

# GUHRING

## *THE NEW GENERATION*

- ▶ torque reduction up to 30 %
- ▶ reduced axial forces
- ▶ increased tool life
- ▶ improved surface finish quality

**Pionex** *the new generation FLUTELESS MACHINE TAPS*

GUHRING – YOUR WORLD-WIDE PARTNER

# Pionex

*the new generation* **FLUTELESS MACHINE TAPS**

A special surface finish treatment in combination with the TiCN-coating ensures increased wear-resistance.



## **Optimised polygon form**

Based to a geometric modification the contact surface between tool and functionality area could be optimised. This reduced torque by up to 30 %.

## **Tool material**

Increased wear-resistance thanks to the application of a new powder metallurgical base material.

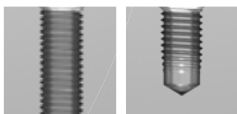
## **Shank tolerance h6**

Due to the shank tolerance h6 the new fluteless tap generation can be applied in all standard clamping chucks.

## **New lubricating groove geometry**

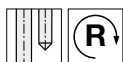
Thanks to the optimised lubricating grooves the lubricating effect has been clearly improved in the forming lead area.



|                                                                                                                                     |                                                                                                                             |                                                                                                                                           |                                                                                                                                                                                               |                                                                                                                   |                                                                                                                   |                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                     | Thread depth                                                                                                                | ≤3xD                                                                                                                                      |                                                                                                                                                                                               |                                                                                                                   |                                                                                                                   |                                                                                                                   |
|                                                                                                                                     | Tool material                                                                                                               | HSS-E-PM                                                                                                                                  |                                                                                                                                                                                               |                                                                                                                   |                                                                                                                   |                                                                                                                   |
|                                                                                                                                     | Lead form                                                                                                                   | C                                                                                                                                         | E                                                                                                                                                                                             | C                                                                                                                 | E                                                                                                                 |                                                                                                                   |
|                                                                                                                                     | Surface                                                                                                                     |                                                          |                                                                                                            |                                |                                |                                                                                                                   |
|                                                                                                                                     | Coolant delivery                                                                                                            |                                                          |                                                                                                            |                                |                                |                                                                                                                   |
|                                                                                                                                     | Shank tolerance                                                                                                             | h6                                                                                                                                        | h6                                                                                                                                                                                            | h6                                                                                                                | h6                                                                                                                |                                                                                                                   |
| <div></div> <div>THROUGH HOLE<br/>BLIND HOLE</div> |                                                                                                                             |                                                          |                                                                                                            |                                |                                |                                                                                                                   |
| <div>● = Neat oil</div> <div>● = Soluble oil</div> <div>△ = Paste</div> <div>□ = MQL</div>                                          | <div>Thread type</div> <div>M</div> <div>MF</div> <div>UNC</div> <div>UNF</div> <div>G</div> <div>Suitable lubricant:</div> | <div>Tolerance</div> <div>6HX</div> <div>6GX</div> <div>6HX</div> <div>6GX</div> <div>2BX</div> <div>2BX</div> <div>- X</div> <div></div> | <div>Article no./page</div> <div>4487 p. 4</div> <div>4488 p. 4</div> <div>4489 p. 7</div> <div>4490 p. 7</div> <div>4491 p. 10</div> <div>4492 p. 11</div> <div>4493 p. 12</div> <div></div> | <div>4494 p. 4</div> <div></div> <div>4495 p. 7</div> <div></div> <div></div> <div></div> <div></div> <div></div> | <div>4485 p. 6</div> <div></div> <div>4486 p. 9</div> <div></div> <div></div> <div></div> <div></div> <div></div> | <div>4483 p. 5</div> <div></div> <div>4484 p. 8</div> <div></div> <div></div> <div></div> <div></div> <div></div> |
|                                                                                                                                     |                                                                                                                             | <div>●/●/△</div>                                                                                                                          | <div>●/●/△</div>                                                                                                                                                                              | <div>●/●/△/□</div>                                                                                                | <div>●/●/△/□</div>                                                                                                |                                                                                                                   |

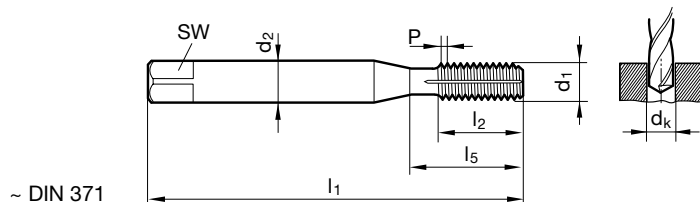
|          | Group of materials                                                              | Tensile strength                 | Material example                                         | Material no.                         | Recommended cutting speed $v_c$ [m/min] |    |    |    |
|----------|---------------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------|--------------------------------------|-----------------------------------------|----|----|----|
| <b>P</b> | <b>P1</b> Structural and free cutting steels, heat-treatable steels unalloyed   | ≤800 N/mm <sup>2</sup>           | S235JR<br>C15<br>11SMnPb30                               | 1.0037<br>1.0401<br>1.0718           | 25                                      | 25 | 25 | 25 |
|          | <b>P2</b> Free-cutting steels, unalloyed case hardened steels, nitriding steels | 800 - 1000 N/mm <sup>2</sup>     | S355J2<br>C60<br>31CrMo12                                | 1.0577<br>1.0601<br>1.8515           | 25                                      | 25 | 25 | 25 |
|          | <b>P3</b> Alloyed heat-treatable steels, tool steels, high speed steels         | 800 - 1200 N/mm <sup>2</sup>     | 42CrMo4<br>36CrNiMo4<br>X36CrMo17<br>HS 6-5-2            | 1.7225<br>1.6511<br>1.2316<br>1.3343 | 15                                      | 15 | 15 | 15 |
| <b>M</b> | <b>M1</b> Stainless steels, sulphured, austenitic                               | ≤1000 N/mm <sup>2</sup>          | X5CrNi18-10<br>X6CrNiTi18-10<br>X8CrNiS18-9              | 1.4301<br>1.4571<br>1.4305           | 15                                      | 15 | 15 | 15 |
|          | <b>M2</b> Stainless- and acidresistant steels, martensitic                      | ≤1000 N/mm <sup>2</sup>          | X17CrNi16-2<br>X90CrMoV18<br>X2CrTi12                    | 1.4057<br>1.4112<br>1.4512           | 10                                      | 10 | 10 | 10 |
|          | <b>M3</b> Duplex and Super Duplex                                               | ≤1300 N/mm <sup>2</sup>          | X2CrNiMoN22-5-3<br>X2CrNiMoN25-7-4<br>X2CrNiMoCuWN25-7-4 | 1.4462<br>1.4410<br>1.4501           | 6                                       | 6  | 6  | 6  |
| <b>K</b> | <b>K1</b> Cast Iron                                                             | 300 HB                           | EN-GJL-150<br>EN-GJL-250<br>EN-GJL-300                   | 0.6015<br>0.6025<br>0.6030           |                                         |    |    |    |
|          | <b>K2</b> Spheroidal graphite iron and malleable cast iron                      | 350 HB                           | EN-GJS-400-15<br>EN-GJS-600-3<br>EN-GJS-700-2            | 0.7040<br>0.7060<br>0.7070           | 30                                      | 30 | 30 | 30 |
|          | <b>K3</b> ADI<br>GGV                                                            | 1000 N/mm <sup>2</sup><br>350 HB | EN-GJS1000-5<br>EN-GJV250<br>EN-GJV400                   |                                      | 25                                      | 25 | 25 | 25 |
| <b>N</b> | <b>N1</b> Aluminium and wrought alloys                                          | ≤450 N/mm <sup>2</sup>           | Al99,5H<br>AlMgSi1<br>AlZn4,5Mg                          | 3.0250<br>3.2315<br>3.4335           | 15                                      | 15 | 15 | 15 |
|          | <b>N2</b> Al cast alloys                                                        | ≤600 N/mm <sup>2</sup>           | GD-ALSi5Cu1Mg<br>GD-ALSi8Cu3<br>G-ALSi9Mg<br>G-ALSi12    | 3.2134<br>3.2162<br>3.2373<br>3.2581 | 30                                      | 30 | 30 | 30 |
|          | <b>N3</b> Magnesium alloys                                                      | ≤500 N/mm <sup>2</sup>           | GDMgAl8Zn1                                               | 3.5812.08                            |                                         |    |    |    |
|          | <b>N4</b> Copper and copper alloys                                              | long-chipping                    | CuZn20<br>CuZn37Pb0,5                                    | 2.0250<br>2.0332                     | 30                                      | 30 | 30 | 30 |
|          |                                                                                 | short-chipping                   | CuZn39Pb2<br>CuZn43Pb2                                   | 2.0380<br>2.0410                     |                                         |    |    |    |
|          | <b>N5</b> Copper special alloys                                                 | ≤1400 N/mm <sup>2</sup>          | Ampco                                                    |                                      |                                         |    |    |    |
| <b>S</b> | <b>N6</b> Plastics<br>[Thermoplastics, Duroplastics]                            | long-chipping<br>short-chipping  | PMMA, POM,PVC<br>Pertinax                                |                                      |                                         |    |    |    |
|          | <b>S1</b> Titanium and Titanium alloys                                          | ≤ 1200 N/mm <sup>2</sup>         | Titan<br>TiAl5Sn2<br>TiAl6V4                             | 3.702<5<br>3.7115<br>3.7165          | 8                                       | 8  | 8  | 8  |
| <b>H</b> | <b>S2</b> Nickel, cobalt, iron alloys                                           | ≤ 1400 N/mm <sup>2</sup>         | Hastelloy C4<br>Inconel 718<br>Nimonic 105               | 2.4610<br>2.4668<br>2.4634           | 8                                       | 8  | 8  | 8  |
|          | <b>H1</b><br><b>H2</b> High tensile/<br>hardened steels                         | 45 - 55 HRC<br>55 - 62 HRC       |                                                          |                                      |                                         |    |    |    |

