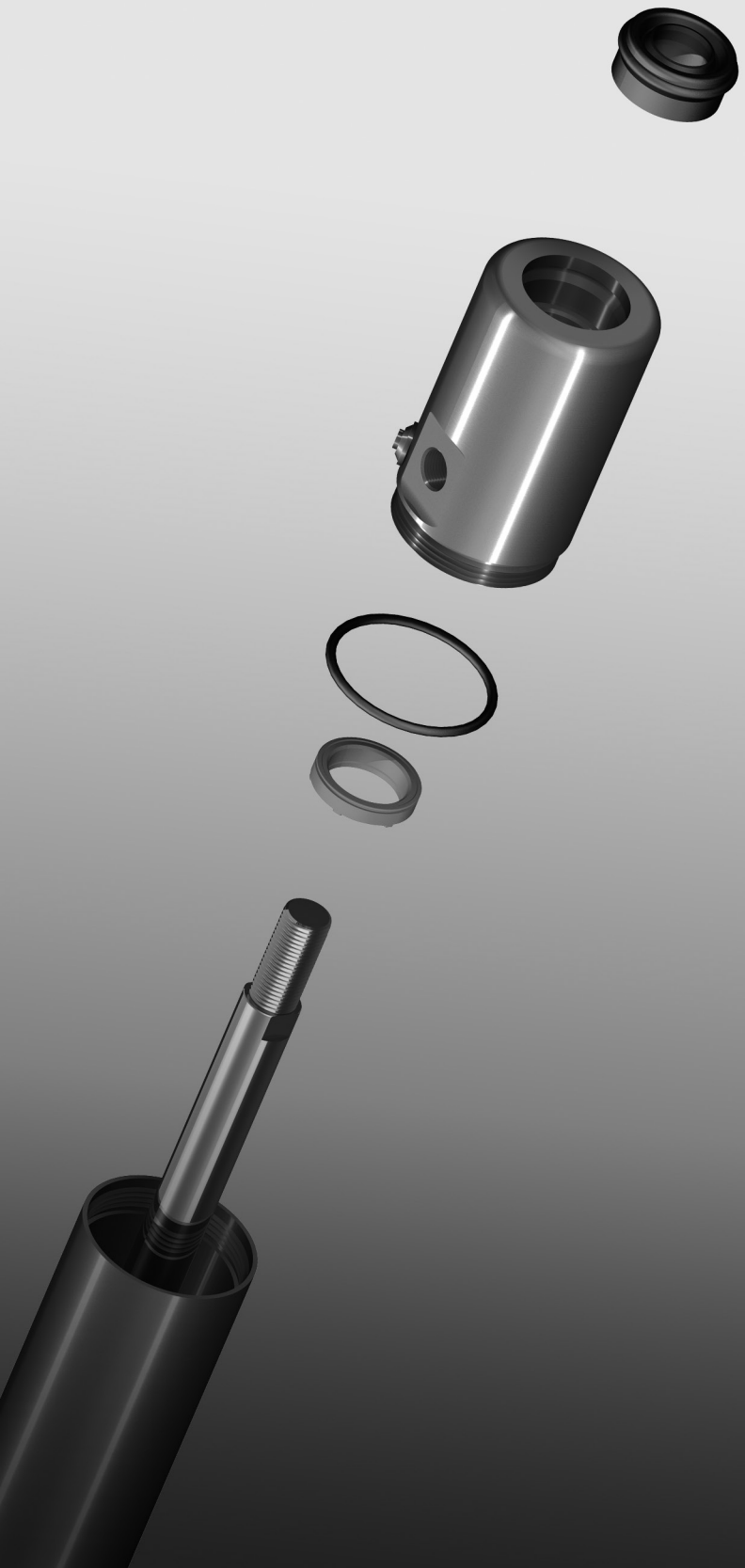
Cylinder with piston rod

Round cylinder, stainless steel

CRHD



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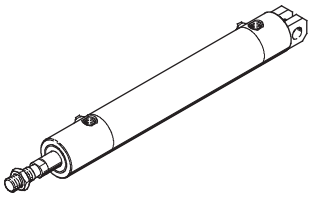
Repair instructions (en)



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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 CRHD.

The cylinder with piston rod CRHD 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.

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 control sections 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**

  Contain an overview of available assembly aids such as lubricating greases, 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 original spare parts.

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.

