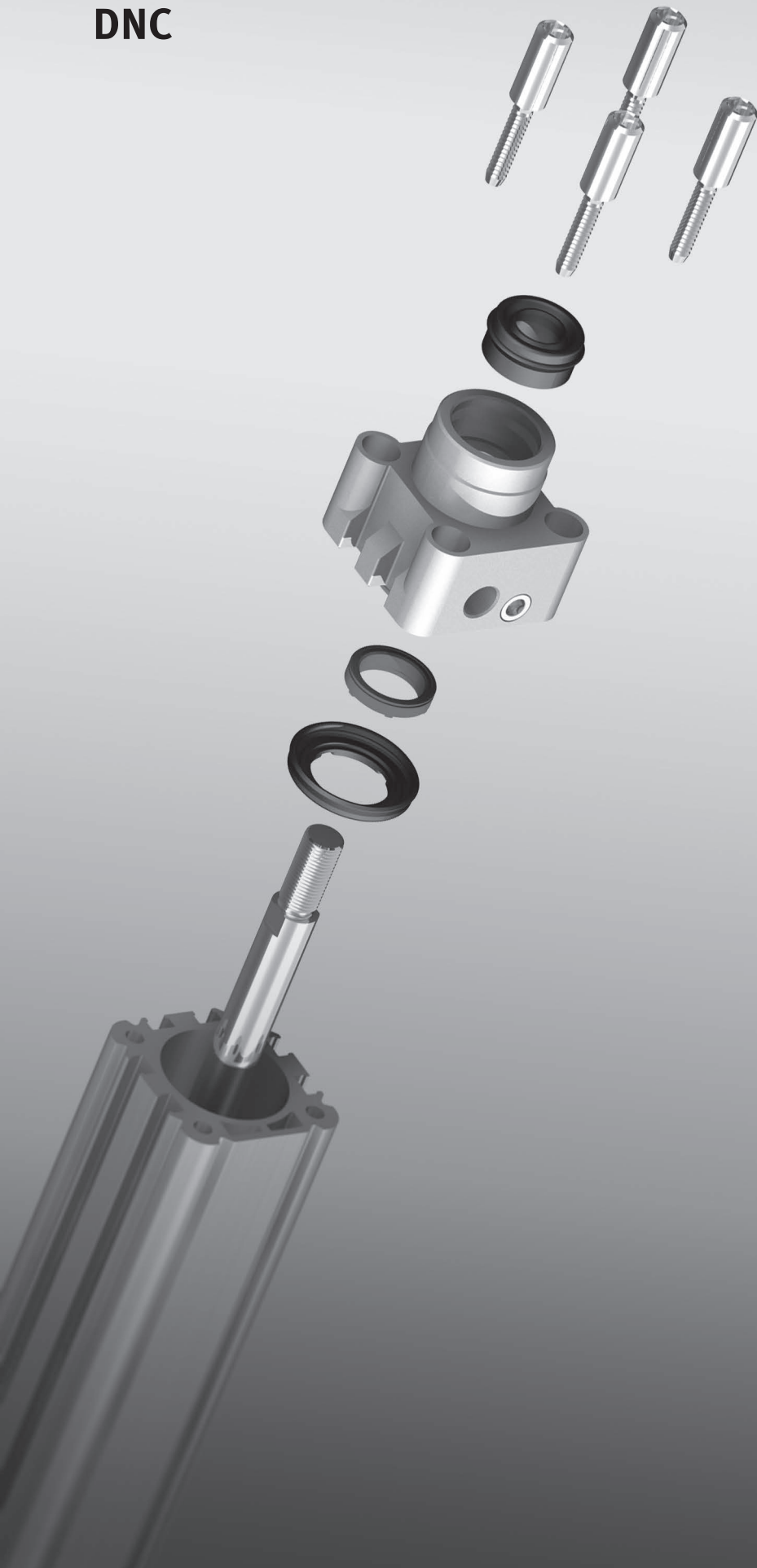


Cylinder with piston rod

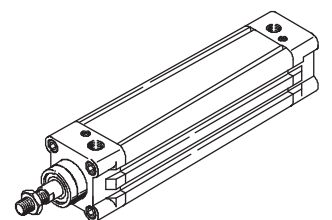
Standard cylinders to ISO 15552

DNC



FESTO

Repair
instructions (en)



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

Foreword

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

Differences 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 incorrect use of the products.

Further information is given 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 proper repair of the cylinder with piston rod of the type DNC.

The DNC cylinder with piston rod 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 all 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 information about its function, structure, application, installation, commissioning, maintenance and care, etc. This information is available 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. It can be found in the online spare parts catalogue on the Festo website (spareparts.Festo.com).

- Assembly aids**
 Contains an overview of the available installation resources, e.g. lubricating greases, thread-locking agents, maintenance tools, etc. (resources for installation and maintenance). It 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 note informs you about necessary steps for environmentally compatible handling of materials and supplies, and any guidelines, directives and regulations to be followed.



Accessories

This sign contains information on context-related accessories and attachments.



Documents

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

1.3 General safety instructions



Warning

The cylinder with piston rod may 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 respective 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.



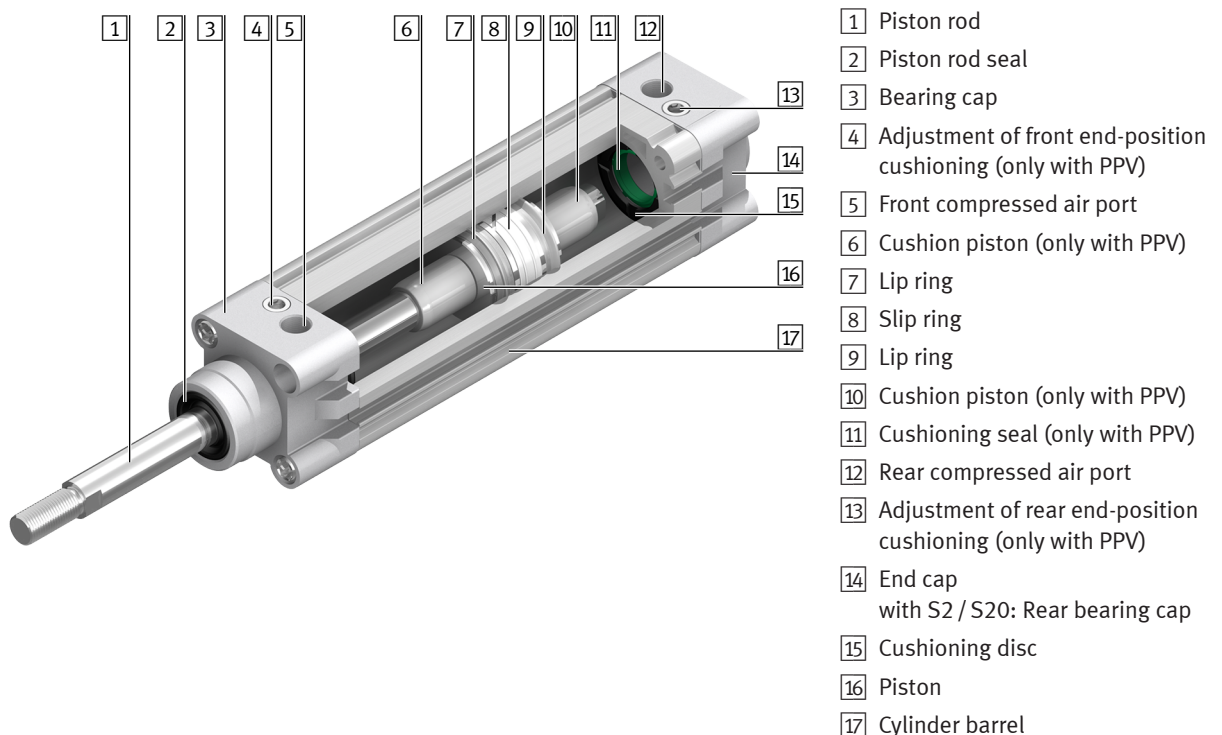
Environment

Components and equipment replaced during repair must be disposed of in accordance with the relevant local environmental protection regulations.

