

Product note

Hints on broaching of external and internal profiles

Note on applicability

Illustrations in this publication may deviate from the product supplied. Errors and omissions due to technical progress expected.

A word on copyright

This document is protected by copyright and was originally compiled in German.
The duplication and distribution of this document or parts thereof is prohibited without prior consent of the copyright owner, and any violators will be prosecuted. All rights, including the right to translate, are reserved.

© Copyright by INDEX-Werke GmbH & Co. KG

General	4
Hints on application	4
Function description.....	5
Setting hints.....	6
Hints on external broaching	6
Hints on internal broaching	7
Technology hints	9
Work spindle speed at broaching.....	10
Hints on producing broaching tools.....	10
Workspace / Selections.....	11

Product note

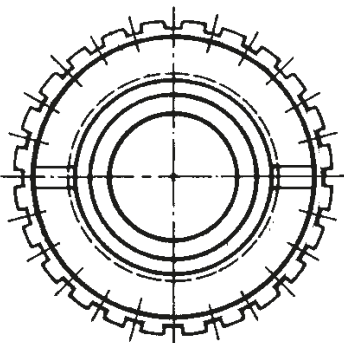
Hints on broaching of external and internal profiles
W9800064EN-11.10.23

General

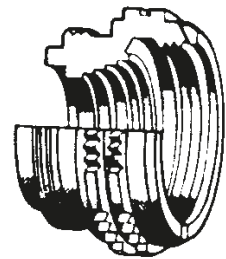
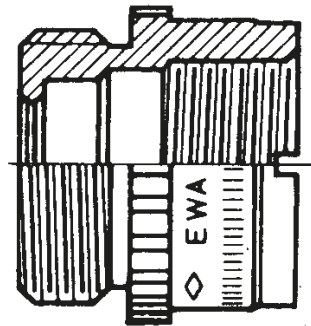
Hints on application

Appropriate tool holders for external and internal broaching in automatic production have been developed. The tool holder has no own drive, the drive of the tool holder with the broaching tool is accomplished by the actual work piece. At a not rotating work piece the tool holder with the tool must be driven, the rotating direction is in both cases irrelevant. With these tool holders it is not only economical but in technically entirely satisfactory way possible to completely turn work pieces and automatically produce profiles.

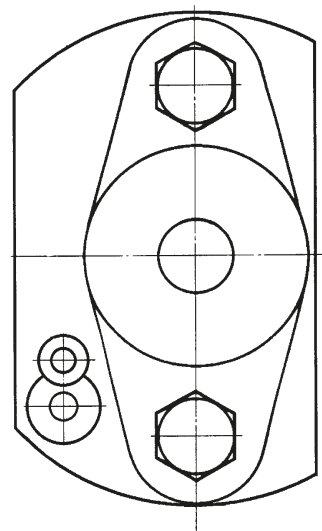
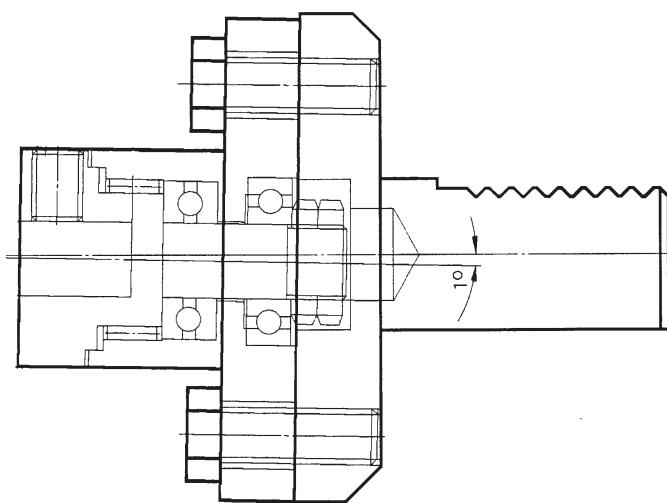
Regular profile



