

# DRILLING PARAMETERS

**RPM**

$$n = \frac{v_c \cdot 1000}{\pi \cdot D} \quad (\text{rev/min})$$

**Cutting speed**

$$v_c = \frac{n \cdot \pi \cdot D}{1000} \quad (\text{m/min})$$

**Feed speed**

$$v_f = f \cdot n \quad (\text{mm/min})$$

**Cross section area of the hole**

$$A_T = \frac{\pi \cdot D^2}{4} \quad (\text{mm}^2)$$

**Metal removal rate**

$$Q = \frac{v_f \cdot A_T}{1000} \quad (\text{cm}^3/\text{min})$$

**Power requirement**

$$P_c = \frac{Q}{60 \cdot 1000 \cdot \eta} \cdot k_c \cdot \sin \kappa \quad (\text{kW})$$

**Torque**

$$M_c = \frac{f \cdot k_c}{1000} \cdot \frac{D^2}{8} \cdot \sin \kappa \quad (\text{Nm})$$

**Feed force (approx.)**

$$F_f = 0,63 \cdot \frac{D}{2} \cdot f \cdot k_c \cdot \sin \kappa \quad (\text{N})$$

**Machining time**

$$T_c = \frac{L + h}{v_f} \quad (\text{min/piece})$$

$f$  = Feed per revolution (mm/rev)  
 $h$  = Distance from drill point to workpiece before feeding (mm)  
 $k_c$  = Specific cutting force (N/mm<sup>2</sup>)  
 $L$  = Depth of hole (mm)  
 $\eta$  = Machine efficiency (%)

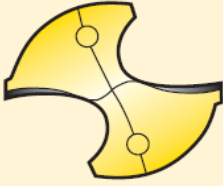
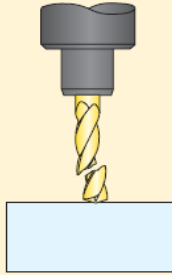
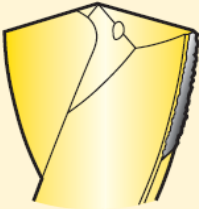
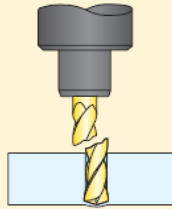
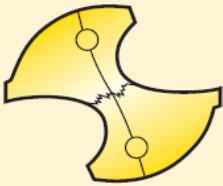
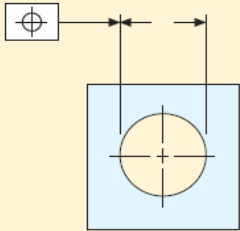

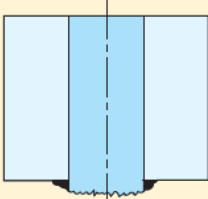

$\kappa = 90^\circ$   
 $\sin \kappa = 1$  } for insert drills

$\kappa = 70^\circ$   
 $\sin \kappa = 0,94$  } for solid, CrownLoc and brazed drills

## Average $k_c$ -values, drilling

Seco material group	$k_c$ -value
1	1800
2	1950
3	2100
4	2300
5	2600
6	2800
7	4000
8	2600
9	2800
10	2850
11	3100
12	1400
13	1600
14	1900
15	2400
16	890
17	930
20	3235
21	4110
22	1770

# DRILLING PROBLEMS

<p><b>Rapid flank wear</b></p> 	<ul style="list-style-type: none"> <li>• Check the machine spindle, fixture and clamping of the component.</li> <li>• Increase coolant concentration.</li> <li>• Reduce the cutting speed.</li> </ul>	<p><b>Breakage on contact</b></p> 	<ul style="list-style-type: none"> <li>• Check and make sure it is within 0.04 mm TIR.</li> <li>• Check the machine spindle, fixture and clamping of the component.</li> <li>• Reduce feed during entrance.</li> </ul>
<p><b>Wear/Periphery land</b></p> 	<ul style="list-style-type: none"> <li>• Check and make sure it is within 0.04 mm TIR.</li> <li>• Check the machine spindle, fixture and clamping of the component.</li> <li>• Increase coolant concentration.</li> <li>• Reduce the cutting speed.</li> </ul>	<p><b>Breakage at hole bottom</b></p> 	<ul style="list-style-type: none"> <li>• Check and make sure it is within 0.04 mm TIR.</li> <li>• Check the machine spindle, fixture and clamping of the component.</li> <li>• Reduce feed during entrance.</li> <li>• Increase coolant pressure and adjust the feed to optimize the chip formation.</li> <li>• Regrind the drill.</li> </ul>
<p><b>Chipping/Centre</b></p> 	<ul style="list-style-type: none"> <li>• Check and make sure it is within 0.04 mm TIR.</li> <li>• Check the machine spindle, fixture and clamping of the component.</li> <li>• Reduce feed during entrance.</li> <li>• Increase coolant pressure and adjust the feed to optimize the chip formation.</li> </ul>	<p><b>Poor tolerance/ Positioning</b></p> 	<ul style="list-style-type: none"> <li>• Check and make sure it is within 0.04 mm TIR.</li> <li>• Check the machine spindle, fixture and clamping of the component.</li> <li>• Reduce feed during entrance.</li> <li>• Reduce the feed.</li> <li>• Increase coolant pressure and adjust the feed to optimize the chip formation.</li> <li>• Regrind the drill.</li> </ul>
<p><b>Chipping/Outer corner, cutting edge</b></p> 	<ul style="list-style-type: none"> <li>• Check the machine spindle, fixture and clamping of the component.</li> <li>• Reduce feed during entrance.</li> <li>• Increase coolant concentration.</li> <li>• Regrind the drill.</li> <li>• Reduce the cutting speed.</li> </ul>	<p><b>Burrs on exit</b></p> 	<ul style="list-style-type: none"> <li>• Reduce the width of edge preparation (<math>b_n</math>).</li> </ul>
<p><b>Built-up edge</b></p> 	<ul style="list-style-type: none"> <li>• Increase coolant concentration.</li> <li>• Increase the cutting speed or, if the drill is worn, regrind it.</li> </ul>		