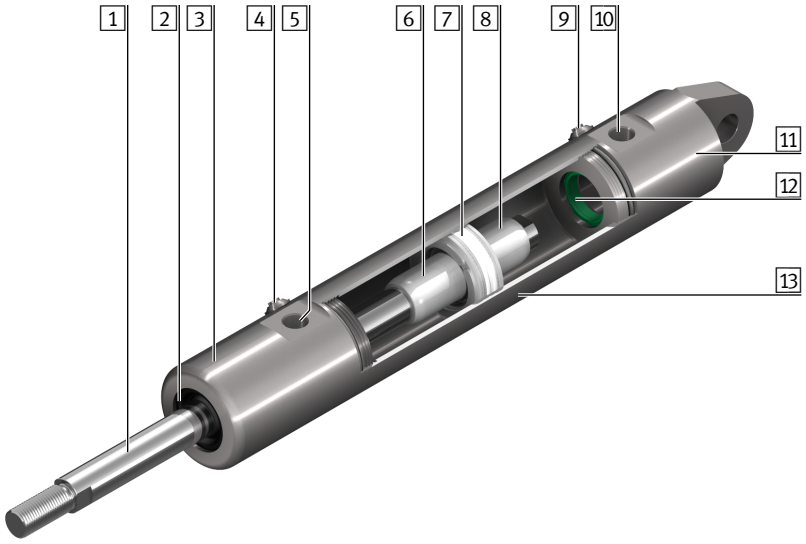
Environment

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 in the cylinder barrel when the cylinder chamber is pressurised. The piston rod transmits the movement to the outside. The advanced piston rod is retracted again when the other cylinder chamber is pressurised.



1 Piston rod
2 Piston rod seal
3 Bearing cap
4 Adjustment of front end-position cushioning
5 Front compressed air connection
6 Cushioning boss
7 Piston
8 Cushioning boss
9 Adjustment of rear end-position cushioning
10 Rear compressed air connection
11 End cap with lug
12 Cushioning seal
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:

CRHD Cylinder of the type CRHD
32 Piston diameter 32 mm
100 Stroke 100 mm
PPV Adjustable end-position cushioning
A Sensing option (magnetic piston)
MC End cap with clevis
S6 Heat-resistant seals (repair-relevant feature (see chapter 2.3 "Repair-relevant features")

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 Repair-relevant features

Some of the features that the cylinder with piston rod can be equipped with require a different repair approach. These are referred to as "repair-relevant" features and are listed in the left-hand column in the table below.

If the cylinder to be repaired has one of these repair-relevant features, the appropriate repair description (see right-hand column in the table below) must be used.

Note
A cylinder can only have one repair-relevant feature. It can additionally be equipped with one or more other features (see middle column).

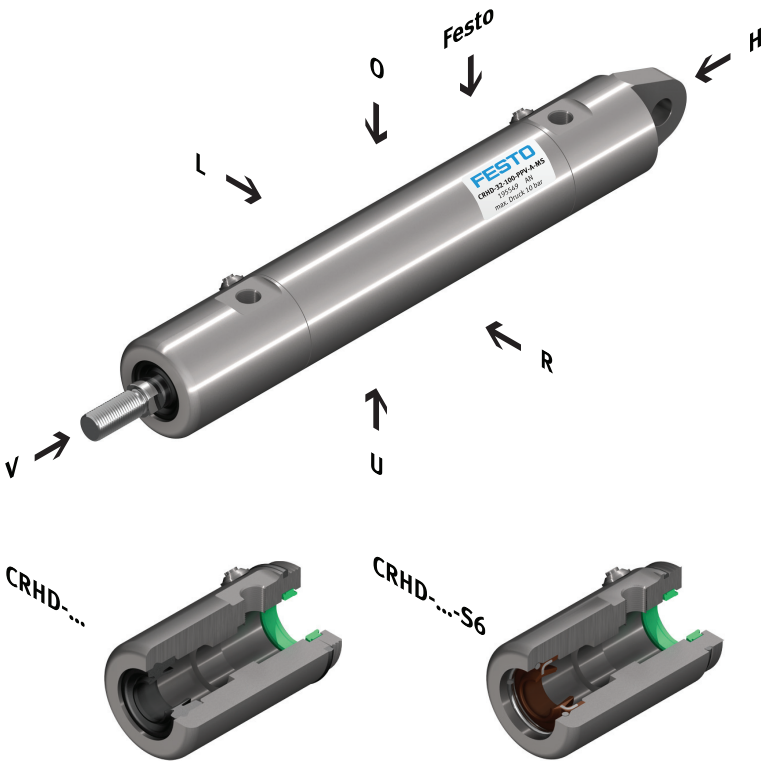
Cylinder and repair-relevant feature	Other features	Described from page
CRHD-... without repair-relevant feature	PPV, A, MQ, MC, MS	11
CRHD-...-**S6** (heat-resistant seals up to max. 120 °C)	PPV, A, MQ, MC, MS	16

Example for the cylinder in chapter 2.2 "Type codes (ascertaining the features of a cylinder)"

Of the features in the sample cylinder, the feature "S6" is relevant to the repair. The description in chapter 4.4 "Repairing the cylinder CRHD-...-S6" on page 16 must therefore be used to repair this cylinder with piston rod.

2.4 Orientation designations and bearing cap variants

This diagram provides an overview of the orientation designations of the cylinder with piston rod as well as the different variants of the bearing cap and seals for repair-relevant features.