## Fluteless machine taps for ISO metric threads

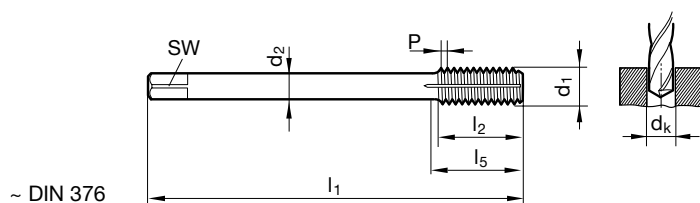


|   |   |
|---|---|
| P | • |
| M | • |
| K | • |
| N | ○ |
| S | • |
| H |   |

| Tool material    | HSS-E-PM |     |     |
|------------------|----------|-----|-----|
| Tolerance on Ø   | 4HX/6HX  | 6GX | 6HX |
| Surface          | Ⓢ        | Ⓢ   | Ⓢ   |
| Type             | N        | N   | N   |
| Form             | C        | C   | E   |
| Internal cooling | ✗        | ✗   | ✗   |



~ DIN 371



~ DIN 376

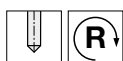


| DIN 2174 ~DIN 371/~DIN 376 |       |        |        |       |         |        |        |          | Article no.    | 4487 | 4488 | 4494 |
|----------------------------|-------|--------|--------|-------|---------|--------|--------|----------|----------------|------|------|------|
|                            |       |        |        |       |         |        |        |          | Discount group | 208  | 208  | 208  |
| d1                         | P     | d2     | SW     | dk    | l1      | l2     | l5     | Code no. | Availability   |      |      |      |
| mm                         | mm    | mm     | mm     | mm    | mm      | mm     | mm     |          |                |      |      |      |
| M1                         | 0.250 | 2.500  | 2.100  | 0.90  | 40.000  | 4.000  |        | 1.000    | •              |      |      |      |
| M1,2                       | 0.250 | 2.500  | 2.100  | 1.10  | 40.000  | 4.800  |        | 1.200    | •              |      |      |      |
| M1,4                       | 0.300 | 2.500  | 2.100  | 1.25  | 40.000  | 5.600  |        | 1.400    | •              |      |      |      |
| M1,6                       | 0.350 | 2.500  | 2.100  | 1.45  | 40.000  | 6.400  |        | 1.600    | •              |      |      |      |
| M1,7                       | 0.350 | 2.500  | 2.100  | 1.55  | 40.000  | 6.800  |        | 1.700    | •              |      |      |      |
| M1,8                       | 0.350 | 2.500  | 2.100  | 1.65  | 40.000  | 7.300  |        | 1.800    | •              |      |      |      |
| M2                         | 0.400 | 2.800  | 2.100  | 1.85  | 45.000  | 8.000  | 13.500 | 2.000    | •              | •    | •    | •    |
| M2,5                       | 0.450 | 2.800  | 2.100  | 2.30  | 50.000  | 9.000  | 14.500 | 2.500    | •              | •    | •    | •    |
| M3                         | 0.500 | 3.500  | 2.700  | 2.80  | 56.000  | 10.000 | 18.000 | 3.000    | •              | •    | •    | •    |
| M4                         | 0.700 | 4.500  | 3.400  | 3.70  | 63.000  | 12.000 | 21.000 | 4.000    | •              | •    | •    | •    |
| M5                         | 0.800 | 6.000  | 4.900  | 4.65  | 70.000  | 14.000 | 25.000 | 5.000    | •              | •    | •    | •    |
| M6                         | 1.000 | 6.000  | 4.900  | 5.55  | 80.000  | 16.000 | 30.000 | 6.000    | •              | •    | •    | •    |
| M8                         | 1.250 | 8.000  | 6.200  | 7.40  | 90.000  | 17.000 | 35.000 | 8.000    | •              | •    | •    | •    |
| M10                        | 1.500 | 10.000 | 8.000  | 9.30  | 100.000 | 20.000 | 39.000 | 10.000   | •              | •    | •    | •    |
| M12                        | 1.750 | 9.000  | 7.000  | 11.20 | 110.000 | 24.000 | 49.000 | 12.000   | •              | •    | •    | •    |
| M14                        | 2.000 | 11.000 | 9.000  | 13.10 | 110.000 | 26.000 | 53.000 | 14.000   | •              | •    | •    | •    |
| M16                        | 2.000 | 12.000 | 9.000  | 15.10 | 110.000 | 26.000 | 54.000 | 16.000   | •              | •    | •    | •    |
| M20                        | 2.500 | 16.000 | 12.000 | 18.90 | 140.000 | 32.000 | 62.000 | 20.000   | •              | •    | •    | •    |

Article no. 4487 from Ø M2 with oil grooves, Ø tolerance ≤ M1.4 = 4HX



# Oil feed fluteless taps f. ISO metric threads



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

Tool material **HSS-E-PM**

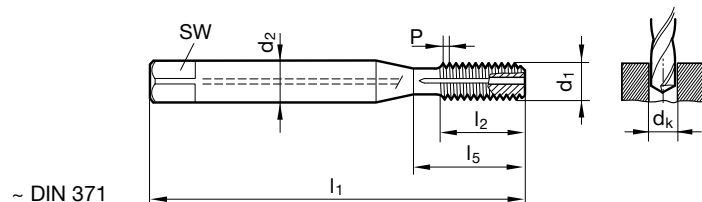
Tolerance on Ø 6HX

Surface **C**

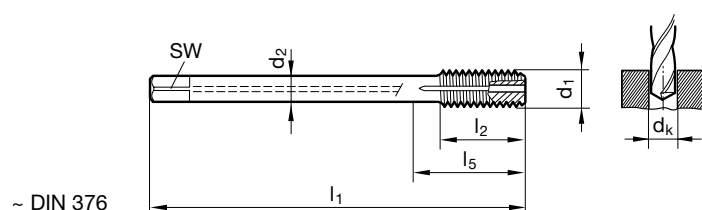
Type N

Form E

Internal cooling



~ DIN 371



~ DIN 376



DIN 2174 ~DIN 371/~DIN 376

Article no.

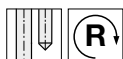
4483

Discount group

208

| d1  | P     | d2     | SW     | dk    | l1      | l2     | l5     | Code no. | Availability |
|-----|-------|--------|--------|-------|---------|--------|--------|----------|--------------|
| mm  | mm    | mm     | mm     | mm    | mm      | mm     | mm     |          |              |
| M5  | 0.800 | 6.000  | 4.900  | 4.65  | 70.000  | 8.500  | 25.000 | 5.000    | •            |
| M6  | 1.000 | 6.000  | 4.900  | 5.55  | 80.000  | 11.000 | 30.000 | 6.000    | •            |
| M8  | 1.250 | 8.000  | 6.200  | 7.40  | 90.000  | 14.000 | 35.000 | 8.000    | •            |
| M10 | 1.500 | 10.000 | 8.000  | 9.30  | 100.000 | 16.000 | 39.000 | 10.000   | •            |
| M12 | 1.750 | 9.000  | 7.000  | 11.20 | 110.000 | 18.500 | 49.000 | 12.000   | •            |
| M14 | 2.000 | 11.000 | 9.000  | 13.10 | 110.000 | 20.000 | 53.000 | 14.000   | •            |
| M16 | 2.000 | 12.000 | 9.000  | 15.10 | 110.000 | 20.000 | 54.000 | 16.000   | •            |
| M20 | 2.500 | 16.000 | 12.000 | 18.90 | 140.000 | 25.000 | 62.000 | 20.000   | •            |
|     |       |        |        |       |         |        |        |          |              |

## Oil feed fluteless taps f. ISO metric threads



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

Tool material **HSS-E-PM**

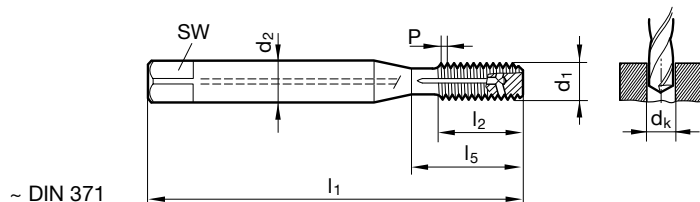
Tolerance on Ø 6HX

Surface

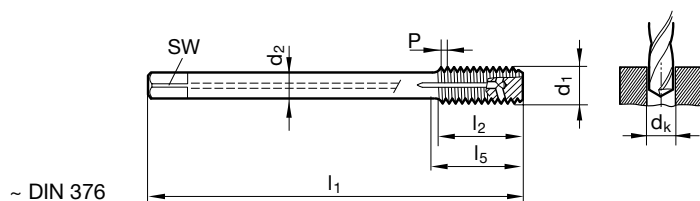
Type N

Form C

Internal cooling



~ DIN 371



~ DIN 376



DIN 2174 ~DIN 371/~DIN 376

Article no.

