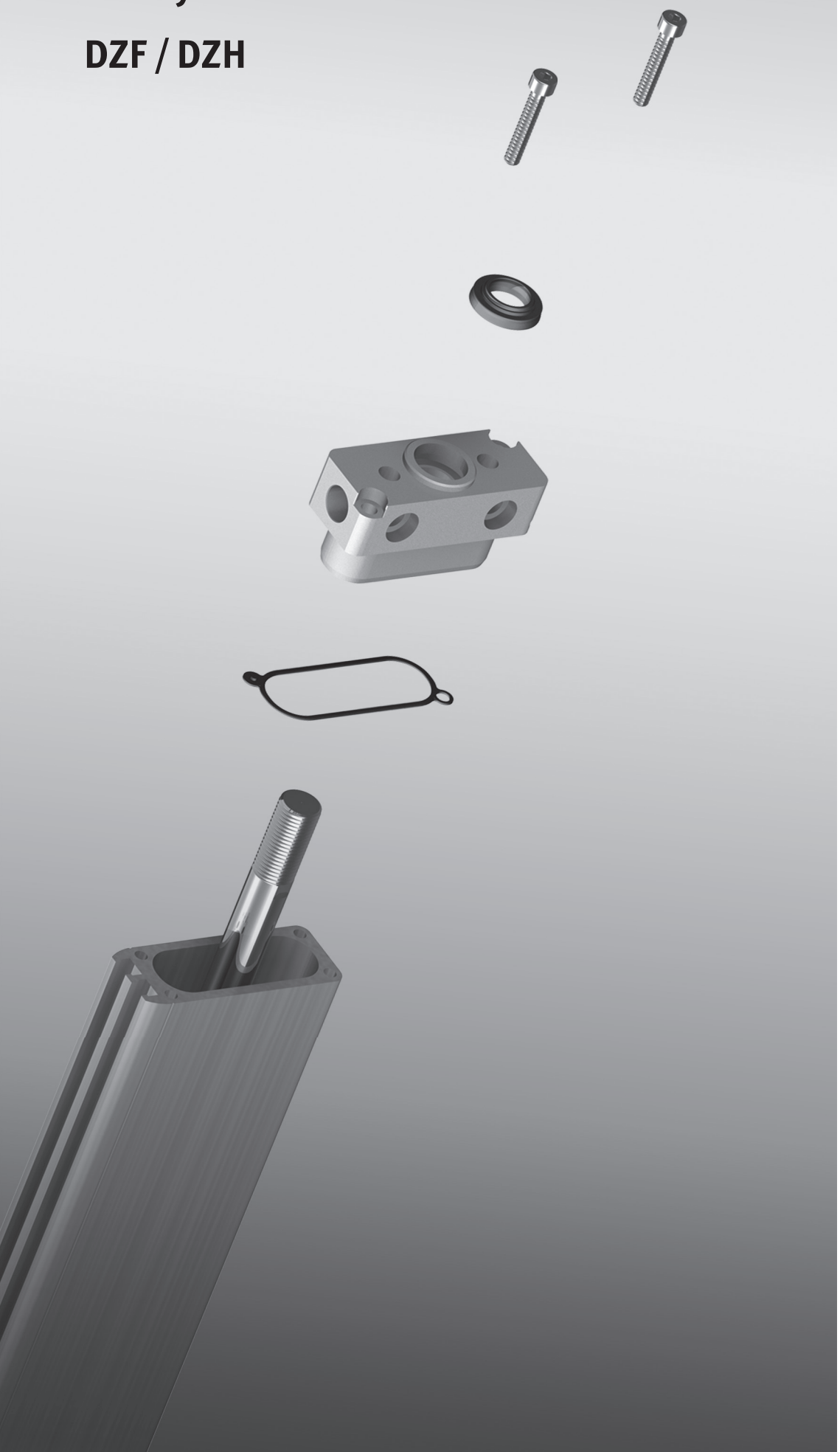
Cylinder with piston rod

Flat cylinder

DZF / DZH



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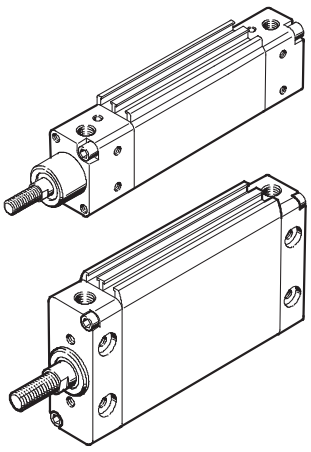
Repair instructions (en)



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All technical data are subject to change according to technical updates.

Preface

These repair instructions are valid for the cylinders with piston rod listed on the title page to the exclusion of any liability claims.

Deviations compared to the descriptions in these repair instructions may arise depending on the design and/or modification status of the cylinder with piston rod. The user must check this prior to carrying out the repair and take the deviations into consideration if necessary.

These repair instructions have been prepared with care.

Festo AG & Co. KG does not, however, accept liability for any errors in these repair instructions or their consequences. Likewise no liability is accepted for direct or consequential damage resulting from improper use of the products.

More detailed information on this can be found in chapter 8 "Liability".

The relevant regulations on occupational safety, safety engineering and interference suppression as well as the stipulations contained in these repair instructions must be observed when working on the products.

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1 Important information

1.1 About these repair instructions

This document contains important information about the professional repair of the cylinder with piston rod of the type DZF/DZH.

The cylinder with piston rod DZF / DZH is fully repairable in the event of damage due to normal wear. The entire cylinder must be replaced in the event of damage to the cylinder barrel.

These repair instructions are **not** valid for the cylinder with piston rod EZH. This cylinder with piston rod is not repairable and must be replaced.

Before carrying out a repair, the relevant chapter in these instructions must be read in full and followed consistently.

For reasons of clarity, these repair instructions do not contain complete detailed information. The following documents should therefore also be available when repairing the cylinder with piston rod:

- **Operating instructions for the respective cylinder with piston rod**

  Contains information about the operating elements and connections of the cylinder with piston rod as well as the function, structure, application, installation, commissioning, maintenance and care, etc. can be found on the Festo website (www.Festo.com).
- **Spare parts documentation**

  Contains an overview of the spare and wearing parts as well as information on their installation. Can be found in the online spare parts catalogue on the Festo website (spareparts.festo.com).
- **Assembly aids**

  Contains an overview of available assembly aids such as lubricating greases, screw locking agents, maintenance tools, etc. (aids for assembly and maintenance). Can be found in the online spare parts catalogue on the Festo website (www.Festo.com).

