

# Expander® Sealing Plugs EH 22880. - Constructional Guidelines / Assembly Instructions

## Component Requirements (22880.0004 – 22880.0094):

### Drilling Holes

- The counterbore relation  $d_2/d_3$  has to be according to the catalogue specification.
- Roundness tolerances have to be within  $t = 0,05$  mm.
- With hard materials (see picture 1) the drilling roughness has to be  $R_z = 10$  to  $30 \mu\text{m}$ .
- Drilling tolerance  $d_1 = + 0,1$  mm.
- Longitudinal rifles and spiral grooves have to be avoided as they have a negative influence on the sealing.
- Drilling holes have to be kept absolutely free from oil, grease and chips.**

### Roundness Tolerance

To achieve a secure functioning of the Expander® Sealing Plugs in respect to pressure effectiveness and sealing, a roundness tolerance of  $t = 0,05$  mm has to be adhered to.

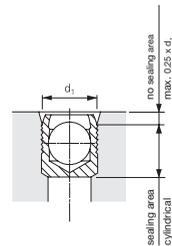


### Drilling Tolerance

The drilling tolerance is  $+ 0,1$  mm.

### Drilling Conicity

Within the active sealing area of the Expander® Sealing Plugs, the drilling hole has to be cylindrical. The drilling hole entrance may be conical up to  $0,25 \times d_1$  as this zone does not have any primary influence on the sealing function.



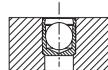
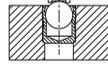
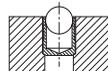
### Galvanic Corrosion

An eventual contact corrosion has to be considered.

## Assembly Instructions:

### Mounting Procedure

- The Expander® Sealing Plug has to be inserted into the counterbore hole with the ball facing out. The upper sleeve edge must not protrude the working piece. Mounting dimensions given in the catalogue have to be considered.
- When having only a small or no counterbore hole at all the sleeve bottom has to be supported sufficiently.
- Press in the ball by means of a press or setting die until the upper crown is lying underneath the sleeve edge. Respective standard values for stroke  $s$  and dimension  $x$  can be seen from the table below.



### Tools

For the assembly of Expander® Sealing Plugs, please use setting dies according to the catalogue specification.

### Disassembly process

Thanks to their strength of approx. 45 HRC, the balls can be drilled out using a drill fitted with a hard-metal bit.

- 1a Drill out Expander® Sealing Plugs with diameters of **up to Ø 6 mm directly in one operation step and drill to the next larger diameter** according to standard sheet.
- 1b Drill out Expander® Sealing Plugs with diameters of **Ø 6 mm or more in several operation steps and drill to the next larger diameter** according to standard sheet.
2. Clean the bore and free it from chips and possible leftovers of the sleeve (without oil and grease).
3. Insert a new Expander® Sealing Plug.

### Attention!

After the disassembly always insert the Expander® Sealing Plug diameter next in size!

## Component Requirements (22880.0304 – 22880.0420):

### Drilling Holes

- Roundness tolerances have to be within  $t = 0,05$  mm.
- With hard materials the drilling roughness has to be  $R_z = 10$  to  $30 \mu\text{m}$ .
- Drilling tolerance  $d_1 = + 0,12$  mm.
- Longitudinal rifles and spiral grooves have to be avoided as they have a negative influence on the sealing.
- Drilling holes have to be kept absolutely free from oil, grease and chips.**

### Roundness Tolerance

To achieve a secure functioning of the Expander® Sealing Plugs in respect to pressure effectiveness and sealing, a roundness tolerance of  $t = 0,05$  mm has to be adhered to.

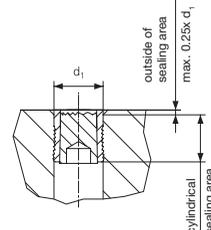


### Drilling Tolerance

The drilling tolerance  $d_1 = + 0,12$  mm with pull-anchor.