4485

Discount group

208

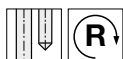
| d1  | P     | d2     | SW     | dk    | l1      | l2     | l5     | Code no. |
|-----|-------|--------|--------|-------|---------|--------|--------|----------|
| mm  | mm    | mm     | mm     | mm    | mm      | mm     | mm     |          |
| M5  | 0.800 | 6.000  | 4.900  | 4.65  | 70.000  | 8.500  | 25.000 | 5.000    |
| M6  | 1.000 | 6.000  | 4.900  | 5.55  | 80.000  | 11.000 | 30.000 | 6.000    |
| M8  | 1.250 | 8.000  | 6.200  | 7.40  | 90.000  | 14.000 | 35.000 | 8.000    |
| M10 | 1.500 | 10.000 | 8.000  | 9.30  | 100.000 | 16.000 | 39.000 | 10.000   |
| M12 | 1.750 | 9.000  | 7.000  | 11.20 | 110.000 | 18.500 | 49.000 | 12.000   |
| M14 | 2.000 | 11.000 | 9.000  | 13.10 | 110.000 | 20.000 | 53.000 | 14.000   |
| M16 | 2.000 | 12.000 | 9.000  | 15.10 | 110.000 | 20.000 | 54.000 | 16.000   |
| M20 | 2.500 | 16.000 | 12.000 | 18.90 | 140.000 | 25.000 | 62.000 | 20.000   |

Availability

•  
•  
•  
•  
•  
•  
•



# Fluteless machine taps for ISO metric fine threads



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

Tool material

HSS-E-PM

Tolerance on Ø

6HX

6GX

6HX

Surface

C

C

C

Type

N

N

N

Form

C

C

E

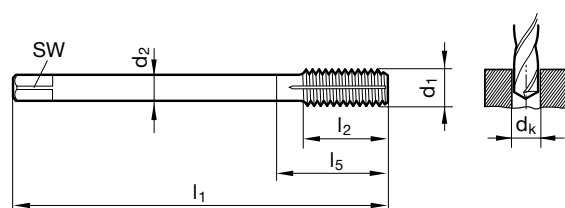
Internal cooling

X

X

X

DIN 371



DIN 2174 ~DIN 374

Article no.

4489

4490

4495

Discount group

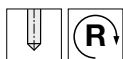
208

208

208

| d1         | d2     | SW     | dk    | l1      | l2     | l5     | Code no. | Availability |   |   |
|------------|--------|--------|-------|---------|--------|--------|----------|--------------|---|---|
|            | mm     | mm     | mm    | mm      | mm     | mm     |          |              |   |   |
| M8 x 1     | 6.000  | 4.900  | 7.55  | 90.000  | 16.000 | 35.000 | 8.005    | •            | • | • |
| M10 x 1    | 7.000  | 5.500  | 9.55  | 90.000  | 16.000 | 35.000 | 10.005   | •            | • | • |
| M10 x 1,25 | 7.000  | 5.500  | 9.40  | 100.000 | 20.000 | 39.000 | 10.006   | •            | • | • |
| M12 x 1,25 | 9.000  | 7.000  | 11.40 | 100.000 | 20.000 | 40.000 | 12.006   | •            | • | • |
| M12 x 1,5  | 9.000  | 7.000  | 11.30 | 100.000 | 20.000 | 40.000 | 12.007   | •            | • | • |
| M14 x 1,25 | 11.000 | 9.000  | 13.40 | 100.000 | 20.000 | 40.000 | 14.006   | •            | • | • |
| M14 x 1,5  | 11.000 | 9.000  | 13.30 | 100.000 | 20.000 | 40.000 | 14.007   | •            | • | • |
| M16 x 1,5  | 12.000 | 9.000  | 15.30 | 100.000 | 22.000 | 44.000 | 16.007   | •            | • | • |
| M20 x 1,5  | 16.000 | 12.000 | 19.30 | 125.000 | 25.000 | 44.000 | 20.007   | •            | • | • |

## Oil feed fluteless taps f. ISO metric fine threads



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

Tool material **HSS-E-PM**

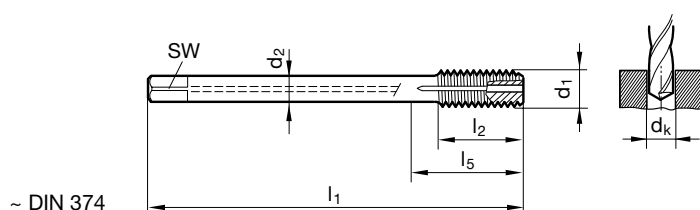
Tolerance on Ø 6HX

Surface **C**

Type N

Form E

Internal cooling



DIN 2174 ~DIN 374

Article no.

4484

Discount group

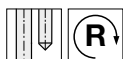
208

| d1         | d2     | SW     | dk    | l1      | l2     | l5     | Code no. | Availability |
|------------|--------|--------|-------|---------|--------|--------|----------|--------------|
| mm         | mm     | mm     | mm    | mm      | mm     | mm     |          |              |
| M8 x 1     | 6.000  | 4.900  | 7.55  | 90.000  | 11.000 | 35.000 | 8.005    | •            |
| M10 x 1    | 7.000  | 5.500  | 9.55  | 90.000  | 11.000 | 35.000 | 10.005   | •            |
| M10 x 1,25 | 7.000  | 5.500  | 9.40  | 100.000 | 14.000 | 39.000 | 10.006   | •            |
| M12 x 1,25 | 9.000  | 7.000  | 11.40 | 100.000 | 16.000 | 40.000 | 12.006   | •            |
| M12 x 1,5  | 9.000  | 7.000  | 11.30 | 100.000 | 16.000 | 40.000 | 12.007   | •            |
| M14 x 1,25 | 11.000 | 9.000  | 13.40 | 100.000 | 15.000 | 40.000 | 14.006   | •            |
| M14 x 1,5  | 11.000 | 9.000  | 13.30 | 100.000 | 15.000 | 40.000 | 14.007   | •            |
| M16 x 1,5  | 12.000 | 9.000  | 15.30 | 100.000 | 15.000 | 44.000 | 16.007   | •            |
| M20 x 1,5  | 16.000 | 12.000 | 19.30 | 125.000 | 16.000 | 44.000 | 20.007   | •            |





# Oil feed fluteless taps f. ISO metric fine threads



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

Tool material **HSS-E-PM**

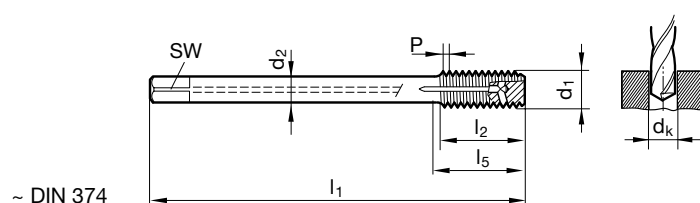
Tolerance on Ø 6HX

Surface

Type N

Form C

Internal cooling



~ DIN 374



DIN 2174 ~DIN 374

Article no.

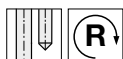
4486

Discount group

208

| d1         | d2     | SW     | dk    | l1      | l2     | l5     | Code no. | Availability |
|------------|--------|--------|-------|---------|--------|--------|----------|--------------|
|            | mm     | mm     | mm    | mm      | mm     | mm     |          |              |
| M8 x 1     | 6.000  | 4.900  | 7.55  | 90.000  | 11.000 | 35.000 | 8.005    | •            |
| M10 x 1    | 7.000  | 5.500  | 9.55  | 90.000  | 11.000 | 35.000 | 10.005   | •            |
| M10 x 1,25 | 7.000  | 5.500  | 9.40  | 100.000 | 14.000 | 39.000 | 10.006   | •            |
| M12 x 1,25 | 9.000  | 7.000  | 11.40 | 100.000 | 16.000 | 40.000 | 12.006   | •            |
| M12 x 1,5  | 9.000  | 7.000  | 11.30 | 100.000 | 16.000 | 40.000 | 12.007   | •            |
| M14 x 1,25 | 11.000 | 9.000  | 13.40 | 100.000 | 15.000 | 40.000 | 14.006   | •            |
| M14 x 1,5  | 11.000 | 9.000  | 13.30 | 100.000 | 15.000 | 40.000 | 14.007   | •            |
| M16 x 1,5  | 12.000 | 9.000  | 15.30 | 100.000 | 15.000 | 44.000 | 16.007   | •            |
| M20 x 1,5  | 16.000 | 12.000 | 19.30 | 125.000 | 16.000 | 44.000 | 20.007   | •            |
|            |        |        |       |         |        |        |          |              |

## Fluteless machine taps for UNC-threads



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

Tool material **HSS-E-PM**

Tolerance on Ø **2BX**

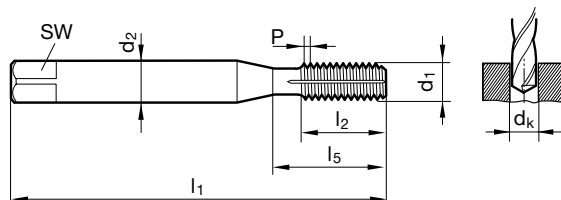
Surface **Ⓢ**

Type **N**

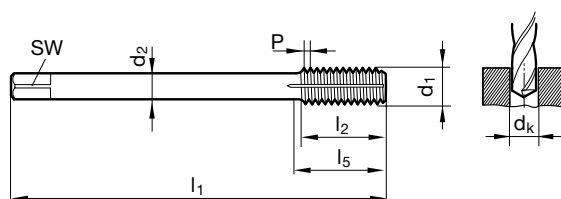
Form **C**

Internal cooling

~ DIN 371



~ DIN 376



**DIN 2184-1 ~DIN 371/~DIN 376**

Article no.

