 2 | 6.000    | •            |
| 8.000       | 8.000       | 60.000   | 19.000   | 27.000   | 2 | 8.000    | •            |
| 10.000      | 10.000      | 70.000   | 22.000   | 32.000   | 2 | 10.000   | •            |
| 12.000      | 12.000      | 75.000   | 26.000   | 39.000   | 2 | 12.000   | •            |
| 16.000      | 16.000      | 75.000   | 32.000   | 48.000   | 2 | 16.000   | •            |
| 20.000      | 20.000      | 100.000  | 40.000   | 59.000   | 2 | 20.000   | •            |

## XL slot drills (2-fluted)


**P** • **GÜHRING NAVIGATOR**
**M** • Cutting data page 32

**K** •

**N** ○

**S** •

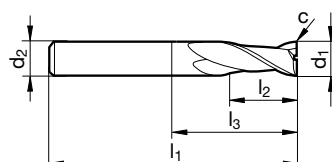
**H** •

- centre cutting
- with special drill face

Tool material **Solid carbide**Surface **F** **F**

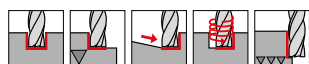
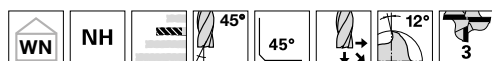
Type N N

Shank form HA HB



| Article no.    |        |         |        |        |          |   |          | 19990        | 19991 |
|----------------|--------|---------|--------|--------|----------|---|----------|--------------|-------|
| Discount group |        |         |        |        |          |   |          | 206          | 206   |
| d1 e8          | d2 h6  | l1      | l2     | l3     | c        | Z | Code no. | Availability |       |
| mm             | mm     | mm      | mm     | mm     | mm x 45° |   |          |              |       |
| 3.000          | 3.000  | 60.000  | 20.000 | 32.000 | 0.030    | 2 | 3.000    | •            |       |
| 4.000          | 4.000  | 60.000  | 20.000 | 32.000 | 0.040    | 2 | 4.000    | •            |       |
| 5.000          | 5.000  | 75.000  | 25.000 | 47.000 | 0.050    | 2 | 5.000    | •            |       |
| 6.000          | 6.000  | 75.000  | 30.000 | 39.000 | 0.060    | 2 | 6.000    | •            | •     |
| 8.000          | 8.000  | 75.000  | 30.000 | 39.000 | 0.080    | 2 | 8.000    | •            | •     |
| 10.000         | 10.000 | 100.000 | 40.000 | 60.000 | 0.100    | 2 | 10.000   | •            | •     |
| 12.000         | 12.000 | 100.000 | 45.000 | 55.000 | 0.120    | 2 | 12.000   | •            | •     |
| 14.000         | 14.000 | 100.000 | 45.000 | 55.000 | 0.140    | 2 | 14.000   | •            | •     |
| 16.000         | 16.000 | 100.000 | 45.000 | 62.000 | 0.160    | 2 | 16.000   | •            | •     |
| 18.000         | 18.000 | 100.000 | 45.000 | 63.000 | 0.180    | 2 | 18.000   | •            | •     |
| 20.000         | 20.000 | 100.000 | 45.000 | 62.000 | 0.200    | 2 | 20.000   | •            | •     |

## Slot drills (3-fluted)


**P** • **GÜHRING NAVIGATOR**
**M** • Cutting data page 32

**K** •

**N** ○

**S** •

**H**

- high-performance slot drill with a quick helix for an especially smooth cutting operation
- centre cutting
- with special drill face

Tool material

Solid carbide

Surface

F

F

Type

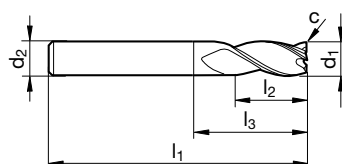
NH

NH

Shank form

~HA

~HB



Article no.

19986

19987

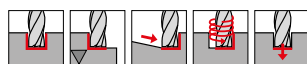
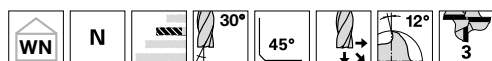
Discount group

206

206

| d1 e8  | d2 h6  | l1      | l2     | l3     | c        | Z | Code no. | Availability |
|--------|--------|---------|--------|--------|----------|---|----------|--------------|
| mm     | mm     | mm      | mm     | mm     | mm x 45° |   |          |              |
| 2.000  | 4.000  | 50.000  | 6.000  | 8.900  | 0.030    | 3 | 2.000    | ●            |
| 3.000  | 6.000  | 57.000  | 8.000  | 11.900 | 0.050    | 3 | 3.000    | ● ●          |
| 4.000  | 6.000  | 57.000  | 11.000 | 14.900 | 0.060    | 3 | 4.000    | ● ●          |
| 5.000  | 6.000  | 57.000  | 13.000 | 18.400 | 0.080    | 3 | 5.000    | ● ●          |
| 6.000  | 6.000  | 57.000  | 13.000 | 21.000 | 0.090    | 3 | 6.000    | ● ●          |
| 8.000  | 8.000  | 63.000  | 19.000 | 27.000 | 0.120    | 3 | 8.000    | ● ●          |
| 10.000 | 10.000 | 72.000  | 22.000 | 32.000 | 0.150    | 3 | 10.000   | ● ●          |
| 12.000 | 12.000 | 83.000  | 26.000 | 38.000 | 0.180    | 3 | 12.000   | ● ●          |
| 14.000 | 14.000 | 83.000  | 26.000 | 38.000 | 0.210    | 3 | 14.000   | ● ●          |
| 16.000 | 16.000 | 92.000  | 32.000 | 44.000 | 0.240    | 3 | 16.000   | ● ●          |
| 20.000 | 20.000 | 104.000 | 38.000 | 54.000 | 0.300    | 3 | 20.000   | ● ●          |

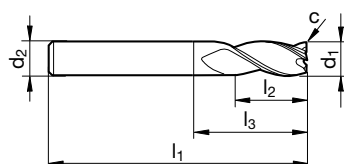
## Slot drills (3-fluted)



|                                                                                                    |   |                                                  |
|----------------------------------------------------------------------------------------------------|---|--------------------------------------------------|
| <b>P</b>                                                                                           | • | <b>GÜHRING</b> NAVIGATOR<br>Cutting data page 32 |
| <b>M</b>                                                                                           | • |                                                  |
| <b>K</b>                                                                                           | • |                                                  |
| <b>N</b>                                                                                           | ○ |                                                  |
| <b>S</b>                                                                                           | • |                                                  |
| <b>H</b>                                                                                           |   |                                                  |
| <ul style="list-style-type: none"><li>• centre cutting</li><li>• with special drill face</li></ul> |   |                                                  |

Tool material **Solid carbide**

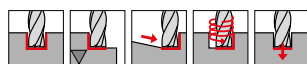
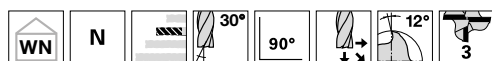
|            |          |          |
|------------|----------|----------|
| Surface    | <b>F</b> | <b>F</b> |
| Type       | N        | N        |
| Shank form | ~HA      | HB       |



Article no. **19982** **19983**  
Discount group **206** **206**

| d1 e8  | d2 h6  | l1      | l2     | l3     | c        | Z | Code no. | Availability |
|--------|--------|---------|--------|--------|----------|---|----------|--------------|
| mm     | mm     | mm      | mm     | mm     | mm x 45° |   |          |              |
| 2.000  | 4.000  | 50.000  | 6.000  | 9.400  | 0.030    | 3 | 2.000    | •            |
| 3.000  | 6.000  | 57.000  | 8.000  | 12.900 | 0.050    | 3 | 3.000    | • •          |
| 4.000  | 6.000  | 57.000  | 11.000 | 16.400 | 0.060    | 3 | 4.000    | • •          |
| 5.000  | 6.000  | 57.000  | 13.000 | 19.900 | 0.080    | 3 | 5.000    | • •          |
| 6.000  | 6.000  | 57.000  | 13.000 | 21.000 | 0.090    | 3 | 6.000    | • •          |
| 8.000  | 8.000  | 63.000  | 19.000 | 27.000 | 0.120    | 3 | 8.000    | • •          |
| 10.000 | 10.000 | 72.000  | 22.000 | 32.000 | 0.150    | 3 | 10.000   | • •          |
| 12.000 | 12.000 | 83.000  | 26.000 | 38.000 | 0.180    | 3 | 12.000   | • •          |
| 14.000 | 14.000 | 83.000  | 26.000 | 38.000 | 0.210    | 3 | 14.000   | • •          |
| 16.000 | 16.000 | 92.000  | 32.000 | 44.000 | 0.190    | 3 | 16.000   | • •          |
| 20.000 | 20.000 | 104.000 | 38.000 | 54.000 | 0.240    | 3 | 20.000   | • •          |

## Slot drills (3-fluted)


**GÜHRING** NAVIGATOR

Cutting data page 32

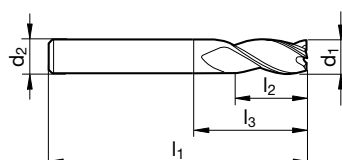
|   |   |
|---|---|
| P | • |
| M | • |
| K | • |
| N | ○ |
| S | • |
| H |   |

- centre cutting
- with special drill face

Tool material **Solid carbide**

Surface **A**

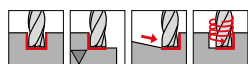
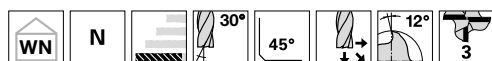
Type **N**

Shank form **cyl.**

Article no. **19963**

Discount group **206**

| d1 h8  | d2 h6  | l1      | l2     | l3     | Z | Code no. | Availability |
|--------|--------|---------|--------|--------|---|----------|--------------|
| mm     | mm     | mm      | mm     | mm     |   |          |              |
| 2.000  | 4.000  | 40.000  | 6.000  | 9.400  | 3 | 2.000    | •            |
| 3.000  | 6.000  | 45.000  | 8.000  | 12.900 | 3 | 3.000    | •            |
| 4.000  | 6.000  | 45.000  | 11.000 | 16.400 | 3 | 4.000    | •            |
| 5.000  | 6.000  | 50.000  | 13.000 | 19.900 | 3 | 5.000    | •            |
| 6.000  | 6.000  | 50.000  | 13.000 | 19.000 | 3 | 6.000    | •            |
| 8.000  | 8.000  | 60.000  | 19.000 | 25.500 | 3 | 8.000    | •            |
| 10.000 | 10.000 | 70.000  | 22.000 | 30.000 | 3 | 10.000   | •            |
| 12.000 | 12.000 | 75.000  | 26.000 | 36.000 | 3 | 12.000   | •            |
| 16.000 | 16.000 | 75.000  | 32.000 | 44.000 | 3 | 16.000   | •            |
| 20.000 | 20.000 | 100.000 | 40.000 | 54.000 | 3 | 20.000   | •            |

## Slot drills XL (3-fluted)

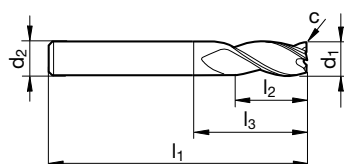


|                                                                                                    |   |                          |
|----------------------------------------------------------------------------------------------------|---|--------------------------|
| <b>P</b>                                                                                           | • | <b>GÜHRING</b> NAVIGATOR |
| <b>M</b>                                                                                           | • |                          |
| <b>K</b>                                                                                           | • |                          |
| <b>N</b>                                                                                           | ○ |                          |
| <b>S</b>                                                                                           | • |                          |
| <b>H</b>                                                                                           |   |                          |
| Cutting data page 32                                                                               |   |                          |
| <ul style="list-style-type: none"><li>• centre cutting</li><li>• with special drill face</li></ul> |   |                          |

Tool material **Solid carbide**Surface **F** **F**

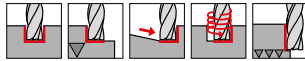
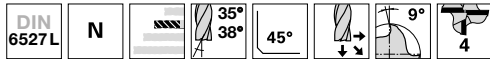
Type N N