Interrupted profile



Work pieces with external profile

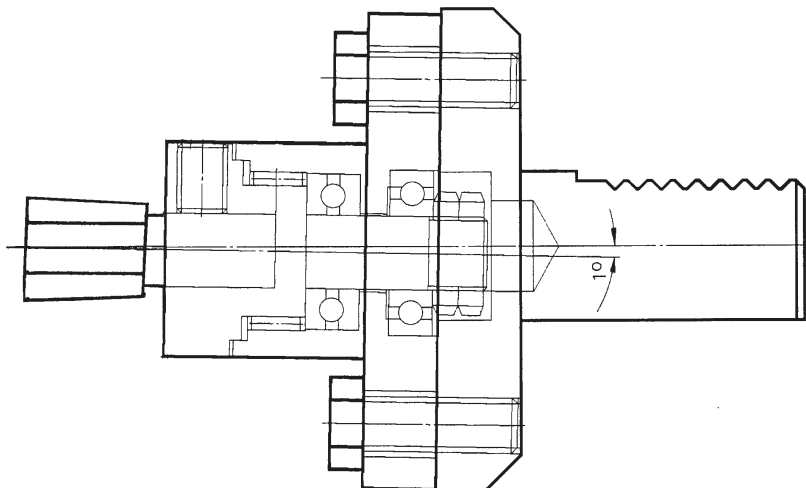


Broaching holder for internal profiles

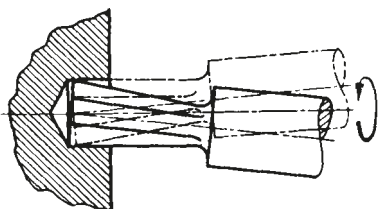
General

Function description

As soon as the broaching tool, due to the feed motion, contacts the rotating work piece it will be driven.



Due to the slight inclination of the tool axis the tool will “wobble” so that the tool does not cut with its whole circumference. This causes a considerably lower cutting force than it would be if the complete tool were pushed into the material. This enables the clamping force of the collet to sufficiently chuck the work piece.



With this must be pointed out that the represented “wobbling” is relative only to the work piece. The turning axis of the tool does not really change.

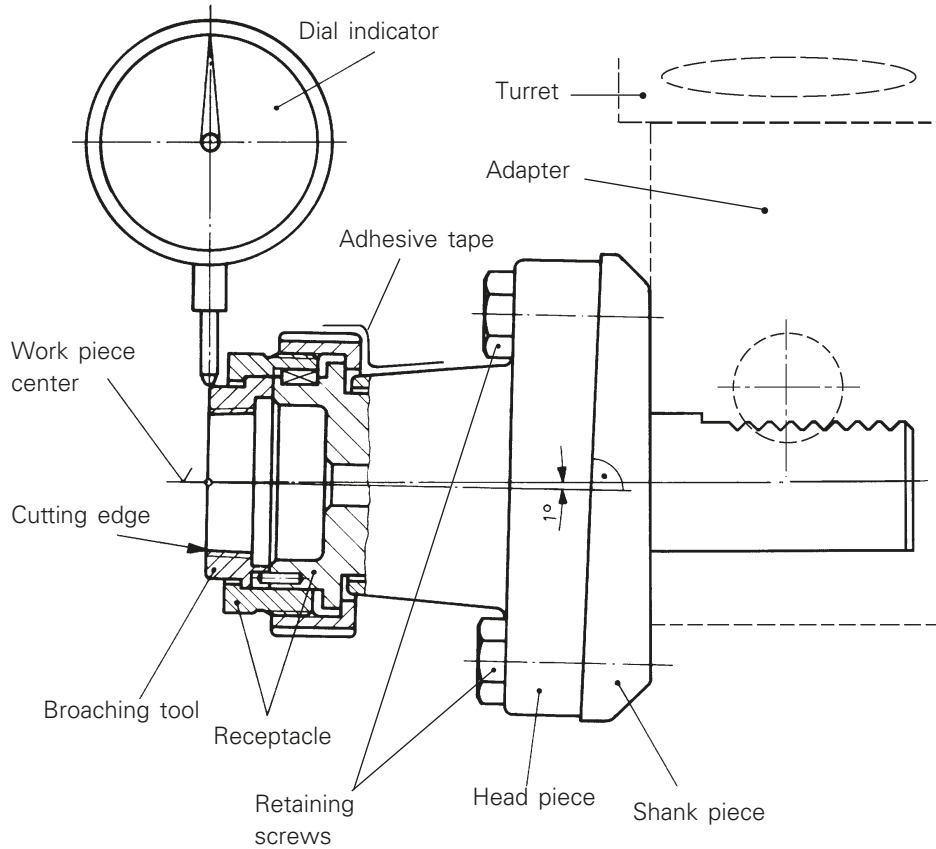
Because of the inclination of the tool holder the foremost cutting edge must be aligned with the spindle axis. This can be achieved by obeying the following adjusting hints.