### Drilling Conicity

Within the active sealing area of the Expander® Sealing Plugs, the drilling hole has to be cylindrical. The drilling hole entrance may be conical up to  $0,25 \times d_1$  as this zone does not have any primary influence on the sealing function.



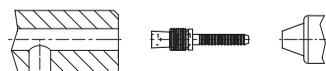
### Galvanic Corrosion

An eventual contact corrosion has to be considered.

## Assembly Instructions:

### Mounting Procedure

- The Expander® Sealing Plug with pull-anchor has to be flush mounted into the sleeve of the assembling tool.
- The Expander® Sealing Plug has to be mounted into the bore hole to be sealed. The assembly operation has to be activated until the pull-anchor breaks when having achieved the nominal breaking load.



### Attention

- The assembly of the Expander® Sealing Plug has to be effected only in a clean working environment.
- The anchor and sleeve of the Sealing Plug must neither be cleaned nor greased.

### Tools

For a failure-free assembly of the Expander® Sealing Plug the original tools and the appropriate equipment according to the technical data sheet are to be used.

### Disassembly process

For the Expander® Sealing Plug type with pull-anchor a disassembly is possible.

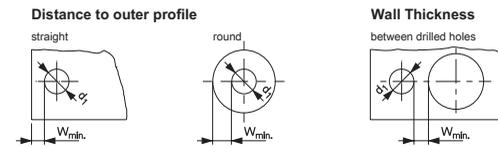
- Strike back the anchor inside of the sleeve with the help of the punch.
- Break out the sleeve and remove the struck anchor.
- Redrill the bore hole to the **Expander® Sealing Plug diameter next in size** according to the standard sheet.
- Clean the bore and free it from chips and possible leftovers of the sleeve (without oil and grease).
- Insert a new Expander® Sealing Plug.

### Attention!

After the disassembly always insert the Expander® Sealing Plug diameter next in size!

## Wall Thicknesses / Edge Distances (EH 22880.)

The Expander® Sealing Plug is anchored to the basic material by radial expansion of the sleeve. Depending on the basic materials' characteristics forces resulting from this type of anchorage as well as the hydraulic pressures and temperature loads will necessitate minimum wall thicknesses and edge distances.



For standard values of minimum wall thicknesses and edge distances ( $W_{\min}$ ) refer to table.

### Calculation of standard values

Diameter of the Expander® Sealing Plug:

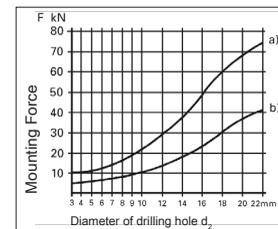
$$d_1 \geq 4 \text{ mm: } W_{\min} = f_{\min} \times d_1$$

$$d_1 < 4 \text{ mm: } W_{\min} = f_{\min} \times d_1 + 0,5$$

Description	ETG -100 AISI 1144	C 15 Pb 1.0403	GG - 25 DIN 1691	GGG - 50 DIN 1693	AlCuMg <sub>2</sub> 3.1354	AlMgSiPb 3.0615	G-AISI7Mg 3.2371
Tensile strength Rm N/mm <sup>2</sup>	1000	560	250	500	480	340	300
Min. breaking elongation A5 / %	6	6	-	7	8	8	4
Average permanent elongation limit R <sub>p0.2</sub> N/mm <sup>2</sup>	865	300	-	320	380	300	250
<b>Basic material</b>				<b>Factor f<sub>min</sub></b>			
Body from stain- less steel	0,6	0,8	1,0	0,8	0,8	1,0	1,0
Body from steel	0,5	0,6	1,0	0,6	0,6	1,0	1,0
Type with pull-anchor	0,5	0,6	1,0	0,6	0,6	1,0	1,0

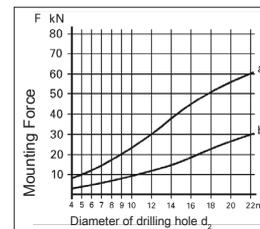
## Mounting / Assembly Forces

**Expander® Sealing Plug  
Body from stainless steel  
Art. No.  
22880.0053 to 22880.0094**



Measured in steel having a tensile strength of  $R_m = 1000$  N/mm<sup>2</sup>. When using basic materials with lower tensile strengths values are lower