2 General product description

2.1 Functional description

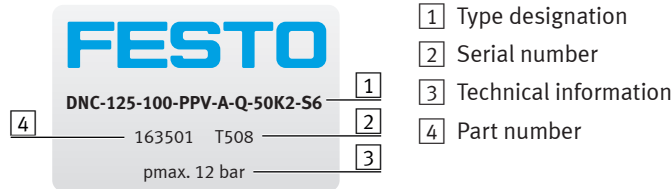
The piston moves in the cylinder barrel when the cylinder chamber is pressurised. The piston rod transfers the movement to the outside. The advanced piston rod is retracted again when the other cylinder chamber is pressurised.



2.2 Type codes (determining the features of a cylinder)

The precise features of a cylinder with piston rod can be determined with the help of the rating plate on the cylinder. The type code is 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 name plate provides the following information:

- DNC** Cylinder of the type DNC
- 125** Piston diameter 125 mm
- 100** Stroke 100 mm
- PPV** Adjustable end-position cushioning
- A** Sensing option (magnetic piston)
- Q** Square piston rod (protection against rotation)
- 50K2** Piston rod thread extended by 50 mm
- 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 with which the cylinder with piston rod can be equipped require a different repair approach. These features 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).

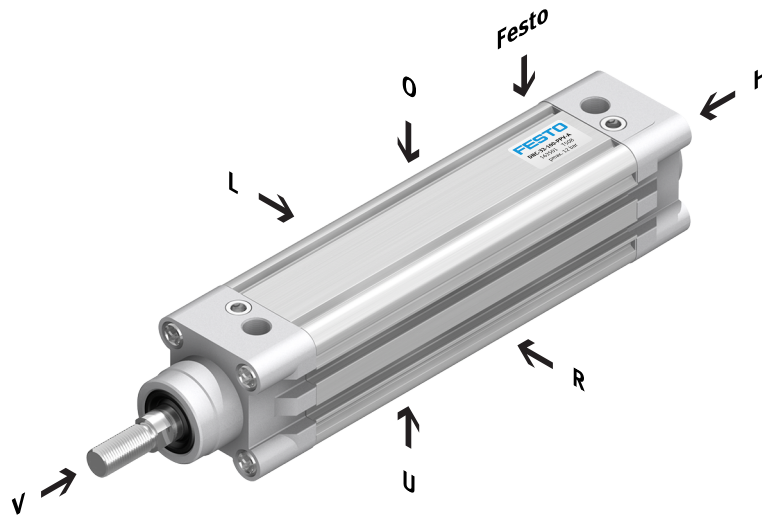
Cylinder and repair-relevant feature	Other features	described from page
DNC-... without repair-relevant feature	PPV, A, Q, S2, S20, ...K2 – K10, S10, S11, R3	15
DNC-...- S6 (heat-resistant seals up to max. 120 °C)	PPV, A, Q, S2, S20, ...K2 – K10, R3	19
DNC-...- TT (resistant to low temperatures down to max. -40 °C)	PPV, A, S2, S20, ...K2, K3, ...K5, ...K8, R3	23
DNC-...- R8 (dust protected)	PPV, A, S2, ...K2 – ...K8	27
DNC-...- A3 (unlubricated operation)	PPV, A, S2, S20, ...K2 – K10, R3	31

Example for the cylinder in Chapter 2.2 “Type codes (determining the features of a cylinder)”

Of the features in the example cylinder, feature "S6" is repair relevant. The description in Chapter 3.2 “DNC-...-S6” on page 19 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 (name-plate) as reference point

O = top

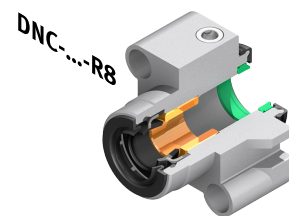
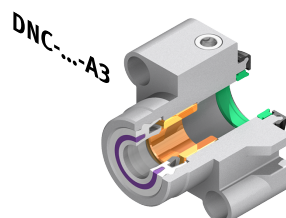
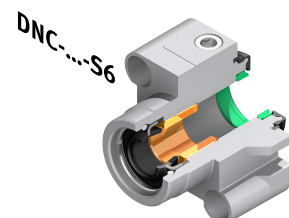
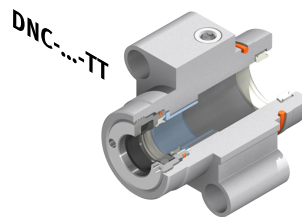
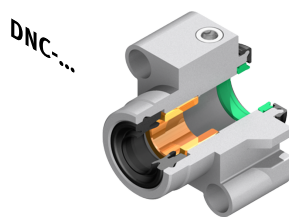
U = bottom

R = right

L = left

V = front

H = rear



Features:

S6 = Heat-resistant seals

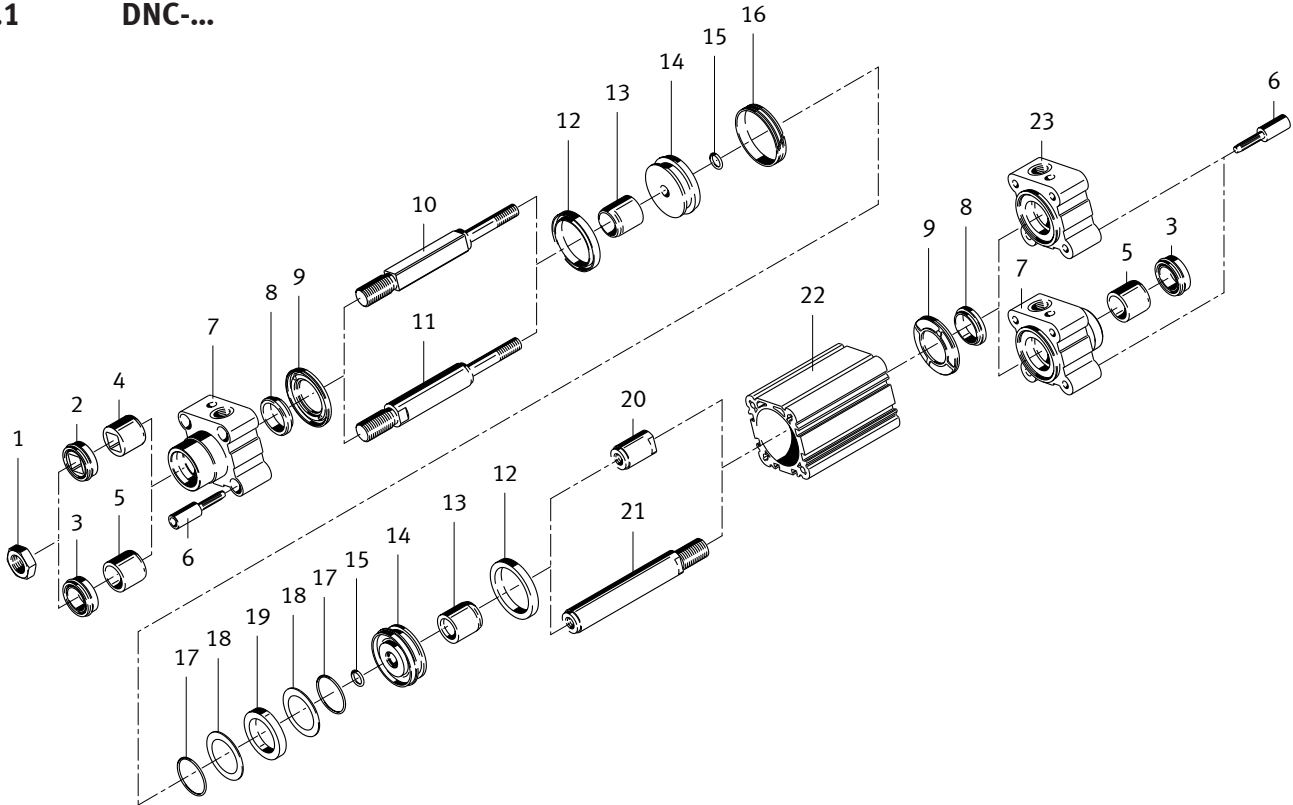
R8 = Dust protection

TT = Low temperature

A3 = Un lubricated operation (PE seal)

3 Components list

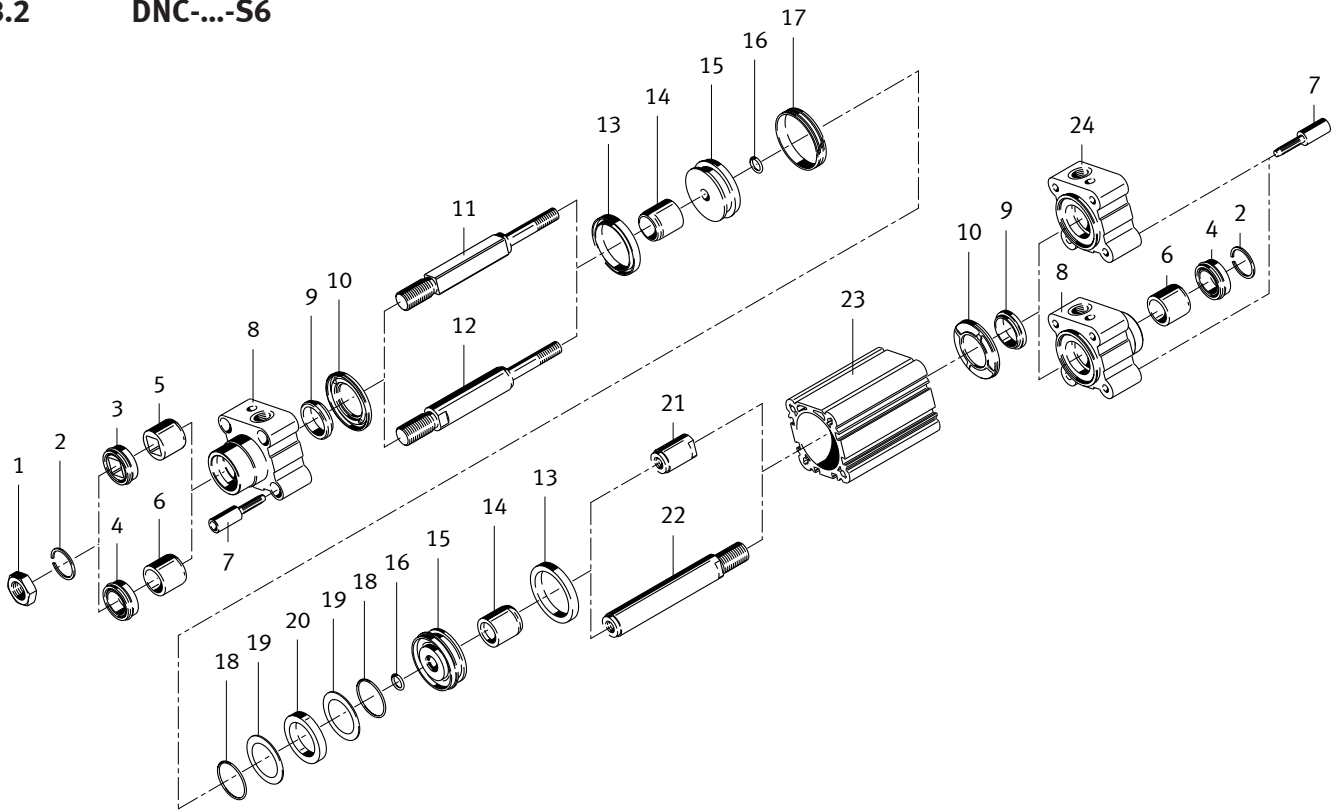
3.1 DNC-...



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	Piston rod seal	for square piston rod
3	Piston rod seal	for round piston rod
4	Bearing	for square piston rod
5	Bearing	for round piston rod
6	Flange screw	Use screw locking agent (set of wearing parts)
7	Bearing cap	
8	Cushioning seal	only with -PPV-
9	Cushioning disc	
10	Piston rod (square)	
11	Piston rod (round)	
12	Lip ring (piston seal)	
13	Cushioning boss	only with -PPV-
14	Piston	
15	O-ring	
16	Sliding ring	
17	O-ring	only with -A-
18	Washer	only with -A-
19	Magnet	only with -A-
20	Threaded coupling	Use screw locking agent (set of wearing parts)
21	Piston rod	with through piston rod
22	Cylinder barrel	
23	End cap	