Product note

Hints on broaching of external and internal profiles
W9800064EN-11.10.23

Setting hints

Hints on external broaching



1. Insert the tool holder in the adapter, but do not clamp it.
2. Insert the broaching tool in the tool holder and clamp it.
3. Fit the dial indicator.
4. Set the dial indicator probe against the foremost external edge of the broaching tool.



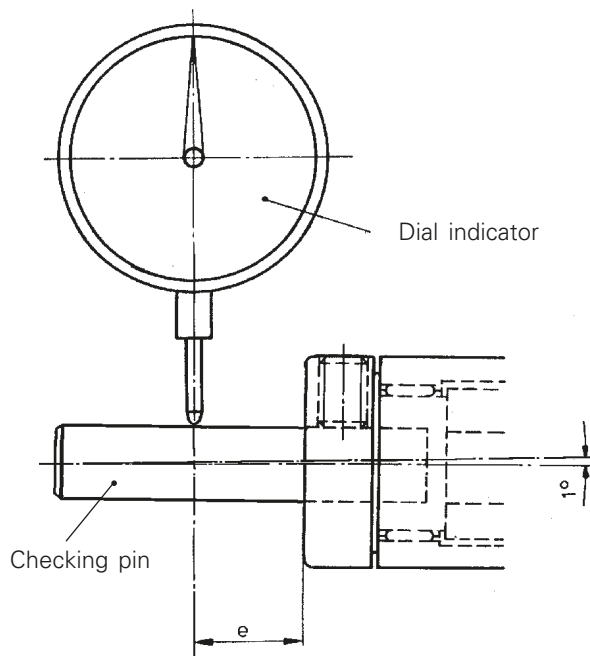
The external edge of the broaching tool must be aligned exactly with the profile (see picture on page 10).

5. Check the run-out of the clamped broaching tool by rotating the tool holder in the adapter. At this the receptacle with the clamped broaching tool must not be turned relatively to the head piece. This can be avoided by attaching a piece of adhesive tape.
6. The adjustable head piece in relation to the shank piece of the tool holder enables exact adjusting to the work piece center, or respectively, adjusting the run-out.
7. Clamp the head piece with the retaining screws.
8. Finally clamp the adjusted tool holder in the turret.

Setting hints

Hints on internal broaching

Checking position



1. Insert the tool holder in the adapter, but do not clamp it.
2. Insert the checking pin into the mounting bore of the tool holder
3. Fit the dial indicator.



The checking position on the checking pin and the foremost position of the broaching tool must have the same distance from the front face of the broaching holder. The distance "e" depends on the broaching depth. The clamping position and the measuring point must be concentric with each other.