1.2 Pictograms used in these repair instructions

Warning

This sign indicates a dangerous situation for persons and/or the product. Failure to observe this warning can result in injury to persons and/or damage to the device.

Note

This sign provides important tips and information that can make your work easier.

Environment

This sign provides information on the steps required for environmentally-friendly use of materials and equipment, as well as the guidelines and regulations that may need to be observed.

Accessories

This sign contains information on accessories and attachments relevant to the context.

Documents

This sign contains references to other chapters or documents containing additional information.

1.3 General safety instructions

Warning

The cylinder with piston rod must only be repaired by authorised and trained persons in accordance with the specifications in the technical documentation and using genuine spare parts (of the appropriate type and version).

Installation and repair by unauthorised and untrained persons, repairs using non-original spare parts or without the technical documentation required for installation and/or repair are dangerous and therefore not permitted.

Repairs must only be carried out in conjunction with these repair instructions and the device-specific operating instructions.

Note

Instead of carrying out the repair yourself, your local Festo sales office offers the option of having the repair carried out by Festo.

Environment

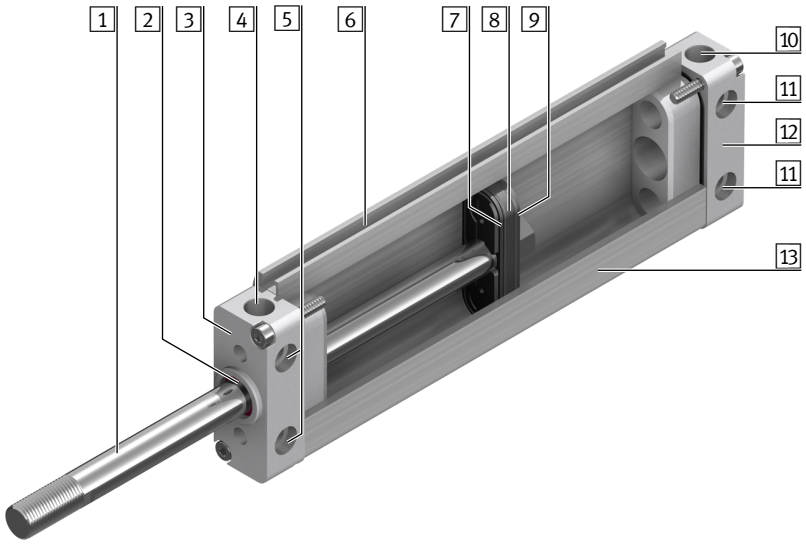
Components and equipment replaced as part of a repair must be disposed of in accordance with the locally valid environmental protection regulations.

2 General product description

2.1 Functional description

The piston moves forward in the cylinder barrel when the rear cylinder chamber is pressurised. The piston rod transmits the movement to the outside. The advanced piston rod is retracted again when the front cylinder chamber is pressurised.

2.1.1 Cut-away illustration of the flat cylinder DZF



1 Piston rod
2 Piston rod seal
3 Bearing cap
4 Compressed air connection, front cylinder chamber
5 Front holes for cylinder mounting
6 Mounting slot for proximity sensor
7 Front piston seal
8 Piston with magnet
9 Rear piston seal
10 Compressed air connection, rear cylinder chamber
11 Rear holes for cylinder mounting
12 End cap
with S2 / S20: Rear bearing cap
13 Cylinder barrel

2.2 Type codes (ascertaining the features of a cylinder)

The precise features of the current cylinder with piston rod can be ascertained with the help of the rating plate on the cylinder. The type designation is located directly beneath the Festo logo and describes the cylinder's features separated by a hyphen (-).

Example:

1 Type designation
2 Serial number
3 Technical information
4 Part number

The type designation on this rating plate provides the following information:

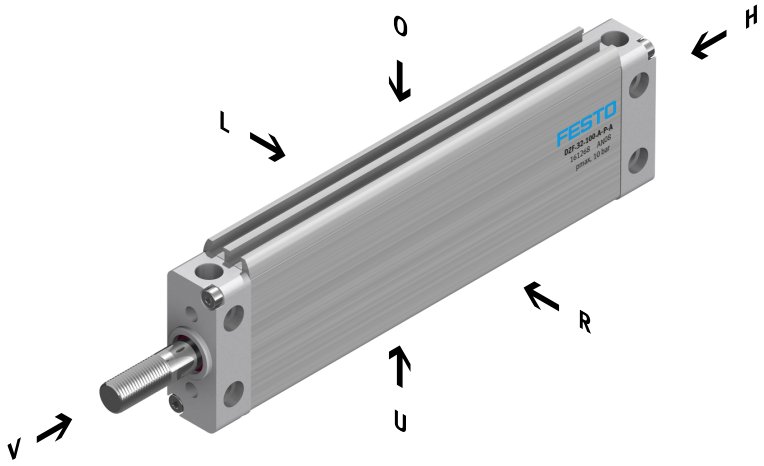
DZF Cylinder of the type DZF (double-acting)
32 Piston diameter 32 mm
100 Stroke 100 mm
A Male piston rod thread
P Elastic cushioning rings/pads at both ends
A Sensing option (magnetic piston)

Note

A list and description of all possible equipment features of the cylinder with piston rod can be found in the data sheet. It is available on the Festo website (www.Festo.com).

2.3 Orientation designations

This diagram provides an overview of the orientation designations for the cylinder with piston rod.

