

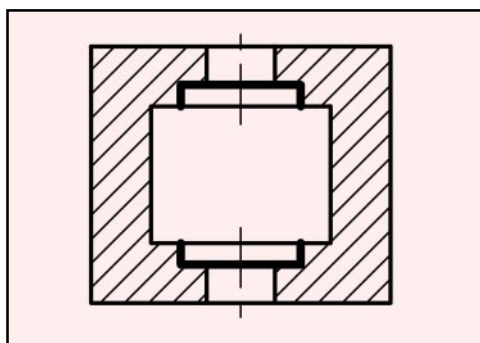
GH-Z/E

Plan- und Formsinken, vor- und rückwärts in einem Arbeitsgang. Durch Drehrichtungsänderung zwangsgesteuertes Ein- und Ausfahren der Messer.



GH-Z

Spotfacing and formsinking, forward and backward in a single work operation. Positively controlled extension and retraction of blades by changing the sense of spindle rotation.



GH-Z/E REVERSER



HEULE

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- Section 1 > Tool Description**

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- Section 3 > Tool Maintenance**

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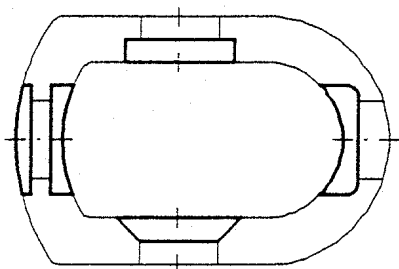
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- Section 6 > Information / Special Application**

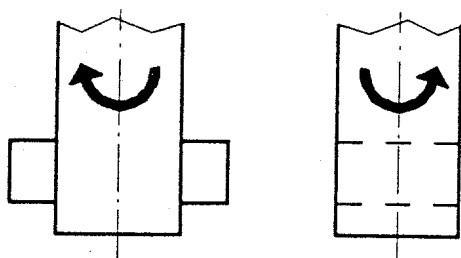
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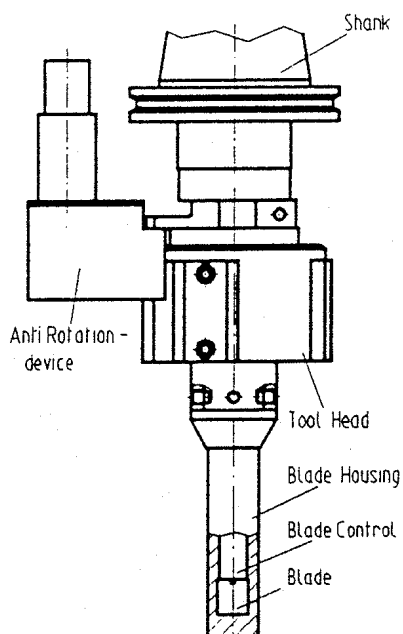
1. Tool Description



GH-Z tools are made to produce **forward** and **reverse spotfaces** as well as **form back counterbores**.



Depending on the direction of rotation of the spindle the blades are either extended (clockwise rotation of the spindle) or retracted into the tool (counter-clockwise rotation of the spindle).



A complete tool consists of the following components:

- Tool Head
- Shank
- Anti-Rotation Device
- Blade Housing
- Blade Control
- Blades / Insert Cartridges, Inserts

HEULE offers five different sizes of tool heads. The bore and countersink diameters determine the size of tool head that has to be used.

GH11 92

Tool Description

GH-Z 1-01

The execution of the **shank**, normally a steep taper, as well as the **anti-rotation device** are dependent of the machine tool and have to be adapted individually to your machine.

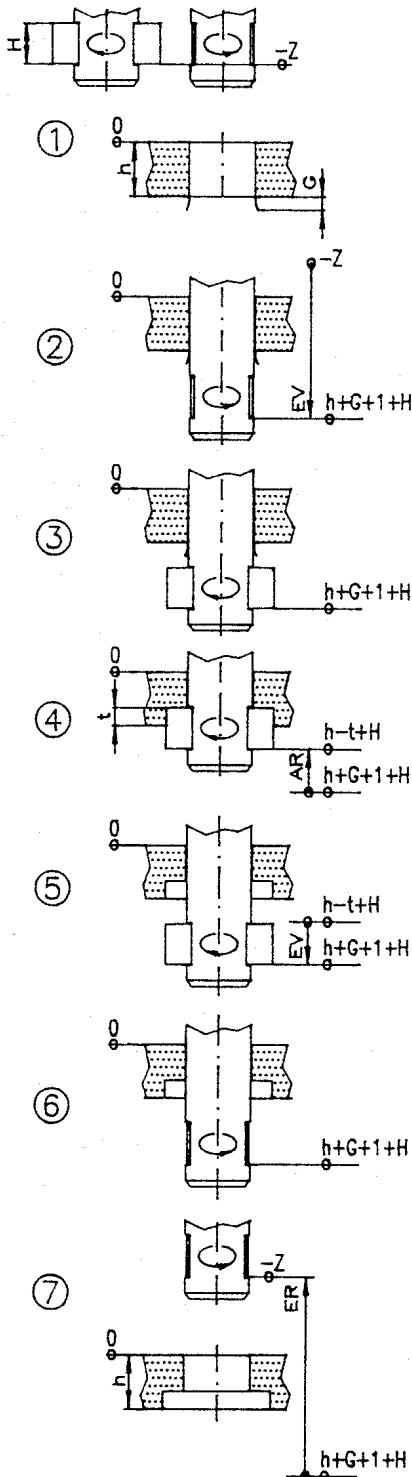
The **tool head** with shank and anti-rotation device are modular and can be used for different applications according to the working range of the tool head.