Shank form HA HB

Article no. **19984** **19985**Discount group **206** **206**

| d1 e8  | d2 h6  | l1      | l2     | l3     | c        | Z | Code no. | Availability |
|--------|--------|---------|--------|--------|----------|---|----------|--------------|
| mm     | mm     | mm      | mm     | mm     | mm x 45° |   |          |              |
| 3.000  | 6.000  | 57.000  | 12.000 | 16.900 | 0.050    | 3 | 3.000    | • •          |
| 4.000  | 6.000  | 63.000  | 19.000 | 24.400 | 0.060    | 3 | 4.000    | • •          |
| 5.000  | 6.000  | 68.000  | 24.000 | 30.900 | 0.080    | 3 | 5.000    | • •          |
| 6.000  | 6.000  | 72.000  | 24.000 | 36.000 | 0.090    | 3 | 6.000    | • •          |
| 8.000  | 8.000  | 88.000  | 38.000 | 52.000 | 0.120    | 3 | 8.000    | • •          |
| 10.000 | 10.000 | 95.000  | 45.000 | 55.000 | 0.150    | 3 | 10.000   | • •          |
| 12.000 | 12.000 | 110.000 | 53.000 | 65.000 | 0.180    | 3 | 12.000   | • •          |
| 14.000 | 14.000 | 110.000 | 53.000 | 65.000 | 0.210    | 3 | 14.000   | • •          |
| 16.000 | 16.000 | 125.000 | 63.000 | 80.000 | 0.190    | 3 | 16.000   | • •          |
| 20.000 | 20.000 | 141.000 | 75.000 | 95.000 | 0.240    | 3 | 20.000   | • •          |

## HPC end mills (4-fluted)



|   |   |
|---|---|
| P | • |
| M | • |
| K | • |
| N | ○ |
| S | • |
| H | ○ |

## GÜHRING NAVIGATOR

Cutting data page 32

- high-performance end mills with variable helix angle
- centre cutting

Tool material

Solid carbide

Surface

F

F

Type

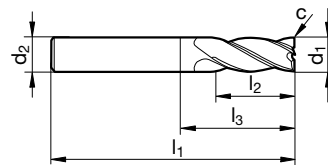
N

N

Shank form

HA

HB



Article no.

19980

19981

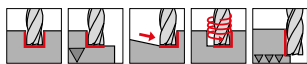
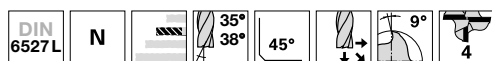
Discount group

206

206

| d1 e8  | d2 h6  | l1      | l2     | l3     | c        | Z | Code no. | Availability |   |
|--------|--------|---------|--------|--------|----------|---|----------|--------------|---|
| mm     | mm     | mm      | mm     | mm     | mm x 45° |   |          |              |   |
| 3.000  | 6.000  | 57.000  | 8.000  | 11.400 | 0.060    | 4 | 3.000    | •            | • |
| 4.000  | 6.000  | 57.000  | 11.000 | 14.900 | 0.080    | 4 | 4.000    | •            | • |
| 5.000  | 6.000  | 57.000  | 13.000 | 17.400 | 0.100    | 4 | 5.000    | •            | • |
| 6.000  | 6.000  | 57.000  | 13.000 | 21.000 | 0.120    | 4 | 6.000    | •            | • |
| 8.000  | 8.000  | 63.000  | 19.000 | 27.000 | 0.160    | 4 | 8.000    | •            | • |
| 10.000 | 10.000 | 72.000  | 22.000 | 32.000 | 0.200    | 4 | 10.000   | •            | • |
| 12.000 | 12.000 | 83.000  | 26.000 | 38.000 | 0.240    | 4 | 12.000   | •            | • |
| 14.000 | 14.000 | 83.000  | 26.000 | 38.000 | 0.280    | 4 | 14.000   | •            | • |
| 16.000 | 16.000 | 92.000  | 32.000 | 44.000 | 0.320    | 4 | 16.000   | •            | • |
| 20.000 | 20.000 | 104.000 | 38.000 | 54.000 | 0.400    | 4 | 20.000   | •            | • |

## HPC end mills (4-fluted)


**GÜHRING** NAVIGATOR

Cutting data page 32

|   |   |
|---|---|
| P | • |
| M | • |
| K | • |
| N | ○ |
| S | • |
| H | ○ |

- high-performance end mills with variable helix angle
- neck clearance
- centre cutting

Tool material

Solid carbide

Surface

F

F

Type

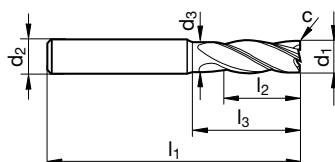
N

N

Shank form

HA

HB



Article no.

19940

19941

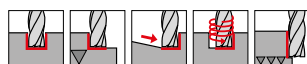
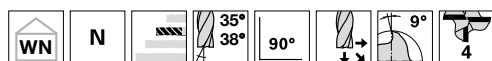
Discount group

206

206

| d1 e8  | d2 h6  | d3     | l1      | l2     | l3       | c     | Z | Code no. | Availability |
|--------|--------|--------|---------|--------|----------|-------|---|----------|--------------|
| mm     | mm     | mm     | mm      | mm     | mm x 45° | mm    |   |          |              |
| 3.000  | 6.000  | 2.800  | 57.000  | 8.000  | 12.000   | 0.060 | 4 | 3.000    | •            |
| 4.000  | 6.000  | 3.800  | 57.000  | 11.000 | 15.000   | 0.080 | 4 | 4.000    | •            |
| 5.000  | 6.000  | 4.800  | 57.000  | 13.000 | 18.000   | 0.100 | 4 | 5.000    | •            |
| 6.000  | 6.000  | 5.700  | 57.000  | 13.000 | 20.000   | 0.120 | 4 | 6.000    | •            |
| 8.000  | 8.000  | 7.700  | 63.000  | 19.000 | 26.000   | 0.160 | 4 | 8.000    | •            |
| 10.000 | 10.000 | 9.500  | 72.000  | 22.000 | 30.000   | 0.200 | 4 | 10.000   | •            |
| 12.000 | 12.000 | 11.500 | 83.000  | 26.000 | 36.000   | 0.240 | 4 | 12.000   | •            |
| 14.000 | 14.000 | 13.500 | 83.000  | 26.000 | 36.000   | 0.280 | 4 | 14.000   | •            |
| 16.000 | 16.000 | 15.500 | 92.000  | 32.000 | 42.000   | 0.320 | 4 | 16.000   | •            |
| 20.000 | 20.000 | 19.500 | 104.000 | 38.000 | 52.000   | 0.400 | 4 | 20.000   | •            |

## HPC end mills (4-fluted)



|   |   |
|---|---|
| P | • |
| M | • |
| K | • |
| N | ○ |
| S | • |
| H | ○ |

## GÜHRING NAVIGATOR

Cutting data page 32

- high-performance end mills with variable helix angle
- centre cutting

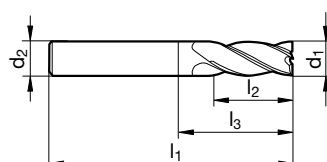
Tool material Solid carbide

Surface P

Type N

Shank form ~HA

NEW

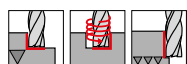
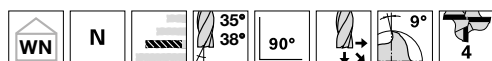


Article no. 19950

Discount group 206

| d1 f8  | d2 h6  | l1      | l2     | l3     | Z | Code no. | Availability |
|--------|--------|---------|--------|--------|---|----------|--------------|
| mm     | mm     | mm      | mm     | mm     |   |          |              |
| 3.000  | 4.000  | 50.000  | 8.000  | 11.400 | 4 | 3.000    | •            |
| 4.000  | 4.000  | 50.000  | 11.000 | 18.000 | 4 | 4.000    | •            |
| 5.000  | 5.000  | 50.000  | 13.000 | 18.000 | 4 | 5.000    | •            |
| 6.000  | 6.000  | 50.000  | 15.000 | 20.000 | 4 | 6.000    | •            |
| 8.000  | 8.000  | 60.000  | 20.000 | 29.000 | 4 | 8.000    | •            |
| 10.000 | 10.000 | 70.000  | 27.000 | 34.000 | 4 | 10.000   | •            |
| 12.000 | 12.000 | 75.000  | 30.000 | 39.000 | 4 | 12.000   | •            |
| 14.000 | 14.000 | 75.000  | 30.000 | 39.000 | 4 | 14.000   | •            |
| 16.000 | 16.000 | 75.000  | 30.000 | 39.000 | 4 | 16.000   | •            |
| 20.000 | 20.000 | 100.000 | 40.000 | 54.000 | 4 | 20.000   | •            |

## HPC end mills (4-fluted)



**P** • **GÜHRING NAVIGATOR**

**M** • Cutting data page 34

**K** •

**N** ○

**S** •

**H** ○

- high-performance end mills with variable helix angle
- centre cutting

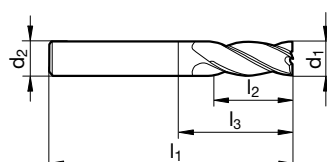
Tool material **Solid carbide**

Surface **P**

Type **N**

Shank form **~HA**

**NEW**



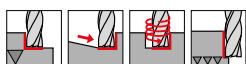
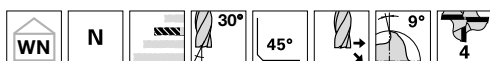
Article no. **19951**

Discount group **206**

| d1 f8  | d2 h6  | l1      | l2     | l3     | Z | Code no. | Availability |
|--------|--------|---------|--------|--------|---|----------|--------------|
| mm     | mm     | mm      | mm     | mm     |   |          |              |
| 3.000  | 4.000  | 60.000  | 16.000 | 19.400 | 4 | 3.000    | •            |
| 4.000  | 4.000  | 60.000  | 20.000 | 23.000 | 4 | 4.000    | •            |
| 5.000  | 6.000  | 68.000  | 24.000 | 28.400 | 4 | 5.000    | •            |
| 6.000  | 6.000  | 68.000  | 24.000 | 32.000 | 4 | 6.000    | •            |
| 8.000  | 8.000  | 88.000  | 38.000 | 52.000 | 4 | 8.000    | •            |
| 10.000 | 10.000 | 100.000 | 50.000 | 60.000 | 4 | 10.000   | •            |
| 12.000 | 12.000 | 100.000 | 53.000 | 61.000 | 4 | 12.000   | •            |
| 14.000 | 14.000 | 100.000 | 53.000 | 62.000 | 4 | 14.000   | •            |
| 16.000 | 16.000 | 125.000 | 63.000 | 77.000 | 4 | 16.000   | •            |
| 20.000 | 20.000 | 141.000 | 75.000 | 91.000 | 4 | 20.000   | •            |



## End mills (4-fluted)

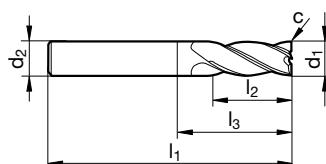


|          |   |                                                  |
|----------|---|--------------------------------------------------|
| <b>P</b> | • | <b>GÜHRING NAVIGATOR</b><br>Cutting data page 34 |
| <b>M</b> | • |                                                  |
| <b>K</b> | • |                                                  |
| <b>N</b> | ○ |                                                  |
| <b>S</b> | • |                                                  |
| <b>H</b> | ○ |                                                  |