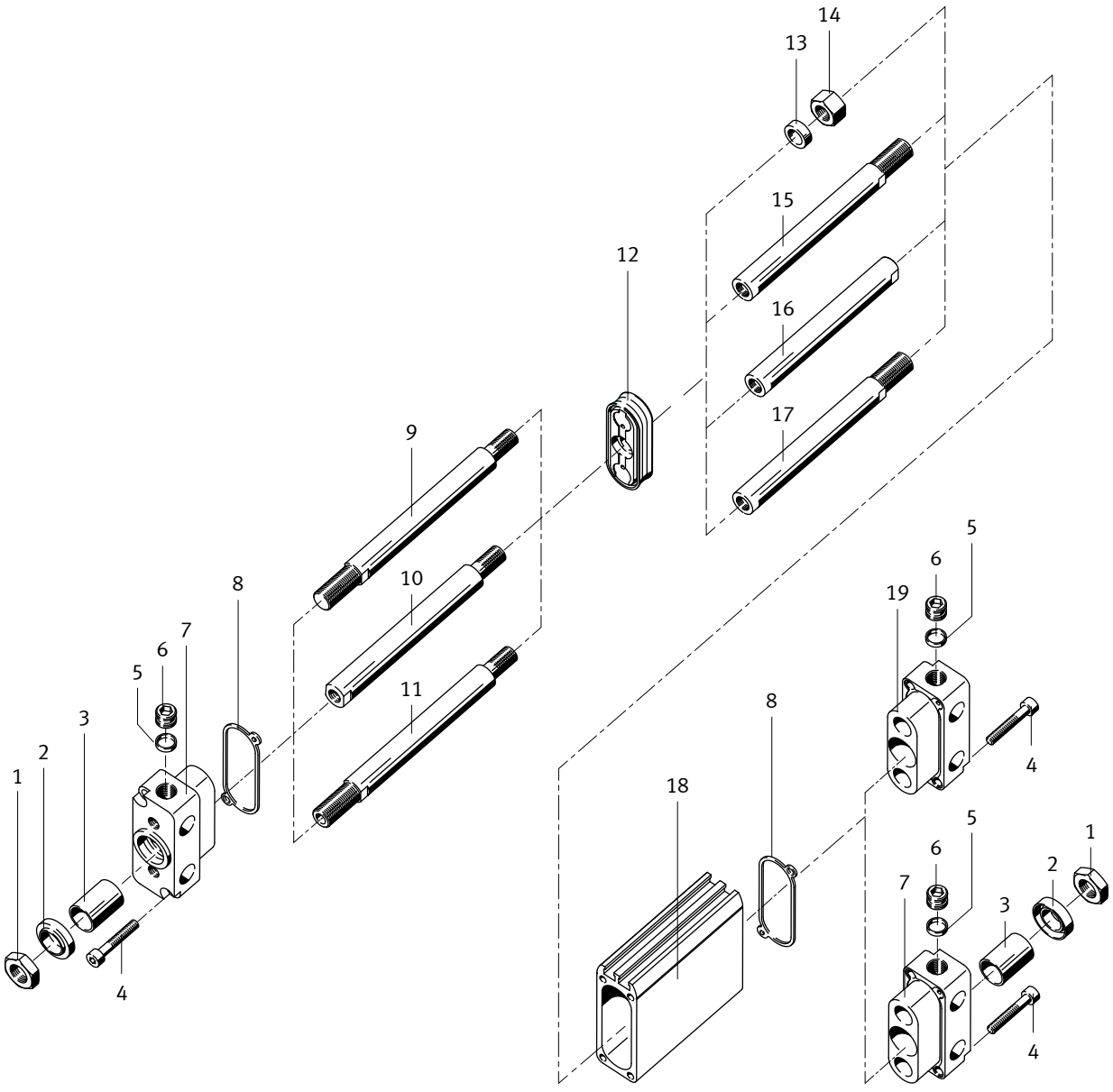


Orientation:

Festo = product identification (rating plate) as reference point
O = top
U = underneath
R = right
L = left
V = front
H = rear