**4491**

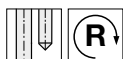
Discount group

**208**

| d1        | d2     | SW     | dk    | l1      | l2     | l5     | Code no. | Availability |
|-----------|--------|--------|-------|---------|--------|--------|----------|--------------|
| mm        | mm     | mm     | mm    | mm      | mm     | mm     |          |              |
| 4 - 40    | 3.500  | 2.700  | 2.55  | 56.000  | 11.000 | 18.000 | 2.845    | •            |
| 6 - 32    | 4.000  | 3.000  | 3.15  | 56.000  | 12.000 | 20.000 | 3.505    | •            |
| 8 - 32    | 4.500  | 3.400  | 3.80  | 63.000  | 12.000 | 21.000 | 4.166    | •            |
| 10 - 24   | 6.000  | 4.900  | 4.35  | 70.000  | 14.000 | 25.000 | 4.826    | •            |
| 12 - 24   | 6.000  | 4.900  | 5.00  | 80.000  | 16.000 | 30.000 | 5.486    | •            |
| 1/4 - 20  | 7.000  | 5.500  | 5.75  | 80.000  | 16.000 | 30.000 | 6.350    | •            |
| 5/16 - 18 | 8.000  | 6.200  | 7.30  | 90.000  | 18.000 | 35.000 | 7.938    | •            |
| 3/8 - 16  | 10.000 | 8.000  | 8.80  | 90.000  | 20.000 | 35.000 | 9.525    | •            |
| 7/16 - 14 | 8.000  | 6.200  | 10.30 | 100.000 | 22.000 | 42.000 | 11.113   | •            |
| 1/2 - 13  | 9.000  | 7.000  | 11.80 | 100.000 | 25.000 | 40.000 | 12.700   | •            |
| 9/16 - 12 | 11.000 | 9.000  | 13.30 | 100.000 | 28.000 | 40.000 | 14.288   | •            |
| 5/8 - 11  | 12.000 | 9.000  | 14.80 | 100.000 | 30.000 | 44.000 | 15.875   | •            |
| 3/4 - 10  | 14.000 | 11.000 | 17.90 | 110.000 | 33.000 | 44.000 | 19.050   | •            |



# Fluteless machine taps for UNF-threads



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

Tool material **HSS-E-PM**

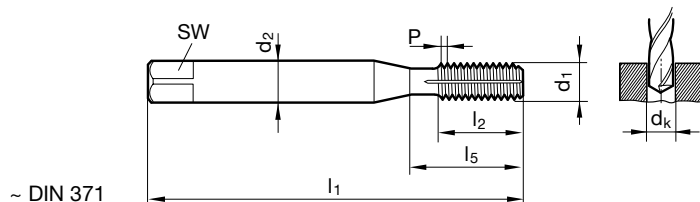
Tolerance on Ø **2BX**

Surface **Ⓢ**

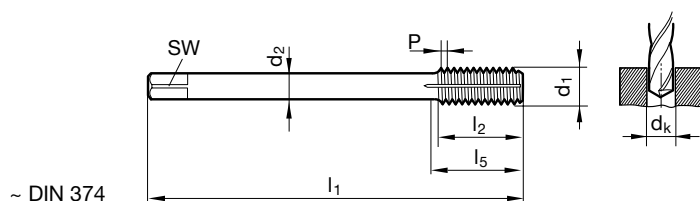
Type **N**

Form **C**

Internal cooling



~ DIN 371



~ DIN 374


**DIN 2184-1 ~DIN 371/~DIN 374**

Article no.

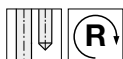
**4492**

Discount group

**208**

| d1        | d2     | SW     | dk    | l1      | l2     | l5     | Code no. | Availability |
|-----------|--------|--------|-------|---------|--------|--------|----------|--------------|
| mm        | mm     | mm     | mm    | mm      | mm     | mm     |          |              |
| 4 - 48    | 3.500  | 2.700  | 2.60  | 56.000  | 10.000 | 18.000 | 2.845    | •            |
| 6 - 40    | 4.000  | 3.000  | 3.20  | 56.000  | 11.000 | 20.000 | 3.505    | •            |
| 8 - 36    | 4.500  | 3.400  | 3.85  | 63.000  | 12.000 | 21.000 | 4.166    | •            |
| 10 - 32   | 6.000  | 4.900  | 4.45  | 70.000  | 14.000 | 25.000 | 4.826    | •            |
| 12 - 28   | 6.000  | 4.900  | 5.10  | 80.000  | 16.000 | 30.000 | 5.486    | •            |
| 1/4 - 28  | 7.000  | 5.500  | 5.95  | 80.000  | 16.000 | 30.000 | 6.350    | •            |
| 5/16 - 24 | 8.000  | 6.200  | 7.45  | 90.000  | 18.000 | 35.000 | 7.938    | •            |
| 3/8 - 24  | 10.000 | 8.000  | 9.05  | 100.000 | 18.000 | 39.000 | 9.525    | •            |
| 7/16 - 20 | 8.000  | 6.200  | 10.55 | 100.000 | 22.000 | 42.000 | 11.113   | •            |
| 1/2 - 20  | 9.000  | 7.000  | 12.10 | 100.000 | 20.000 | 40.000 | 12.700   | •            |
| 9/16 - 18 | 11.000 | 9.000  | 13.65 | 100.000 | 22.000 | 40.000 | 14.288   | •            |
| 5/8 - 18  | 12.000 | 9.000  | 15.25 | 100.000 | 22.000 | 44.000 | 15.875   | •            |
| 3/4 - 16  | 14.000 | 11.000 | 18.35 | 110.000 | 25.000 | 44.000 | 19.050   | •            |

## Fluteless machine taps for BSP-threads



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

Tool material **HSS-E-PM**

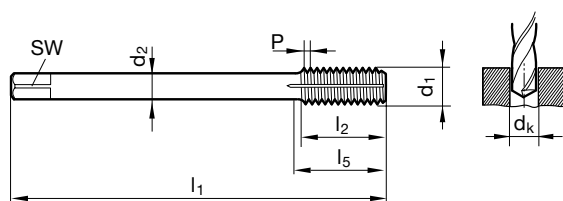
Tolerance on Ø

Surface **C**

Type **N**

Form **C**

Internal cooling



DIN 2184-1 DIN 2189

Article no.

**4493**

Discount group

**208**

| d1   | P      | d2     | SW     | dk    | l1      | l2     | l5     | Code no. |
|------|--------|--------|--------|-------|---------|--------|--------|----------|
|      | G/inch | mm     | mm     | mm    | mm      | mm     | mm     |          |
| G1/8 | 28.000 | 7.000  | 5.500  | 9.30  | 90.000  | 18.000 | 35.000 | 9.728    |
| G1/4 | 19.000 | 11.000 | 9.000  | 12.50 | 100.000 | 20.000 | 40.000 | 13.157   |
| G3/8 | 19.000 | 12.000 | 9.000  | 16.00 | 100.000 | 22.000 | 44.000 | 16.662   |
| G1/2 | 14.000 | 16.000 | 12.000 | 20.00 | 125.000 | 25.000 | 44.000 | 20.955   |

