Solid carbide twist drills

Type 158

botek
Manufacturing deep and precise holes is a technical challenge when processing metal. Accordingly, specialising in deep hole drilling technology was the founding idea in 1974 of botek Präzisionsbohrtechnik GmbH in Riederich.

Botek grew to be an international supplier of deep hole drilling tools. Over 500 employees in the main company develop and manufacture single and two fluted drills, deep hole drilling tools BTA and Ejector systems as well as special tools.

A complete product program, regarding all deep hole drilling aspects and a team of highly qualified and dedicated cutting specialists make botek a competent partner for the automobile industry and their suppliers, shipbuilding industry, hydraulic industry as well as motor, gear and machine building companies.

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- We reserve the right to make modifications in the interests of technical improvement. Such modifications cannot, in principle, be accepted as justifiable reasons for complaint.
- Subject to change. The manufacturer accepts no responsibility for misprints and other errors.

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Carbide twist drills
botek advantages
NEW: Carbide twist drills with internal coolant supply

1. Twist drills from the deep hole drilling tool specialist.
2. Top product quality, since **development and manufacturing** take place at botek.
3. Extremely good productivity achieved by high feed rates.
4. Outstanding tool life and good breaking resistance due to the extreme toughness of the carbide.
5. Trouble free chip removal due to special flute surface finish.
6. 4 margins for high hole accuracy and centreline deviation.
7. Suitable for emulsion, neat cutting oil or MQL.
8. Coating and regrinding service available at botek.

Large flute for optimum chip removal!
Excellent chip breaking due to new flute geometry!
Stable cutting edges for maximum tool life!
4 margins provide very good accuracy and drilling stability!
Conditions for successful deep hole drilling:

1. An efficient coolant and filtration system with a filtration of 20 μm to 30 μm (the smaller the diameter, the better the coolant and filtration should be).
2. Suitable coolant, i.e. deep hole drilling oil or emulsion (min. 6 % concentration, with additives) has to be provided in sufficient quantity and pressure. Minimum quantity lubrication (MQL) is also possible.
3. Guidance with a pilot hole in the workpiece.

Machining sequence:

1. Drill pilot hole
   (for size see table “Dimensions for the guide hole”).
   → We recommend to use botek pilot drills Type 153

2. The twist drill is fed into pilot hole while non rotating or rotated slowly at < 200 RPM.
3. Switch on the coolant.
4. Switch on RPM and feed.
5. After reaching the drilling depth switch off the RPM.
6. Switch off the coolant pump.
7. Fast retract with the spindle stopped or slowly rotated < 50 RPM. Please see our safety instructions (page 9).
Angular drilling

1. Spot facing.
2. Drill pilot hole (for size see table "Dimensions for the guide hole").
   - We recommend to use botek pilot drills Type 158
3. The twist drill is fed into pilot hole while non rotating or rotated slowly at $< 200$ RPM.
4. Switch on the coolant.
5. Switch on RPM and feed.
6. After reaching the drilling depth switch off the RPM.
7. Switch off the coolant.
8. Fast retract with the spindle stopped or slowly rotated $< 50$ RPM.

The mentioned values are guide values. The maximum possible values depend on the diameter and length ratio of the tool.

The carbide twist drill is a self centering drilling tool. However, a guidance by means of a pilot hole is necessary. Drill lengths exceeding 15 x Dia., high feed rates while drilling and the resulting deflection forces might cause tool breakage. Quality and accuracy of the pilot hole affect tool life and centreline deviation.