Blade housing, **blade control** and **blades** will be produced individually for each application, i.e. these parts have to conform to the bore and countersink diameter as well as to the work piece height.

Upon request GH-Z tools are available with **through tool coolant supply**. The coolant will pass through the steep taper, i.e. through the center of the spindle (not through the anti-rotation device).

2. Application of GH-Z Tools

2.1. GH-Z Operational sequence / Programming reference



1. After **each** tool change the start position of the tool has to be newly defined. This can be achieved by **minimum two spindle rotations** clockwise and afterwards counter-clockwise. This changeover guarantees the perfect function of the tool.

G Burr Length

2. Spindle rotating **counter-clockwise** passing through the bore with rapid-feed, forwards (blades retracted).

h Workpiece Height

H Blade Height

EV Rapid-Feed, forwards

3. Change over the sense of the spindle rotation to **clockwise** (blades extended).

4. Machine the work piece with working-feed, backwards.

t Countersink Depth

AR Working feed, backwards (0.05 - 0.1 mm/U)

5. Travel out of the work piece with rapid-feed, forwards (direction of spindle rotation: **clockwise**).

6. Change the direction of the spindle rotation **counter-clockwise** (blades retracted).

7. Withdraw the tool from the work piece with rapid-feed, backwards.

ER Rapid-Feed, backwards

2.2. Cutting Data

Apart from the quality of the material the cutting values depend on the stability of the machine and the state of the preparatory treatment (casting inclusions, interrupted cut, etc.). The following data can be referenced as standard values:

Cutting speeds: According to other two-bladed HSS tools in the corresponding material and with the equivalent countersink diameter.

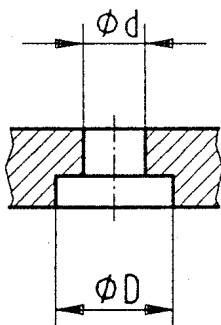
Please pay attention to the kinematics of the tool. When working with high speed rates we recommend you to reduce them when changing the sense of rotation.

Examples (standard values):

revs. / min. D	steel cast iron materials		non-ferrous heavy metals	
	HSS 20 m/min. (65 sfpm)	carbide 35 m/min. (115 sfpm)	HSS 30 m/min. (98 sfpm)	carbide 45 m/min. (148 sfpm)
Ø 8	800	1400	1200	1800
Ø 10	640	1120	960	1440
Ø 20	320	560	480	720
Ø 30	220	380	320	480
Ø 40	160	280	240	360
Ø 50	120	220	200	280
Ø 60	100	180	160	240

(sfpm = 3.28 * m/min.)

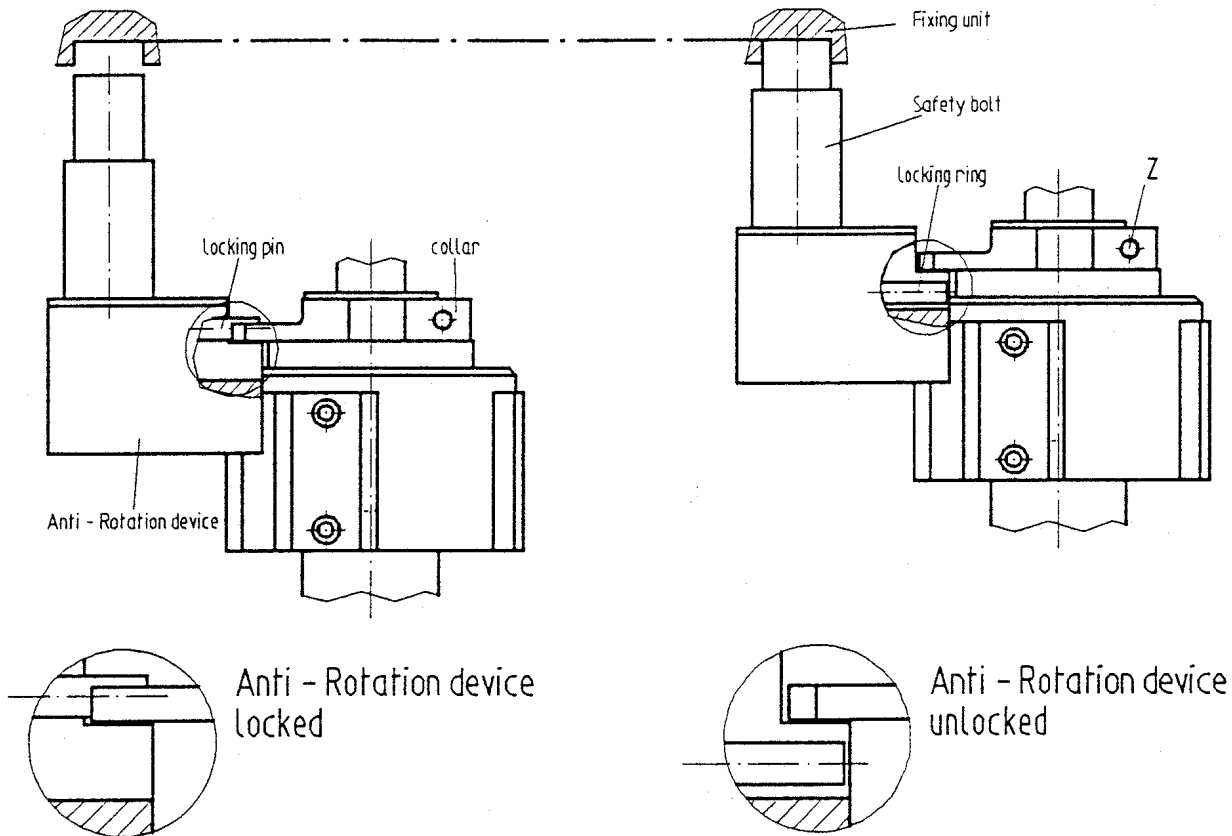
Feed rates: 0,04 to 0,1 mm/rev.
The feed is based on the relation between the countersink diameter (D) and the bore diameter (d).
(as diameter (D) approaches 2x that of diameter (d) ==> the slower the feed)