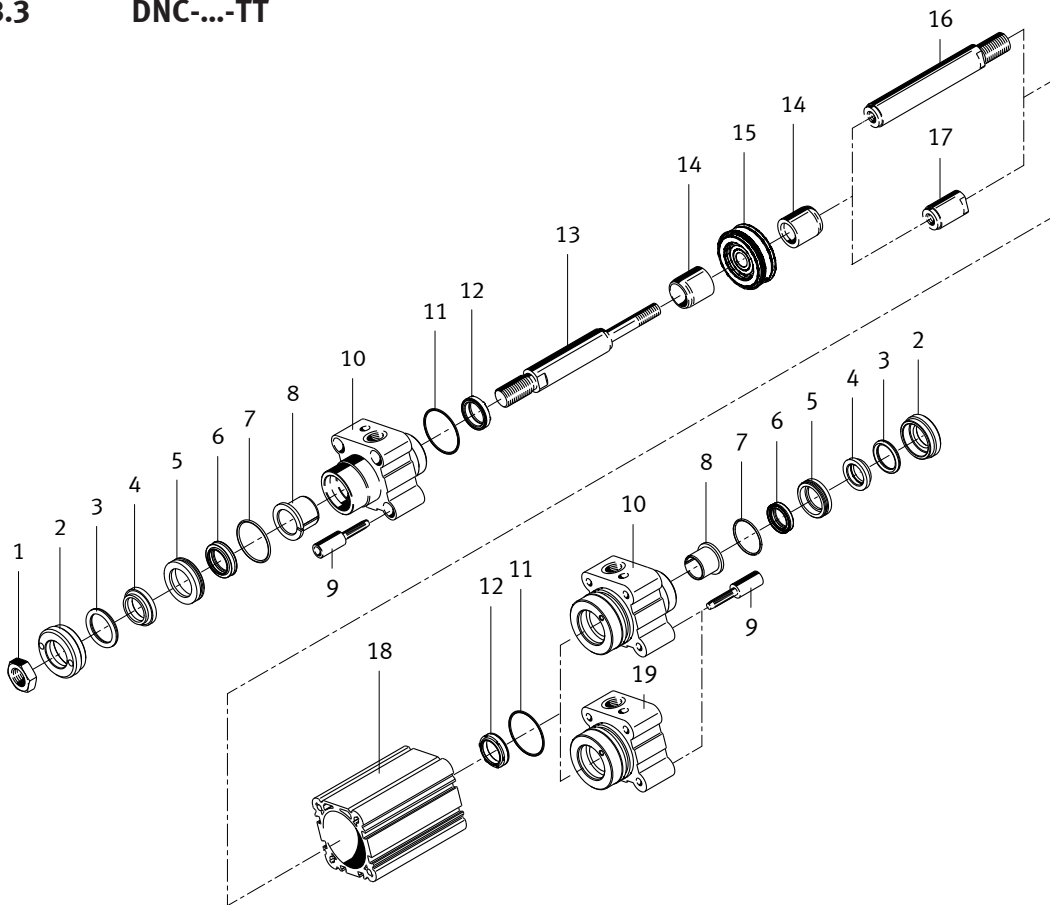
3.2 DNC-...-S6



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	
3	Piston rod seal	for square piston rod
4	Piston rod seal	for round piston rod
5	Bearing	for square piston rod
6	Bearing	for round piston rod
7	Flange screw	Use screw locking agent (set of wearing parts)
8	Bearing cap	
9	Cushioning seal	only with -PPV-
10	Cushioning disc	
11	Piston rod (square)	
12	Piston rod (round)	
13	Lip ring (piston seal)	
14	Cushioning boss	only with -PPV-
15	Piston	
16	O-ring	
17	Sliding ring	
18	O-ring	only with -A-
19	Washer	only with -A-
20	Magnet	only with -A-
21	Threaded coupling	Use screw locking agent (set of wearing parts)
22	Piston rod	with through piston rod
23	Cylinder barrel	
24	End cap	

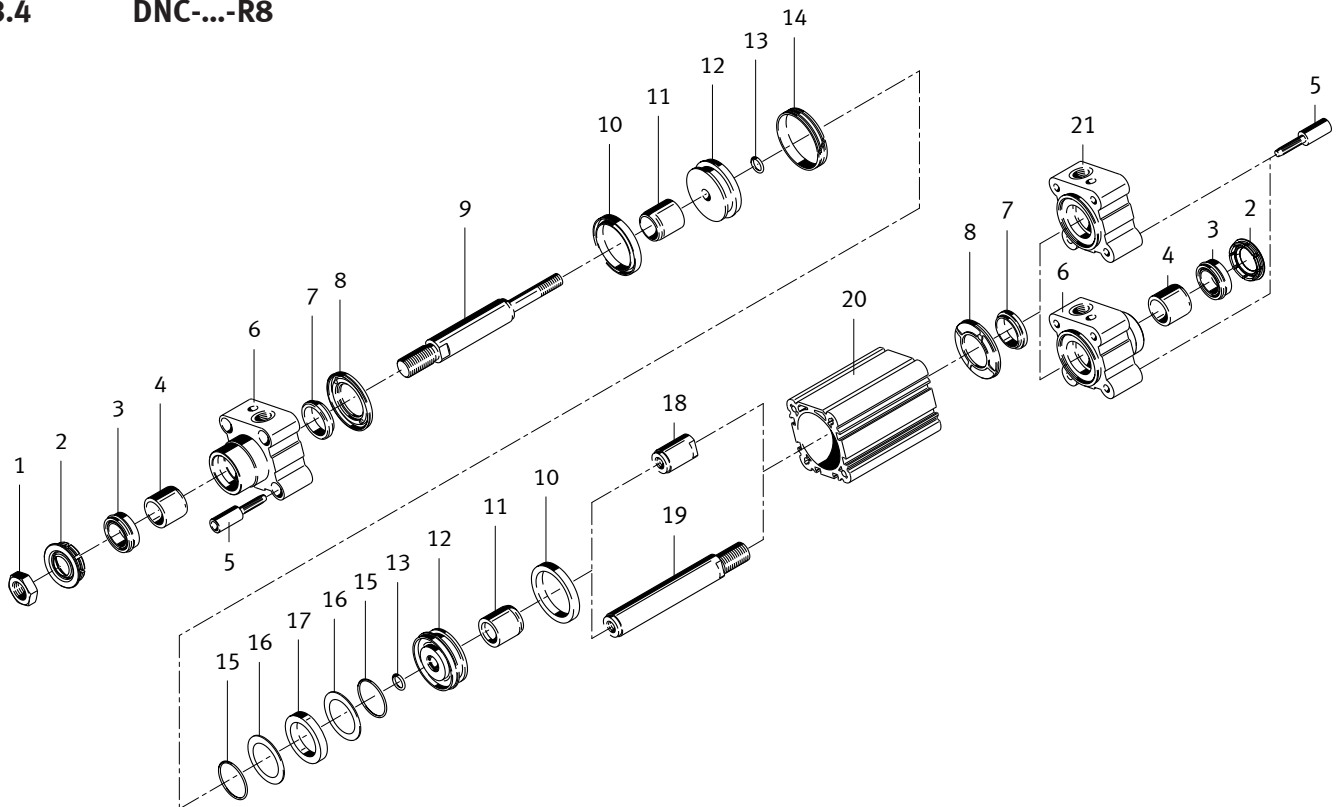
3.3 DNC-...-TT



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	Screwed insert	
3	O-ring	
4	Excluder	
5	Insert sleeve	
6	Wiper seal	
7	O-ring	
8	Flanged bearing	
9	Flange screw	Use screw locking agent (set of wearing parts)
10	Bearing cap	
11	O-ring	
12	Cushioning seal	
13	Piston rod	
14	Cushioning boss	only with -PPV-
15	Piston	
16	Piston rod	with through piston rod
17	Threaded coupling	Use screw locking agent (set of wearing parts)
18	Cylinder barrel	
19	End cap	