Orientation:

Festo = product identification (rating plate) as reference point

O = top

U = underneath

R = right

L = left

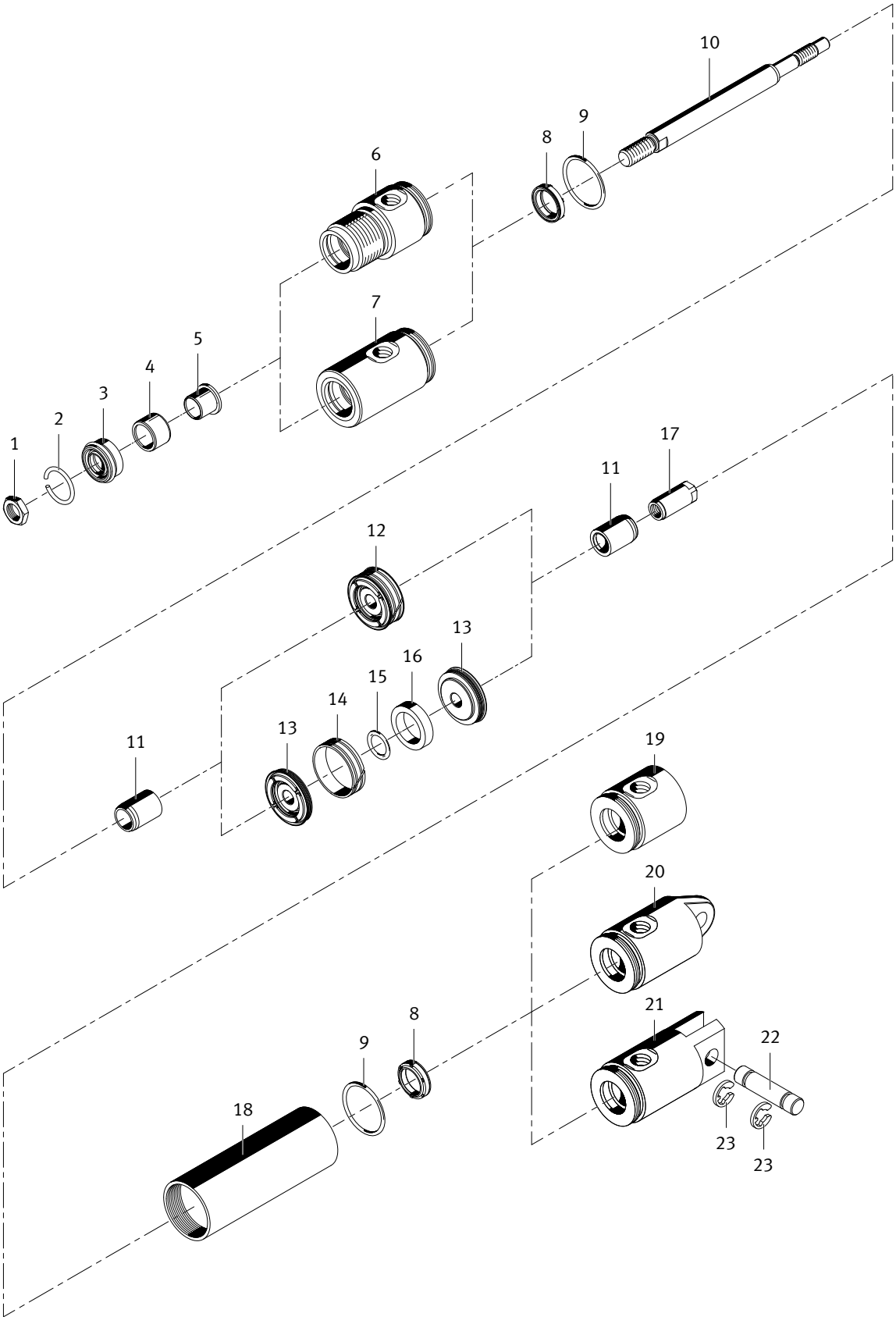
V = front

H = rear

Key features:

S6 = Heat-resistant seals

3 Component overview



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	
2	Retaining ring	Only with -S6-
3	Piston rod seal	
4	Sleeve	
5	Bearing bush	
6	Bearing cap MQ	MQ only, use screw locking agent
7	Bearing cap	Use screw locking agent
8	Cushioning seal	
9	O-ring	
10	Piston rod	
11	Cushioning boss	
12	Piston, one-piece	Only with CRHD-32-...
13	Piston	
14	Guiding band	
15	O-ring	
16	Magnet	
17	Threaded coupling	Use screw locking agent
18	Cylinder barrel	
19	End cap	Use screw locking agent
20	End cap MS	MS only, use screw locking agent
21	End cap MC	MC only, use screw locking agent
22	Pin	MC only
23	Retaining washer	MC only

4 Repair steps

4.1 Preparation

- Before starting the repair, remove any attachments (clamping device, end-position lock, etc.) in accordance with the instructions in 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.