Standard values:

Feed rates	Relation D / d				
	1.9	1.8	1.6	1.4	1.2
mm/rev.	0.03	0.04	0.06	0.08	0.1
in./rev.	0.0012	0.0016	0.0023	0.0030	0.0040

2.3. Adjustment of the CNC anti-rotation device on the machine



Loosen collar screw "Z".

Rotate the collar so that the locking pin (on the anti-rotation device) lines up and will fall between the forks of the collar. Put tool into the machine manually. While doing this, position the anti-rotation device with the loosened collar so that the safety bolt engages in the counterpart of the machine (fixing unit).

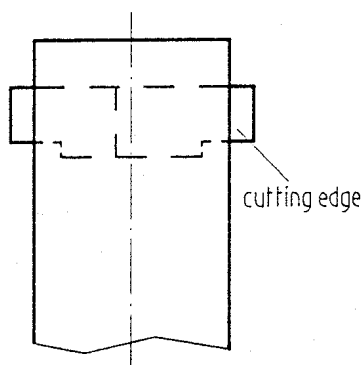
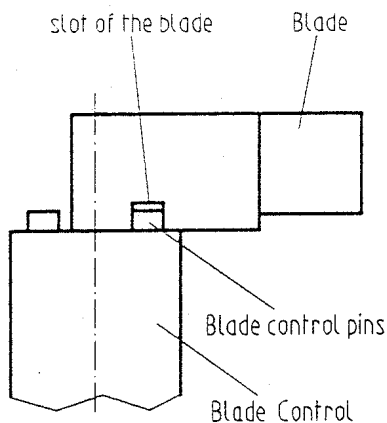
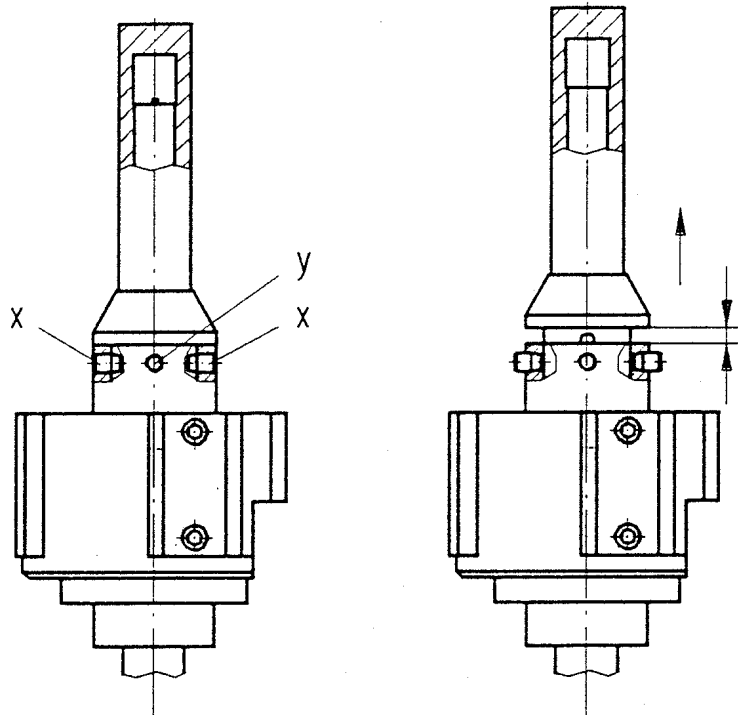
Tighten collar screw "Z".

In case that the tool change position is not yet completely right the collar screw "Z" can be loosened again and the collar can be re-positioned correctly.

GH01 93	Tool Application	GH-Z 2-03
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3. Tool Maintenance

3.1. Changing blades



Loosen stop screw "Y" (one turn only).

Loosen clamping screws "X" until the blade housing freely slides forward.

Push the blade housing away from the tool head to the stop. The cutting blades can now easily be removed from the blade window as the pins of the blade control are no longer engaged in the blade control slot of the blades.

Insert the new set of blades into the blade window so that the cutting edges stand only 2-4mm out of the blade window.

The blades cannot be inserted the wrong way as the position of the blades is defined by a guiding chamfer on the blades.