Availability

•  
•  
•  
•



## Recommended tapping size holes for thread forming

| Std. ISO metric threads<br>DIN 13 |       |                   |                   |         |                           |         | ISO metric fine threads<br>DIN 13                                   |       |                   |                   |         |                           |             |          |       |                   |                   |         |                           |         |
|-----------------------------------|-------|-------------------|-------------------|---------|---------------------------|---------|---------------------------------------------------------------------|-------|-------------------|-------------------|---------|---------------------------|-------------|----------|-------|-------------------|-------------------|---------|---------------------------|---------|
| nom. Ø                            | pitch | tapp. size hole Ø | tapp. size hole Ø |         | core Ø of int. thread 7H* |         | nom. x Ø                                                            | pitch | tapp. size hole Ø | tapp. size hole Ø |         | core Ø of int. thread 7H* |             | nom. x Ø | pitch | tapp. size hole Ø | tapp. size hole Ø |         | core Ø of int. thread 7H* |         |
| mm                                | mm    | mm                | min. mm           | max. mm | min. mm                   | max. mm | mm                                                                  | mm    | mm                | min. mm           | max. mm | min. mm                   | max. mm     | mm       | mm    | mm                | min. mm           | max. mm | min. mm                   | max. mm |
| M1                                | 0.25  | 0.90              | 0.89              | 0.92    | 0.729                     | 0.819   | M 2.5 x 0.35                                                        | 2.35  | 2.35              | 2.38              | 2.121   | 2.221                     | M 17 x 1.50 | 16.30    | 16.26 | 16.38             | 15.376            | 15.751  |                           |         |
| M1.2                              | 0.25  | 1.10              | 1.09              | 1.12    | 0.929                     | 1.019   | M 3 x 0.35                                                          | 2.85  | 2.85              | 2.88              | 2.621   | 2.721                     | M 18 x 1.00 | 17.55    | 17.52 | 17.62             | 16.917            | 17.217  |                           |         |
| M1.4                              | 0.30  | 1.28              | 1.27              | 1.30    | 1.075                     | 1.181   | M 4 x 0.35                                                          | 3.85  | 3.85              | 3.88              | 3.621   | 3.721                     | M 18 x 1.50 | 17.30    | 17.26 | 17.38             | 16.376            | 16.751  |                           |         |
| M1.6                              | 0.35  | 1.46              | 1.45              | 1.48    | 1.221                     | 1.346   | M 4 x 0.50                                                          | 3.80  | 3.78              | 3.83              | 3.459   | 3.639                     | M 18 x 2.00 | 17.10    | 17.05 | 17.20             | 15.835            | 16.310  |                           |         |
| M1.7                              | 0.35  | 1.56              | 1.55              | 1.58    | 1.321                     | 1.446   | M 5 x 0.50                                                          | 4.80  | 4.78              | 4.83              | 4.459   | 4.639                     | M 20 x 1.00 | 19.55    | 19.52 | 19.62             | 18.917            | 19.217  |                           |         |
| M1.8                              | 0.35  | 1.66              | 1.65              | 1.68    | 1.421                     | 1.546   | M 5.5 x 0.50                                                        | 5.30  | 5.28              | 5.33              | 4.959   | 5.139                     | M 20 x 1.50 | 19.30    | 19.26 | 19.38             | 18.376            | 19.751  |                           |         |
| M 2                               | 0.40  | 1.85              | 1.84              | 1.88    | 1.567                     | 1.679   | M 6 x 0.75                                                          | 5.65  | 5.62              | 5.70              | 5.188   | 5.424                     | M 24 x 1.00 | 23.55    | 23.52 | 23.62             | 22.917            | 23.217  |                           |         |
| M 2.2                             | 0.45  | 2.00              | 2.01              | 2.05    | 1.713                     | 1.838   | M 7 x 0.75                                                          | 6.65  | 6.62              | 6.70              | 6.188   | 6.424                     | M 24 x 1.50 | 23.30    | 23.26 | 23.38             | 22.376            | 22.751  |                           |         |
| M 2.5                             | 0.45  | 2.30              | 2.28              | 2.32    | 2.013                     | 2.138   | M 8 x 0.75                                                          | 7.65  | 7.62              | 7.70              | 7.188   | 7.424                     | M 24 x 2.00 | 23.10    | 23.05 | 23.20             | 21.835            | 22.310  |                           |         |
| M 3                               | 0.50  | 2.80              | 2.78              | 2.85    | 2.459                     | 2.639   | M 8 x 1.00                                                          | 7.55  | 7.52              | 7.62              | 6.917   | 7.217                     | M 27 x 1.50 | 26.30    | 26.26 | 26.38             | 25.376            | 25.751  |                           |         |
| M 3.5                             | 0.60  | 3.25              | 3.23              | 3.30    | 2.850                     | 3.050   | M 9 x 0.75                                                          | 8.65  | 8.62              | 8.70              | 8.188   | 8.424                     | M 30 x 1.50 | 29.30    | 29.26 | 29.38             | 28.376            | 28.751  |                           |         |
| M 4                               | 0.70  | 3.70              | 3.68              | 3.76    | 3.242                     | 3.466   | M 9 x 1.00                                                          | 8.55  | 8.52              | 8.62              | 7.917   | 8.217                     | M 33 x 1.50 | 32.30    | 32.26 | 32.38             | 31.376            | 31.751  |                           |         |
| M 4.5                             | 0.75  | 4.20              |                   |         |                           |         | M 10 x 0.75                                                         | 9.65  | 9.62              | 9.70              | 9.188   | 9.424                     | M 36 x 1.50 | 35.30    | 35.26 | 35.38             | 34.376            | 34.751  |                           |         |
| M 5                               | 0.80  | 4.65              | 4.62              | 4.71    | 4.134                     | 4.384   | M 10 x 1.00                                                         | 9.55  | 9.52              | 9.62              | 8.917   | 9.217                     | M 39 x 1.50 | 38.30    | 38.26 | 38.38             | 37.376            | 37.751  |                           |         |
| M 6                               | 1.00  | 5.55              | 5.52              | 5.62    | 4.917                     | 5.217   | M 10 x 1.25                                                         | 9.40  | 9.36              | 9.47              | 8.647   | 8.982                     | M 42 x 1.50 | 41.30    | 41.26 | 41.38             | 40.376            | 40.751  |                           |         |
| M 7                               | 1.00  | 6.55              | 6.52              | 6.62    | 5.917                     | 6.217   | M 11 x 0.75                                                         | 10.65 | 10.62             | 10.70             | 10.188  | 10.424                    |             |          |       |                   |                   |         |                           |         |
| M 8                               | 1.25  | 7.40              | 7.36              | 7.47    | 6.647                     | 6.982   | M 11 x 1.00                                                         | 10.55 | 10.52             | 10.62             | 9.917   | 10.217                    |             |          |       |                   |                   |         |                           |         |
| M 9                               | 1.25  | 8.40              | 8.36              | 8.47    | 7.647                     | 7.982   | M 12 x 1.00                                                         | 11.55 | 11.52             | 11.62             | 10.917  | 11.217                    |             |          |       |                   |                   |         |                           |         |
| M 10                              | 1.50  | 9.30              | 9.26              | 9.38    | 8.376                     | 8.751   | M 12 x 1.25                                                         | 11.40 | 11.36             | 11.47             | 10.647  | 10.982                    |             |          |       |                   |                   |         |                           |         |
| M 11                              | 1.50  | 10.30             | 10.26             | 10.38   | 9.376                     | 9.751   | M 12 x 1.50                                                         | 11.30 | 11.26             | 11.38             | 10.376  | 10.751                    |             |          |       |                   |                   |         |                           |         |
| M 12                              | 1.75  | 11.20             | 11.15             | 11.29   | 10.106                    | 10.531  | M 14 x 1.00                                                         | 13.55 | 13.52             | 13.62             | 12.917  | 13.217                    |             |          |       |                   |                   |         |                           |         |
| M 14                              | 2.00  | 13.10             | 13.05             | 13.20   | 11.835                    | 12.310  | M 14 x 1.25                                                         | 13.40 | 13.36             | 13.47             | 12.647  | 12.982                    |             |          |       |                   |                   |         |                           |         |
| M 16                              | 2.00  | 15.10             | 15.05             | 15.20   | 13.835                    | 14.310  | M 14 x 1.50                                                         | 13.30 | 13.26             | 13.38             | 12.376  | 12.751                    |             |          |       |                   |                   |         |                           |         |
| M 18                              | 2.50  | 16.90             | 16.83             | 17.02   | 15.294                    | 15.854  | M 15 x 1.00                                                         | 14.55 | 14.52             | 14.62             | 13.917  | 14.217                    |             |          |       |                   |                   |         |                           |         |
| M 20                              | 2.50  | 18.90             | 18.83             | 19.02   | 17.294                    | 17.854  | M 15 x 1.50                                                         | 14.30 | 14.26             | 14.38             | 13.376  | 13.751                    |             |          |       |                   |                   |         |                           |         |
| M 22                              | 2.50  | 20.90             | 20.83             | 21.02   | 19.294                    | 19.854  | M 16 x 1.00                                                         | 15.55 | 15.52             | 15.62             | 14.917  | 15.217                    |             |          |       |                   |                   |         |                           |         |
| M 24                              | 3.00  | 22.70             | 22.62             | 22.80   | 20.752                    | 21.382  | M 16 x 1.50                                                         | 15.30 | 15.26             | 15.38             | 14.376  | 14.751                    |             |          |       |                   |                   |         |                           |         |
| M 27                              | 3.00  | 25.70             | 25.62             | 25.80   | 23.752                    | 24.382  | M 17 x 1.00                                                         | 16.55 | 16.52             | 16.62             | 15.917  | 16.217                    |             |          |       |                   |                   |         |                           |         |
| M 30                              | 3.50  | 28.50             | 28.40             | 28.60   | 26.211                    | 26.921  | * M 2.5 x 0.35 up to M 4 x 0.35 tapping size hole of int. thread 6H |       |                   |                   |         |                           |             |          |       |                   |                   |         |                           |         |
| M 33                              | 3.50  | 31.50             | 31.40             | 31.60   | 29.211                    | 29.921  |                                                                     |       |                   |                   |         |                           |             |          |       |                   |                   |         |                           |         |
| M 36                              | 4.00  | 34.30             | 34.17             | 34.40   | 31.670                    | 32.420  |                                                                     |       |                   |                   |         |                           |             |          |       |                   |                   |         |                           |         |
| M 39                              | 4.00  | 37.30             | 37.17             | 37.40   | 34.670                    | 35.420  |                                                                     |       |                   |                   |         |                           |             |          |       |                   |                   |         |                           |         |
| M 42                              | 4.50  | 40.10             | 39.95             | 40.20   | 37.129                    | 37.979  |                                                                     |       |                   |                   |         |                           |             |          |       |                   |                   |         |                           |         |

\* M 2 up to M 2.5 tapping size hole of int. thread 6H

### Tapping size hole diameter tolerance zone for thread forming (to DIN 13, section 50)

Due to the tensile strength it is not necessary to adhere to the tapping size hole diameter tolerance class 6H; tolerance class 7H satisfies the requirement that the flank coverage of external and internal threads should not fall below 0.32 x P. In addition, formed threads generally possess a higher tensile strength in comparison to cut threads thanks to an uninterrupted grain flow and subsequent work hardening.