3 Component overview

3.1 Flat cylinder DZF-...

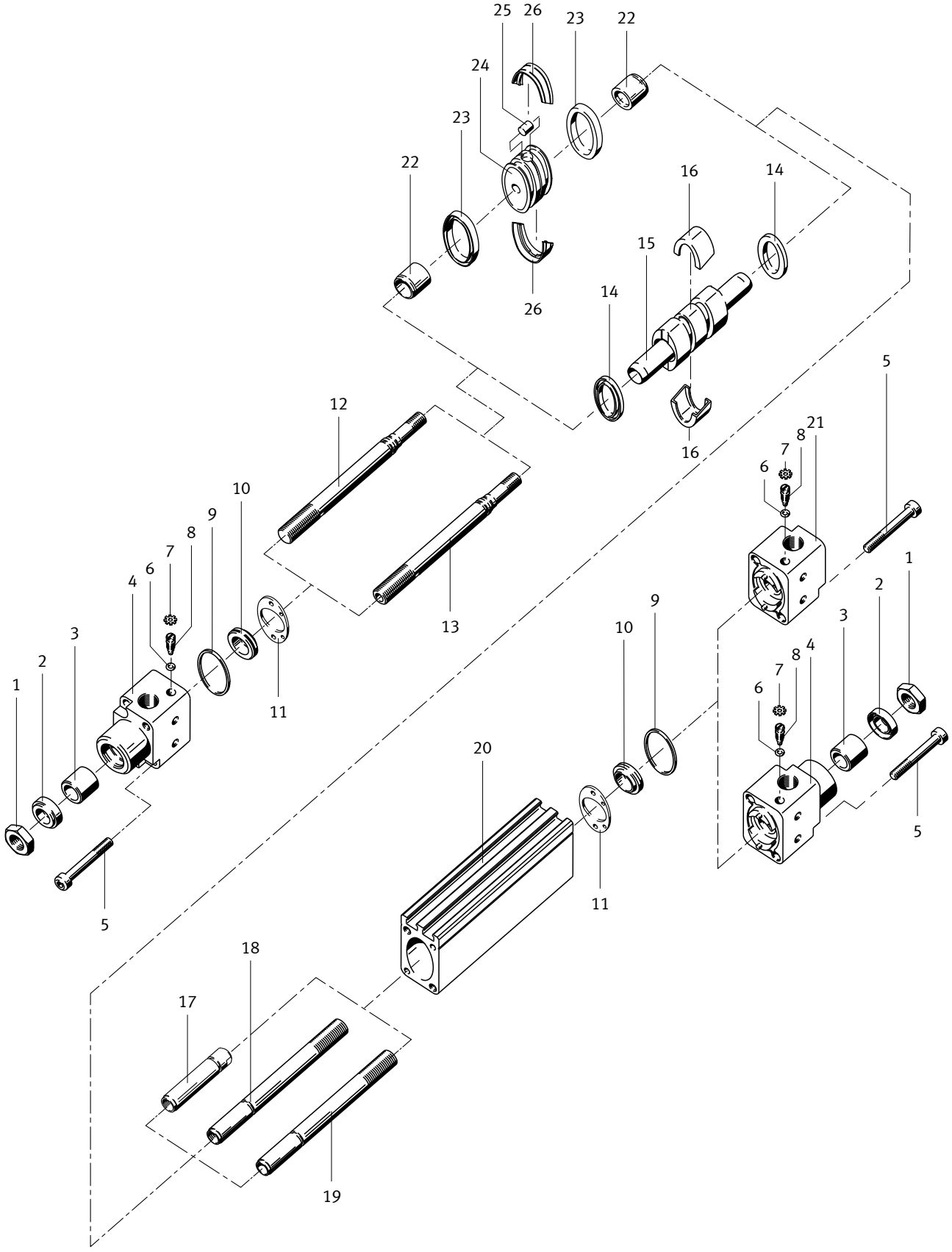


This diagram is intended only to provide an overview of the individual components. To order spare and wearing parts, please use the online spare parts catalogue on the Festo website (spareparts.festo.com).

Item	Designation	Note
1	Hex nut	For piston rod with male thread
2	Piston rod seal	
3	Bearing bush	
4	Self-tapping screw	Use screw locking agent
5	O-ring	
6	Threaded pin	
7	Bearing cap	
8	Seal	
9	Piston rod with male thread	
10	Piston rod with female thread	
11	Piston rod with male thread, hollow	S20 only
12	Piston	
13	Washer	Not S2, not S20
14	Hex nut	Not S2, not S20
15	Piston rod with male thread	S2 only, use screw locking agent
16	Piston rod with female thread	S2 only, use screw locking agent
17	Piston rod with male thread, hollow	S20 only, use screw locking agent
18	Cylinder barrel	
19	End cap	

The feature S6 indicates the design/material variants and is of little or no importance for the order of the repair steps.

3.2 Flat cylinder DZH-...



This diagram is intended only to provide an overview of the individual components. To order spare and wearing parts, please use the online spare parts catalogue on the Festo website (spareparts.festo.com).

Item	Designation	Note
1	Hex nut	For piston rod from size DZH-25-...
2	Piston rod seal	
3	Bearing bush	
4	Bearing cap	
5	Self-tapping screw	Use screw locking agent
6	O-ring	
7	Serrated ring	Only from size DZH-32-...
8	Regulating screw	
9	O-ring	
10	Cushioning seal	
11	Washer	Only DHZ-25-...-PPV-A and DHZ-25-...-PPV-A-S6
12	Piston rod with male thread	
13	Hollow piston rod with male thread	Only with DZH-...-S20
14	Groove ring	
15	Piston	
16	Guiding band	
17	Threaded coupling	
18	Piston rod extension	Only with DZH-...-S2, use screw locking agent
19	Hollow piston rod extension	Only with DZH-...-S20, use screw locking agent
20	Cylinder barrel	
21	End cap	
22	Cushioning boss	Only from size DZH-50-...
23	Groove ring	Only from size DZH-50-...
24	Piston	Only from size DZH-50-...
25	Magnet	Only from size DZH-32-...
26	Guiding band	Only from size DZH-50-...

4 Repair steps

4.1 Preparation

- Before starting the repair, remove any attachments on the cylinder barrel, the bearing and end caps or the piston rod in accordance with the accompanying operating instructions.
- Keep your working environment tidy.
- Only use the spare parts and assembly aids (grease, locking agent, etc.) provided in the set of wearing parts.

Warning

Make sure that the bearing cap cannot suddenly come flying off.

- Remove the non-return valves and tubing connection from the cylinder and depressurise the cylinder completely so that any pressure present is not suddenly released when the cylinder is opened.

To prevent damage to sealing rims or guide surfaces, do not use pointed or sharp-edged assembly aids.

4.2 Visual inspection

Check the cylinder for visible damage that might impair its function (e.g. warping of the piston rod) as well as deposits and scoring. The entire cylinder must be replaced if the cylinder barrel is showing significant damage.

4.3 Repairing the flat cylinder DZF-...

Note

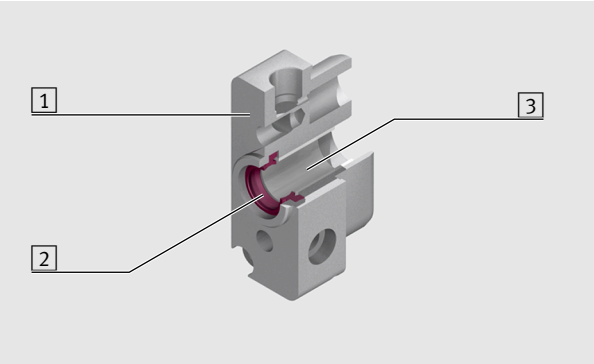
The following cylinders **cannot** be repaired:

- DZF-12-...
- DZF-18-...

The description in this section can be used to repair cylinders of the type DZF-... with the following features:

Code	Description
A	Male piston rod thread
No specification	Female piston rod thread
P	Elastic cushioning rings/pads
A	Position sensing
S2	Through piston rod
S6	Seals heat-resistant up to 120°C
S20	Through, hollow piston rod

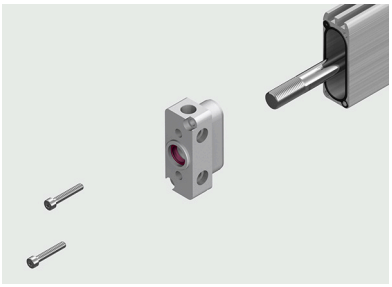
4.3.1 Structure of the bearing cap



1 Bearing cap
2 Piston rod seal
3 Bearing

4.3.2 Removing the bearing and end caps

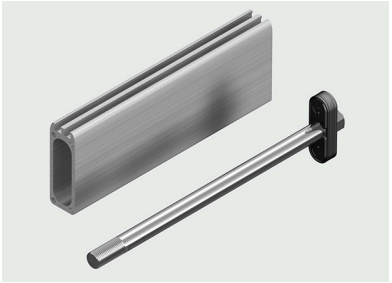
- Loosen the screws in the bearing and end caps (the rear bearing cap on cylinders with through piston rod (S2 / S20)) and remove them.
- Pull the bearing and end caps (both bearing caps on cylinders with through piston rod (S2/S20)) away from the cylinder barrel and piston rod.