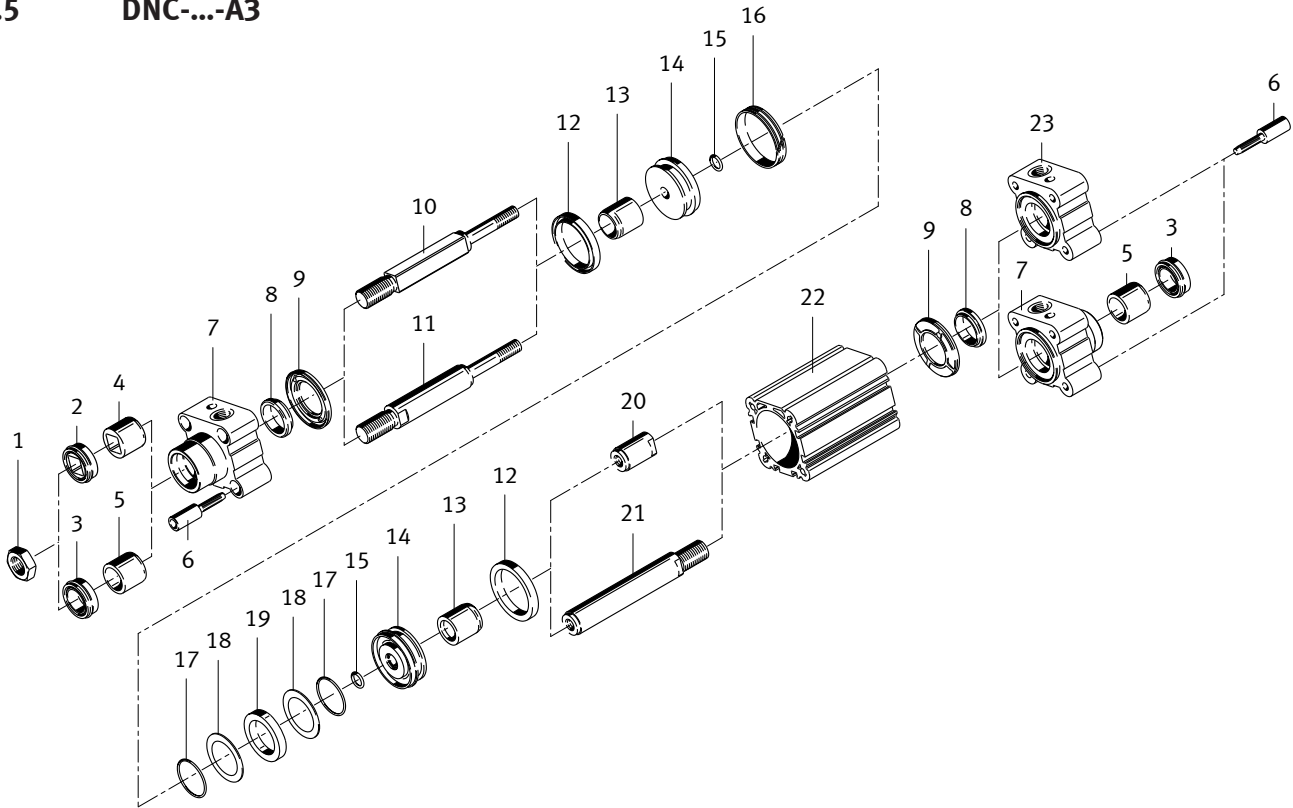
3.4 DNC-...-R8



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	Scraper	
3	Piston rod seal	
4	Bearing	
5	Flange screw	Use screw locking agent (set of wearing parts)
6	Bearing cap	
7	Cushioning seal	only with -PPV-
8	Cushioning disc	
9	Piston rod	
10	Lip ring (piston seal)	
11	Cushioning boss	only with -PPV-
12	Piston	
13	O-ring	
14	Sliding ring	
15	O-ring	only with -A-
16	Washer	only with -A-
17	Magnet	only with -A-
18	Threaded coupling	Use screw locking agent (set of wearing parts)
19	Piston rod	with through piston rod
20	Cylinder barrel	
21	End cap	

3.5 DNC-...-A3



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	Piston rod seal	for square piston rod
3	Piston rod seal	for round piston rod
4	Bearing	for square piston rod
5	Bearing	for round piston rod
6	Flange screw	Use screw locking agent (set of wearing parts)
7	Bearing cap	
8	Cushioning seal	only with -PPV-
9	Cushioning disc	
10	Piston rod (square)	
11	Piston rod (round)	
12	Lip ring (piston seal)	
13	Cushioning boss	only with -PPV-
14	Piston	
15	O-ring	
16	Sliding ring	
17	O-ring	only with -A-
18	Washer	only with -A-
19	Magnet	only with -A-
20	Threaded coupling	Use screw locking agent (set of wearing parts)
21	Piston rod	with through piston rod
22	Cylinder barrel	
23	End cap	

4 Repair steps

4.1 Preparatory measures

- Before starting the repair, remove any attachments (clamping device, end-position locking, etc.) 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 check 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, such as warping of the piston rod as well as deposits and scoring. The entire cylinder must be replaced if the cylinder barrel is showing signs of significant damage.

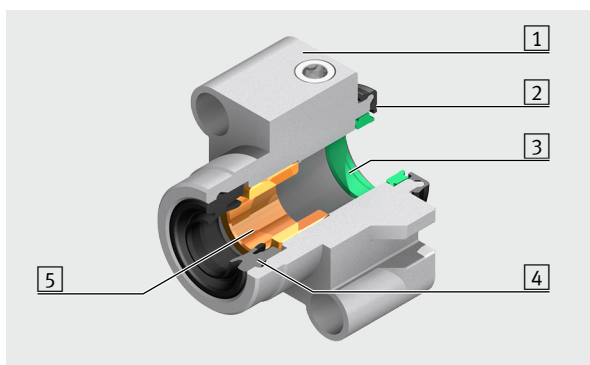
4.3 Repairing the cylinder DNC-...

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

Des.	Description
P	Elastic cushioning discs
PPV	Adjustable pneumatic cushioning
A	Position sensing option
Q	Square piston rod
S2	Through piston rod
S20	Through, hollow piston rod
...K2	Extended male piston rod thread
K3	Female piston rod thread

Des.	Description
...K5	Piston rod with special thread
K7	Piston rod with external hexagon
...K8	Extended piston rod
K10	Smooth anodised aluminium coated piston rod
S10	Slow speed
S11	Low friction
R3	High corrosion protection

4.3.1 Structure of the bearing cap



- 1 Bearing cap
- 2 Cushioning disc
- 3 Cushioning seal (only on cylinders with adjustable cushioning PPV)
- 4 Piston rod seal
- 5 Bearing

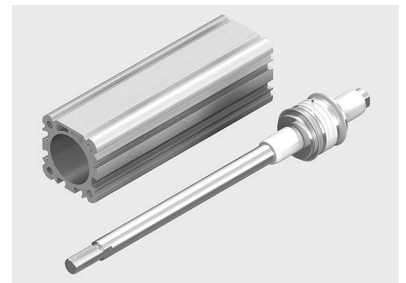
4.3.2 Removing the bearing and end caps

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

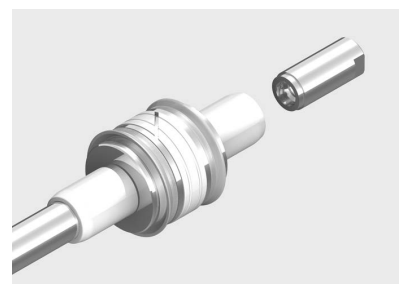
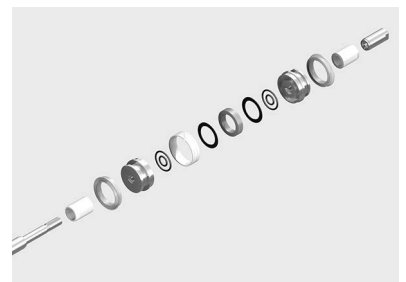


4.3.3 Replacing the piston components

- 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) shows signs of significant damage.