4. Set the dial indicator probe against the checking pin (see distance "e")
5. Check the run-out of the clamped broaching tool by rotating the tool holder in the adapter. At this the receptacle (mounting bore) with the clamped broaching tool must not be turned relatively to the head piece. This can be avoided by attaching a piece of adhesive tape.
6. The adjustable head piece in relation to the shank piece of the tool holder enables exact adjusting to the work piece center, or respectively, adjusting the run-out.

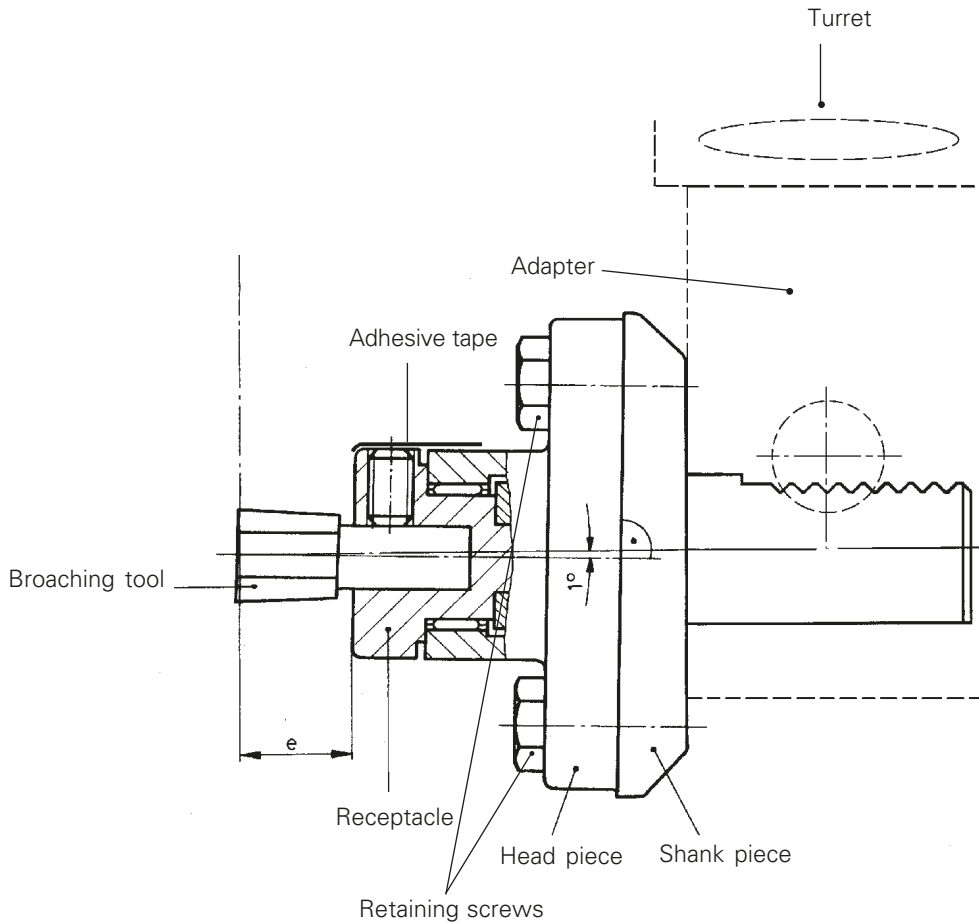
Product note

Hints on broaching of external and internal profiles
W9800064EN-11.10.23

Setting hints

Hints on internal broaching

Working position



1. Exchange the checking pin for the broaching tool. The broaching tool must be supported at the bottom in the mounting bore.
2. Clamp the head piece with the retaining screws,
3. Finally clamp the adjusted tool holder in the turret.



Distance "e":

The measuring point on the checking pin and the front face of the broaching tool have the same distance from the front face of the tool holder.
The distance "e" depends on the broaching depth.