• centre cutting

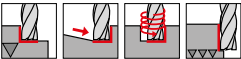
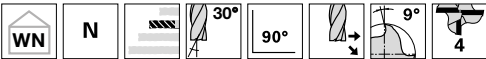
Tool material **Solid carbide**

|            |          |          |
|------------|----------|----------|
| Surface    | <b>F</b> | <b>F</b> |
| Type       | N        | N        |
| Shank form | HA       | HB       |



| Article no.    |        |         |        |        |          |   |          | 19978        | 19979 |
|----------------|--------|---------|--------|--------|----------|---|----------|--------------|-------|
| Discount group |        |         |        |        |          |   |          | 206          | 206   |
| d1 e8          | d2 h6  | l1      | l2     | l3     | c        | Z | Code no. | Availability |       |
| mm             | mm     | mm      | mm     | mm     | mm x 45° |   |          |              |       |
| 2.000          | 2.000  | 32.000  | 8.000  | 10.000 | 0.025    | 4 | 2.000    | •            |       |
| 3.000          | 3.000  | 38.000  | 12.000 | 15.000 | 0.050    | 4 | 3.000    | •            |       |
| 4.000          | 4.000  | 40.000  | 12.000 | 16.000 | 0.050    | 4 | 4.000    | •            |       |
| 5.000          | 5.000  | 50.000  | 15.000 | 20.000 | 0.050    | 4 | 5.000    | •            |       |
| 6.000          | 6.000  | 57.000  | 16.000 | 21.000 | 0.050    | 4 | 6.000    | •            | •     |
| 7.000          | 8.000  | 60.000  | 16.000 | 23.000 | 0.100    | 4 | 7.000    | •            | •     |
| 8.000          | 8.000  | 68.000  | 22.000 | 32.000 | 0.100    | 4 | 8.000    | •            | •     |
| 9.000          | 10.000 | 72.000  | 22.000 | 31.400 | 0.100    | 4 | 9.000    | •            | •     |
| 10.000         | 10.000 | 72.000  | 25.000 | 32.000 | 0.100    | 4 | 10.000   | •            | •     |
| 11.000         | 12.000 | 83.000  | 26.000 | 37.000 | 0.100    | 4 | 11.000   | •            | •     |
| 12.000         | 12.000 | 83.000  | 28.000 | 38.000 | 0.100    | 4 | 12.000   | •            | •     |
| 14.000         | 14.000 | 83.000  | 28.000 | 38.000 | 0.150    | 4 | 14.000   | •            | •     |
| 16.000         | 16.000 | 92.000  | 35.000 | 44.000 | 0.150    | 4 | 16.000   | •            | •     |
| 18.000         | 18.000 | 92.000  | 35.000 | 44.000 | 0.150    | 4 | 18.000   | •            | •     |
| 20.000         | 20.000 | 104.000 | 40.000 | 54.000 | 0.150    | 4 | 20.000   | •            | •     |

End mills (4-fluted)



P

M

K

N

S

H

•

•

•

○

•

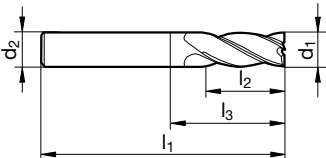
○

**GÜHRING**NAVIGATOR

Cutting data page 34

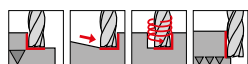
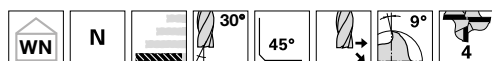
• centre cutting

|               |               |
|---------------|---------------|
| Tool material | Solid carbide |
| Surface       | A             |
| Type          | N             |
| Shank form    | cyl.          |



| Article no.    |        |         |        |        |   |          | 19961        |
|----------------|--------|---------|--------|--------|---|----------|--------------|
| Discount group |        |         |        |        |   |          | 206          |
| d1 h8          | d2 h6  | l1      | l2     | l3     | Z | Code no. | Availability |
| mm             | mm     | mm      | mm     | mm     |   |          |              |
| 2.000          | 4.000  | 40.000  | 6.000  | 8.900  | 4 | 2.000    | ●            |
| 3.000          | 6.000  | 45.000  | 8.000  | 11.900 | 4 | 3.000    | ●            |
| 4.000          | 6.000  | 45.000  | 11.000 | 15.900 | 4 | 4.000    | ●            |
| 5.000          | 6.000  | 50.000  | 13.000 | 18.900 | 4 | 5.000    | ●            |
| 6.000          | 6.000  | 50.000  | 13.000 | 19.000 | 4 | 6.000    | ●            |
| 8.000          | 8.000  | 60.000  | 19.000 | 25.500 | 4 | 8.000    | ●            |
| 10.000         | 10.000 | 70.000  | 22.000 | 30.000 | 4 | 10.000   | ●            |
| 12.000         | 12.000 | 75.000  | 26.000 | 36.000 | 4 | 12.000   | ●            |
| 16.000         | 16.000 | 75.000  | 32.000 | 44.000 | 4 | 16.000   | ●            |
| 20.000         | 20.000 | 100.000 | 40.000 | 54.000 | 4 | 20.000   | ●            |

## XL end mills (4-fluted)


**P** • **GÜHRING NAVIGATOR**
**M** • Cutting data page 34

**K** •

**N** ○

**S** •

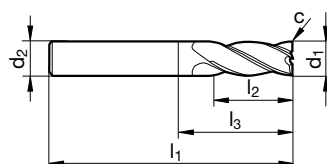
**H** ○

• centre cutting

Tool material **Solid carbide**Surface **F** **F**

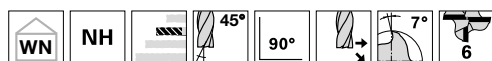
Type N N

Shank form HA HB

Article no. **19976** **19977**Discount group **206** **206**

| d1 e8  | d2 h6  | l1      | l2     | l3     | c        | Z | Code no. | Availability |
|--------|--------|---------|--------|--------|----------|---|----------|--------------|
| mm     | mm     | mm      | mm     | mm     | mm x 45° |   |          |              |
| 3.000  | 6.000  | 57.000  | 15.000 | 18.900 | 0.050    | 4 | 3.000    | ● ●          |
| 4.000  | 6.000  | 63.000  | 19.000 | 23.900 | 0.050    | 4 | 4.000    | ● ●          |
| 5.000  | 6.000  | 68.000  | 24.000 | 29.900 | 0.050    | 4 | 5.000    | ● ●          |
| 6.000  | 6.000  | 68.000  | 24.000 | 32.000 | 0.050    | 4 | 6.000    | ● ●          |
| 8.000  | 8.000  | 88.000  | 38.000 | 52.000 | 0.100    | 4 | 8.000    | ● ●          |
| 10.000 | 10.000 | 95.000  | 45.000 | 55.000 | 0.100    | 4 | 10.000   | ● ●          |
| 12.000 | 12.000 | 110.000 | 53.000 | 65.000 | 0.100    | 4 | 12.000   | ● ●          |
| 14.000 | 14.000 | 110.000 | 53.000 | 65.000 | 0.150    | 4 | 14.000   | ● ●          |
| 16.000 | 16.000 | 125.000 | 63.000 | 77.000 | 0.150    | 4 | 16.000   | ● ●          |
| 18.000 | 18.000 | 125.000 | 63.000 | 77.000 | 0.150    | 4 | 18.000   | ● ●          |
| 20.000 | 20.000 | 141.000 | 75.000 | 91.000 | 0.150    | 4 | 20.000   | ● ●          |

## Multi-tooth end mills (6-fluted)



|   |   |
|---|---|
| P | • |
| M | • |
| K | • |
| N | • |
| S | • |
| H | ○ |

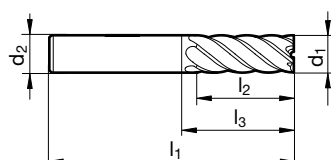
## GÜHRING NAVIGATOR

Cutting data page 34

• without centre cutting

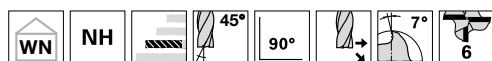
Tool material Solid carbide

|            |    |    |
|------------|----|----|
| Surface    | F  | F  |
| Type       | NH | NH |
| Shank form | HA | HB |



| Article no.    |        |         |        |        |   |          | 19972        | 19973 |
|----------------|--------|---------|--------|--------|---|----------|--------------|-------|
| Discount group |        |         |        |        |   |          | 206          | 206   |
| d1 e8          | d2 h6  | l1      | l2     | l3     | Z | Code no. | Availability |       |
| mm             | mm     | mm      | mm     | mm     |   |          |              |       |
| 3.000          | 4.000  | 50.000  | 10.000 | 12.100 | 6 | 3.000    | •            |       |
| 4.000          | 6.000  | 57.000  | 11.000 | 15.900 | 6 | 4.000    | •            | •     |
| 5.000          | 6.000  | 57.000  | 13.000 | 15.900 | 6 | 5.000    | •            | •     |
| 6.000          | 6.000  | 57.000  | 13.000 | 21.000 | 6 | 6.000    | •            | •     |
| 8.000          | 8.000  | 63.000  | 19.000 | 27.000 | 6 | 8.000    | •            | •     |
| 10.000         | 10.000 | 72.000  | 22.000 | 32.000 | 6 | 10.000   | •            | •     |
| 12.000         | 12.000 | 83.000  | 26.000 | 38.000 | 6 | 12.000   | •            | •     |
| 14.000         | 14.000 | 83.000  | 26.000 | 38.000 | 6 | 14.000   | •            | •     |
| 16.000         | 16.000 | 92.000  | 32.000 | 44.000 | 6 | 16.000   | •            | •     |
| 18.000         | 18.000 | 92.000  | 32.000 | 44.000 | 6 | 18.000   | •            | •     |
| 20.000         | 20.000 | 104.000 | 38.000 | 54.000 | 6 | 20.000   | •            | •     |

## Multi-tooth end mills (6-fluted)

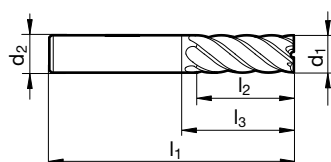


|          |   |                                                  |
|----------|---|--------------------------------------------------|
| <b>P</b> | • | <b>GÜHRING NAVIGATOR</b><br>Cutting data page 34 |
| <b>M</b> | • |                                                  |
| <b>K</b> | • |                                                  |
| <b>N</b> | • |                                                  |
| <b>S</b> | • |                                                  |
| <b>H</b> | ○ |                                                  |

• without centre cutting

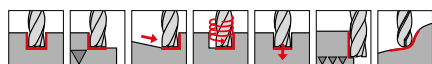
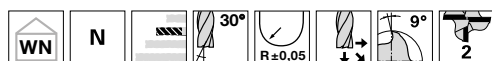
Tool material **Solid carbide**

|            |          |          |
|------------|----------|----------|
| Surface    | <b>F</b> | <b>F</b> |
| Type       | NH       | NH       |
| Shank form | HA       | HB       |



| Article no.    |        |         |        |        |   |          | 19974        | 19975 |
|----------------|--------|---------|--------|--------|---|----------|--------------|-------|
| Discount group |        |         |        |        |   |          | 206          | 206   |
| d1 e8          | d2 h6  | l1      | l2     | l3     | Z | Code no. | Availability |       |
| mm             | mm     | mm      | mm     | mm     |   |          |              |       |
| 4.000          | 6.000  | 63.000  | 16.000 | 18.500 | 6 | 4.000    | •            | •     |
| 5.000          | 6.000  | 63.000  | 18.000 | 20.500 | 6 | 5.000    | •            | •     |
| 6.000          | 6.000  | 63.000  | 18.000 | 27.000 | 6 | 6.000    | •            | •     |
| 8.000          | 8.000  | 68.000  | 24.000 | 32.000 | 6 | 8.000    | •            | •     |
| 10.000         | 10.000 | 80.000  | 30.000 | 40.000 | 6 | 10.000   | •            | •     |
| 12.000         | 12.000 | 93.000  | 36.000 | 48.000 | 6 | 12.000   | •            | •     |
| 14.000         | 14.000 | 100.000 | 42.000 | 55.000 | 6 | 14.000   | •            | •     |
| 16.000         | 16.000 | 108.000 | 48.000 | 60.000 | 6 | 16.000   | •            | •     |
| 18.000         | 18.000 | 114.000 | 54.000 | 66.000 | 6 | 18.000   | •            | •     |
| 20.000         | 20.000 | 126.000 | 60.000 | 76.000 | 6 | 20.000   | •            | •     |

# Ball nose slot drills (2-fluted)



|                  |   |                                                  |
|------------------|---|--------------------------------------------------|
| P                | • | <b>GÜHRING NAVIGATOR</b><br>Cutting data page 34 |
| M                | • |                                                  |
| K                | • |                                                  |
| N                | • |                                                  |
| S                | • |                                                  |
| H                | ○ |                                                  |
| • centre cutting |   |                                                  |

Tool material

Solid carbide

Surface

F

F

Type

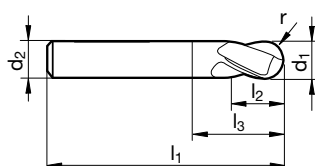
N

N

Shank form

HA

HB



Article no.