- Unscrew the threaded coupling (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.
- Clean the thread of the piston rod and threaded coupling to remove any screw locking agent residue.
- 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.
- Use the screw locking agent included in the set of wearing parts to wet the inside of the threaded coupling (the rear part of the piston rod on cylinders with through piston rod (S2 / S20)) and screw it onto the piston rod with the appropriate torque (see table).



Type	Torque
DNC-32	9 Nm
DNC-40	20 Nm
DNC-50	30 Nm
DNC-63	45 Nm
DNC-80	60 Nm
DNC-100	60 Nm
DNC-125	170 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	Cylinder with S10/S11	other cylinders
Inside surface of cylinder barrel	extremely thin grease film ¹⁾	apply a thin film ²⁾ of grease
Surface of piston rod	extremely thin grease film ¹⁾	apply a thin film ²⁾ of grease
Piston seal lip rings	apply thin film ²⁾ of grease on the outside	apply thin film ²⁾ of grease on the outside
Piston surface between lip rings (grease reservoir ³⁾)	Fill 1/3 with grease	Fill 2/3 with grease
Cushioning boss	apply thin film ²⁾ of grease on the outside	apply thin film ²⁾ of grease on the outside

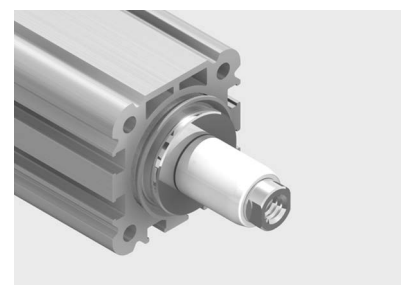
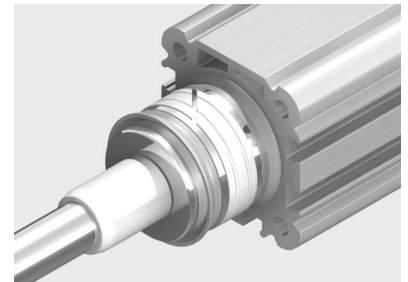
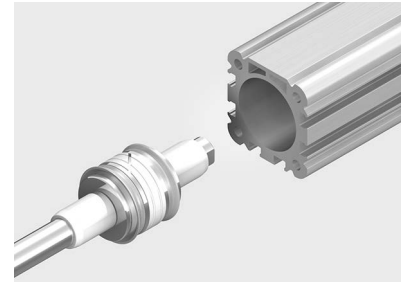
¹⁾ See Chapter [5.2.1 “Extremely thin grease film”](#)

²⁾ See Chapter [5.2.2 “Thin grease film”](#)

³⁾ See Chapter [5.2.3 “Grease reservoir”](#)

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

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 cylinder barrel.

- Insert the piston fully into the cylinder barrel.
- Push the piston far enough into the cylinder barrel so that the first lip 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.

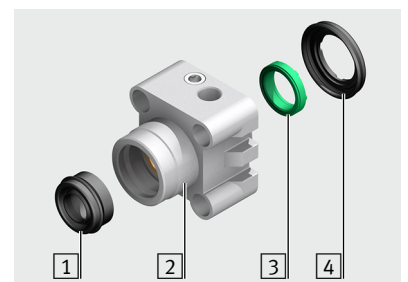


Note

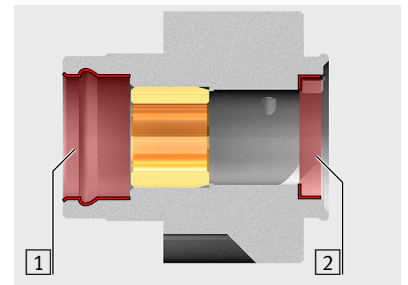
This approach ensures that the sealing lips of the two lip rings sit correctly in the cylinder barrel.

4.3.5 Repairing and attaching the bearing and end caps

- Remove the piston rod seal **1** from the bearing cap **2** (the front and rear bearing caps on cylinders with through piston rod (S2 / S20)).
- Pull the cushioning discs **4** off the bearing cap and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).
- **Only on cylinders with adjustable cushioning (PPV)**
Remove the cushioning seal **3** from the bearing cap and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).

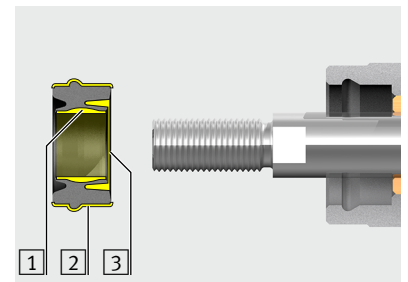


- Clean the seat of the piston rod seal **1**.
- **Only on cylinders with adjustable cushioning (PPV)**
Clean the seat of the cushioning seal **2**.



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

Area	Cylinder with S10/ S11	other cylinders
1 Grease reservoir ¹⁾ for piston rod	Fill 1/3 with grease	Fill 2/3 with grease
2 External surface for bearing cap	apply a thin film ²⁾ of grease	apply a thin film ²⁾ of grease
3 Grease reservoir ¹⁾ for bearing	Fill 1/3 with grease	Fill 2/3 with grease



¹⁾ See Chapter [5.2.3 “Grease reservoir”](#)

²⁾ See Chapter [5.2.2 “Thin grease film”](#)

- Use a suitable thrust piece to insert the piston rod seal in the bearing cap (in both bearing caps on cylinders with through piston rod (S2 / S20)).



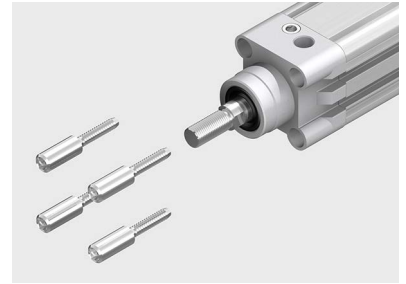
Note

Note the mounting direction (inscription facing out).
Note the mounting position on cylinders with square piston rod.

- **Only on cylinders with adjustable cushioning (PPV)**
Apply a thin film of grease on the front side of the new cushioning seals facing the sealing surface and insert them in the bearing cap and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).
- Place the new cushioning discs on the bearing cap and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).
- To protect the bearing and seal, 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 up to the cylinder barrel.
- Place the rear end cap on the cylinder barrel.



- Wet the screws with the screw locking agent included in the set of wearing parts to the screws.
- Turn the screws through the bearing and end caps 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
DNC-32	7 Nm
DNC-40	7 Nm
DNC-50	13 Nm
DNC-63	13 Nm
DNC-80	35 Nm
DNC-100	35 Nm
DNC-125	40 Nm

- Perform a functional test or start up the repaired cylinder as described in the operating instructions (enclosed with the cylinder or can be found on the Festo website (www.Festo.com)).