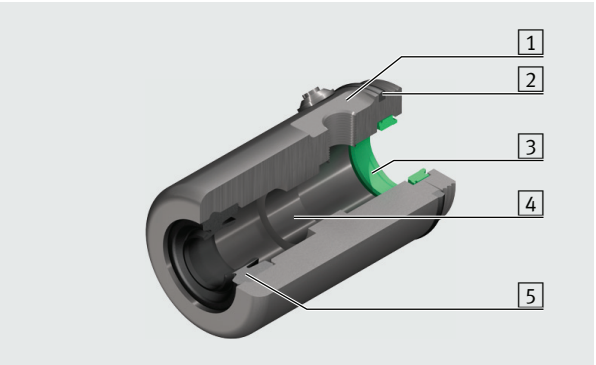
4.3 Repairing the cylinder CRHD-...

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

Code	Description
PPV	Adjustable pneumatic cushioning
A	External position sensing

Code	Description
MQ	Bearing cap with male thread
MC	End cap with clevis
ms	End cap with lug

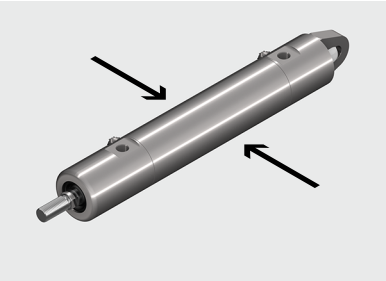
4.3.1 Structure of the bearing cap



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

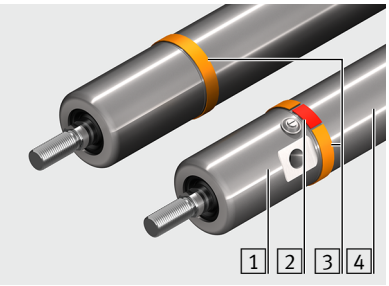
4.3.2 Removing the bearing and end caps

Warning
Use clamping protection to prevent damage to the surface of the cylinder barrel and deformation of the cylinder barrel.

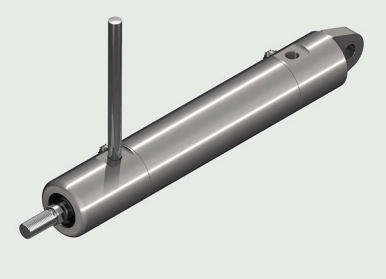


- Clamp the cylinder barrel in a vice.
- Push the piston rod fully into the cylinder.

Warning
Risk of burns from hot surfaces.
Wear suitable protective gloves.
The area near the cushioning screw [2] must not be heated.



- Heat the thread section [3] between the bearing cap [1] and cylinder barrel [4] to between 160 °C and 170 °C.
- Unscrew the bearing cap from the cylinder barrel using a threaded pin (see chapter 7.2 "Special tools").
- Pull the piston rod out of the cylinder barrel.
- Remove the end cap as described above with the bearing cap.



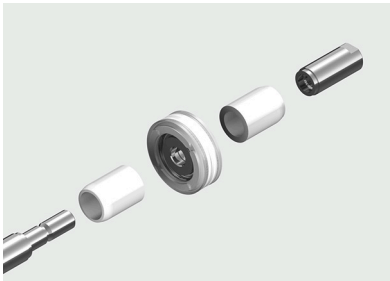
Note
The surface of the cylinder barrel should be repolished if it has been damaged.

- 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.
- Remove any residue of the screw locking agent from the thread of the cylinder barrel.

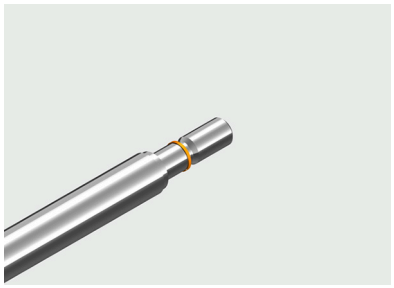
4.3.3 Replacing the piston components

Note
The piston on the CRHD-32-... is the only piston size that consists of one component, all others consist of five components.

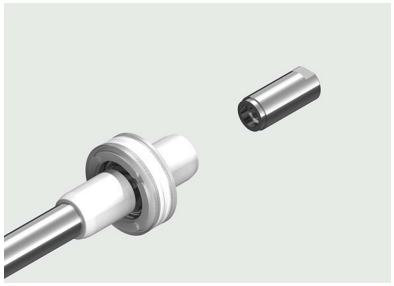
- Unscrew the threaded coupling from the piston rod.
- Remove the piston components from the piston rod, noting the order and orientation.
- Remove any residues of the screw locking agent from the threads of the piston rod and threaded coupling as well as the seat of the piston.
- Clean the piston rod as described in chapter 5.1 "Cleaning".