19968

19969

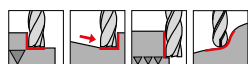
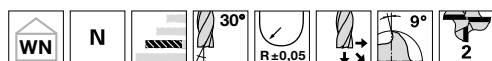
Discount group

206

206

| d1 e8  | d2 h6  | l1      | l2     | l3     | r      | Z | Code no. | Availability |
|--------|--------|---------|--------|--------|--------|---|----------|--------------|
| mm     | mm     | mm      | mm     | mm     | mm     |   |          |              |
| 2.000  | 4.000  | 40.000  | 6.000  | 9.400  | 1.000  | 2 | 2.000    | •            |
| 3.000  | 4.000  | 50.000  | 7.000  | 11.900 | 1.500  | 2 | 3.000    | •            |
| 4.000  | 6.000  | 50.000  | 8.000  | 13.400 | 2.000  | 2 | 4.000    | •            |
| 5.000  | 6.000  | 50.000  | 10.000 | 16.900 | 2.500  | 2 | 5.000    | •            |
| 6.000  | 6.000  | 50.000  | 10.000 | 20.000 | 3.000  | 2 | 6.000    | •            |
| 8.000  | 8.000  | 60.000  | 19.000 | 27.000 | 4.000  | 2 | 8.000    | •            |
| 10.000 | 10.000 | 70.000  | 22.000 | 30.000 | 5.000  | 2 | 10.000   | •            |
| 12.000 | 12.000 | 75.000  | 26.000 | 39.000 | 6.000  | 2 | 12.000   | •            |
| 14.000 | 14.000 | 75.000  | 26.000 | 40.000 | 7.000  | 2 | 14.000   | •            |
| 16.000 | 16.000 | 75.000  | 26.000 | 43.000 | 8.000  | 2 | 16.000   | •            |
| 18.000 | 18.000 | 100.000 | 32.000 | 52.000 | 9.000  | 2 | 18.000   | •            |
| 20.000 | 20.000 | 100.000 | 32.000 | 50.000 | 10.000 | 2 | 20.000   | •            |

## XL ball nose slot drills (2-fluted)


**P** • **GÜHRING** NAVIGATOR

**M** • Cutting data page 34

**K** •

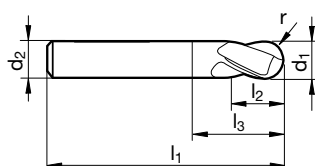
**N** •

**S** •

**H** ○ • centre cutting
Tool material **Solid carbide**Surface **F** **F**

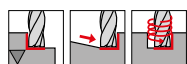
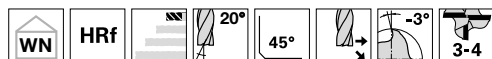
Type N N

Shank form HA HB



| Article no.    |        |         |        |        |       |   |          | 19970        | 19971 |
|----------------|--------|---------|--------|--------|-------|---|----------|--------------|-------|
| Discount group |        |         |        |        |       |   |          | 206          | 206   |
| d1 e8          | d2 h6  | l1      | l2     | l3     | r     | Z | Code no. | Availability |       |
| mm             | mm     | mm      | mm     | mm     | mm    |   |          |              |       |
| 3.000          | 3.000  | 60.000  | 20.000 | 32.000 | 1.500 | 2 | 3.000    | •            |       |
| 4.000          | 4.000  | 60.000  | 20.000 | 32.000 | 2.000 | 2 | 4.000    | •            |       |
| 5.000          | 5.000  | 75.000  | 25.000 | 47.000 | 2.500 | 2 | 5.000    | •            |       |
| 6.000          | 6.000  | 75.000  | 30.000 | 39.000 | 3.000 | 2 | 6.000    | •            | •     |
| 8.000          | 8.000  | 75.000  | 30.000 | 39.000 | 4.000 | 2 | 8.000    | •            | •     |
| 10.000         | 10.000 | 100.000 | 40.000 | 60.000 | 5.000 | 2 | 10.000   | •            | •     |
| 12.000         | 12.000 | 100.000 | 45.000 | 55.000 | 6.000 | 2 | 12.000   | •            | •     |
|                |        |         |        |        |       |   |          |              |       |
|                |        |         |        |        |       |   |          |              |       |

# Roughing end mills with fine teeth



|                  |   |                                                  |
|------------------|---|--------------------------------------------------|
| P                | • | <b>GÜHRING</b> NAVIGATOR<br>Cutting data page 32 |
| M                |   |                                                  |
| K                | • |                                                  |
| N                |   |                                                  |
| S                | ○ |                                                  |
| H                | • |                                                  |
| • centre cutting |   |                                                  |

Tool material

Solid carbide

Surface

F

F

Type

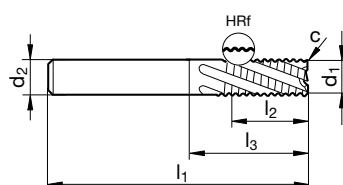
HRf

HRf

Shank form

HA

HB



Article no.

19964

19965

Discount group

206

206

| d1 h10 | d2 h6  | l1     | l2     | l3     | c        | Z | Code no. |
|--------|--------|--------|--------|--------|----------|---|----------|
| mm     | mm     | mm     | mm     | mm     | mm x 45° |   |          |
| 4.000  | 6.000  | 54.000 | 8.000  | 12.900 | 0.160    | 3 | 4.000    |
| 5.000  | 6.000  | 54.000 | 8.000  | 14.400 | 0.200    | 3 | 5.000    |
| 6.000  | 6.000  | 54.000 | 8.000  | 18.000 | 0.240    | 3 | 6.000    |
| 8.000  | 8.000  | 58.000 | 11.000 | 22.000 | 0.320    | 3 | 8.000    |
| 10.000 | 10.000 | 66.000 | 13.000 | 26.000 | 0.200    | 4 | 10.000   |
| 12.000 | 12.000 | 73.000 | 16.000 | 28.000 | 0.240    | 4 | 12.000   |
| 16.000 | 16.000 | 82.000 | 19.000 | 34.000 | 0.320    | 4 | 16.000   |
| 20.000 | 20.000 | 92.000 | 19.000 | 42.000 | 0.400    | 4 | 20.000   |

Availability

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•

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•

•

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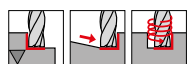
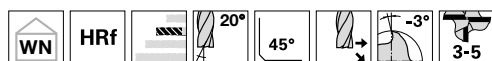
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## Roughing end mills with fine teeth

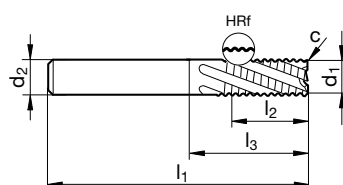


|                  |   |                          |
|------------------|---|--------------------------|
| P                | • | <b>GÜHRING</b> NAVIGATOR |
| M                |   |                          |
| K                | • |                          |
| N                |   |                          |
| S                | ○ |                          |
| H                | • |                          |
| • centre cutting |   |                          |

Cutting data page 32

Tool material **Solid carbide**

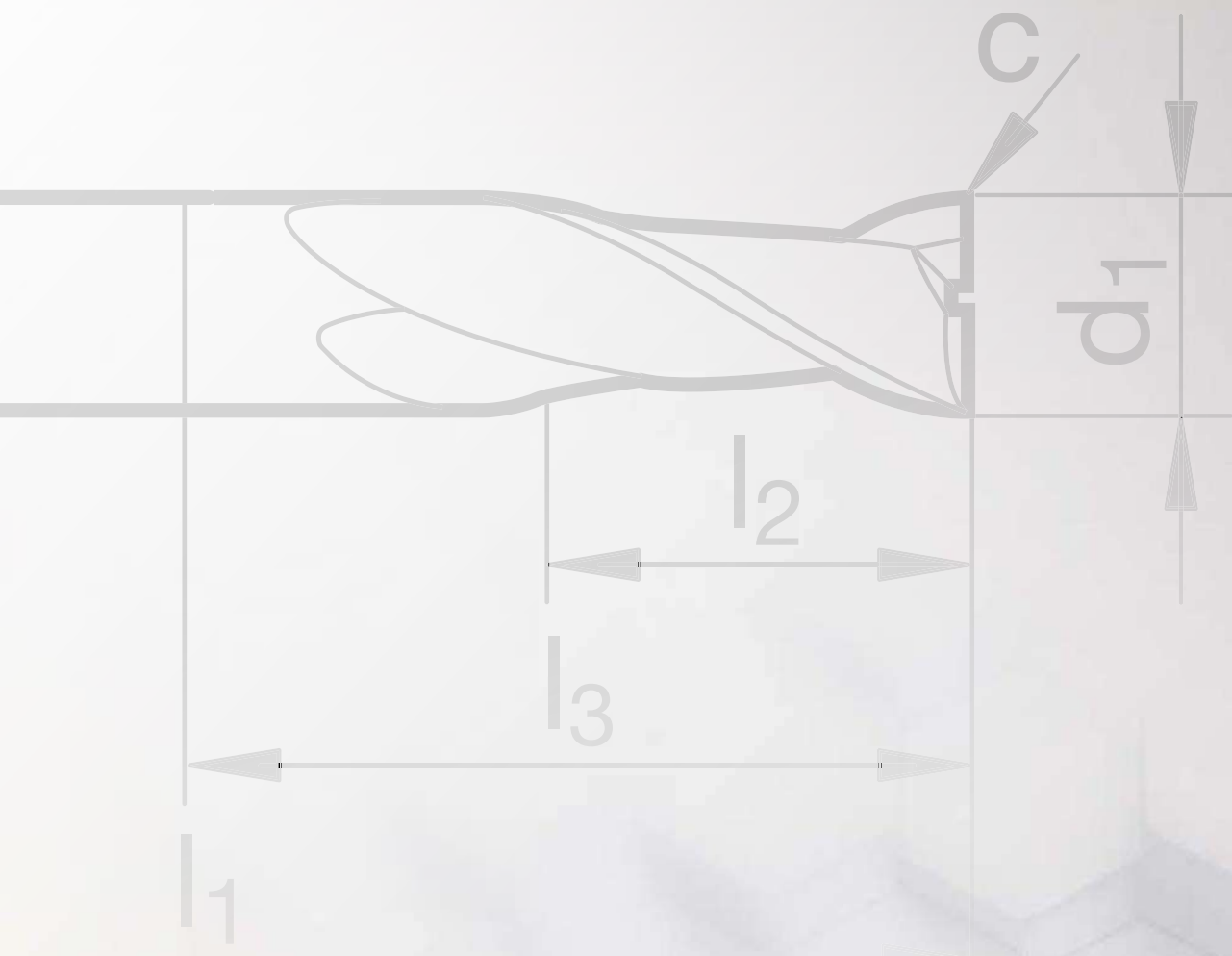
|            |          |          |
|------------|----------|----------|
| Surface    | <b>F</b> | <b>F</b> |
| Type       | HRf      | HRf      |
| Shank form | HA       | HB       |



| Article no.    |        |         |        |        |          |   |          | 19966        | 19967 |
|----------------|--------|---------|--------|--------|----------|---|----------|--------------|-------|
| Discount group |        |         |        |        |          |   |          | 206          | 206   |
| d1 h10         | d2 h6  | l1      | l2     | l3     | c        | Z | Code no. | Availability |       |
| mm             | mm     | mm      | mm     | mm     | mm x 45° |   |          |              |       |
| 5.000          | 6.000  | 57.000  | 16.000 | 19.000 | 0.200    | 3 | 5.000    | •            | •     |
| 6.000          | 6.000  | 57.000  | 16.000 | 21.000 | 0.240    | 3 | 6.000    | •            | •     |
| 8.000          | 8.000  | 63.000  | 19.000 | 27.000 | 0.320    | 3 | 8.000    | •            | •     |
| 10.000         | 10.000 | 72.000  | 22.000 | 32.000 | 0.200    | 4 | 10.000   | •            | •     |
| 12.000         | 12.000 | 83.000  | 26.000 | 38.000 | 0.240    | 4 | 12.000   | •            | •     |
| 16.000         | 16.000 | 92.000  | 32.000 | 44.000 | 0.320    | 4 | 16.000   | •            | •     |
| 20.000         | 20.000 | 104.000 | 38.000 | 54.000 | 0.400    | 4 | 20.000   | •            | •     |
| 25.000         | 25.000 | 121.000 | 45.000 | 65.000 | 0.600    | 5 | 25.000   | •            | •     |



d2



# NAVIGATOR

# **GUHRING**NAVIGATOR Milling cutters

Tools with **bold** feed column no. (FC no.) are preferred choice.