4.3.3 Replacing the piston components

- Pull the piston rod out of the cylinder barrel.
- Check the cylinder barrel and piston rod for damage.

  The entire cylinder must be replaced if the cylinder barrel (particularly the bearing surface) is showing significant damage.



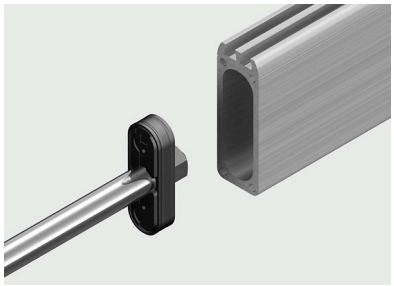
- Unscrew the hex nut (the rear part of the piston rod on cylinders with through piston rod (S2 / S20)) from the piston rod.
- Remove the piston components from the piston rod, noting the order and orientation.
- Remove any residue of the screw locking agent from the threads of the piston rod and hex nut (the rear part of the piston rod on cylinders with through piston rod (S2 / S20)).
- Replace the components with those included in the set of wearing parts and reassemble the piston components on the piston rod in the correct order.

- Apply the screw locking agent contained in the set of wearing parts to the inside of the hex nut (the rear part of the piston rod on cylinders with through piston rod (S2 / S20)) and screw it onto the piston rod with the corresponding torque (see table).

Type	Torque
DZF-25	10 Nm
DZF-25-...-A-P-A-S20	5 Nm
DZF-32	14.5 Nm
DZF-32-...-P-A-S2	20 Nm
DZF-25-...-A-P-A-S20	10 Nm
DZF-40	20 Nm
DZF-40-...-P-A-S2	9.5 Nm
DZF-40-...-A-P-A-S2	9.5 Nm
DZF-40-...-A-P-A-S20	9.5 Nm
DZF-50-...-P-A	20 Nm
DZF-50-...-A-P-A	20 Nm
DZF-50-...-P-A-S6	20 Nm
DZF-50-...-P-A-S2	40 Nm
DZF-50-...-A-P-A-S2	40 Nm
DZF-50-...-A-P-A-S20	15 Nm
DZF-63	20 Nm
DZF-63-...-P-A-S6	40 Nm
DZF-63-...-A-P-A-S6	40 Nm
DZF-63-...-P-A-S2	40 Nm
DZF-63-...-A-P-A-S2	40 Nm
DZF-63-...-A-P-A-S20	20 Nm

4.3.4 Inserting the piston rod into the cylinder barrel

- Clean the inside surface of the cylinder barrel as described in chapter 5.1 "Cleaning".
- Apply the grease included in the set of wearing parts to the following parts:



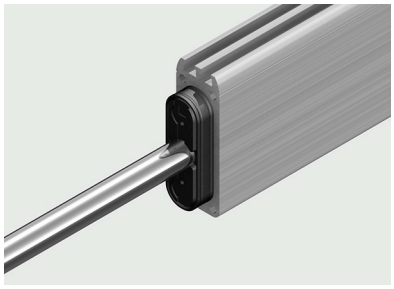
Component	Greasing
Inside surface of cylinder barrel	Thin film[1)]
Surface of piston rod	Thin film[1)]
Piston seals	Thin film[1)] on outside
Piston surface between piston seals (grease reservoir[2)])	Fill 2/3 with grease

[1)] See chapter 5.2.2 "Thin grease film"

[2)] See chapter 5.2.3 "Grease reservoir"

- Place the piston flat against the front side of the cylinder barrel and insert the piston seal into the cylinder barrel by tilting it slightly.

  The lip of the piston seal must not fold back against the side of the piston.



Note

If necessary use a flat and blunt-edged object to insert the piston seal into the cylinder barrel.

- Insert the piston fully into the cylinder barrel.

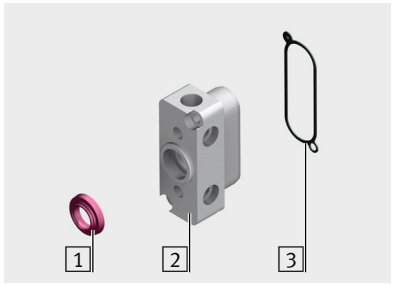
- Push the piston far enough into the cylinder barrel so that the first piston seal protrudes slightly at the other end of the cylinder barrel.
- Pull the piston rod back again until the piston is sitting fully in the cylinder barrel.

Note

This approach ensures that the lips of the two piston seals sit correctly in the cylinder barrel.

4.3.5 Repairing the bearing and end caps

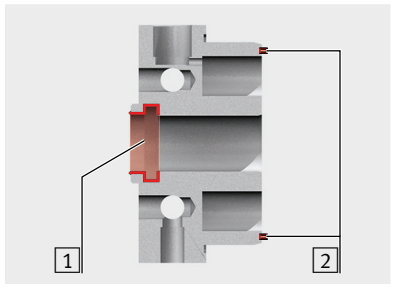
- Remove the seal [3] from the slot of the bearing cap [2] and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).
- Remove the piston rod seal [1] from the bearing cap [2] (the front and rear bearing caps on cylinders with through piston rod (S2 / S20)).



Warning

Check the plain bearing in the bearing cap (the front and rear bearing caps on cylinders with through piston rod (S2 / S20)) for visible damage that might impair its function, such as deposits and scoring. The entire bearing cap must be replaced if the plain bearing is showing significant damage.

- Clean the seat of the piston rod seal [1] and seal [2].