Technology hints

The turned diameter for external broaching should be, according to material, approximately 0.02 to 0.04mm larger than the finished dimension of the particular profile. This must be established for the particular case by experiment. This ensures machining of the entire profile

For guiding the external broaching tool it is recommended to turn on a spigot with the core diameter of the broach profile, i.e. of the particular profile and chamfer the O.D. at 45°.

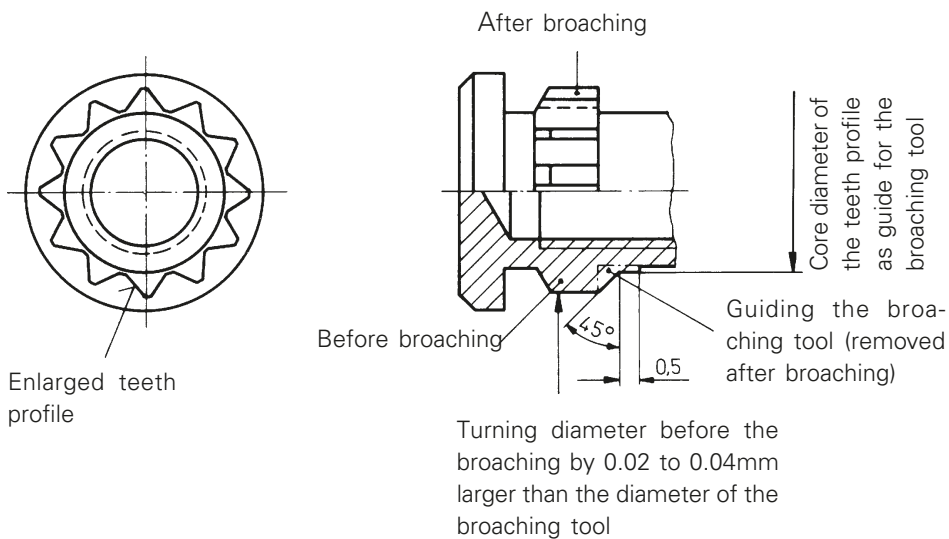
After broaching the spigot can be removed by turning. Possibly a chamfer of 45° is sufficient.

As guidance for the feed rates we recommend, according to the size of the profile, for brass and light metal 0.1 to 0.2mm, and for steel 0.05mm per revolution.



These values apply according to chip volume and the desired surface finish.

Generally applies: The smaller the diameter the smaller the feed.



For internal broaching the bore diameter should be larger than the across flats dimension of the particular polygon (square, hexagon etc.) i.e:

up to	9mm diameter	ca. 0.1mm
over	9mm diameter	ca. 0.2mm

Furthermore the bore must be countersunk under 90°. The 90°-countersink should be at least the size of the dimension over corners. By driving the tool there might be a marking on the countersink. This as well as the chips at the bottom are removed by finish-countersinking.

Product note

Hints on broaching of external and internal profiles
W9800064EN-11.10.23

Technology hints

Work spindle speed at broaching

During pushing the broaching tool against the work piece the work spindle speed should be under 2000min^{-1} .

After the drive has been accomplished, or, respectively after the pushing, the speed can be increased again (max. 6000min^{-1}).

Hints on producing broaching tools

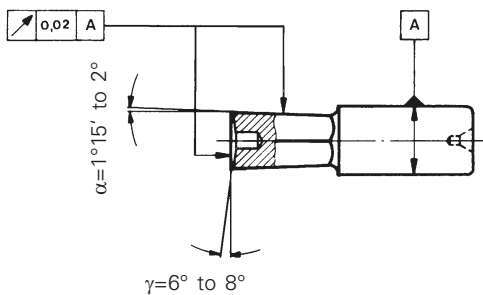
The broaching tools for internal- and external broaching are made of high speed steel HSS.

The clearance angle is chosen under consideration of the tool inclination of 1° with $\alpha = 1^\circ 15'$ to $\alpha = 2^\circ$. Normally is chosen $\alpha = 1^\circ 30'$, for tough material $\alpha = 2^\circ$ too.