$a_e$  = Width of cut

$a_p$  = Depth of cut

Art. no.

Comp. std.

Comp. std.

\* For large cutting depths on unstable machines  $f_z$  and  $v_c$  must be reduced or a 4-flute tool must be applied.

| Cutter-Ø<br>mm                                   | Feed column no.                                                                                                                                                                                       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                                                  | 37                                                                                                                                                                                                    | 38    | 39    | 40    | 41    | 42    | 43    | 44    | 45    | 46    | 47    | 48    | 49    | 50    | 51    | 52    |
|                                                  | $f_z$ (mm/tooth)                                                                                                                                                                                      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| <b>2,00</b>                                      | 0,001                                                                                                                                                                                                 | 0,001 | 0,001 | 0,002 | 0,002 | 0,004 | 0,005 | 0,006 | 0,007 | 0,008 | 0,010 | 0,012 | 0,014 | 0,016 | 0,018 | 0,020 |
| <b>3,00</b>                                      | 0,002                                                                                                                                                                                                 | 0,002 | 0,003 | 0,003 | 0,004 | 0,007 | 0,010 | 0,010 | 0,010 | 0,015 | 0,016 | 0,013 | 0,019 | 0,022 | 0,024 | 0,030 |
| <b>5,00</b>                                      | 0,005                                                                                                                                                                                                 | 0,006 | 0,007 | 0,009 | 0,010 | 0,014 | 0,020 | 0,020 | 0,022 | 0,025 | 0,026 | 0,026 | 0,028 | 0,030 | 0,032 | 0,038 |
| <b>6,00</b>                                      | 0,006                                                                                                                                                                                                 | 0,008 | 0,009 | 0,011 | 0,013 | 0,017 | 0,024 | 0,025 | 0,027 | 0,031 | 0,029 | 0,033 | 0,039 | 0,036 | 0,041 | 0,047 |
| <b>8,00</b>                                      | 0,010                                                                                                                                                                                                 | 0,012 | 0,014 | 0,016 | 0,019 | 0,024 | 0,032 | 0,032 | 0,035 | 0,042 | 0,042 | 0,047 | 0,053 | 0,052 | 0,058 | 0,064 |
| <b>10,00</b>                                     | 0,013                                                                                                                                                                                                 | 0,015 | 0,018 | 0,021 | 0,025 | 0,030 | 0,038 | 0,039 | 0,044 | 0,050 | 0,053 | 0,059 | 0,065 | 0,066 | 0,073 | 0,080 |
| <b>12,00</b>                                     | 0,010                                                                                                                                                                                                 | 0,018 | 0,022 | 0,026 | 0,030 | 0,036 | 0,046 | 0,048 | 0,052 | 0,059 | 0,063 | 0,072 | 0,079 | 0,085 | 0,090 | 0,100 |
| <b>16,00</b>                                     | 0,020                                                                                                                                                                                                 | 0,023 | 0,027 | 0,032 | 0,038 | 0,045 | 0,054 | 0,058 | 0,063 | 0,071 | 0,079 | 0,088 | 0,095 | 0,100 | 0,110 | 0,120 |
| <b>20,00</b>                                     | 0,023                                                                                                                                                                                                 | 0,028 | 0,033 | 0,038 | 0,045 | 0,057 | 0,066 | 0,073 | 0,080 | 0,090 | 0,097 | 0,100 | 0,110 | 0,120 | 0,130 | 0,140 |
| <b>25,00</b>                                     | 0,030                                                                                                                                                                                                 | 0,035 | 0,040 | 0,045 | 0,055 | 0,065 | 0,075 | 0,100 | 0,120 | 0,130 | 0,140 | 0,150 | 0,165 | 0,170 | 0,180 | 0,190 |
| Material group                                   | Material examples<br>Figures in bold = material no. to DIN EN 10 027                                                                                                                                  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Common structural steels                         | <b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2)<br><b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500) |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Free-cutting steels                              | <b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36)<br><b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)                                             |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Unalloyed heat-treatable steels                  | <b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30)<br><b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45)<br><b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)                                                          |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Alloyed heat-treatable steels                    | <b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4<br><b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4                                                                  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Unalloyed case hard. steels                      | <b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)                                                                                                                                                        |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Alloyed case hardened steels                     | <b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6<br><b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5                                                                                 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Nitriding steels                                 | <b>1.8504</b> 34CrAl6<br><b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7                                                                                                                              |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Tool steels                                      | <b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9<br><b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4                                    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| High speed steels                                | <b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3                                                                                                                                 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Spring steels                                    | <b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)                                                                                                                               |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Hardened steels                                  | –                                                                                                                                                                                                     |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Stainless steels, sulphured                      | <b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.4105</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9                                                                                                  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| austenitic                                       | <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A)                                                                                                  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| martensitic                                      | <b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2                                                                                                         |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Cast iron                                        | <b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20)<br><b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)                                                                  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Spheroidal graphite iron and malleable cast iron | <b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMW-350-4 (GTW35)<br><b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)                                                    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Chilled cast iron                                | –                                                                                                                                                                                                     |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| New cast materials GGV                           | <b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35)<br><b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6                                                                                      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| New cast materials ADI                           | <b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000)<br><b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)                                                                        |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Special alloys                                   | Nimonic, Inconel, Monel, Hastelloy                                                                                                                                                                    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Ti and Ti-alloys                                 | <b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2<br><b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1                                       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Aluminium and Al-alloys                          | <b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1                                                                                                                                      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Al wrought alloys                                | <b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5                                                                                                       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Al cast alloys ≤ 10 % Si                         | <b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9                                                                                                                             |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| ≤ 24 % Si                                        | <b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg                                                                                                                                    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Magnesium alloys                                 | <b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1                                                                                                                         |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Copper, low-alloyed                              | <b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnNb                                                                                                                                   |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Brass, short-chipping                            | <b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2                                                                                                                             |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| long-chipping                                    | <b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5                                                                                                                                 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Bronze, short-chipping                           | <b>2.1090</b> CuSn7ZnNb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn                                                                                                                               |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|                                                  | <b>2.0790</b> CuNi18Zn19Pb                                                                                                                                                                            |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Bronze, long-chipping                            | <b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10                                                                                                                                      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|                                                  | <b>2.0980</b> CuAl11Ni, <b>2.1247</b> CuBe2                                                                                                                                                           |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Duroplastics                                     | Epoxy resin, Resopal, Pertinax, Moltopren                                                                                                                                                             |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Thermoplastics                                   | Plexiglass, Hostalen, Novodur, Makralon                                                                                                                                                               |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Kevlar                                           | Kevlar                                                                                                                                                                                                |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Glass, carbon concentr. plastics                 | GFK/CFK                                                                                                                                                                                               |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |

Corrections  $v_c$  and  $f_z$

# Slot milling

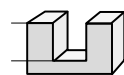
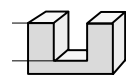
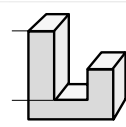
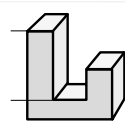
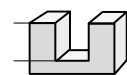
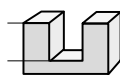
# Roughing

|    | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide              | Solid carbide        | Solid carbide |
|----|---------------|---------------|---------------|---------------|---------------|----------------------------|----------------------|---------------|
|    | N             | N             | N             | N             | NH            | W                          | N                    | HRf           |
| HA | 19988/19962   | 19982/19963   | 19990         | 19984         | 19986         | 19994/19996                | 19980/19940          | 19964/19966   |
| HB | 19989         | 19983         | 19991         | 19985         | 19987         | 19995/19997<br>19992/19993 | 19981/19941<br>19950 | 19965/19967   |

HPC

54HRC

54HRC


 $a_e = 1 \times D$ 
 $a_e = 1 \times D$ 
 $a_e = 1 \times D$ 
 $a_e = 1 \times D$ 
 $a_e = 1 \times D$ 
 $a_e = 1 \times D$ 
 $a_e = 0,5-1,0 \times D$ 
 $a_e = 0,5-1,0 \times D$ 

 $a_p = 0,5 \times D$ 
 $a_p = 0,5 \times D$ 
 $a_p = 2 \times D$ 
 $a_p = 2 \times D$ 
 $a_p = 1 \times D$ 
 $a_p = 1 \times D$ 
 $a_p = 1 \times D$ 
 $a_p = 1 \times D$ 