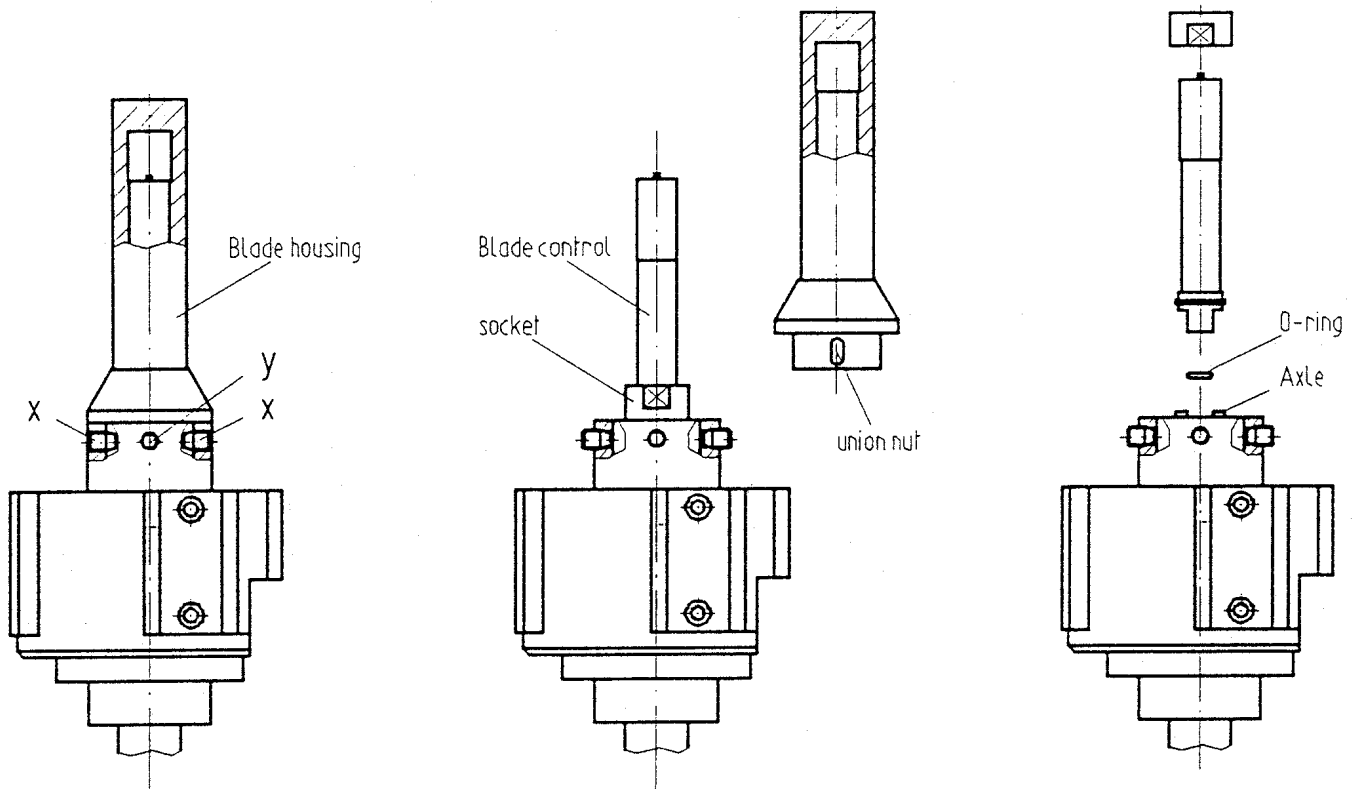
"Press" the blade housing lightly against the tool head and at the same time slowly twist the tool shank until the pins of the blade control engage in the blade control slots of the blades and the blade housing clings again to the tool head.

Retighten the clamping screws "X" evenly and afterwards also tighten stop screw "Y".

Check whether the clamping screws "X" are securely fastened.

By twisting the tool shank (hold the tool head firmly) the blades should move in and out easily.

3.2. Dismantling of blade housing and blade control



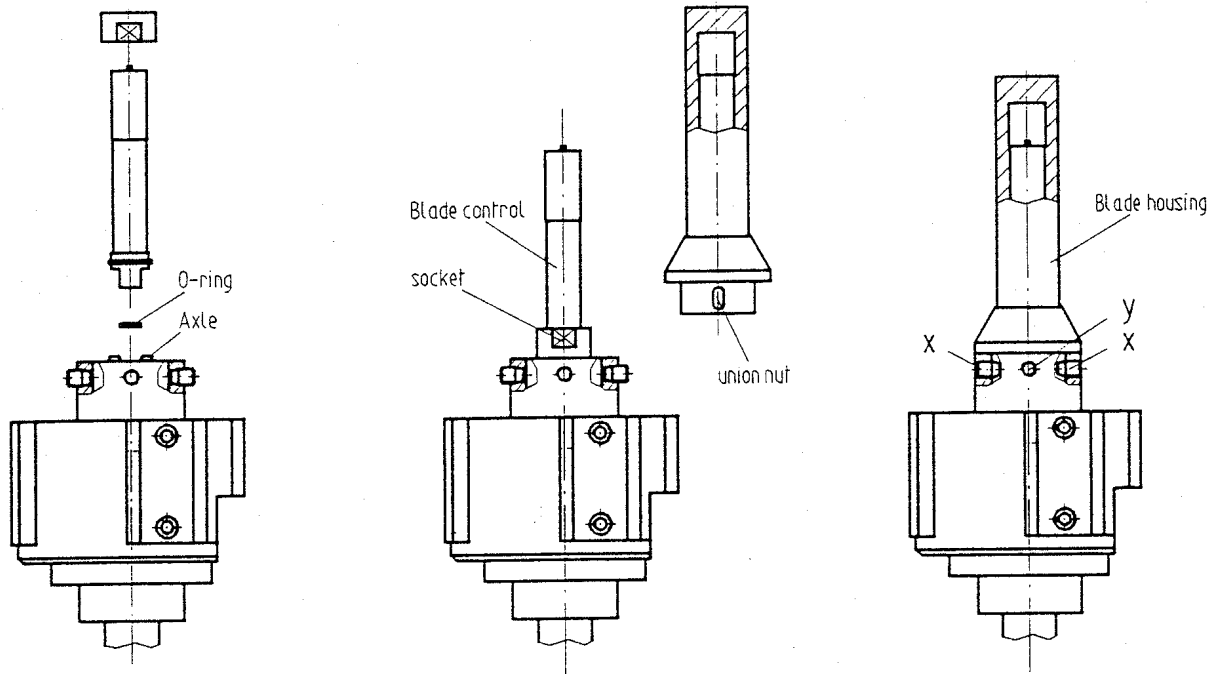
Loosen clamping screws "X" and stop screw "Y" until the blade housing can be removed from the tool head.