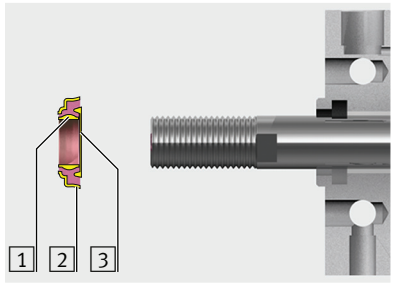


- Grease the new piston rod seal (one per bearing cap on cylinders with through piston rod (S2 / S20)) as follows:

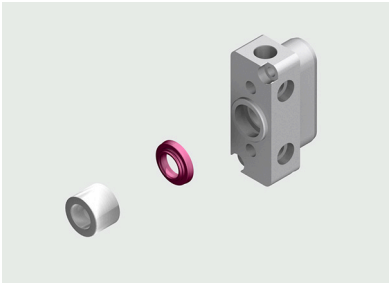
Component	Greasing
[1] Grease reservoir[2] for piston rod	Fill 2/3 with grease
[2] External surface for bearing cap	Thin film[1]
[3] Grease reservoir[2] for bearing	Fill 2/3 with grease

[1] See chapter 5.2.2 "Thin grease film"

[2] See chapter 5.2.3 "Grease reservoir"



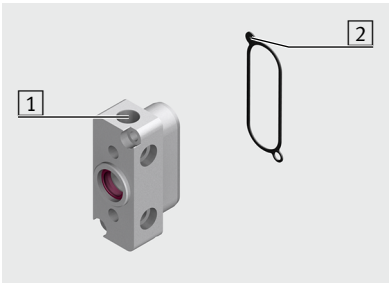
- Insert the piston rod seal into the bearing cap (in both bearing caps on cylinders with through piston rod (S2/S20)) using an appropriate thrust piece.



Note

Note the mounting direction (individual sealing lips facing out).

- Grease the new seal from the set of wearing parts and insert it into the slots in the bearing cap and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).



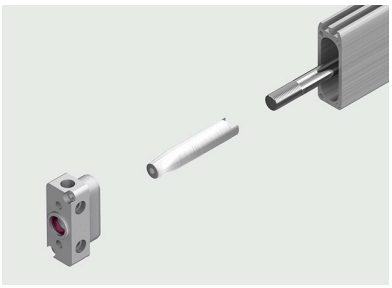
Note

Note the mounting direction.

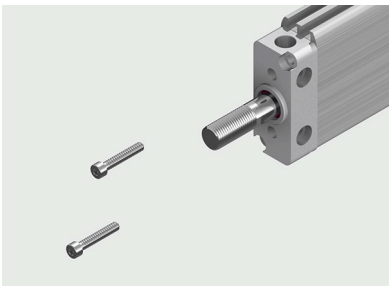
The through-holes for the self-tapping screws must not be covered by the seal and the closed lug [2] must be pointing upwards towards the compressed air connection [1].

4.3.6 Attaching the bearing and end caps

- To protect the bearing and seals, place the appropriate mounting sleeve (see chapter 7.2 "Special tools") on the thread of the piston rod to prevent damage.
- Guide the bearing cap (both bearing caps on cylinders with through piston rod (S2 / S20)) over the mounting sleeve onto the piston rod as far as the cylinder barrel.
- Place the end cap at the other end of the cylinder barrel.



- Apply the screw locking agent contained in the set of wearing parts to the two screws.
- Turn the screws through the bearing and end caps (through both bearing caps on cylinders with through piston rod (S2/S20)) into the cylinder barrel.
- Align the bearing and end caps flush with the cylinder barrel.
- Tighten the screws using the appropriate torque (see table).



Type	Torque
DZH-25	3 Nm
DZH-32	3 Nm
DZH-40	6 Nm
DZH-50	12 Nm
DZH-63	25 Nm
DZF-63-...-P-A	6 Nm
DZF-63-...-P-A-S6	19 Nm
DZF-63-...-A-P-A-S6	19 Nm
DZF-63-...-A-P-A-S2	19 Nm
DZF-63-...-A-P-A-S20	19 Nm

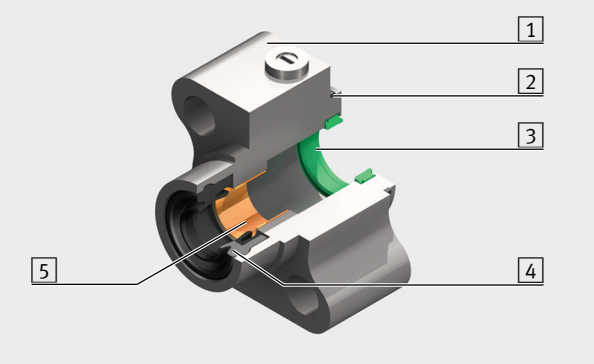
- Perform a functional test as per the operating instructions (enclosed with the cylinder or can be called up on the Festo website (www.Festo.com)) and commission the repaired cylinder.

4.4 Repairing the flat cylinder DZH-...

The description in this section can be used to repair cylinders of the type DZH-... with the following features:

Code	Description
PPV	Pneumatic cushioning adjustable at both ends
A	Position sensing
S2	Through piston rod
S6	Seals heat-resistant up to 120°C
S20	Through, hollow piston rod

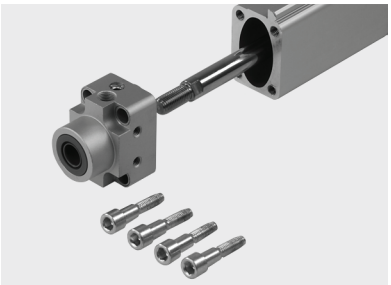
4.4.1 Structure of the bearing cap (schematic representation)



1 Bearing cap
2 O-ring
3 Cushioning seal
4 Piston rod seal
5 Bearing

4.4.2 Removing the bearing and end caps

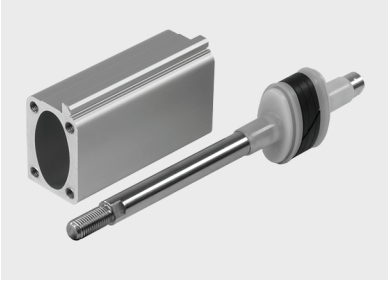
- Loosen the screws in the bearing and end caps (the rear bearing cap on cylinders with through piston rod (S2 / S20)) and remove them.
- Pull the bearing and end caps away from the cylinder barrel and piston rod.
- Remove any residue of the screw locking agent from the threads of the screws.



4.4.3 Replacing the piston components

- Pull the piston rod out of the cylinder barrel.
- Check the cylinder barrel and piston rod for damage.

  The entire cylinder must be replaced if the cylinder barrel (particularly the bearing surface) is showing significant damage.



- Replace the components contained in the set of wearing parts:
  - the two groove rings and
  - the two-piece guiding band.