| $v_c$<br>m/min | Feed<br>col. no. | $v_c$<br>m/min | Feed<br>col. no. | $v_c$<br>m/min | Feed<br>col. no. | $v_c$<br>m/min | Feed<br>col. no. | $v_c$<br>m/min | Feed<br>col. no. | $v_c$<br>m/min | Feed<br>col. no. | $v_c$<br>m/min | Feed<br>col. no. | $v_c$<br>m/min | Feed<br>col. no. |
|----------------|------------------|----------------|------------------|----------------|------------------|----------------|------------------|----------------|------------------|----------------|------------------|----------------|------------------|----------------|------------------|
| 85 - 105       | 42               | 85 - 105       | 42               | 72 - 88        | 39               | 72 - 88        | 39               | 94 - 116       | 43               |                |                  | 170 - 208      | 51               |                |                  |
| 81 - 99        | 41               | 81 - 99        | 41               | 67 - 83        | 38               | 67 - 83        | 38               | 89 - 109       | 42               |                |                  | 157 - 193      | 50               |                |                  |
| 85 - 105       | 41               | 85 - 105       | 41               | 72 - 88        | 38               | 72 - 88        | 38               | 94 - 116       | 42               |                |                  | 170 - 208      | 50               |                |                  |
| 63 - 77        | 42               | 63 - 77        | 42               | 54 - 66        | 39               | 54 - 66        | 39               | 69 - 85        | 43               |                |                  | 126 - 154      | 49               |                |                  |
| 85 - 105       | 41               | 85 - 105       | 41               | 72 - 88        | 38               | 72 - 88        | 38               | 94 - 116       | 42               |                |                  | 170 - 208      | 50               |                |                  |
| 76 - 94        | 41               | 76 - 94        | 41               | 63 - 77        | 38               | 63 - 77        | 38               | 84 - 104       | 42               |                |                  | 151 - 185      | 50               |                |                  |
| 63 - 77        | 42               | 63 - 77        | 42               | 54 - 66        | 39               | 54 - 66        | 39               | 69 - 85        | 43               |                |                  | 126 - 154      | 49               |                |                  |
| 76 - 94        | 42               | 76 - 94        | 42               | 63 - 77        | 39               | 63 - 77        | 39               | 84 - 104       | 43               |                |                  | 151 - 185      | 49               |                |                  |
| 63 - 77        | 42               | 63 - 77        | 42               | 54 - 66        | 39               | 54 - 66        | 39               | 69 - 85        | 43               |                |                  | 126 - 154      | 48               | 72 - 88        | 39               |
| 90 - 110       | 41               | 90 - 110       | 41               | 67 - 83        | 38               | 67 - 83        | 38               | 99 - 121       | 42               |                |                  | 189 - 231      | 50               |                |                  |
| 76 - 94        | 41               | 76 - 94        | 41               | 63 - 77        | 38               | 63 - 77        | 38               | 84 - 104       | 42               |                |                  | 151 - 185      | 50               | 86 - 106       | 41               |
| 54 - 66        | 42               | 54 - 66        | 42               | 45 - 55        | 39               | 45 - 55        | 39               | 59 - 73        | 43               |                |                  | 113 - 139      | 49               | 64 - 80        | 40               |
| 85 - 105       | 41               | 85 - 105       | 41               | 72 - 88        | 38               | 72 - 88        | 38               | 94 - 116       | 42               |                |                  | 170 - 208      | 50               | 97 - 119       | 41               |
| 76 - 94        | 40               | 76 - 94        | 40               | 63 - 77        | 37               | 63 - 77        | 37               | 84 - 104       | 41               |                |                  | 151 - 185      | 48               | 86 - 106       | 39               |
| 76 - 94        | 41               | 76 - 94        | 41               | 63 - 77        | 38               | 63 - 77        | 38               | 84 - 104       | 42               |                |                  | 151 - 185      | 50               | 86 - 106       | 41               |
| 63 - 77        | 40               | 63 - 77        | 40               | 54 - 66        | 37               | 54 - 66        | 37               | 69 - 85        | 41               |                |                  | 126 - 154      | 48               | 72 - 88        | 39               |
| 45 - 55        | 42               | 45 - 55        | 42               | 40 - 50        | 39               | 40 - 50        | 39               | 49 - 61        | 43               |                |                  | 94 - 116       | 49               | 54 - 66        | 47               |
| 45 - 55        | 40               |                |                  |                |                  |                |                  | 49 - 61        | 41               |                |                  | 94 - 116       | 48               | 54 - 66        | 26               |
| 45 - 55        | 40               |                |                  |                |                  |                |                  | 49 - 61        | 41               |                |                  | 44 - 54        | 46               | 25 - 31        | 38               |
|                |                  |                |                  |                |                  |                |                  |                |                  |                |                  |                |                  | 18 - 22        | 38               |
| 45 - 55        | 42               | 45 - 55        | 42               |                |                  |                |                  | 49 - 61        | 43               |                |                  | 80 - 100       | 49               |                |                  |
| 40 - 50        | 40               | 40 - 50        | 40               |                |                  |                |                  | 45 - 55        | 41               |                |                  | 70 - 90        | 48               |                |                  |
| 36 - 44        | 41               | 36 - 44        | 41               |                |                  |                |                  | 39 - 49        | 42               |                |                  | 65 - 70        | 49               | 43 - 53        | 40               |
| 108 - 132      | 41               | 108 - 132      | 41               | 94 - 116       | 38               | 94 - 116       | 38               | 118 - 146      | 42               |                |                  | 220 - 270      | 50               | 126 - 154      | 42               |
| 99 - 121       | 40               | 99 - 121       | 40               | 85 - 105       | 37               | 85 - 105       | 37               | 108 - 134      | 41               |                |                  | 201 - 247      | 49               | 115 - 141      | 41               |
| 90 - 110       | 41               | 90 - 110       | 41               | 81 - 99        | 38               | 81 - 99        | 38               | 99 - 121       | 42               |                |                  | 182 - 224      | 50               | 104 - 128      | 42               |
| 81 - 99        | 40               | 81 - 99        | 40               | 67 - 83        | 37               | 67 - 83        | 37               | 89 - 109       | 41               |                |                  | 157 - 193      | 49               | 90 - 110       | 41               |
| 54 - 66        | 40               | 54 - 66        | 40               |                |                  |                |                  | 59 - 73        | 41               |                |                  | 107 - 131      | 47               | 61 - 75        | 39               |
|                |                  |                |                  |                |                  |                |                  |                |                  |                |                  |                |                  |                |                  |
|                |                  |                |                  |                |                  |                |                  |                |                  |                |                  |                |                  |                |                  |
|                |                  |                |                  |                |                  |                |                  |                |                  |                |                  |                |                  |                |                  |
| 27 - 33        | 40               | 27 - 33        | 40               |                |                  |                |                  | 29 - 37        | 41               |                |                  | 56 - 70        | 48               |                |                  |
| 45 - 55        | 40               | 45 - 55        | 40               | 58 - 72        | 37               | 58 - 72        | 37               | 49 - 61        | 41               |                |                  | 54 - 86        | 43               |                |                  |
| 36 - 44        | 40               | 36 - 44        | 40               | 31 - 39        | 37               | 31 - 39        | 37               | 39 - 49        | 41               |                |                  | 44 - 72        | 42               |                |                  |
| 405 - 495      | 43               |                |                  |                |                  |                |                  |                |                  | 297 - 363      | 46               |                |                  |                |                  |
| 495 - 605      | 43               |                |                  |                |                  |                |                  |                |                  | 360 - 440      | 46               |                |                  |                |                  |
| 198 - 242      | 42               |                |                  |                |                  |                |                  | 217 - 267      | 43               | 144 - 176      | 45               |                |                  |                |                  |
| 162 - 198      | 43               |                |                  |                |                  |                |                  | 178 - 218      | 44               | 117 - 143      | 46               |                |                  |                |                  |
| 225 - 275      | 44               |                |                  |                |                  |                |                  |                |                  | 171 - 209      | 47               |                |                  |                |                  |
| 108 - 132      | 43               |                |                  |                |                  |                |                  | 118 - 146      | 44               | 81 - 99        | 46               |                |                  |                |                  |
| 90 - 110       | 43               |                |                  |                |                  |                |                  | 99 - 121       | 44               | 72 - 88        | 46               |                |                  | 117 - 143      | 42               |
| 81 - 99        | 42               |                |                  |                |                  |                |                  |                |                  | 67 - 83        | 45               |                |                  |                |                  |
| 90 - 110       | 42               |                |                  |                |                  |                |                  | 99 - 121       | 43               | 72 - 88        | 45               |                |                  | 117 - 143      | 42               |
| 72 - 88        | 41               |                |                  |                |                  |                |                  | 79 - 97        | 42               | 63 - 77        | 44               |                |                  | 87 - 107       | 41               |
| 72 - 88        | 42               |                |                  |                |                  |                |                  |                |                  | 63 - 77        | 45               |                |                  |                |                  |
| 63 - 77        | 40               |                |                  |                |                  |                |                  |                |                  | 54 - 66        | 43               |                |                  |                |                  |
| 108 - 132      | 40               |                |                  |                |                  |                |                  |                |                  | 81 - 99        | 43               |                |                  |                |                  |
| 99 - 121       | 40               |                |                  |                |                  |                |                  |                |                  | 72 - 88        | 43               |                |                  |                |                  |

 $1 \times D = 75\%$   
 $1,5 \times D = 50\%$ 
 $1 \times D = 75\%$   
 $1,5 \times D = 50\%$ 
 $3 \times D = 50\%$ 
 $3 \times D = 50\%$ 
 $1,5 \times D = 50\%$ 
 $1,5 \times D = 50\%$ 
 $a_e = 1,5 \times D = 50\%$   
 $a_p = 0,25 \times D = 150\%$ 
 $a_e = 0,5 \times D = 120\%$

# **GUHRING**NAVIGATOR Milling cutters

Tools with **bold** feed column no. (FC no.) are preferred choice.

$a_e$  = Width of cut

$a_p$  = Depth of cut

Art. no

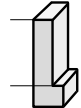
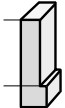
Comp. std.

Comp. std.

\* For large cutting depths on unstable machines  $f_z$  and  $v_c$  must be reduced or a 4-flute tool must be applied.