Caution: The cutting blades are no longer fastened in the window of the blade housing and can easily be pushed out.

The blade control is fastened to the tool head by means of a socket ("union nut"). In order to dismantle the tool head this union nut has to be screwed off.

Attention: Tools with through tool coolant supply have an O-ring placed between blade control and the axle of the tool head.

3.3. Assembly of blade housing and blade control



Attention: In case of exchanging blade housing, blade control and blades it has to be taken into consideration that parts of different applications must not be used together. From the assembly drawing (piece list) delivered with the tool you will see which parts belong together.

Set the blade control into the slot of the axle of the tool head and fasten it with the socket.

Pay attention that the blade control is not mounted in a sloping position onto the tool head.

Tools with through tool coolant supply must have an O-ring.

Please note: The blade control of special tools with blades of different length per set is specially marked. The notch of the blade control has to be aligned with the notch of the axle of the tool head.

When mounting the blade housing it first has to be positioned on the tool head with the aid of the stop screw. The stop screw "Y" has to engage into the elongated hole at the blade housing. Do not fasten stop screw.

Screw in the clamping screws "X", but do not fasten.

Insert blades as per "3.1 Changing blades".

4. Standard application range of GH-Z Tools

4.1. General Explanation

HEULE offers the GH-Z tool range with five different types of tool heads.

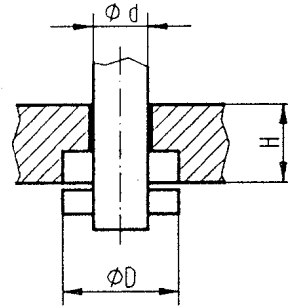
The choice of the tool head is basically depending on the bore diameter.

A large tool head (for example GH-Z 50) can also be used for small bores without any problems. What we do not recommend however is to use the small tool heads for machining large bores. (Due to technical reasons it is in most cases not possible to use the small tool heads above their standard range.)

From the tables on the following pages you can learn the standard application ranges of our GH-Z tools. In case that your particular application cannot be covered with these standard ranges, we will be pleased to check your inquiry individually.

GH11 92	Application Range	GH-Z 4-01
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4.2. General reference



d: bore diameter
 D: countersink diameter
 H: workpiece height

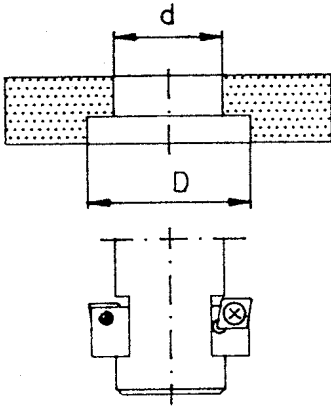
	GH-Z 20	GH-Z 30	GH-Z 50
d*	d _{min} = 8 mm d _{max} = 23 mm	d _{min} = 20 mm d _{max} = 33 mm	d _{min} = 30 mm d _{max} = 60 mm
D**	$D \leq 2 * d - 1 \text{ mm}$	$D \leq 2 * d - 1 \text{ mm}$	$D \leq 2 * d - 2 \text{ mm}$
shank	straight shank Ø 25 mm / 1"	all current steep tapers straight shank Ø 25 mm or 1" other shanks on request	straight shank Ø 32 mm or 1½"
D1	blade housing diameter: dependent on the bore diameter standard value: $D1 = d - 0.2 \text{ mm}$		
Ls*	working length: dependent on the work piece $Ls \geq H + 5 \text{ mm}$ Standard: Ls=60/100/150mm Ls _{max} : 250 mm*		
Hm	blade height: dependent on the application H = 8 - 18 mm		
L2	dependent on steep taper, i.e. shank		

GH11 92

Application Range

GH-Z 4-02

4.3. GH-Z Tools: partition of the cut

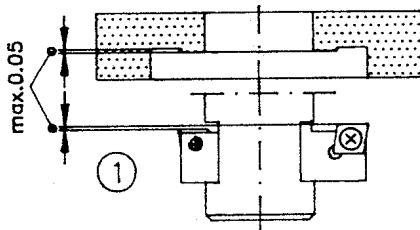


GH-Z tools are balanced two bladed cutting tools. This two bladed system is very advantageous as far as partition of cut and forces are concerned.

Up to bore diameter 20mm GH-Z tools will be equipped with solid HSS or solid carbide blades. From bore diameter 20 on we offer insert cartridges and inserts as a more economical solution.

Depending on bore and countersink diameter considerable chip widths can occur which would have to be partitioned to several cuts when manufacturing conventionally (example: turning on a lathe).