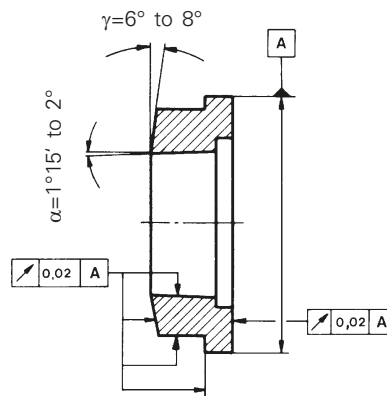
The cutting angle $\gamma = 6^\circ$ to 8° .

For obtaining a good profile surface finish it is sometimes necessary to slightly blunt the cutting edge with an oil stone. Furthermore, for adjusting the external broaching tool, it is necessary hat the outside diameter, the spigot diameter, the back resting face and the inside profile of the broaching tool are absolutely concentric with each other.

Internal broaching tool



External broaching tool



α = clearance angle
 γ = cutting angle

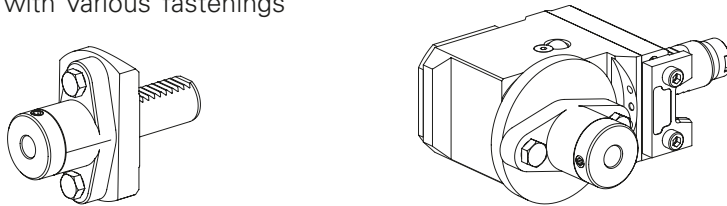
Technology hints

Workspace / Selections

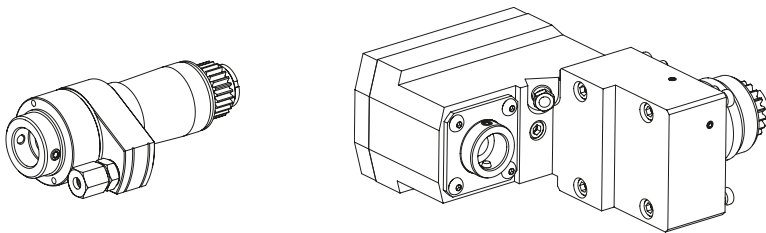
Use with 3/4" and 1" shank



Use with VDI, with various fastenings



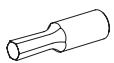
Use with 36mm shank and compact shank



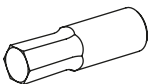
Other dimensions or profiles on request!



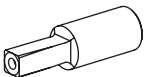
The length of the polygon should not exceed the dimension of the particular dimension across flats as otherwise a "torsion" will occur. This can be avoided to a great extent when the spindle rotating direction is reversed after every 1mm broaching depth.



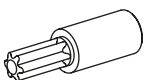
Slotting tool with shank diameter 8mm, for hexagon socket AF3-6mm for machining steel DIN1651 (9S20k) and non-ferrous metals



Slotting tool with shank diameter 12mm, for hexagon socket AF2-14mm for machining steel DIN1651 (9S20k) and AF2-17mm for non-ferrous metals



Slotting tool with shank diameter 12mm, for square socket AF3-12mm for machining steel DIN1651 (9S20k) and non-ferrous metals



Slotting tool with shank diameter 12mm
Torx 15-55 for machining steel DIN1651 (9S20k)
Torx 15-70 for non-ferrous metals



Matching slotting tools can be found on the Internet at ixshop.ixworld.com in Section "Tool holder accessories (Cutting tools)"

Product note

Hints on broaching of external and internal profiles
W9800064EN-11.10.23

INDEX

**INDEX-Werke GmbH & Co. KG
Hahn & Tessky**

Plochinger Straße 92
D-73730 Esslingen

Fon +49 711 3191-0
Fax +49 711 3191-587

info@index-werke.de
www.index-werke.de