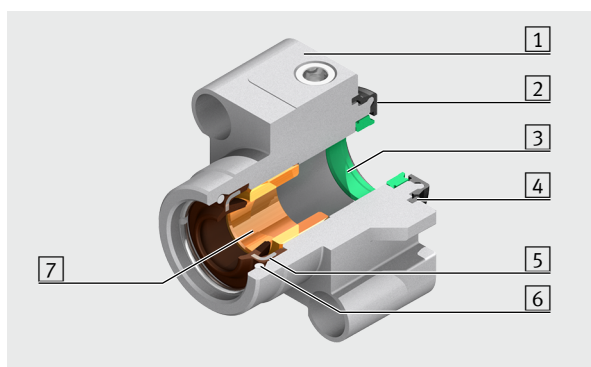
4.4 Repairing the cylinder DNC-...-S6

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

Des.	Description
P	Elastic cushioning discs
PPV	Adjustable pneumatic cushioning
A	Position sensing option
Q	Square piston rod
S2	Through piston rod
S20	Through, hollow piston rod
...K2	Extended male piston rod thread

Des.	Description
K3	Female piston rod thread
...K5	Piston rod with special thread
K7	Piston rod with external hexagon
...K8	Extended piston rod
K10	Smooth anodised aluminium coated piston rod
R3	High corrosion protection

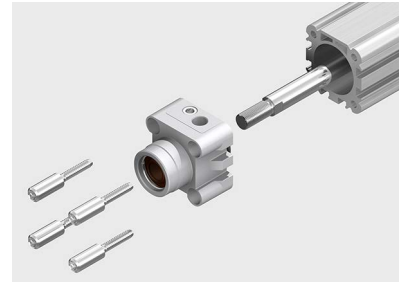
4.4.1 Structure of the bearing cap



- 1 Bearing cap
- 2 Cushioning disc
- 3 Cushioning seal (only on cylinders with adjustable cushioning PPV)
- 4 Sealing ring
- 5 Piston rod seal with metal insert
- 6 Retaining ring
- 7 Bearing

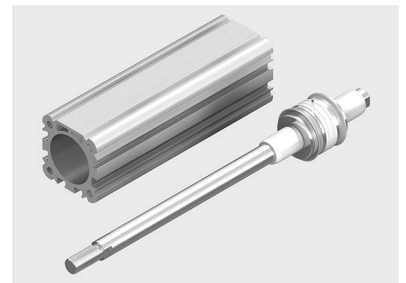
4.4.2 Removing the bearing and end caps

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

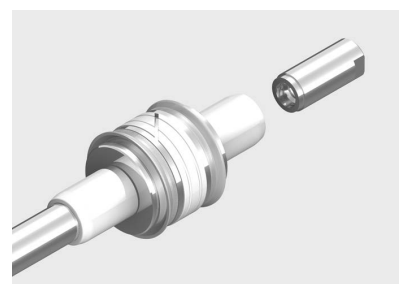
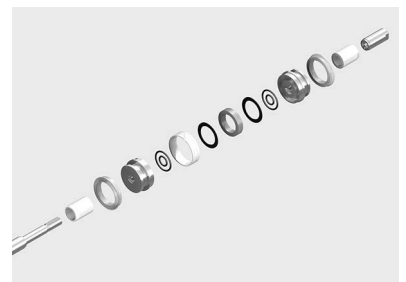


4.4.3 Replacing the piston components

- 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) shows signs of significant damage.



- Unscrew the threaded coupling (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.
- Clean the thread of the piston rod and threaded coupling to remove any screw locking agent residue.
- 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.
- Use the screw locking agent included in the set of wearing parts to wet the inside of the threaded coupling (the rear part of the piston rod on cylinders with through piston rod (S2 / S20)) and screw it onto the piston rod with the appropriate torque (see table).



Type	Torque
DNC-32	9 Nm
DNC-40	20 Nm
DNC-50	30 Nm
DNC-63	45 Nm
DNC-80	60 Nm
DNC-100	60 Nm
DNC-125	170 Nm

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	apply a thin film ¹⁾ of grease
Surface of piston rod	apply a thin film ¹⁾ of grease
Piston seal lip rings	apply thin film ¹⁾ of grease on the outside
Piston surface between lip rings (grease reservoir ²⁾)	Fill 2/3 with grease
Cushioning boss	apply thin film ¹⁾ of grease on the 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 lip ring into the cylinder barrel by tilting and turning it slightly.

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



Note

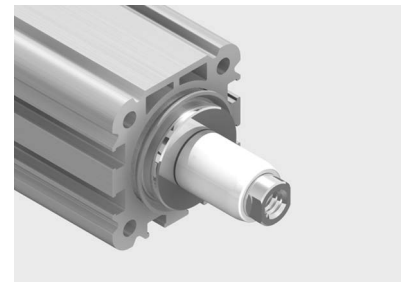
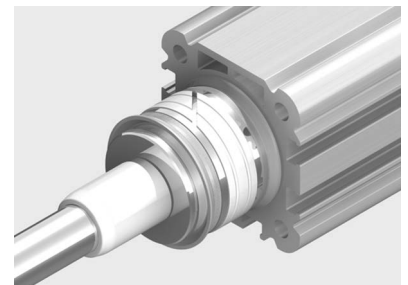
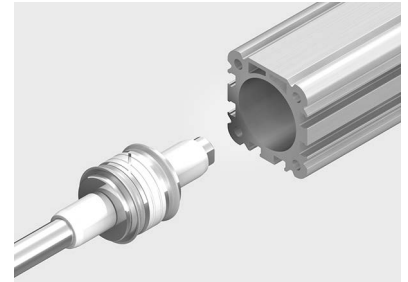
If necessary use a flat and blunt-edged object to insert the lip ring into the cylinder barrel.

- Insert the piston fully into the cylinder barrel.
- Push the piston far enough into the cylinder barrel so that the first lip 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.



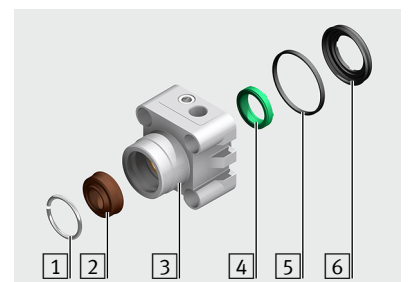
Note

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

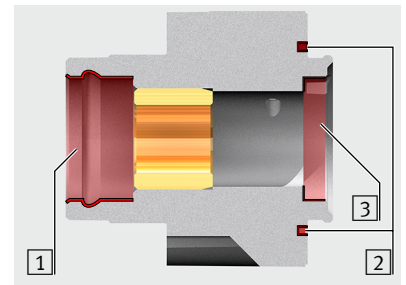


4.4.5 Repairing and attaching the bearing and end caps

- Remove the retaining ring [1] and the piston rod seal [2] from the bearing cap [3] (the front and rear bearing caps on cylinders with through piston rod (S2 / S20)).
- Pull the cushioning discs [6] off the bearing cap and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).
- Remove the sealing ring [5] from the bearing cap [3] and end cap (the front and rear bearing caps on cylinders with through piston rod (S2 / S20)).
- **Only on cylinders with adjustable cushioning (PPV)**
Remove the cushioning seal [4] from the bearing cap and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).



- Clean the seats of the piston rod seal **1** and the sealing ring **2**.
- **Only on cylinders with adjustable cushioning (PPV)**
Clean the seat of the cushioning seal **3**.