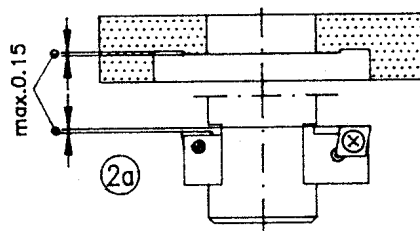
From a certain chip width it is also necessary to partition the cut when using GH-Z tools (from chip width of 14–16 mm on). Apart from using two tools there are two other possibilities to partition the cut.



1. If an undercut is tolerable

By displacing the cutting units mutually the total width of the chip can be divided up.

Due to the tolerances of the inserts and the insert cartridges the cutting edge can vary up to 0.05mm. Therefore a step of maximum 0.05mm is possible on the spotface. (picture 1).

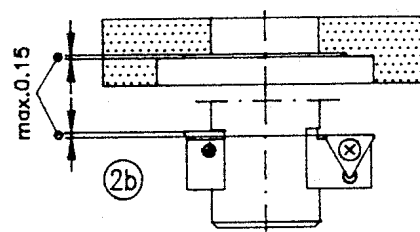


2. If a defined undercut is tolerable

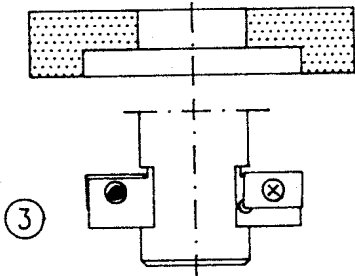
By deliberately displacing the cutting edges of about 0.15mm it is possible to get a defined undercut.

Picture 2a: The small diameter is worked deeper, i.e. it becomes relieved.

Picture 2b: The countersink diameter is worked deeper.



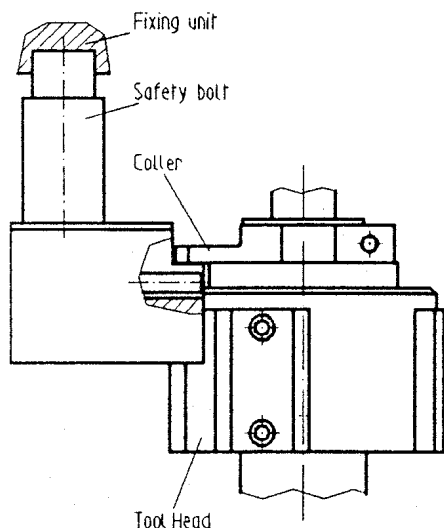
GH11 92	Application Range	GH-Z 4-04
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3. If an undercut is not tolerable

If none of the above mentioned versions is acceptable the blades have to be large enough that the total countersink diameter can be produced with one cut. As a rule for such cases we recommend to use a tool for the roughing operation and another tool for the finishing operation. The roughing tool will work with a partitioned cut and the finishing tool will be equipped with blades long enough to produce the final countersink diameter with one cut.

5. Anti-Rotation Device

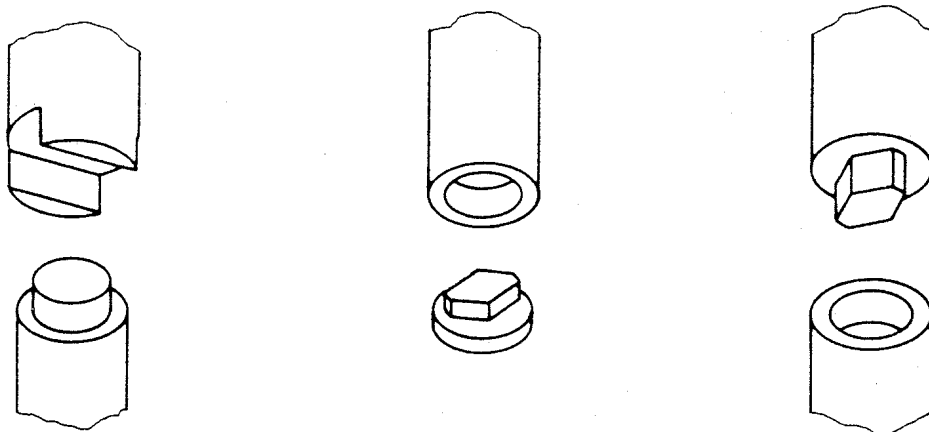


The anti-rotation device secures the tool head from twisting, i.e. the anti-rotation device takes over the torque resulting from the brake when changing the direction of rotation (similar as with tapping heads).

If the GH-Z tool is used on a CNC machine or whether the tool will be changed by hand we will provide you with the appropriate anti-rotation device in either case.

For a **CNC application** you require an anti-rotation device whose position with regard to the tool remains fixed during the tool change as well as when placed in the tool magazine.

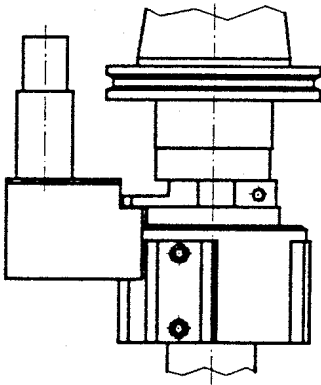
If the **tool will be changed manually** a simple torque support is sufficient. Such a simple support can either be produced by the customer himself or be supplied by HEULE:



The safety bolt of the anti-rotation device has to be positioned to any recess (bore) or to a bolt, i.e. screw head of the spindle nose (spindle sleeve) of the machine. Positioning facilities for coolant adapter or multiple-spindle heads are suitable anchorage points.

HEULE will design the anti-rotation device according to the customer's data.