- Push a cushioning boss onto the piston rod.
- Apply screw locking agent (included in the set of wearing parts) all around the piston rod on the chamfered end.
- Reassemble the piston components in the correct sequence.
- Push the complete piston into the correct position on the piston rod with one rotation (to evenly distribute the screw locking agent).
- Push the second cushioning boss onto the piston rod.



- Apply the screw locking agent included in the set of wearing parts to the inside of the threaded coupling and screw it onto the piston rod with the corresponding torque (see table).



Type	Torque
CRHD-32	10 Nm
CRHD-40	20 Nm
CRHD-50	50 Nm
CRHD-63	50 Nm
CRHD-80	60 Nm
CRHD-100	60 Nm

- Apply the grease included in the set of wearing parts to the following parts:

Component	Greasing
Surface of piston rod	Thin film[1)]
Piston surface between lip rings	Thin film[1)]
Cushioning boss	Thin film[1)] on outside

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

4.3.4 Inserting the piston rod into the cylinder barrel

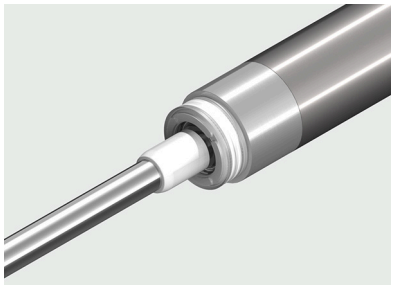
- Clean the inner surface of the cylinder barrel as described in chapter 5.1 "Cleaning".
- Apply the grease included in the set of wearing parts to the following parts:

Component	Greasing
Insert sleeve for piston	Thin film[1)]
Inner surface of cylinder barrel	Thin film[1)]

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

- Insert a suitable insert sleeve, which covers the internal thread of the cylinder barrel, on to the cylinder barrel.
- Insert the piston fully into the cylinder barrel through the insert sleeve.

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

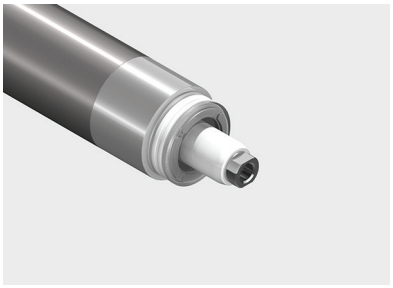


Note

If necessary use a flat and blunt-edged object to insert the lip ring into the insert sleeve.

- Place the insert sleeve for the piston on the other end of the cylinder barrel.

  Push the piston far enough through the cylinder barrel and insert sleeve so that the first lip ring protrudes slightly out of the insert sleeve.
- Pull the piston rod back again until the piston is sitting fully in the cylinder barrel.

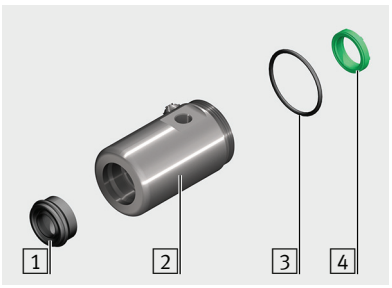


Note

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

4.3.5 Repairing and attaching the bearing and end caps

- Remove the piston rod seal [1] from the bearing cap [2].
- Remove the O-ring [3] from the groove of the bearing cap and end cap.
- Remove the cushioning seal [4] from the bearing and end caps.

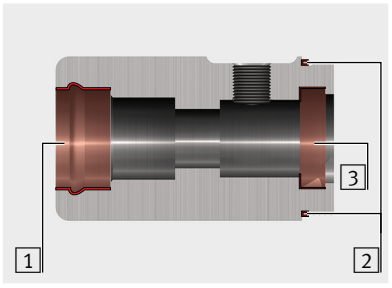


Warning

Check the plain bearing in the bearing cap 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 any residue of the screw locking agent from the threads of the bearing and end caps.
- 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".

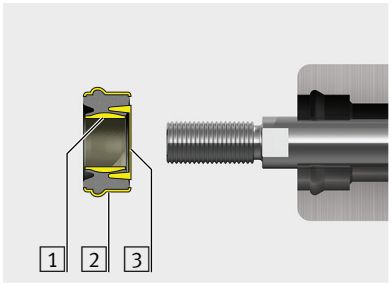


- Grease the new piston rod seal as follows:

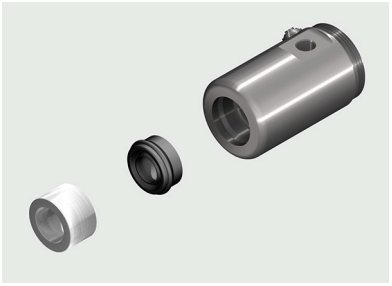
Area	Greasing
[1] Grease reservoir[1] for piston rod	Fill 2/3 with grease
[2] External surface for bearing cap	Thin film[2]
[3] Grease reservoir[1] for bearing	Fill 2/3 with grease

[1] See chapter 5.2.3 "Grease reservoir"

[2] See chapter 5.2.2 "Thin grease film"



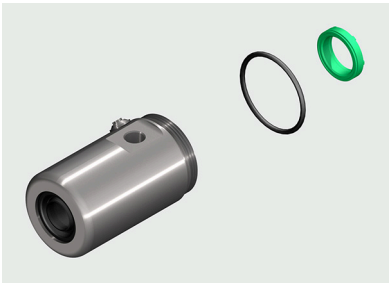
- Insert the piston rod seal into the bearing cap using an appropriate thrust piece.