| UNC-threads<br>ASME B1.1 |              |                   |                   |         |                          |         | UNF-threads<br>ASME B1.1 |              |                   |                   |         |                          |         | (Whitworth-) pipe thread G<br>DIN EN ISO 228-1 |          |                   |                   |         |                       |         |
|--------------------------|--------------|-------------------|-------------------|---------|--------------------------|---------|--------------------------|--------------|-------------------|-------------------|---------|--------------------------|---------|------------------------------------------------|----------|-------------------|-------------------|---------|-----------------------|---------|
| nom. Ø                   | pitch        | tapp. size hole Ø | tapp. size hole Ø |         | core Ø of int. thread 2B |         | nom. Ø                   | pitch        | tapp. size hole Ø | tapp. size hole Ø |         | core Ø of int. thread 2B |         | nom. Ø                                         | pitch    | tapp. size hole Ø | tapp. size hole Ø |         | core Ø of int. thread |         |
| per inch                 | mm           | mm                | min. mm           | max. mm | min. mm                  | max. mm | per inch                 | mm           | mm                | min. mm           | max. mm | min. mm                  | max. mm | inch                                           | per inch | mm                | min. mm           | max. mm | min. mm               | max. mm |
| Nr. 1 - 64               | <b>1.68</b>  | 1.67              | 1.70              | 1.425   | 1.580                    |         | Nr. 1 - 72               | <b>1.70</b>  | 1.69              | 1.72              | 1.473   | 1.610                    |         | G 1/16                                         | 28       | <b>7.30</b>       | 7.28              | 7.35    | 6.561                 | 6.843   |
| Nr. 2 - 56               | <b>1.98</b>  | 1.97              | 2.01              | 1.694   | 1.872                    |         | Nr. 2 - 64               | <b>2.00</b>  | 1.99              | 2.03              | 1.755   | 1.910                    |         | G 1/8                                          | 28       | <b>9.30</b>       | 9.28              | 9.35    | 8.566                 | 8.848   |
| Nr. 3 - 48               | <b>2.28</b>  | 2.27              | 2.32              | 1.941   | 2.146                    |         | Nr. 3 - 56               | <b>2.30</b>  | 2.29              | 2.34              | 2.024   | 2.197                    |         | G 1/4                                          | 19       | <b>12.50</b>      | 12.48             | 12.55   | 11.445                | 11.890  |
| Nr. 4 - 40               | <b>2.55</b>  | 2.54              | 2.59              | 2.157   | 2.385                    |         | Nr. 4 - 48               | <b>2.60</b>  | 2.59              | 2.63              | 2.271   | 2.459                    |         | G 3/8                                          | 19       | <b>16.00</b>      | 15.98             | 16.05   | 14.950                | 15.395  |
| Nr. 5 - 40               | <b>2.90</b>  | 2.89              | 2.94              | 2.487   | 2.698                    |         | Nr. 5 - 44               | <b>2.90</b>  | 2.89              | 2.93              | 2.550   | 2.741                    |         | G 1/2                                          | 14       | <b>20.00</b>      | 19.98             | 20.12   | 18.631                | 19.172  |
| Nr. 6 - 32               | <b>3.15</b>  | 3.14              | 3.19              | 2.642   | 2.896                    |         | Nr. 6 - 40               | <b>3.20</b>  | 3.19              | 3.24              | 2.819   | 3.023                    |         | G 5/8                                          | 14       | <b>22.00</b>      | 21.98             | 22.12   | 20.587                | 21.128  |
| Nr. 8 - 32               | <b>3.80</b>  | 3.78              | 3.82              | 3.302   | 3.531                    |         | Nr. 8 - 36               | <b>3.85</b>  | 3.83              | 3.88              | 3.404   | 3.607                    |         | G 3/4                                          | 14       | <b>25.50</b>      | 25.48             | 25.62   | 24.117                | 24.658  |
| Nr. 10 - 24              | <b>4.35</b>  | 4.33              | 4.39              | 3.683   | 3.937                    |         | Nr. 10 - 32              | <b>4.45</b>  | 4.43              | 4.49              | 3.962   | 4.166                    |         | G 7/8                                          | 14       | <b>29.25</b>      | 29.23             | 29.37   | 27.877                | 28.418  |
| Nr. 12 - 24              | <b>5.00</b>  | 4.97              | 5.03              | 4.343   | 4.597                    |         | Nr. 12 - 28              | <b>5.10</b>  | 5.07              | 5.13              | 4.496   | 4.724                    |         | G 1                                            | 11       | <b>32.00</b>      | 31.98             | 32.15   | 30.291                | 30.931  |
| 1/4                      | <b>5.75</b>  | 5.72              | 5.80              | 4.978   | 5.258                    |         | 1/4                      | <b>5.95</b>  | 5.92              | 5.99              | 5.359   | 5.588                    |         | G 1 1/4                                        | 11       | <b>40.75</b>      | 40.70             | 40.85   | 38.952                | 39.592  |
| 5/16                     | <b>7.30</b>  | 7.26              | 7.37              | 6.401   | 6.731                    |         | 5/16                     | <b>7.45</b>  | 7.42              | 7.50              | 6.782   | 7.036                    |         |                                                |          |                   |                   |         |                       |         |
| 3/8                      | <b>8.80</b>  | 8.77              | 8.88              | 7.798   | 8.153                    |         | 3/8                      | <b>9.05</b>  | 9.02              | 9.10              | 8.838   | 8.636                    |         |                                                |          |                   |                   |         |                       |         |
| 7/16                     | <b>10.30</b> | 10.27             | 10.37             | 9.144   | 9.550                    |         | 7/16                     | <b>10.55</b> | 10.48             | 10.58             | 9.728   | 10.033                   |         |                                                |          |                   |                   |         |                       |         |
| 1/2                      | <b>11.80</b> | 11.77             | 11.88             | 10.592  | 11.024                   |         | 1/2                      | <b>12.10</b> | 12.08             | 12.18             | 11.328  | 11.608                   |         |                                                |          |                   |                   |         |                       |         |
| 9/16                     | <b>13.30</b> | 13.28             | 13.39             | 11.989  | 12.446                   |         | 9/16                     | <b>13.65</b> | 13.61             | 13.72             | 12.751  | 13.081                   |         |                                                |          |                   |                   |         |                       |         |
| 5/8                      | <b>14.80</b> | 14.78             | 14.90             | 13.386  | 13.868                   |         | 5/8                      | <b>15.25</b> | 15.21             | 15.32             | 14.351  | 14.681                   |         |                                                |          |                   |                   |         |                       |         |
| 3/4                      | <b>17.90</b> | 17.85             | 17.97             | 16.307  | 16.840                   |         | 3/4                      | <b>18.35</b> | 18.30             | 18.41             | 17.323  | 17.678                   |         |                                                |          |                   |                   |         |                       |         |
| 7/8                      | <b>21.00</b> | 20.95             | 21.10             | 19.177  | 19.761                   |         | 7/8                      | <b>21.40</b> | 21.35             | 21.49             | 20.269  | 20.650                   |         |                                                |          |                   |                   |         |                       |         |
| 1                        | <b>24.00</b> | 23.95             | 24.12             | 21.971  | 22.606                   |         | 1                        | <b>24.45</b> | 24.40             | 24.54             | 23.114  | 23.571                   |         |                                                |          |                   |                   |         |                       |         |

## Thread production by pressure deformation

Fluteless taps are used for the forming of internal threads without chip removal. In contrast to conventional tapping where material is cut from the workpiece, thread forming is a pressure deformation process without chip removal for the production of internal threads. During the process the material is cold formed without interrupting the grain flow.

According to DIN 8583, thread forming is described as “pressing the thread into the workpiece with a tool possessing a spiral working area”. The spiral threaded, polygonal portion of the fluteless tap is “screwed” into the pre-drilled workpiece with an appropriate constant feed rate equal to the thread pitch. Hereby the thread profile is pressed gradually via the forming lead into the material of the workpiece so to speak. Subsequently, the pressure in the deformation zone exceeds the compression limit, the workpiece becomes ductile and is deformed. The material yields radially, “flows” along the thread profile in the unoccupied base of the tool and forms the minor diameter of the nut thread. The flow process creates the process specific form pockets (claws).

The tapping size hole diameter is heavily dependent on the formability of the material, the workpiece geometry and the required effective depth of the thread. In comparison to conventional tapping, a larger diameter tapping size hole should be selected. With a larger diameter tapping size hole the load on the tool is reduced whilst increasing the tool life. Thanks to the uninterrupted grain flow, the loading capacity of the thread remains sufficient with a 50% effective thread depth.

The partially formed crests of the thread with decreasing effective thread depth are a typical characteristic of threads produced by the thread forming process. With the flanks of the thread fully formed, they have no influence on the tensile strength of the thread. If necessary, the required deformation level of the thread should be determined by performing a test.

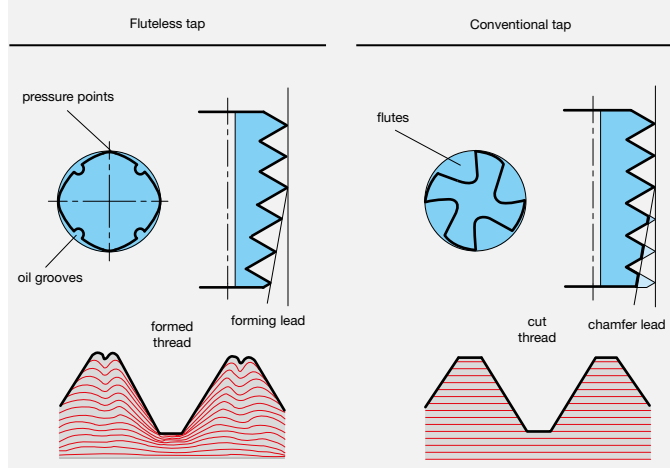
Lubrication is of significant importance. The lubrication prevents material from building up on the thread flanks and ensures that the necessary torque for the forming process is not too high. Therefore, under no circumstances should there ever be a break-down in lubrication! Preference should be given to lubricants such as cooling agents or oils containing graphite such as those used in rolling processes. Always follow the rule: “The better the lubrication the easier the thread forming process!”