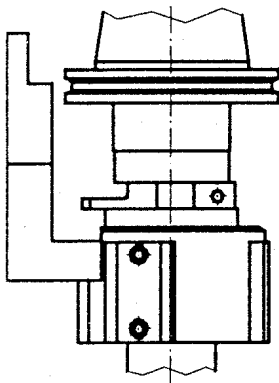
5.1. CNC Anti-Rotation Device



The anti-rotation device is designed for the **automatic tool change** and will be adjusted according to the machine tool.

The necessary data has to be made available to HEULE by the customer (see data sheet "anti-rotation device").

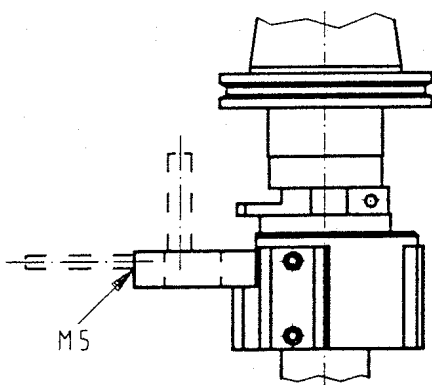
5.2. Fixed Support



The tool will be changed **manually** with a fix support on the machine. In this case the anti-rotation device will also be adjusted to the machine tool.

The necessary data has to be made available to HEULE by the customer (see data sheet "anti-rotation device").

5.3. Simple holding device



The tool will be changed **manually** with a fix support on the machine.

HEULE supplies a stop arm to which either a bar with an M5 thread can be screwed in on the face or a bolt with a slot (width 12mm) can be fastened.

With this solution there are no restrictions regarding the use of the tool, i.e. the customer will be able to use the tool universally on different machines.

5.4. The customer makes his own support

The support will be fastened to the tool head with two M5 screws.

6. Information / Special Application

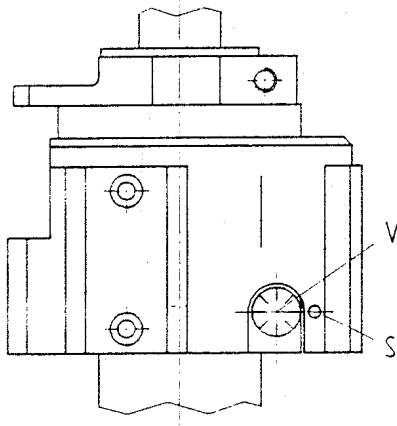
6.1. Fine adjustment of the countersink diameter

The following tool heads offer a micro-adjusting feature for the countersink diameter:

GH-Z 20K
 GH-Z 30K
 GH-Z 50K
 GH-Z 70K

Procedure:

- Loosen safety screw "S"
- Adjust countersink diameter with set screw "V" (screw with scaling)



The scaling serves only as non-dimensional marking. The relation between countersink diameter and revolution of the screw depends on the dimensioning of the tool and is not defined.

The countersink diameter is determined by measuring the distance between the cutting blades and can be adjusted with the screw "V".

Reduce countersink diameter: turn screw "V" clockwise

Increase countersink diameter: turn screw "V" counter-clockwise

(As a rule there is only a reduction of the countersink diameter possible from the nominal diameter on.)

- Secure set screw "V" with safety screw "S".

7. Ordering Reference / Data Sheets

The HEULE GH-Z tools will be individually adapted to the customer's application. This means that blade housing, blade control and blades/insert cartridges will be re-engineered and manufactured corresponding to each application.

The **shank** and **anti-rotation device** will be adapted to your machine tool.

The more detailed the documentation of an application you send us, the easier and quicker we can handle your inquiry/order.

If you complete our data sheets for

- **GH-Z Tool**

and

- **Anti-Rotation Device**

this should provide us with all the necessary technical information.

We kindly ask you to copy these two data sheets from this documentation.

Data sheet for GH-Z/E tools

Customer: _____

Address: _____

Date: _____

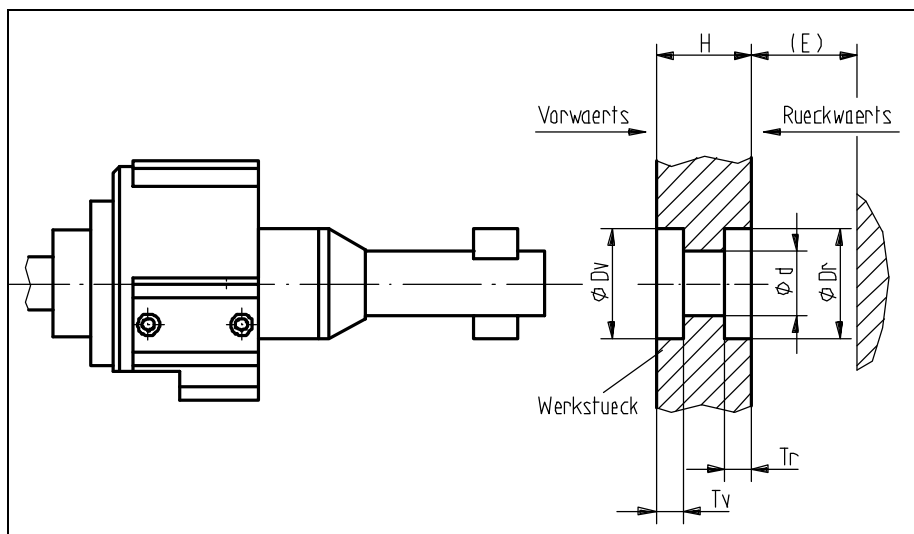
Contact: _____

Department: _____

Telephone: _____

Telefax: _____

Represented by:



Work piece:

Work piece drawing enclosed

Part name: _____

Bore diameter **d:** _____ mm Tolerance: _____
(prior to the countersink operation)

Countersink \emptyset **Dv:** _____ mm Countersink- \emptyset **Dr:** _____ mm
Tolerance: _____ Tolerance: _____

Countersink depth **Tv:** _____ mm Countersink depth **Tr:** _____ mm

Work piece height **H:** _____ mm Limits **E:** _____ mm

Material: _____

Machining: backwards forward and backwards
 spotface form countersink (enclose drawing)

Tool:

Blade material: HSS Carbide HSS-TiN

Through coolant: no yes
 through taper (Ex. DIN69871 B)
 through spindle centre

Tool-shank: _____

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In case you need anti-rotation device, please fill in the necessary data as per attached data sheet

Remarks: _____

Data sheet for anti-rotation devices

Customer: _____

Address: _____

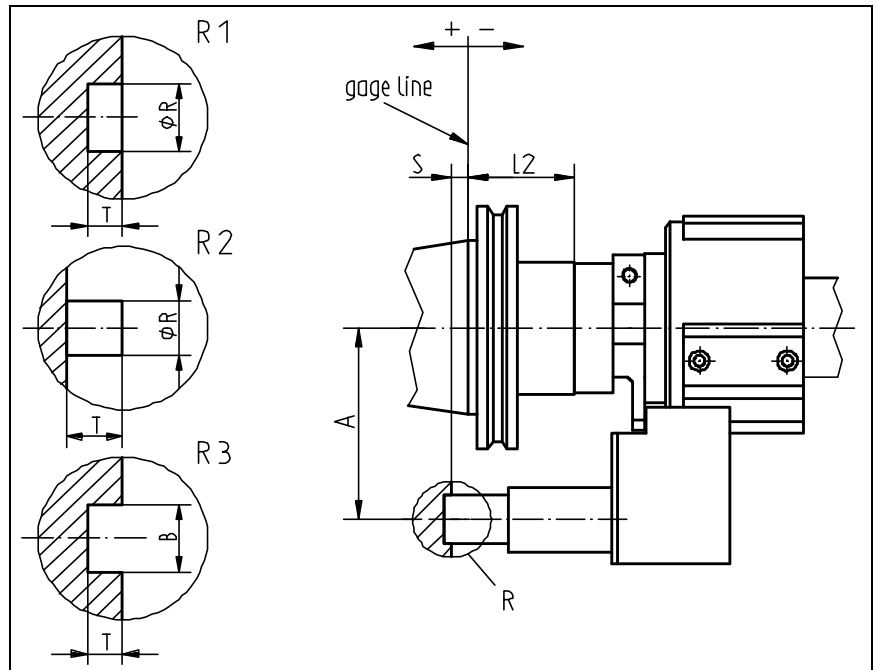
Date: _____

Contact: _____

Department: _____

Telephone: _____

Telefax: _____



Represented by: _____

Execution:

- automatic tool change
 manual tool change

- A:** Distance spindle axis - fixing unit axis A: _____ mm
S: Distance gage line - fixing unit S: _____ mm
L2: Distance gage line- tool stop L2: _____ mm
R: Shape of the fixing unit

Please fill in the necessary data for the required type or enclose the drawing of the spindle nose.

- R1: Bore** diameter R: _____ mm
 depth T: _____ mm
R2: Bolt diameter R: _____ mm
 height T: _____ mm
R3: Slot width B: _____ mm
 depth T: _____ mm

drawing of the spindle nose enclosed

- Machine:** Machine type: _____
 Tool shank: _____
 Spindle feed only: Spindle housing
 table feed
 spindle feed only

Remarks: _____

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HEULE - Programm

COFA
Entgraten von ebenen und unebenen Bohrungskanten, vor- und rückwärts in einem Arbeitsgang



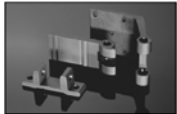
COFA
Deburring of even and uneven bore edges, forward and reverse in a single work operation



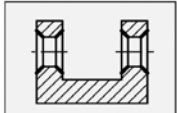
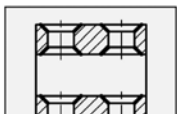

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Die HEULE Werkzeugsysteme sind durch internationale Patente geschützt.
The HEULE tool systems are protected by international patents.

DEFA
Definiertes Fasen von Bohrungen vor- und rückwärts in einem Arbeitsgang




DEFA
Defined bore chamfering forward and reverse in a single work operation

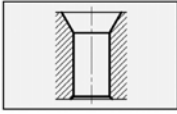
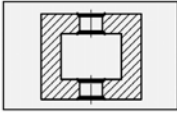
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The HEULE tool systems are protected by international patents.

SNAP / SNAP-Combi
Entgraten vor- und rückwärts kombiniert in einem Werkzeug mit Bohren, Ausspindeln, Fasen, Planenken, etc.




SNAP / SNAP-Combi
Front and back deburring in one single tool in combination with drilling, boring, spotfacing, chamfering, etc.

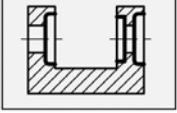
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SOLO
Einfaches Plan- und Formsenken, vor- und rückwärts in einem Arbeitsgang. Ohne Drehmomentstütze und Maschinenanpassung => sofort einsatzbereit



SOLO
Easy front and back spotfacing and formsinking in a single work operation. No anti-rotation device or machine adaptations required => immediately ready for operation

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