| Cutter-Ø<br>mm                                   | Feed column no.                                                                                                                                                                                       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                                                  | 37                                                                                                                                                                                                    | 38    | 39    | 40    | 41    | 42    | 43    | 44    | 45    | 46    | 47    | 48    | 49    | 50    | 51    | 52    |
|                                                  | $f_z$ (mm/tooth)                                                                                                                                                                                      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| <b>2,00</b>                                      | 0,001                                                                                                                                                                                                 | 0,001 | 0,001 | 0,002 | 0,002 | 0,004 | 0,005 | 0,006 | 0,007 | 0,008 | 0,010 | 0,012 | 0,014 | 0,016 | 0,018 | 0,020 |
| <b>3,00</b>                                      | 0,002                                                                                                                                                                                                 | 0,002 | 0,003 | 0,003 | 0,004 | 0,007 | 0,010 | 0,010 | 0,010 | 0,015 | 0,016 | 0,013 | 0,019 | 0,022 | 0,024 | 0,030 |
| <b>5,00</b>                                      | 0,005                                                                                                                                                                                                 | 0,006 | 0,007 | 0,009 | 0,010 | 0,014 | 0,020 | 0,020 | 0,022 | 0,025 | 0,026 | 0,026 | 0,028 | 0,030 | 0,032 | 0,038 |
| <b>6,00</b>                                      | 0,006                                                                                                                                                                                                 | 0,008 | 0,009 | 0,011 | 0,013 | 0,017 | 0,024 | 0,025 | 0,027 | 0,031 | 0,029 | 0,033 | 0,039 | 0,036 | 0,041 | 0,047 |
| <b>8,00</b>                                      | 0,010                                                                                                                                                                                                 | 0,012 | 0,014 | 0,016 | 0,019 | 0,024 | 0,032 | 0,032 | 0,035 | 0,042 | 0,042 | 0,047 | 0,053 | 0,052 | 0,058 | 0,064 |
| <b>10,00</b>                                     | 0,013                                                                                                                                                                                                 | 0,015 | 0,018 | 0,021 | 0,025 | 0,030 | 0,038 | 0,039 | 0,044 | 0,050 | 0,053 | 0,059 | 0,065 | 0,066 | 0,073 | 0,080 |
| <b>12,00</b>                                     | 0,010                                                                                                                                                                                                 | 0,018 | 0,022 | 0,026 | 0,030 | 0,036 | 0,046 | 0,048 | 0,052 | 0,059 | 0,063 | 0,072 | 0,079 | 0,085 | 0,090 | 0,100 |
| <b>16,00</b>                                     | 0,020                                                                                                                                                                                                 | 0,023 | 0,027 | 0,032 | 0,038 | 0,045 | 0,054 | 0,058 | 0,063 | 0,071 | 0,079 | 0,088 | 0,095 | 0,100 | 0,110 | 0,120 |
| <b>20,00</b>                                     | 0,023                                                                                                                                                                                                 | 0,028 | 0,033 | 0,038 | 0,045 | 0,057 | 0,066 | 0,073 | 0,080 | 0,090 | 0,097 | 0,100 | 0,110 | 0,120 | 0,130 | 0,140 |
| <b>25,00</b>                                     | 0,030                                                                                                                                                                                                 | 0,035 | 0,040 | 0,045 | 0,055 | 0,065 | 0,075 | 0,100 | 0,120 | 0,130 | 0,140 | 0,150 | 0,165 | 0,170 | 0,180 | 0,190 |
| Material group                                   | Material examples<br>Figures in bold = material no. to DIN EN 10 027                                                                                                                                  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Common structural steels                         | <b>1.0035</b> S185(St33), <b>1.0486</b> P275N(StE285), <b>1.0345</b> P235GH(H1), <b>1.0425</b> P265GH(H2)<br><b>1.0050</b> E295 (St50-2), <b>1.0070</b> E360 (St70-2), <b>1.8937</b> P500NH (WStE500) |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Free-cutting steels                              | <b>1.0718</b> 11SMnPb30 (9SMnPb28), <b>1.0736</b> 11SMn37 (9SMn36)<br><b>1.0727</b> 46S20 (45S20), <b>1.0728</b> (60S20), <b>1.0757</b> 46SPb20 (45SPb20)                                             |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Unalloyed heat-treatable steels                  | <b>1.0402</b> C22, <b>1.1178</b> C30E (Ck30)<br><b>1.0503</b> C45, <b>1.1191</b> C45E (Ck45)<br><b>1.0601</b> C60, <b>1.1221</b> C60E (Ck60)                                                          |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Alloyed heat-treatable steels                    | <b>1.5131</b> 50MnSi4, <b>1.7003</b> 38Cr2, <b>1.7030</b> 28Cr4<br><b>1.5710</b> 36NiCr6, <b>1.7035</b> 41Cr4, <b>1.7225</b> 42CrMo4                                                                  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Unalloyed case hard. steels                      | <b>1.0301</b> (C10), <b>1.1121</b> C10E (Ck10)                                                                                                                                                        |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Alloyed case hardened steels                     | <b>1.7276</b> 10CrMo11, <b>1.5125</b> 11MnSi6<br><b>1.5752</b> 15NiCr13, <b>1.7131</b> 16MnCr5, <b>1.7264</b> 20CrMo5                                                                                 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Nitriding steels                                 | <b>1.8504</b> 34CrAl6<br><b>1.8519</b> 31CrMoV9, <b>1.8550</b> 34CrAlNi7                                                                                                                              |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Tool steels                                      | <b>1.1750</b> C75W, <b>1.2067</b> 102Cr6, <b>1.2307</b> 29CrMoV9<br><b>1.2080</b> X210Cr12, <b>1.2083</b> X42Cr13, <b>1.2419</b> 105WCr6, <b>1.2767</b> X45NiCrMo4                                    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| High speed steels                                | <b>1.3243</b> S 6-5-2-5, <b>1.3343</b> S 6-5-2, <b>1.3344</b> S 6-5-3                                                                                                                                 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Spring steels                                    | <b>1.5026</b> 55Si7, <b>1.7176</b> 55Cr3, <b>1.8159</b> 51CrV4 (51CrV4)                                                                                                                               |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Hardened steels                                  | –                                                                                                                                                                                                     |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Stainless steels, sulphured                      | <b>1.4005</b> X12CrS13, <b>1.4104</b> X14CrMoS17, <b>1.4105</b> X6CrMoS17, <b>1.4305</b> X8CrNiS18-9                                                                                                  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| austenitic                                       | <b>1.4301</b> X5CrNi18-10 (V2A), <b>1.4541</b> X6CrNiTi18-10, <b>1.4571</b> X6CrNiMoTi 17-12-2 (V4A)                                                                                                  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| martensitic                                      | <b>1.4057</b> X20CrNi172 (X17CrNi16-2), <b>1.4122</b> X39CrMo17-1, <b>1.4521</b> X2CrMoTi18-2                                                                                                         |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Cast iron                                        | <b>0.6010</b> EN-GJL-100 (GG10), <b>0.6020</b> EN-GJL-200 (GG20)<br><b>0.6025</b> EN-GJL-250 (GG25), <b>0.6035</b> EN-GJL-350 (GG35)                                                                  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Spheroidal graphite iron and malleable cast iron | <b>0.7050</b> EN-GJS-500-7 (GGG50), <b>0.8035</b> EN-GJMW-350-4 (GTW35)<br><b>0.7070</b> EN-GJS-700-2 (GGG70), <b>0.8170</b> EN-GJMB-700-2 (GTS70)                                                    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Chilled cast iron                                | –                                                                                                                                                                                                     |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| New cast materials GGV                           | <b>EN-GJV250</b> (GGV25), <b>EN-GJV350</b> (GGV35)<br><b>EN-GJV400</b> (GGV40), <b>EN-GJV500</b> (GGV50), SiMo 6                                                                                      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| New cast materials ADI                           | <b>EN-GJS-800-8</b> (ADI800), <b>EN-GJS-1000-5</b> (ADI1000)<br><b>EN-GJS-1200-2</b> (ADI1200), <b>EN-GJS-1400-1</b> (ADI1400)                                                                        |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Special alloys                                   | Nimonic, Inconel, Monel, Hastelloy                                                                                                                                                                    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Ti and Ti-alloys                                 | <b>3.7024</b> Ti99,5, <b>3.7114</b> TiAl5Sn2,5, <b>3.7124</b> TiCu2<br><b>3.7154</b> TiAl6Zr5, <b>3.7165</b> TiAl6V4, <b>3.7184</b> TiAl4Mo4Sn2,5, - TiAl8Mo1V1                                       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Aluminium and Al-alloys                          | <b>3.0255</b> Al99,5, <b>3.2315</b> AlMgSi1, <b>3.3515</b> AlMg1                                                                                                                                      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Al wrought alloys                                | <b>3.0615</b> AlMgSiPb, <b>3.1325</b> AlCuMg1, <b>3.3245</b> AlMg3Si, <b>3.4365</b> AlZnMgCu1,5                                                                                                       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Al cast alloys ≤ 10 % Si                         | <b>3.2131</b> G-AlSi5Cu1, <b>3.2153</b> G-AlSi7Cu3, <b>3.2573</b> G-AlSi9                                                                                                                             |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| ≤ 24 % Si                                        | <b>3.2581</b> G-AlSi12, <b>3.2583</b> G-AlSi12Cu, - G-AlSi12CuNiMg                                                                                                                                    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Magnesium alloys                                 | <b>3.5200</b> MgMn2, <b>3.5812.05</b> G-MgAl8Zn1, <b>3.5612.05</b> G-MgAl6Zn1                                                                                                                         |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Copper, low-alloyed                              | <b>2.0070</b> SE-Cu, <b>2.1020</b> CuSn6, <b>2.1096</b> G-CuSn5ZnNb                                                                                                                                   |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Brass, short-chipping                            | <b>2.0380</b> CuZn39Pb2, <b>2.0401</b> CuZn39Pb3, <b>2.0410</b> CuZn43Pb2                                                                                                                             |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| long-chipping                                    | <b>2.0250</b> CuZn20, <b>2.0280</b> CuZn33, <b>2.0332</b> CuZn37Pb0,5                                                                                                                                 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Bronze, short-chipping                           | <b>2.1090</b> CuSn7ZnNb, <b>2.1170</b> CuPb5Sn5, <b>2.1176</b> CuPb10Sn                                                                                                                               |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|                                                  | <b>2.0790</b> CuNi18Zn19Pb                                                                                                                                                                            |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Bronze, long-chipping                            | <b>2.0916</b> CuAl5, <b>2.0960</b> CuAl9Mn, <b>2.1050</b> CuSn10<br><b>2.0980</b> CuAl11Ni, <b>2.1247</b> CuBe2                                                                                       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Duroplastics                                     | Epoxy resin, Resopal, Pertinax, Moltopren                                                                                                                                                             |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Thermoplastics                                   | Plexiglass, Hostalen, Novodur, Makralon                                                                                                                                                               |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Kevlar                                           | Kevlar                                                                                                                                                                                                |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Glass, carbon concentr. plastics                 | GFK/CFK                                                                                                                                                                                               |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |