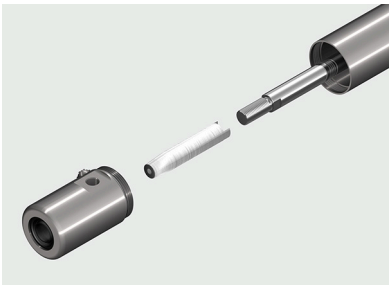
Note

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

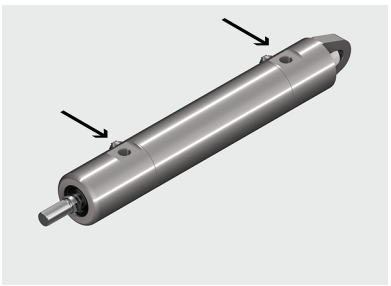
- Grease the new O-rings and insert them into the groove in the bearing and end caps.
- Apply a thin film of grease to the new cushioning seals on the front side of the sealing surface and insert them into the bearing cap and end cap.



- Apply screw locking agent (included in the set of wearing parts) around three-quarters of the end cap thread.
- Screw the end cap as far as possible onto the cylinder barrel.
- Push the piston as far as possible into the cylinder barrel.
- To protect the bearing and seals, place the appropriate assembly sleeve on the thread of the piston rod (see chapter 7.2 "Special tools").



- Apply screw locking agent (included in the set of wearing parts) around three-quarters of the bearing cap thread.
- Push the bearing cap over the assembly sleeve onto the piston rod.
- Screw the bearing cap as far as possible onto the cylinder barrel.
- Align the bearing and end caps so that the two air connections are in line.



- 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.

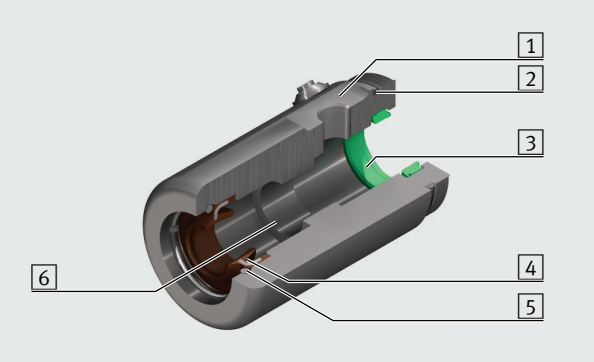
4.4 Repairing the cylinder CRHD-...-S6

The description in this chapter can be used to repair cylinders of the type CRHD-...-S6 with the following features:

Code	Description
PPV	Adjustable pneumatic cushioning
A	External position sensing

Code	Description
MQ	Bearing cap with male thread
MC	End cap with clevis
ms	End cap with lug

4.4.1 Structure of the bearing cap



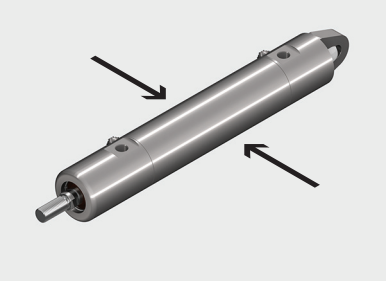
1 Bearing cap
2 O-ring
3 Cushioning seal
4 Piston rod seal
5 Retaining ring
6 Bearing

4.4.2 Removing the bearing and end caps

Warning

Use clamping protection to prevent damage to the surface of the cylinder barrel and deformation of the cylinder barrel.

- Clamp the cylinder barrel in a vice.
- Push the piston rod fully into the cylinder.



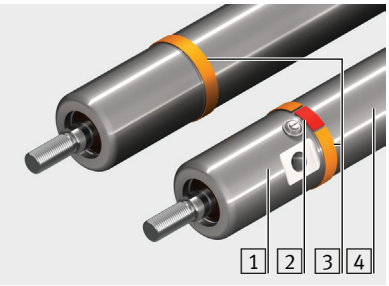
Warning

Risk of burns from hot surfaces.

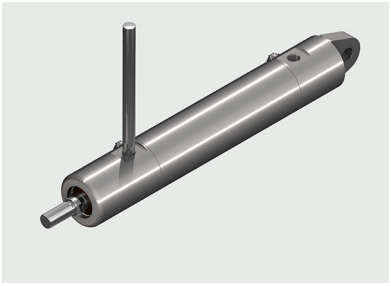
Wear suitable protective gloves.