### Application requirements for carbide twist drills

<table>
<thead>
<tr>
<th>Drill diameter (mm)</th>
<th>Dimensions for the guide hole</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.000 – 14.000 mm</td>
<td>$L$ (mm) [\text{app. 1.5 x D}] [D + 0.01 \text{ to } 0.02 \text{ mm}]</td>
</tr>
</tbody>
</table>
Overview – pilot drills

<table>
<thead>
<tr>
<th>Type</th>
<th>Tool diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 153-02</td>
<td>Standard</td>
</tr>
<tr>
<td>not coolant fed/ point angle 140°, 3 x D (flute length)</td>
<td></td>
</tr>
<tr>
<td>Type 153-03</td>
<td>Standard</td>
</tr>
<tr>
<td>coolant fed/ point angle 140°, 5 x D (flute length)</td>
<td></td>
</tr>
<tr>
<td>Type 158-07</td>
<td>Optimised</td>
</tr>
<tr>
<td>not coolant fed/ point angle 160°, 3 x D (flute length)</td>
<td></td>
</tr>
<tr>
<td>Type 158-08</td>
<td>Standard</td>
</tr>
<tr>
<td>coolant fed/ point angle 160°, 5 x D (flute length)</td>
<td></td>
</tr>
</tbody>
</table>

For angular drilling situations we recommend tapered pilot drills (coolant fed), type 159-01

Overview – carbide twist drills

<table>
<thead>
<tr>
<th>Type</th>
<th>Tool diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typ 158-00</td>
<td>Tool diameter</td>
</tr>
<tr>
<td>Solid carbide twist drill / solid drilling tool/ 4 margins (high-performance twist drill), coolant fed</td>
<td>3,000 – 14,000 mm</td>
</tr>
<tr>
<td>Typ 158-01</td>
<td>Tool diameter</td>
</tr>
<tr>
<td>Solid carbide twist drill/ solid drilling tool/ 2 margins with internal cooling (available on request)</td>
<td>3,000 – 14,000 mm</td>
</tr>
</tbody>
</table>

All tools also available without internal cooling

Standard nose grind

The drill point geometry and the resulting low axial forces allow very high feed rates. Stable cutting edges in combination with the special botek coating guarantee highest tool life.

Clamping shanks for type 158-00
- Standard: DIN 6535 HAK. Others available on request (e.g. DIN 6535 HBK, DIN 6535 HEK).
- All shanks have optimized shank tolerances for hydraulic chucks.

Service
→ Coating
Carbide twist drills can be supplied with several botek coatings. The type of coating depends on the material, coolant and drilling application and is tailored to requirements.

→ Regrinding
botek provides an individual regrinding service and would be pleased to perform this task for you.

→ Process design

→ Customer testing in our trial department

Please contact us.
More information available at www.botek.de
Technical information
Carbide twist drill in solid carbide – version type 158

Guide values for processing various materials with carbide twist drills (coolant fed)