Corrections  $v_c$  and  $f_z$

| Finishing                                                                         |                  |                                                                                   |                  | Fine finishing                                                                    |                  |                                                                                   |                  | Copying                                                                             |                  |                                                                                     |                  |
|-----------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------|------------------|
| Solid carbide                                                                     |                  | Solid carbide                                                                     |                  | Solid carbide                                                                     |                  | Solid carbide                                                                     |                  | Solid carbide                                                                       |                  | Solid carbide                                                                       |                  |
| N                                                                                 |                  | N                                                                                 |                  | NH                                                                                |                  | NH                                                                                |                  | N                                                                                   |                  | N                                                                                   |                  |
| HA                                                                                | 19978/19961      |                                                                                   | 19976            |                                                                                   | 19972            |                                                                                   | 19974*           |                                                                                     | 19968            |                                                                                     | 19970            |
| HB                                                                                | 19979            |                                                                                   | 19977            |                                                                                   | 19973            |                                                                                   | 19975*           |                                                                                     | 19969            |                                                                                     | 19971            |
|                                                                                   |                  |                                                                                   | 19951            |                                                                                   |                  |                                                                                   |                  |                                                                                     |                  |                                                                                     |                  |
|  |                  |  |                  |  |                  |  |                  |  |                  |  |                  |
| $a_e = 0,1 \times D$                                                              |                  | $a_e = 0,1 \times D$                                                              |                  | $a_e = 0,05 \times D$                                                             |                  | $a_e = 0,05 \times D$                                                             |                  | $a_e = 0,05 \times D$                                                               |                  | $a_e = 0,05 \times D$                                                               |                  |
|  |                  |  |                  |  |                  |  |                  |  |                  |  |                  |
| $a_p = 1 \times D$                                                                |                  | $a_p = 2 \times D$                                                                |                  | $a_p = 1,5 \times D$                                                              |                  | $a_p = 3 \times D$                                                                |                  | $a_p = 0,05 \times D$                                                               |                  | $a_p = 0,05 \times D$                                                               |                  |
| $V_c$<br>m/min                                                                    | Feed<br>col. no. | $V_c$<br>m/min                                                                    | Feed<br>col. no. | $V_c$<br>m/min                                                                    | Feed<br>col. no. | $V_c$<br>m/min                                                                    | Feed<br>col. no. | $V_c$<br>m/min                                                                      | Feed<br>col. no. | $V_c$<br>m/min                                                                      | Feed<br>col. no. |
| 157 - 193                                                                         | 48               | 103 - 127                                                                         | 43               | 171 - 209                                                                         | 48               | 136 - 168                                                                         | 45               | 153 - 187                                                                           | 48               | 153 - 187                                                                           | 46               |
| 144 - 176                                                                         | 47               | 94 - 116                                                                          | 42               | 157 - 193                                                                         | 47               | 126 - 154                                                                         | 44               | 144 - 176                                                                           | 47               | 144 - 176                                                                           | 45               |
| 157 - 193                                                                         | 47               | 103 - 127                                                                         | 42               | 171 - 209                                                                         | 47               | 136 - 168                                                                         | 44               | 153 - 187                                                                           | 47               | 153 - 187                                                                           | 45               |
| 117 - 143                                                                         | 46               | 81 - 99                                                                           | 41               | 126 - 154                                                                         | 46               | 100 - 124                                                                         | 43               | 153 - 187                                                                           | 46               | 153 - 187                                                                           | 44               |
| 157 - 193                                                                         | 47               | 103 - 127                                                                         | 42               | 171 - 209                                                                         | 47               | 136 - 168                                                                         | 44               | 135 - 165                                                                           | 47               | 135 - 165                                                                           | 45               |
| 144 - 176                                                                         | 47               | 90 - 110                                                                          | 42               | 153 - 187                                                                         | 47               | 122 - 150                                                                         | 44               | 135 - 165                                                                           | 47               | 135 - 165                                                                           | 45               |
| 117 - 143                                                                         | 46               | 76 - 94                                                                           | 41               | 126 - 154                                                                         | 46               | 100 - 124                                                                         | 43               | 117 - 143                                                                           | 46               | 117 - 143                                                                           | 44               |
| 139 - 171                                                                         | 46               | 90 - 110                                                                          | 41               | 153 - 187                                                                         | 46               | 122 - 150                                                                         | 43               | 126 - 154                                                                           | 46               | 126 - 154                                                                           | 44               |
| 117 - 143                                                                         | 45               | 76 - 94                                                                           | 40               | 126 - 154                                                                         | 45               | 100 - 124                                                                         | 42               | 153 - 187                                                                           | 45               | 153 - 187                                                                           | 43               |
| 175 - 215                                                                         | 47               | 99 - 121                                                                          | 42               | 189 - 231                                                                         | 47               | 151 - 185                                                                         | 44               | 198 - 242                                                                           | 47               | 198 - 242                                                                           | 45               |
| 139 - 171                                                                         | 47               | 90 - 110                                                                          | 42               | 153 - 187                                                                         | 47               | 122 - 150                                                                         | 44               | 171 - 209                                                                           | 47               | 171 - 209                                                                           | 45               |
| 103 - 127                                                                         | 46               | 67 - 83                                                                           | 41               | 117 - 143                                                                         | 46               | 93 - 115                                                                          | 43               | 108 - 132                                                                           | 46               | 108 - 132                                                                           | 44               |
| 157 - 193                                                                         | 47               | 103 - 127                                                                         | 42               | 171 - 209                                                                         | 47               | 136 - 168                                                                         | 44               | 144 - 176                                                                           | 47               | 144 - 176                                                                           | 45               |
| 144 - 176                                                                         | 45               | 90 - 110                                                                          | 40               | 153 - 187                                                                         | 45               | 122 - 150                                                                         | 42               | 135 - 165                                                                           | 45               | 135 - 165                                                                           | 43               |
| 139 - 171                                                                         | 47               | 90 - 110                                                                          | 42               | 153 - 187                                                                         | 47               | 122 - 150                                                                         | 44               | 135 - 165                                                                           | 47               | 135 - 165                                                                           | 45               |
| 117 - 143                                                                         | 45               | 76 - 94                                                                           | 40               | 126 - 154                                                                         | 45               | 100 - 124                                                                         | 42               | 117 - 143                                                                           | 45               | 117 - 143                                                                           | 43               |
| 90 - 110                                                                          | 46               | 58 - 72                                                                           | 41               | 94 - 116                                                                          | 46               | 75 - 93                                                                           | 43               | 85 - 105                                                                            | 46               | 85 - 105                                                                            | 44               |
|                                                                                   |                  |                                                                                   |                  | 94 - 116                                                                          | 45               | 75 - 93                                                                           | 42               | 85 - 105                                                                            | 45               | 85 - 105                                                                            | 43               |
|                                                                                   |                  |                                                                                   |                  | 49 - 61                                                                           | 43               | 39 - 49                                                                           | 41               | 49 - 61                                                                             | 44               | 49 - 61                                                                             | 42               |
| 90 - 110                                                                          | 46               |                                                                                   |                  | 94 - 116                                                                          | 46               | 75 - 93                                                                           | 43               | 85 - 105                                                                            | 46               | 85 - 105                                                                            | 44               |
| 76 - 94                                                                           | 45               |                                                                                   |                  | 81 - 99                                                                           | 45               | 64 - 80                                                                           | 42               | 76 - 94                                                                             | 45               | 76 - 94                                                                             | 43               |
| 72 - 88                                                                           | 46               |                                                                                   |                  | 76 - 94                                                                           | 46               | 61 - 75                                                                           | 43               | 67 - 83                                                                             | 46               | 67 - 83                                                                             | 44               |
| 189 - 231                                                                         | 47               | 135 - 165                                                                         | 42               | 220 - 270                                                                         | 47               | 132 - 162                                                                         | 44               | 198 - 242                                                                           | 47               | 198 - 242                                                                           | 45               |
| 189 - 231                                                                         | 46               | 121 - 149                                                                         | 41               | 202 - 248                                                                         | 46               | 121 - 149                                                                         | 43               | 189 - 231                                                                           | 46               | 189 - 231                                                                           | 44               |
| 171 - 209                                                                         | 47               | 112 - 138                                                                         | 42               | 180 - 220                                                                         | 47               | 108 - 132                                                                         | 44               | 171 - 209                                                                           | 47               | 171 - 209                                                                           | 45               |
| 144 - 176                                                                         | 46               | 94 - 116                                                                          | 41               | 157 - 193                                                                         | 46               | 94 - 116                                                                          | 41               | 144 - 176                                                                           | 46               | 144 - 176                                                                           | 44               |
| 99 - 121                                                                          | 44               |                                                                                   |                  |                                                                                   |                  |                                                                                   |                  | 99 - 121                                                                            | 44               | 99 - 121                                                                            | 42               |
|                                                                                   |                  |                                                                                   |                  |                                                                                   |                  |                                                                                   |                  |                                                                                     |                  |                                                                                     |                  |
|                                                                                   |                  |                                                                                   |                  |                                                                                   |                  |                                                                                   |                  |                                                                                     |                  |                                                                                     |                  |
|                                                                                   |                  |                                                                                   |                  |                                                                                   |                  |                                                                                   |                  |                                                                                     |                  |                                                                                     |                  |
| 54 - 66                                                                           | 45               |                                                                                   |                  | 54 - 66                                                                           | 45               | 32 - 40                                                                           | 42               | 49 - 61                                                                             | 45               | 49 - 61                                                                             | 43               |
| 90 - 110                                                                          | 45               | 58 - 72                                                                           | 40               | 94 - 116                                                                          | 45               | 56 - 70                                                                           | 42               |                                                                                     |                  |                                                                                     |                  |
| 72 - 88                                                                           | 44               | 45 - 55                                                                           | 39               | 76 - 94                                                                           | 44               | 45 - 57                                                                           | 41               |                                                                                     |                  |                                                                                     |                  |
| 765 - 935                                                                         | 50               | 450 - 550                                                                         | 45               | 810 - 990                                                                         | 50               | 486 - 594                                                                         | 41               | 720 - 880                                                                           | 50               | 720 - 880                                                                           | 48               |
|                                                                                   |                  |                                                                                   |                  | 720 - 880                                                                         | 50               | 432 - 528                                                                         | 41               | 855 - 1045                                                                          | 50               | 855 - 1045                                                                          | 48               |
| 373 - 457                                                                         | 48               | 225 - 275                                                                         | 43               | 405 - 495                                                                         | 48               | 243 - 297                                                                         | 45               | 342 - 418                                                                           | 48               | 342 - 418                                                                           | 46               |
| 306 - 374                                                                         | 49               | 180 - 220                                                                         | 44               | 324 - 396                                                                         | 49               | 194 - 238                                                                         | 46               | 288 - 352                                                                           | 49               | 288 - 352                                                                           | 47               |
|                                                                                   |                  |                                                                                   |                  | 450 - 550                                                                         | 50               |                                                                                   |                  | 405 - 495                                                                           | 50               | 405 - 495                                                                           | 48               |
| 198 - 242                                                                         | 49               | 135 - 165                                                                         | 44               | 216 - 264                                                                         | 49               |                                                                                   |                  | 180 - 220                                                                           | 49               | 180 - 220                                                                           | 47               |
| 180 - 220                                                                         | 48               | 108 - 132                                                                         | 43               | 198 - 242                                                                         | 48               | 118 - 146                                                                         | 45               | 171 - 209                                                                           | 48               | 171 - 209                                                                           | 46               |
| 144 - 176                                                                         | 48               | 90 - 110                                                                          | 43               | 162 - 198                                                                         | 48               |                                                                                   |                  | 162 - 198                                                                           | 48               | 162 - 198                                                                           | 46               |
| 180 - 220                                                                         | 48               | 108 - 132                                                                         | 43               | 198 - 242                                                                         | 48               | 118 - 146                                                                         | 45               | 180 - 220                                                                           | 48               | 180 - 220                                                                           | 46               |
| 135 - 165                                                                         | 47               |                                                                                   |                  | 153 - 187                                                                         | 47               | 91 - 113                                                                          | 44               | 171 - 209                                                                           | 47               | 171 - 209                                                                           | 45               |
|                                                                                   |                  |                                                                                   |                  | 153 - 187                                                                         | 47               |                                                                                   |                  | 198 - 242                                                                           | 47               | 198 - 242                                                                           | 45               |
|                                                                                   |                  |                                                                                   |                  | 126 - 154                                                                         | 46               | 75 - 93                                                                           | 43               | 189 - 231                                                                           | 46               | 189 - 231                                                                           | 44               |
|                                                                                   |                  |                                                                                   |                  | 216 - 264                                                                         | 46               |                                                                                   |                  |                                                                                     |                  |                                                                                     |                  |
|                                                                                   |                  |                                                                                   |                  | 198 - 242                                                                         | 46               |                                                                                   |                  |                                                                                     |                  |                                                                                     |                  |

 $a_p 2 \times D = 50\%$ 
 $a_p 3 \times D = 50\%$ 
 $a_p 0,1 \times D = 75\%$

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general catalogue.

# ISO codes

|   |                                                         |
|---|---------------------------------------------------------|
| P | Steel, high-alloyed steel                               |
| M | Stainless steel Stainless                               |
| K | Grey cast iron, spher. graphite and malleable cast iron |
| N | Aluminium and other non-ferrous metals                  |
| S | Special, super and titanium alloys                      |
| H | Hardened steel and chilled cast iron                    |

On the following price and programme pages you will find for every tool recommendations regarding suitability for the application groups and details of max. tensile strength and hardness:

- optimal suitability
- limited suitability

## Surfaces

○ bright

● TiAlN

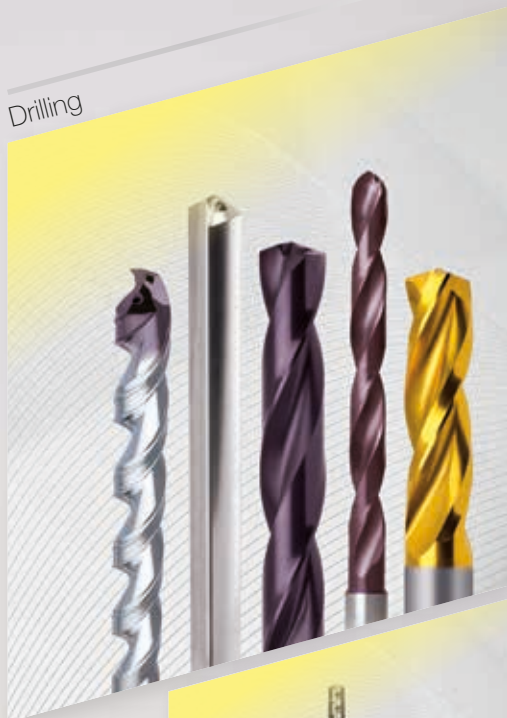
● AlCrN

● FIRE

## Pictograms

|                      |                                                                                                       |                                                                                                |                                                                                                   |                                                                                                |                                                                                                    |                                                                                                |
|----------------------|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| Tool material        | <b>VHM</b>                                                                                            |                                                                                                |                                                                                                   |                                                                                                |                                                                                                    |                                                                                                |
|                      | Solid carbide finest grain (HM-UF)                                                                    |                                                                                                |                                                                                                   |                                                                                                |                                                                                                    |                                                                                                |
| Shank form           |  <b>HA</b>         |  <b>HB</b>  |  <b>~HA</b>    |  <b>~HB</b> |  <b>Cyl</b>     |                                                                                                |
|                      | to DIN 6535                                                                                           |                                                                                                |                                                                                                   |                                                                                                | cylindrical                                                                                        |                                                                                                |
| Standard             |  <b>DIN 6527 L</b> |                                                                                                |  <b>WN</b>     |                                                                                                |                                                                                                    |                                                                                                |
|                      | to DIN                                                                                                |                                                                                                | to Guhring standard                                                                               |                                                                                                |                                                                                                    |                                                                                                |
| Type                 |  <b>N</b>          |  <b>W</b>   |  <b>NH</b>     |  <b>HRf</b> |                                                                                                    |                                                                                                |
| Application          |                    |             |                |             |                 |            |
|                      | Slotting                                                                                              | Roughing                                                                                       | Ramping                                                                                           | Helix                                                                                          | Drilling                                                                                           | Finishing                                                                                      |
| Length               |                    |             |                |             |                                                                                                    |                                                                                                |
|                      | short (DIN)                                                                                           | long (DIN)                                                                                     | medium                                                                                            | extra length                                                                                   |                                                                                                    |                                                                                                |
| No. of cutting edges |  <b>2</b>          |  <b>3</b>   |  <b>4</b>      |  <b>6</b>   |  <b>3-4</b>     |  <b>3-5</b> |
|                      | no. of major cutting edges                                                                            |                                                                                                |                                                                                                   |                                                                                                |                                                                                                    |                                                                                                |
| Helix angle          |  <b>20°</b>        |  <b>30°</b> |  <b>35°</b>    |  <b>45°</b> |  <b>35° 38°</b> |                                                                                                |
|                      | Size of helix angle / no. of different helix angles                                                   |                                                                                                |                                                                                                   |                                                                                                |                                                                                                    |                                                                                                |
| Rake angle           |  <b>-3°</b>        |  <b>7°</b>  |  <b>9°</b>     |  <b>12°</b> |  <b>15°</b>     |                                                                                                |
|                      | Rake angle of circumference cutting edges                                                             |                                                                                                |                                                                                                   |                                                                                                |                                                                                                    |                                                                                                |
| Cutting edge form    |  <b>45°</b>        |  <b>90°</b> |  <b>R±0,05</b> |                                                                                                |                                                                                                    |                                                                                                |
|                      | Corner chamfer                                                                                        |                                                                                                | Radius with tolerance                                                                             |                                                                                                |                                                                                                    |                                                                                                |
| Feed                 |                    |             |                                                                                                   |                                                                                                |                 |                                                                                                |
|                      | for lateral feed                                                                                      | for lateral feed and oblique plunging                                                          |                                                                                                   |                                                                                                | for lateral feed, oblique plunging and drilling                                                    |                                                                                                |

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