The area near the cushioning screw 2 must not be heated.

- Heat the thread section 3 between the bearing cap 1 and cylinder barrel 4 to between 160 °C and 170 °C.



- Unscrew the bearing cap from the cylinder barrel using a threaded pin (see chapter 7.2 "Special tools").
- Pull the piston rod out of the cylinder barrel.
- Remove the end cap as described above with the bearing cap.



Note

The surface of the cylinder barrel should be repolished if it has been damaged.

- Check the cylinder barrel and piston rod for damage.

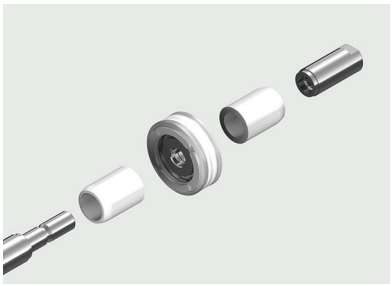
  The entire cylinder must be replaced if the cylinder barrel (particularly the bearing surface) is showing significant damage.
- Remove any residue of the screw locking agent from the thread of the cylinder barrel.

4.4.3 Replacing the piston components

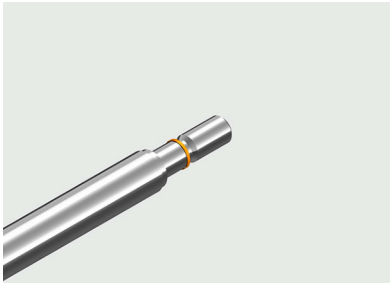
Note

The piston on the CRHD-32-... is the only piston size that consists of one component, all others consist of five components.

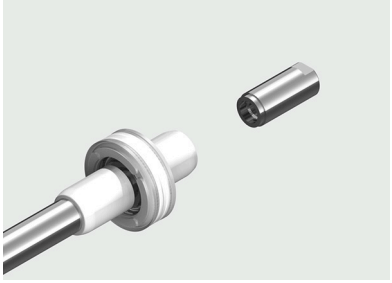
- Unscrew the threaded coupling from the piston rod.
- Remove the piston components from the piston rod, noting the order and orientation.
- Remove any residues of the screw locking agent from the threads of the piston rod and threaded coupling as well as the seat of the piston.
- Clean the piston rod as described in chapter 5.1 "Cleaning".



- Push a cushioning boss onto the piston rod.
- Apply screw locking agent (included in the set of wearing parts) all around the piston rod on the chamfered end.
- Reassemble the piston components in the correct sequence.
- Push the complete piston into the correct position on the piston rod with one rotation (to evenly distribute the screw locking agent).
- Push the second cushioning boss onto the piston rod.



- Apply the screw locking agent included in the set of wearing parts to the inside of the threaded coupling and screw it onto the piston rod with the corresponding torque (see table).



Type	Torque
CRHD-32	10 Nm
CRHD-40	20 Nm
CRHD-50	50 Nm
CRHD-63	50 Nm
CRHD-80	60 Nm
CRHD-100	60 Nm

- Apply the grease included in the set of wearing parts to the following parts:

Component	Greasing
Surface of piston rod	Thin film[1)]
Piston surface between lip rings	Thin film[1)]
Cushioning boss	Thin film[1)] on outside

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

4.4.4 Inserting the piston rod into the cylinder barrel

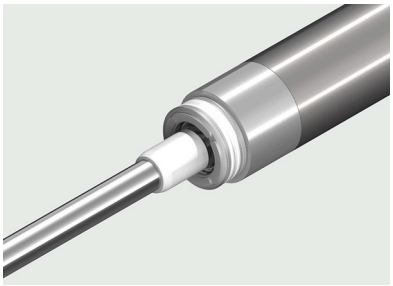
- Clean the inner surface of the cylinder barrel as described in chapter 5.1 "Cleaning".
- Apply the grease included in the set of wearing parts to the following parts:

Component	Greasing
Insert sleeve for piston	Thin film[1)]
Inner surface of cylinder barrel	Thin film[1)]

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

- Insert a suitable insert sleeve, which covers the internal thread of the cylinder barrel, on to the cylinder barrel.
- Insert the piston fully into the cylinder barrel through the insert sleeve.

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



Note

If necessary use a flat and blunt-edged object to insert the lip ring into the insert sleeve.

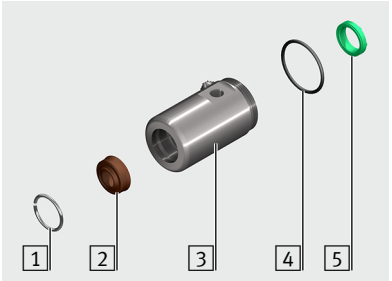
- Place the insert sleeve for the piston on the other end of the cylinder barrel.
- Push the piston far enough through the cylinder barrel and insert sleeve so that the first lip ring protrudes slightly out of the insert sleeve.
- Pull the piston rod back again until the piston is sitting fully in the cylinder barrel.