4.4.4 Inserting the piston rod into the cylinder barrel

- Clean the inside surface of the cylinder barrel as described in chapter 5.1 "Cleaning".
- Apply the grease included in the set of wearing parts to the following parts:

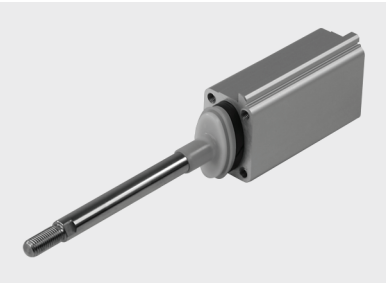
Component	Greasing
Inside surface of cylinder barrel	Thin film[1)]
Surface of piston rod	Thin film[1)]
Groove rings in piston seal	Thin film[1)] on outside
Piston surface between piston seals (grease reservoir[2)])	Fill 2/3 with grease
Cushioning boss	Thin film[1)] on outside

1) See chapter 5.2.2 "Thin grease film"

2) See chapter 5.2.3 "Grease reservoir"

- Place the piston flat against the front side of the cylinder barrel and insert the piston seal into the cylinder barrel by tilting it slightly.

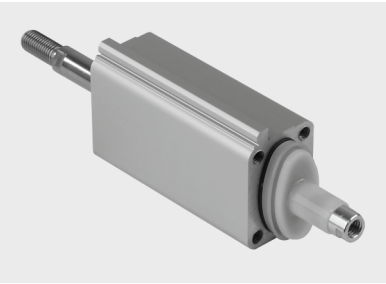
  The sealing lip must not fold back against the side of the piston.



Note

If necessary use a flat and blunt-edged object to insert the groove ring into the cylinder barrel.

- Insert the piston fully into the cylinder barrel.
- Push the piston far enough into the cylinder barrel so that the groove ring protrudes slightly at the other end of the cylinder barrel.
- Pull the piston rod back again until the piston is sitting fully in the cylinder barrel.

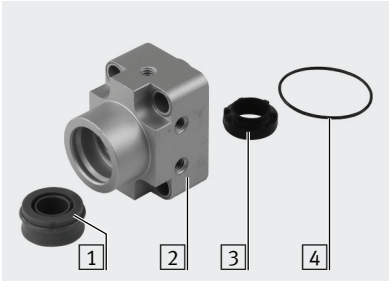


Note

This approach ensures that the lips of the two groove rings sit correctly in the cylinder barrel.

4.4.5 Repairing and attaching the bearing and end caps

- Remove the piston rod seal [1] from the bearing cap [2] (both bearing caps on cylinders with through piston rod (S2 / S20)).
- Remove the O-Ring [4] from the bearing and end caps [2] (both bearing caps on cylinders with through piston rod (S2 / S20)).
- Remove the cushioning seal [3] from the bearing cap and end cap (both bearing caps on cylinders with through piston rod (S2 / S20)).



Warning

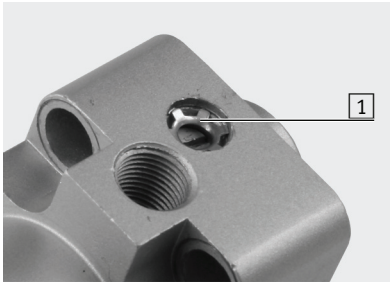
Check the plain bearing in the bearing cap (the front and rear bearing caps on cylinders with through piston rod (S2 / S20)) for visible damage that might impair its function, such as deposits and scoring. The entire bearing cap must be replaced if the plain bearing is showing significant damage.

- Remove the regulating screw from the bearing cap and end cap.

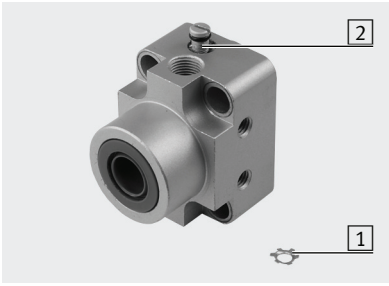
Note

The serrated ring is only present from size DZH-32-....

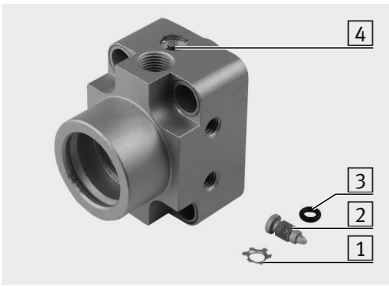
– Remove the serrated ring [1] from the bearing cap and end cap.



– Unscrew the regulating screw [2] fully.



– Remove the O-ring [3] from the regulating screw [2].
– Clean the thread and hole [4] of the end-position cushioning in the bearing cap and end cap.

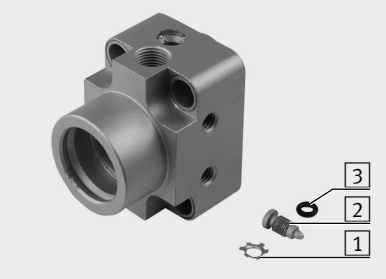


- Insert the regulating screw into the bearing cap and end cap.

Note

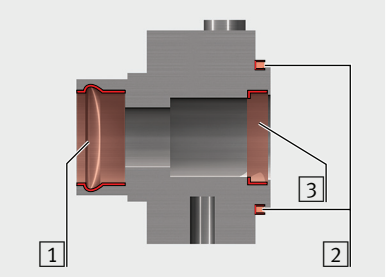
The serrated ring is only present from size DZH-32-....

  - Grease the new O-ring [3] and insert it in the groove in the regulating screw [2].
  - Screw in the regulating screw [2].
  - Insert the serrated ring [1] into the bearing cap and end cap using an appropriate tool.



- Clean the seat of the piston rod seal [1].
- Clean the seat of the O-ring [2].
- Clean the seat of the cushioning seal [3].