### It offers the following advantages:

- no chip formation.
- one tool for the production of threads in through and blind holes.
- application in wide range of materials.
- no cutting errors.
- pitch and angle of thread errors that can occur with thread cutting are eliminated.
- internal threads produced by thread forming possess a higher tensile strength particularly at the thread flanks thanks to the so-called “uninterrupted grain flow” and the cold forming process.
- the surface of the thread is improved.
- fluteless taps can be applied at higher speeds because the formability of many materials increases with the forming speed. This does not have a negative effect on the tool life.
- reduced danger of breakage through rigid design

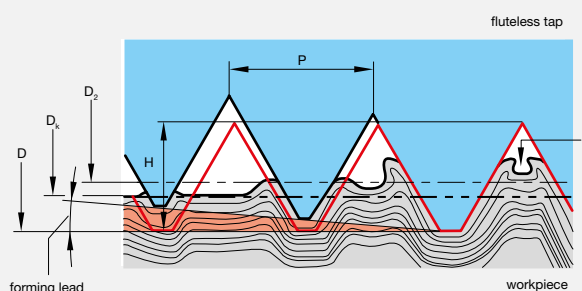
### Process

The production of internal threads without chip removal (thread forming) in comparison to conventional tapping



### Flow characteristics of the material during thread forming and the deformation process

$D$  = nom.- $\varnothing$   
 $D_2$  = flank- $\varnothing$   
 $D_k$  = hole- $\varnothing$   
 $H$  = profile height  
 $P$  = pitch  
 $A$  = form pocket (claw)  
 — finished nut thread





## “Profile“- Guhring’s new fluteless tap generation

### Characteristics and advantages

Conventional fluteless taps, produced by a grinding process only, show traces of microscopic, very fine grinding marks on the surface of the tool. This also applies to the threaded portion of the tool required to perform the thread forming operation.

This surface topography (structure) has a negative effect on the friction between the tool and the material to be re-formed as well as on the herewith associated heat development, on the necessary torque and last but not least on the wear of the pressure points of the fluteless tap. In addition, the “grinding marks” encourage the build-up of the material to be re-formed in the thread flanks of the fluteless tap. This is also called cold welding.

Thanks to a special process to improve the surface topography (structure), Guhring’s new Profile fluteless taps no longer possess these “grinding marks”. This has been confirmed in research and tool life studies in varying materials under production conditions.

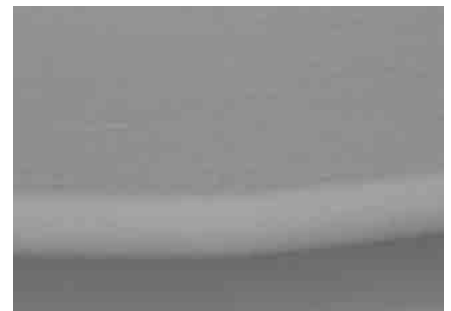
For the user, a longer tool life and increased cutting speeds are the benefits of this special process. The tool life can be increased considerably depending on the material to be machined and the application conditions. A 100% increase in tool life is not unusual.

The improved surface topography is not only of benefit to tools with bright finish. Particularly coated tools also benefit from the new process. Outer contour and forming lead greatly determine the performance of the fluteless tap. Numerous tests have shown that fluteless taps with optimal pressure point geometry and quantity achieve increased tool life and dimensional accuracy.

Further improvements in quality are achieved when the fluteless tap is produced completely in one setting and with one grinding wheel - set-up with a special roll. Pitch errors between the thread crests and former lead transition area do not occur as with the conventional grinding process.

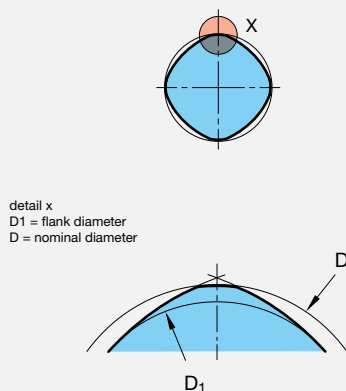


Surface of a conventional fluteless tap

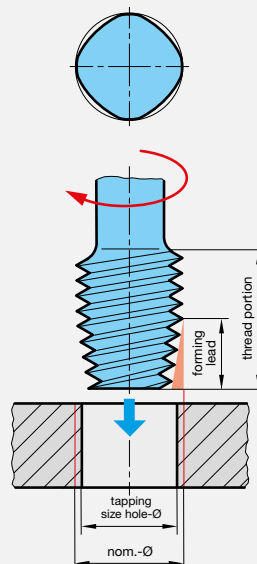


Optimised surface of a Guhring Profile fluteless tap

Cross section of fluteless tap



The principle



Types of tapping size hole

with fluteless taps without oil grooves  
for thread depth  $\leq 1 \times D$



for thread depth  $\geq 1 \times D$

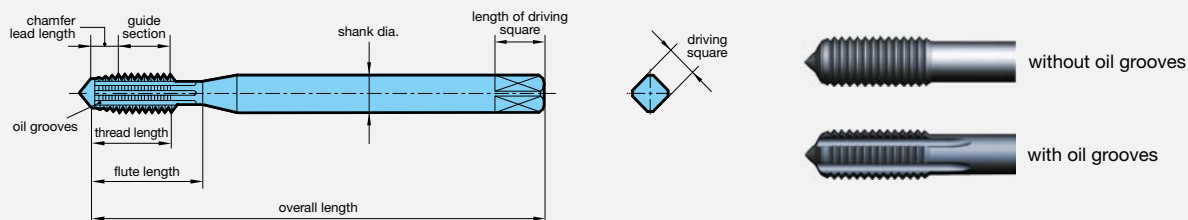


with fluteless taps with oil grooves  
for all thread depths

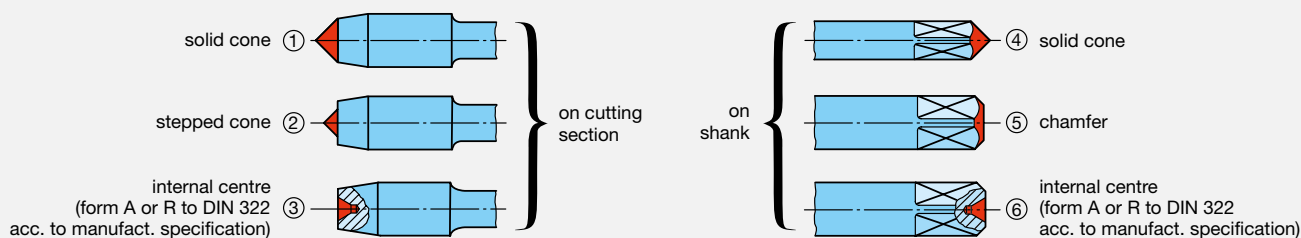


## Definitions, angles, centres, thread tolerances and fits

### Thread portion



### Types of centres (standard, to DIN 2197/DIN 2175)



| Thread dia. range<br>mm | Centre on cutting section        |                        | Centre on shank |
|-------------------------|----------------------------------|------------------------|-----------------|
|                         | with chamfer forms<br>A, C, D, E | with chamfer form<br>B |                 |
| ≤ 5.6                   | ①                                | ①                      | ④⑤⑥             |
| > 5.6 ... 12.8          | ①②③                              | ①②③                    | ④⑤⑥             |
| > 12.8                  | ③                                | ③                      | ⑥               |

### Thread tolerances and fits

Fits between internal and external threads are separated by a diagonal stroke, as for example 6H/6g (internal/external thread). The fit has to be selected in conjunction with the appropriate thread connection.

The tolerance zones of the tolerance classes fine, medium and coarse are allocated to three screw-in lengths short S), normal (N) and long (L). Generally, the following rules apply for selecting a tolerance class:

#### Fine tolerance zone (S):

For precision threads, when only a small variation in the fit is permitted.

#### Screw-in lengths

The quality of thread connection is also affected by the screw-in length. The ISO tolerance system was, especially as regards the pitch diameter, divided into three groups, i.e.

- S (Short) = short screw-in length
- N (Normal) = normal screw-in length
- L (Long) = long screw-in length

#### Medium tolerance zone (N):

General application

#### Coarse tolerance zone (L):

There are no special precision requirements and in cases where production difficulties may occur, e.g. thread production in hot-rolled rods, deep blind holes or plastic components.

The following fit should be selected for normal screw-in length N: To ensure a tighter fit of thread connections, we recommend for short screw-in lengths a narrower fit.





## Tapping size hole diameter

With fluteless tapping, the tapping size hole diameter influences the distinction of the formed thread. A too small tapping size hole diameter results in an over-forming of the thread which must definitely be prevented because this can lead to

tool breakage. A too large tapping size hole is acceptable with certain tolerances because formed threads have a sufficient loading capacity from a 50% bearing depth.