**Expander® Sealing Plug  
Body from steel  
Art. No.  
22880.0004 to 22880.0022**



- Force at min. drilling tolerance
- Force at max. drilling tolerance

## Anchorage Principle (EH 22880.)

There is a direct connection between the necessary drilling roughness required and both, the hardness and the tensile characteristics of the basic material. Depending on the mounting combination of sealing plug and basic material, anchorage can either take place via the rifle profile of the Expander® body (automatic anchorage) or via the surface roughness of the drilling hole.

### Attention

Depending on the type of Expander® Sealing Plug and the hardness of the basic material a bore roughness of  $R_z = 10$ - $30 \mu\text{m}$  has to be adhered to.

### Expander® Sealing Plug

**Art. No. 22880.0004 to 22880.0094**

Requirements to achieve maximum operation reliability

- Drilling tolerance  $d_1 = + 0,1$  mm.
- Consideration of counterbore hole relations.
- Roundness tolerance  $t = 0,05$  mm
- Longitudinal rifles and spiral grooves that may have a negative influence on the sealing effectiveness have to be avoided.
- Drilling holes have to be free from oil and grease.

### Expander® Sealing, type with pull-anchor

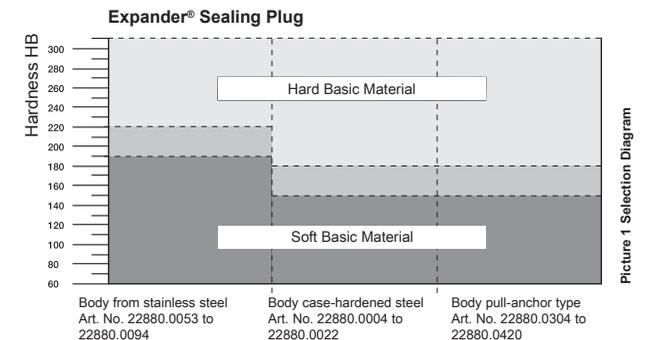
**Art. No. 22880.0304 to 22880.0420**

Requirements to achieve maximum operation reliability

- Drilling tolerance  $d_1 = + 0,12$  mm.
- Roundness tolerance  $t = 0,05$  mm.
- Longitudinal rifles and spiral grooves that may have a negative influence on the sealing effectiveness have to be avoided.
- Drilling holes have to be free from oil and grease.

### Note

In case where an automatic anchorage is not possible when building in the Expander® Sealing Plug into a hard basic material a drilling roughness of  $> R_z = 10$ - $30 \mu\text{m}$  is necessary to achieve the required pressure values. When having roughness  $> R_z = 30 \mu\text{m}$ , leakages may occur.



- Light grey: For the allowed working pressures, the anchorage must be achieved via the drilling roughness. Roughness:  $R_z = 10$ - $30 \mu\text{m}$ .
- Medium grey: Intermediate area: For the allowed working pressures anchorage has to be achieved via the drilling roughness of the basic material. Roughness:  $R_z = 10$ - $30 \mu\text{m}$ .
- Dark grey: The anchorage within the drilling hole of the basic material will automatically be achieved via the rifle profile of the Expander® sealing plug (automatic anchorage).

## Anchorage by Rifle Profile (Automatic Anchorage)

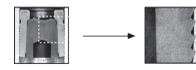
Example:

Expander® Sealing Plug made from case-hardened steel HB = 180, in aluminium alloy HB = 90



Example:

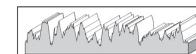
Expander® Sealing Plug, pull-anchor type, made from case-hardened steel HB = 180, in aluminium alloy HB = 90



## Anchorage by Bore Roughness

Required Roughness Design:

An ideal bore roughness for the anchor can be achieved by using a twist drill or countersink.



Undesirable Roughness Design:

Friction will cause a smooth roughness profile that is not desired.