<table>
<thead>
<tr>
<th>Material groups</th>
<th>Aluminium Si-content &lt; 5%</th>
<th>VA steel</th>
<th>Allopred steel</th>
<th>Annealed steel 35 HRC (C ≥ 0.3%)</th>
<th>Annealed steel 35–45 HRC</th>
<th>Hardened steel 45–50 HRC</th>
<th>GG</th>
<th>GGG</th>
<th>C ≤ 0.2%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutting speed m/min</td>
<td>120 - 150</td>
<td>50 - 80</td>
<td>70 - 90</td>
<td>50 - 70</td>
<td>40 - 60</td>
<td>30 - 40</td>
<td>63 - 125</td>
<td>60 - 80</td>
<td>63 - 125</td>
</tr>
<tr>
<td>Drill diameter (mm)</td>
<td>from - to</td>
<td>from - to</td>
<td>from - to</td>
<td>from - to</td>
<td>from - to</td>
<td>from - to</td>
<td>from - to</td>
<td>from - to</td>
<td>from - to</td>
</tr>
<tr>
<td>3.0</td>
<td>0.06 - 0.09</td>
<td>0.06 - 0.12</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>0.06 - 0.12</td>
<td>0.06 - 0.12</td>
<td>0.06 - 0.12</td>
</tr>
<tr>
<td>4.0</td>
<td>0.10 - 0.14</td>
<td>0.08 - 0.16</td>
<td>0.10 - 0.15</td>
<td>0.10 - 0.15</td>
<td>0.10 - 0.15</td>
<td>0.08 - 0.13</td>
<td>0.08 - 0.16</td>
<td>0.08 - 0.16</td>
<td>0.08 - 0.16</td>
</tr>
<tr>
<td>5.0</td>
<td>0.15 - 0.18</td>
<td>0.10 - 0.20</td>
<td>0.10 - 0.20</td>
<td>0.12 - 0.18</td>
<td>0.12 - 0.18</td>
<td>0.10 - 0.15</td>
<td>0.10 - 0.20</td>
<td>0.10 - 0.20</td>
<td>0.10 - 0.20</td>
</tr>
<tr>
<td>6.0</td>
<td>0.20 - 0.25</td>
<td>0.12 - 0.24</td>
<td>0.14 - 0.20</td>
<td>0.14 - 0.20</td>
<td>0.14 - 0.20</td>
<td>0.12 - 0.18</td>
<td>0.12 - 0.24</td>
<td>0.12 - 0.24</td>
<td>0.12 - 0.24</td>
</tr>
<tr>
<td>8.0</td>
<td>0.25 - 0.29</td>
<td>0.16 - 0.28</td>
<td>0.16 - 0.24</td>
<td>0.16 - 0.24</td>
<td>0.16 - 0.24</td>
<td>0.14 - 0.22</td>
<td>0.16 - 0.28</td>
<td>0.16 - 0.28</td>
<td>0.16 - 0.28</td>
</tr>
<tr>
<td>10.0</td>
<td>0.23 - 0.30</td>
<td>0.20 - 0.35</td>
<td>0.18 - 0.27</td>
<td>0.18 - 0.27</td>
<td>0.18 - 0.27</td>
<td>0.15 - 0.25</td>
<td>0.20 - 0.35</td>
<td>0.20 - 0.35</td>
<td>0.20 - 0.35</td>
</tr>
<tr>
<td>12.0</td>
<td>0.32 - 0.40</td>
<td>0.24 - 0.42</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>0.24 - 0.42</td>
<td>0.24 - 0.42</td>
<td>0.24 - 0.42</td>
</tr>
</tbody>
</table>

Please note:
- The recommended values given in the table above only apply when using hydraulic chucks and providing good chip removal.
- Feed rates set to achieve short chips.
- Reduced feed rates for interrupted cuts (hole exit, angled exit, etc.).

Drilling quality
To achieve optimum drilling results when using solid carbide twist drills, various criteria must be applied. In addition to tool design, key factors are machine design and construction, process techniques, pressurized and filtered deep hole drilling coolant. Selection of proper cutting parameters is also a significant factor.

The key factors botek considers when designing gundrills:
- Material type
- Diameter, tolerance and surface finish
- Suitable carbide grade
- Nose grind geometry

In addition to our refined manufacturing and technology for consistent product quality, our application and technical experience help you realize optimal solutions.
Safety instructions:

1. **Before using** the drills make sure the machine has the necessary equipment to do proper deep hole drilling. **The machine should have suitable safety guarding for protection from cutting chips and coolant for operator.** Check with machine builder!

2. **Improper use or handling of deep hole drilling tools can cause serious injuries,** e.g. skin cuts from the cutting edge.

3. **Operating instructions**

<table>
<thead>
<tr>
<th>Tool holder</th>
<th>Tool length</th>
<th>Tool installation</th>
<th>Installation tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
<td>Concentricity ≤ 0.03 mm</td>
</tr>
</tbody>
</table>

   - The tool is securely clamped in a chuck.
   - Clamp on cylindrical part of tool only.

4. The twist drill is fed into drill bush or pilot hole while non rotating or rotated slowly at < 50 RPM. Then the coolant and the machine spindle should get started.