The thread M18x1.5 mm example clearly shows the influence of the tapping size hole diameter selection:

|             |       |       |       |        |        |
|-------------|-------|-------|-------|--------|--------|
| M 18 x 1.00 | 17.55 | 17.52 | 17.62 | 16.917 | 17.217 |
| M 18 x 1.50 | 17.30 | 17.26 | 17.38 | 16.376 | 16.751 |
| M 18 x 2.00 | 17.10 | 17.05 | 17.20 | 15.835 | 16.310 |

Pre-drilling Ø 17.1 mm



Pre-drilling Ø 17.3 mm

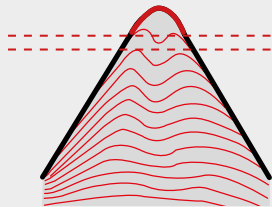


Pre-drilling Ø 17.4 mm



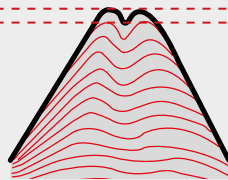
### Tapping size hole diameter is too small:

- thread over-formed
- no form pocket (claw)
- profile too high



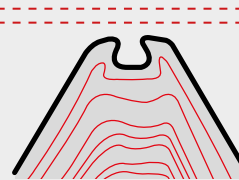
### Optimal tapping size hole diameter:

- thread fully formed
- small form pocket (claw)
- optimal height of profile



### Tapping size hole diameter is too large:

- thread not formed
- large form pocket (claw)
- height of profile too low

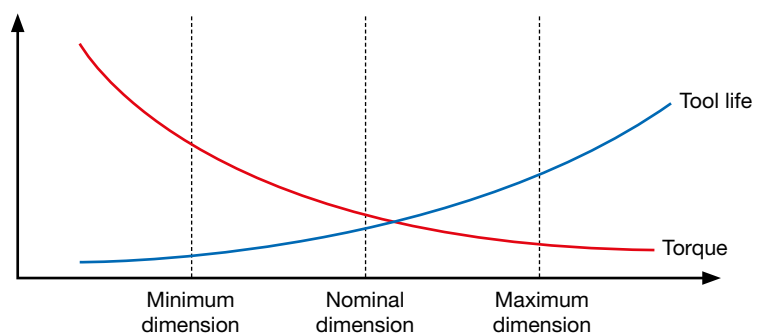


min.  
max.

Tapping size hole diameter tolerance zone to DIN 13, part 50

## Influence of the tapping size hole on tool life, torque and process reliability

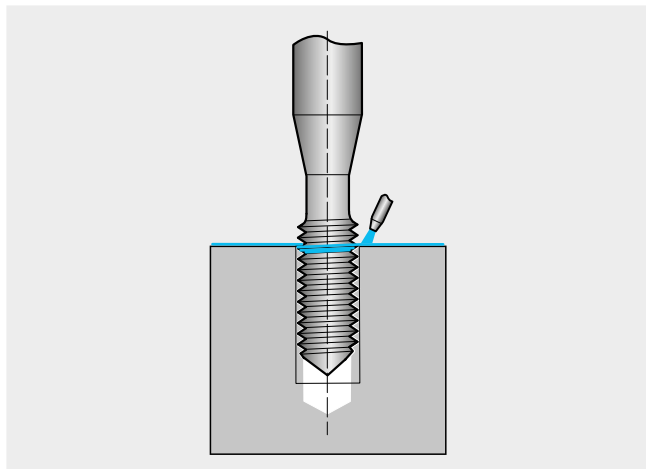
The optimisation of the pre-drilling diameter is especially worthwhile in mass production. The larger it is, the longer the tool life and the less the required torque is. The graphic clearly shows the relationship.



## Lubrication for thread forming

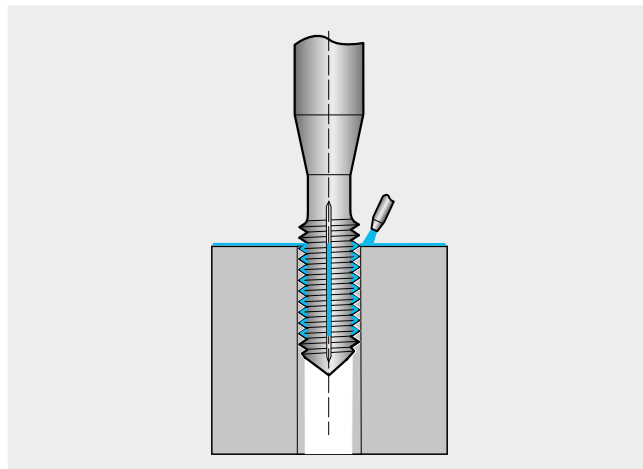
For tool design four different cases should be differentiated between.

**Vertical machining of a blind hole**



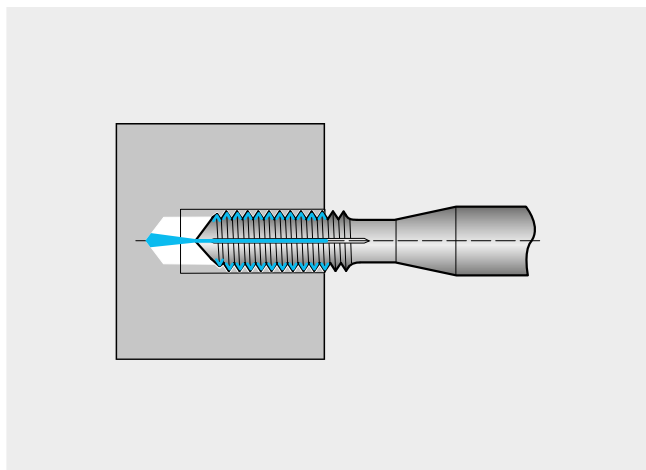
Lubrication grooves and internal coolant delivery is not necessary; external coolant delivery is sufficient (Axial coolant is recommended for very deep threads).

**Vertical machining of a through hole ( $> 1.5 \times D_N$ )**



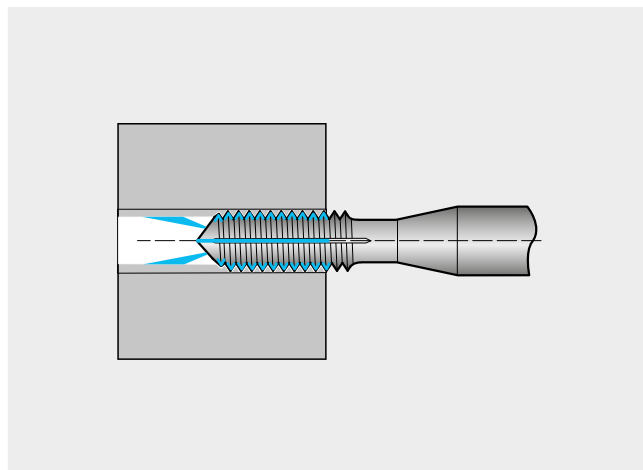
Lubrication grooves are required; internal coolant delivery is not necessary. Via the lubrication grooves the externally delivered coolant can advance to the form edges (Radial coolant is recommended for very deep threads).

**Horizontal machining of blind hole**



Lubrication grooves and internal coolant delivery is necessary. Axial coolant exit is sufficient.

**Horizontal machining of through hole**



Lubrication grooves are required. Internal coolant delivery with radial exit is recommended.

### Cooling lubricants with fluteless taps

With fluteless taps the main task of the coolant is lubrication. The better the lubrication with the maximum concentration, the longer the tool life.

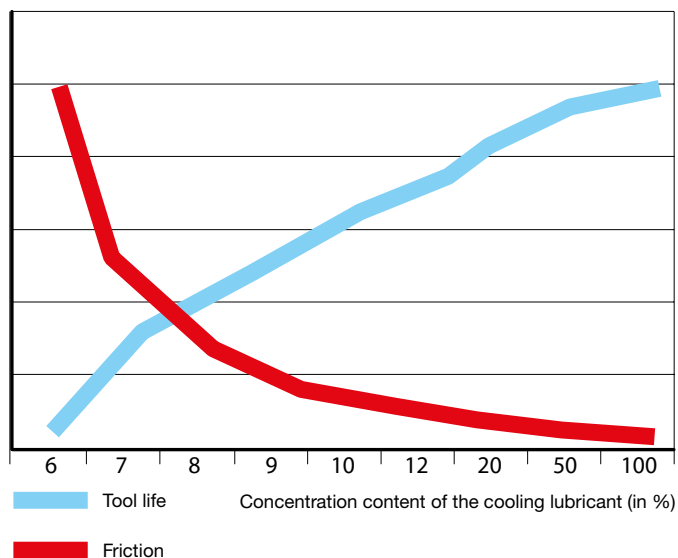
There are two different types of lubricant:

#### Oil based lubricants

These are mineral oils with the best lubricating characteristics. They reduce friction and achieve optimal life.

#### Soluble lubricants

These soluble lubricants are a concentrate thinned to an emulsion prior to the use with water. The concentration must not be below 6%. A content more than 12% is ideal in order to achieve a long life thanks to a good lubrication effect.



# ISO code

|          |                                                 |
|----------|-------------------------------------------------|
| <b>P</b> | Steel, high-alloyed steel                       |
| <b>M</b> | Stainless steel                                 |
| <b>K</b> | Grey cast iron, spher, graphite/mall. cast iron |
| <b>N</b> | Aluminium and other non-ferrous metals          |
| <b>S</b> | Special, super and titanium alloys              |
| <b>H</b> | 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

# Pictograms

|                   |                                                                                                                                                                                               |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tool material     | <div>HSS-E-PM</div>                                                                                                                                                                           |
|                   | High-speed steel                                                                                                                                                                              |
| Tolerance on Ø    | <div>2BX</div> <div>4HX</div> <div>6GX</div> <div>6HX</div>                                                                                                                                   |
| Thread type       | <div></div> <div></div> |
|                   | Blind holeThrough holes and blind holes                                                                                                                                                       |
| Cutting direction | <div></div>                                                                                                |
|                   | right                                                                                                                                                                                         |
| Internal coolant  | <div></div> <div></div> |
|                   | with ICwithout IC                                                                                                                                                                             |
| Form              | <div>C</div> <div>E</div>                                                                                                                                                                     |
| Type              | <div>N</div>                                                                                                                                                                                  |

# Coatings

 TiCN



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