Note

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

4.4.5 Repairing and attaching the bearing and end caps

- Remove the retaining ring [1] and the piston rod seal [2] from the bearing cap [3].
- Remove the O-ring [4] from the groove of the bearing cap and end cap.
- Remove the cushioning seal [5] from the bearing and end caps.

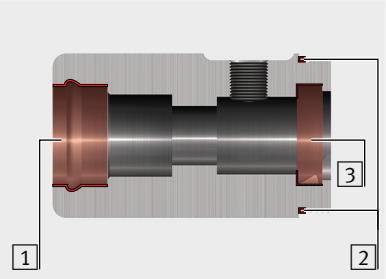


Warning

Check the plain bearing in the bearing cap 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 any residue of the screw locking agent from the threads of the bearing and end caps.
- 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".

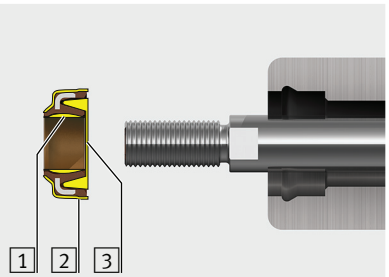


- Grease the new piston rod seal as follows:

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

1) See chapter 5.2.3 "Grease reservoir"

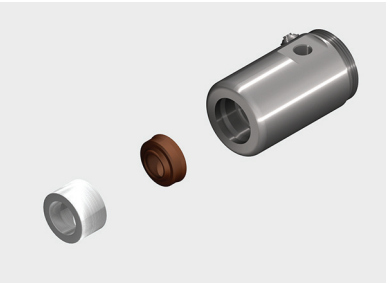
2) See chapter 5.2.2 "Thin grease film"



- Insert the piston rod seal into the bearing cap using an appropriate thrust piece.

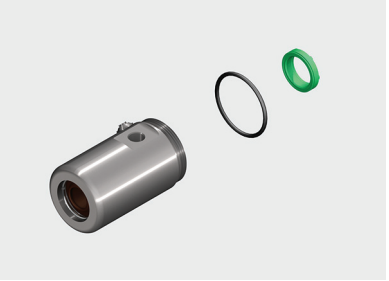
Note

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



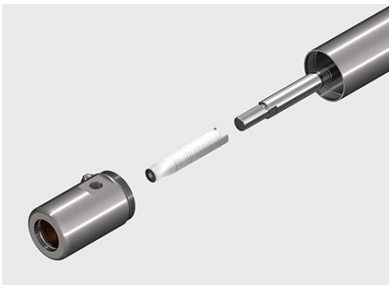
- Compress the retaining ring (e.g. using a pair of pliers) and place it on the piston rod seal.

- Grease the new O-rings and insert them into the groove in the bearing and end caps.
- Apply a thin film of grease to the new cushioning seals on the front side of the sealing surface and insert them into the bearing cap and end cap.



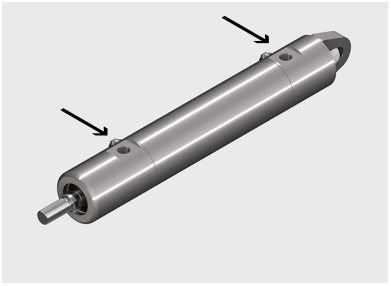
- Apply screw locking agent (included in the set of wearing parts) around three-quarters of the end cap thread.
- Screw the end cap as far as possible onto the cylinder barrel.

- Push the piston as far as possible into the cylinder barrel.
- To protect the bearing and seals, place the appropriate assembly sleeve on the thread of the piston rod (see chapter 7.2 "Special tools").



- Apply screw locking agent (included in the set of wearing parts) around three-quarters of the bearing cap thread.
- Push the bearing cap over the assembly sleeve onto the piston rod.
- Screw the bearing cap as far as possible onto the cylinder barrel.

- Align the bearing and end caps so that the two air connections are in line.



- 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 service life of the seal.
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 chapter provides an overview of the tools and accessories required to repair the cylinder with piston rod.

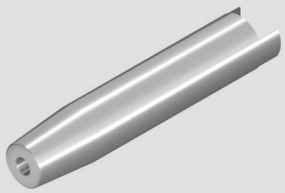
7.1 Standard tools

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

- Screwdriver
- Wrench
- Flat pliers
- 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	Size
Threaded pin	CRHD-32	G1⁄8
	CRHD-40	G1⁄8
	CRHD-50	G1⁄4
	CRHD-63	G3⁄8
	CRHD-80	G3⁄8
	CRHD-100	G3⁄8
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 can be found in the information brochure **"Accessories, equipment and tools"** (7Accessories_a_en).	

Documents

Further information on the special tools and schematic diagrams can be found in the information brochure **"Accessories, equipment and tools"** (7Accessories_a_en). It 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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