  See chapter 5.1 "Cleaning"

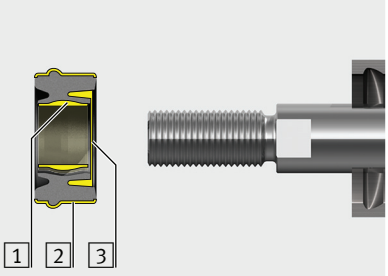


- Grease the new piston rod seal (one per bearing cap on cylinders with through piston rod (S2 / S20)) as follows:

Component	Greasing
[1] Grease reservoir[2] for piston rod	Fill 2/3 with grease
[2] External surface for bearing cap	Thin film[1]
[3] Grease reservoir[2] for bearing	Fill 2/3 with grease

[1] See chapter 5.2.2 "Thin grease film"

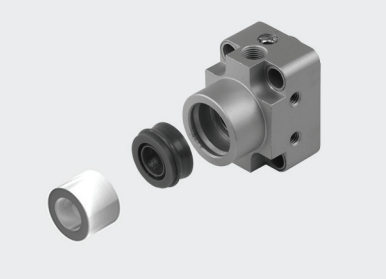
[2] See chapter 5.2.3 "Grease reservoir"



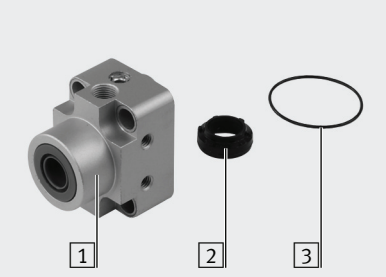
- Insert the piston rod seal into the bearing cap (in both bearing caps on cylinders with through piston rod (S2/S20)) using an appropriate thrust piece.

Note

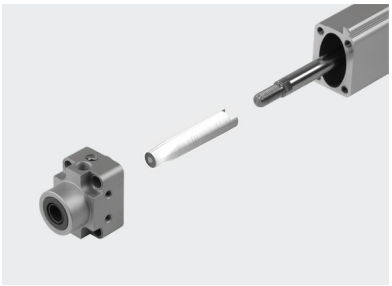
Note the mounting direction (individual sealing lips facing out).



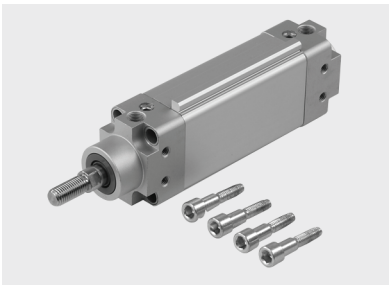
- Grease the new O-rings [3] and insert them into the slots in the bearing cap [1] and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).
- Apply a thin film of grease to the new cushioning seals [2] on the front side with the sealing surface and insert them into the bearing cap [1] and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).



4.4.6 Attaching the bearing and end caps



- To protect the bearing and seals, place the appropriate mounting sleeve (see chapter 7.2 "Special tools") on the thread of the piston rod to prevent damage.
- Guide the bearing cap (both bearing caps on cylinders with through piston rod (S2 / S20)) over the mounting sleeve onto the piston rod as far as the cylinder barrel.
- Place the end cap at the other end of the cylinder barrel.



- Apply the screw locking agent included in the set of wearing parts to the screws.
- Turn the screws through the bearing and end caps (through both bearing caps on cylinders with through piston rod (S2/S20)) into the cylinder barrel.
- Align the bearing and end caps flush with the cylinder barrel.
- Tighten the screws using the appropriate torque (see table).

Type	Torque
DZH-16	3 Nm
DZH-20	3 Nm
DZH-25	6 Nm
DZH-32	11 Nm
DZH-40	11 Nm
DZH-50	15 Nm
DZH-63	15 Nm

- Perform a functional test as per the operating instructions (enclosed with the cylinder or can be called up on the Festo website (www.Festo.com)) and commission the repaired cylinder.

5 Cleaning and greasing

5.1 Cleaning

The seals are designed so that the lubricant film applied to them will be effective for the entire service life. The cylinder must be thoroughly cleaned of all foreign particles, machining residues and old lubricants before it is greased to ensure that this "life-time lubrication" is retained.

Warning

Festo recommends Loctite 7063 and Loctite 7070 for cleaning.

When using other cleaning agents, make sure that they do not corrode the seals of the cylinder with piston rod.
In case of doubt, check the resistance of the seals using the data on the Festo website (www.festo.com).

5.2 Greasing

The various components and seals of the cylinder with piston rod require different levels of greasing depending on a number of factors.

Warning

To guarantee the life-time lubrication, the piston rod with assembled piston and piston seals must be moved a number of times across the entire stroke of the cylinder barrel to produce an even lubricant film.

5.2.1 Extremely thin grease film

A barely continuous film of grease covers the bearing surface. The grease can give a sheen to the surface; however, the colour of the grease must not darken it.

Recommendation:

Apply the grease using a cloth or similar dipped in the grease.

Remove the excess grease from the seal system components (e.g. by drawing the assembled piston with the piston rod once fully through the greased cylinder barrel) and then remove the excess from the seal components by wiping it off.

5.2.2 Thin grease film

A film of grease covers the bearing surface so that the grease colour darkens the surface slightly.

Recommendation:

Apply the grease with a soft brush or similar.

5.2.3 Grease reservoir

There is a certain amount of oil enclosed between two sealing rims or in enclosed ring volumes.

6 Maintenance and care

Clean any dirt from the piston rod using a soft cloth.

All non-abrasive cleaning agents are permissible. In addition, the cylinders are maintenance-free as they have been lubricated for life. Regular removal of the lubricant on the surface of the piston rod reduces its service life.

7 Tools

This section provides an overview of the tools and accessories required to repair and maintain the cylinder with piston rod.

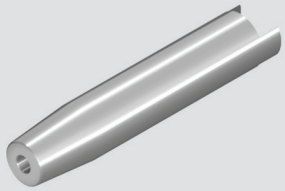
7.1 Standard tools

The following standard tools among others are required to repair the cylinder with piston rod:

- Screwdriver
- Wrench
- Torque wrench (see tables in the corresponding repair steps for values)

7.2 Special tools

The following special tools are required to repair and service the cylinder with piston rod:

Designation	Additional information	Illustration
Mounting sleeve for piston rod	The mounting sleeve for piston rods for protecting the piston rod seal and the bearing in the bearing cap while the repair is being carried out must be produced by the customer. The schematic diagram is included in the information brochure **"Accessories, equipment and tools"** (7Accessories_a_en).	

Documents

Further information on the special tools and schematic diagrams is included in the information brochure **"Accessories, equipment and tools"** (7Accessories_a_en). This can be found in the online spare parts catalogue on the Festo website (http://spareparts.festo.com/xdki/data/SPC/0/PDF_SAFE/Hilfsmittel.pdf).

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