5. **Consequences of failure** to comply with our usage instructions 1 – 4

   - If our deep drilling tools are incorrectly used and our usage recommendations are not followed correctly, people may be injured and/or property may be damaged.
   - There is a risk of fatal injury if the tool breaks and flies through the air in an uncontrolled way!

Please note that all of the usage instructions and values are recommendations only. We are not liable for damage resulting from incorrect handling of our deep drilling tools, operating mistakes, substandard mechanical requirements or improper use of our tools!

Do you have any questions? Please call us on T +49-(0)-7123-3808-0. We would be pleased to advise you.
Technical information

Drilling example

<table>
<thead>
<tr>
<th>Machining example:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Workpiece</td>
<td>Crankshaft</td>
</tr>
<tr>
<td>Drilling dia.</td>
<td>7.0 mm</td>
</tr>
<tr>
<td>Drilling depth</td>
<td>25 - 139 mm</td>
</tr>
<tr>
<td>Coolant pressure</td>
<td>40 bar</td>
</tr>
<tr>
<td>Coolant</td>
<td>Emulsion</td>
</tr>
<tr>
<td>Tool</td>
<td>Carbide twist drill, Ø 7.0 x 205 mm overall length, 160 mm flute length, shank-Ø 8.0 mm</td>
</tr>
<tr>
<td>Cutting data</td>
<td>Vc = 110 m/min n = 5000 rpm f = 0.16 mm/rev, vf = 800 mm/min</td>
</tr>
<tr>
<td>Drilling situation</td>
<td>Solid drilling, hole exit under an angle into existing hole (Ø 10.1 mm)</td>
</tr>
<tr>
<td>Pilot hole</td>
<td>Ø 7.02 mm, 10 mm deep, type 153-02 (not coolant fed)</td>
</tr>
<tr>
<td>Cutting data:</td>
<td>n = 2000 rpm, Vc = 45 m/min, vf = 400 mm/ min, f = 0.2 mm/rev.</td>
</tr>
<tr>
<td>Result after 50 holes</td>
<td>- No visible wear</td>
</tr>
<tr>
<td></td>
<td>- Extremely good surface finish throughout</td>
</tr>
</tbody>
</table>

Chip forms

Minimum quantity lubrication/MQL
Ø 6.0 mm
50 CrMo4SV
Feed: 700 mm/min
Vc = 80 m/min

Emulsion
Ø 7.0 mm
Crankshaft
Feed: 800 mm/min
Vc = 110 m/min
Inquiry/Order
Carbide twist drills

1) Tool type
- 158-00
- 158-01

2) Shank
- Clamping shank DIN 6535 HAK (standard)
- Special shank ________________
  (please supply info on dimensions and version)

3) Tool dimensions (please fill in)

4) Drilling method
- Solid drilling
- Precast hole
- Blind hole
- Through hole
- Cross hole
- Hole exit under an angle
Drilling depth: __________________ mm

5) Pilot drill
- botek pilot drill
- Other manufacturer
  Name: __________________
  Point angle __________________

6) Coating
- TiAlN-coated

7) Drill hole Ø

8) Material
- Material no.: __________
- Description: __________
- Hardness: __________

9) Cooling
- Internal cooling
- Without cooling
- External cooling
- Minimum quantity lubrication

10) Remarks (for machining, application, material etc.)

11) Quantity
- __________ piece(s)

12) Delivery date
- Week __________

13) Customer info
- Customer: __________________
- Phone/Fax: __________________
- Contact: __________________
- Date/Signature: __________________

14) Company stamp

A special inquiry sheet for new tool design or tool redesign is available at www.botek.de.
Stuttgart motorway interchange

A8 from Karlsruhe » Stuttgart motorway interchange
Stgt. Degerloch « A8 from Munich

Herrenberg

B 27 to Tübingen

Tübingen

A81 from Singen »

Riederich

Metzingen

B 312

Reutlingen