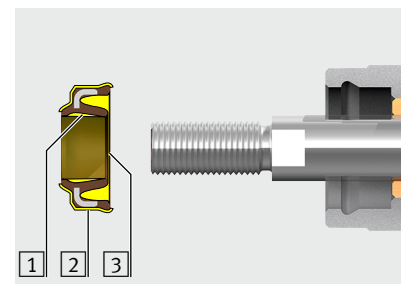


- Grease the new piston rod seal (one per bearing cap on cylinders with through piston rod (S2 / S20)) as follows:

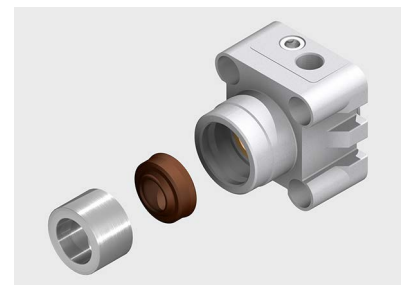
Area	Greasing
1 Grease reservoir ¹⁾ for piston rod	Fill 2/3 with grease
2 External surface for bearing cap	apply a thin film ²⁾ of grease
3 Grease reservoir ¹⁾ for bearing	Fill 2/3 with grease

¹⁾ See Chapter [5.2.3 “Grease reservoir”](#)

²⁾ See Chapter [5.2.2 “Thin grease film”](#)



- Use a suitable thrust piece to insert the piston rod seal (in both bearing caps on cylinders with through piston rod (S2 / S20)).



Note

Note the mounting direction (individual sealing lips facing out).
Note the mounting position on cylinders with square piston rod.

- Compress the retaining ring (e.g. using pliers) and place it on the piston rod seal (in both bearing caps on cylinders with through piston rod (S2 / S20)).



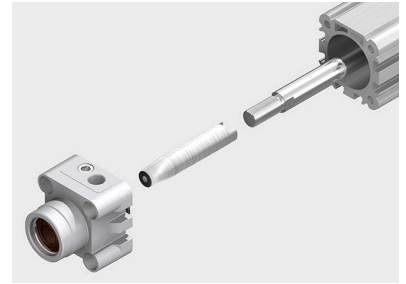
- **Only on cylinders with adjustable cushioning (PPV)**

Apply a thin film of grease on the front side of the new cushioning seals facing the sealing surface and insert them in the bearing cap and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).

- Insert the sealing ring in the groove of the bearing cap and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20))
- Place the new cushioning discs on the bearing cap and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).



- To protect the bearing and seal, 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 up to the cylinder barrel.
- Place the rear end cap on the cylinder barrel.



- Wet the screws with the screw locking agent included in the set of wearing parts to the screws.
- Turn the screws through the bearing and end caps 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
DNC-32	7 Nm
DNC-40	7 Nm
DNC-50	13 Nm
DNC-63	13 Nm
DNC-80	35 Nm
DNC-100	35 Nm
DNC-125	40 Nm

- Carry out a functional test or start up the repaired cylinder as described in the operating instructions (enclosed with the cylinder or can be found on the Festo website (www.Festo.com)).

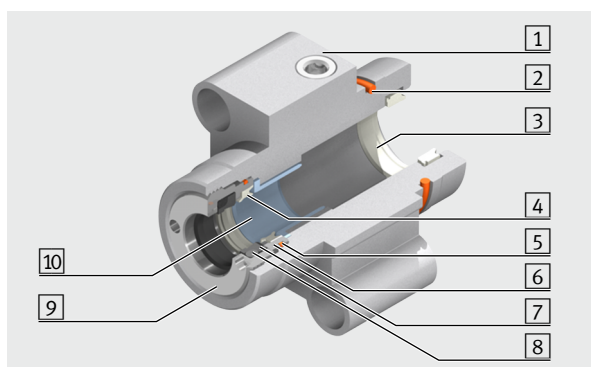
4.5 Repairing the cylinder DNC-...-TT

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

Des.	Description
PPV	Adjustable pneumatic cushioning
A	Position sensing option
S2	Through piston rod
S20	Through, hollow piston rod
...K2	Extended male piston rod thread

Des.	Description
K3	Female piston rod thread
K3	Female piston rod thread
...K5	Piston rod with special thread
...K8	Extended piston rod
R3	High corrosion protection

4.5.1 Structure of the bearing cap



- 1 Bearing cap
- 2 O-ring
- 3 Cushioning seal
- 4 Wiper seal
- 5 O-ring
- 6 Insert sleeve
- 7 Excluder
- 8 O-ring
- 9 Screwed insert
- 10 Bearing

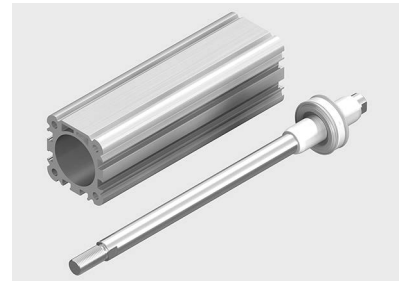
4.5.2 Removing the bearing and end caps

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

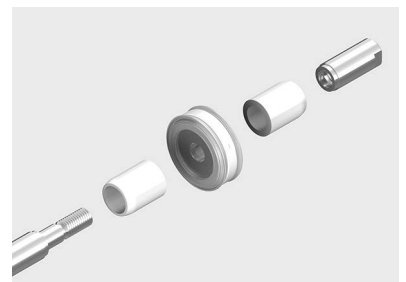


4.5.3 Replacing the piston components

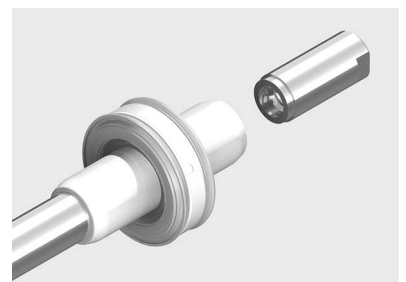
- Pull the piston rod out of the cylinder barrel.
- Check the cylinder barrel and piston rod for damage.
The entire cylinder must be replaced if the cylinder barrel (particularly the bearing surface) shows signs of significant damage.



- Unscrew the threaded coupling (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.
- Clean the thread of the piston rod and threaded coupling to remove any screw locking agent residue.
- Replace the piston and, if necessary, the cushion piston and reassemble the piston components on the piston rod in the correct order.



- Use the screw locking agent included in the set of wearing parts to wet the inside of the threaded coupling (the rear part of the piston rod on cylinders with through piston rod (S2 / S20)) and screw it onto the piston rod with the appropriate torque (see table).



Type	Torque
DNC-32	9 Nm
DNC-40	20 Nm
DNC-50	30 Nm
DNC-63	45 Nm
DNC-80	60 Nm
DNC-100	60 Nm

4.5.4 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	other cylinders
Inside surface of cylinder barrel	apply a thin film ¹⁾ of grease
Surface of piston rod	apply a thin film ¹⁾ of grease
Piston seal lip rings	apply thin film ¹⁾ of grease on the outside
Piston surface between lip rings (grease reservoir ²⁾)	Fill 2/3 with grease
Cushioning boss	apply thin film ¹⁾ of grease on the 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 lip ring into the cylinder barrel by tilting and turning it slightly.

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



Note

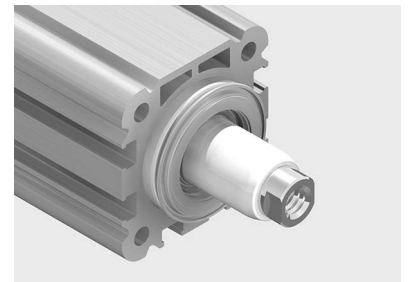
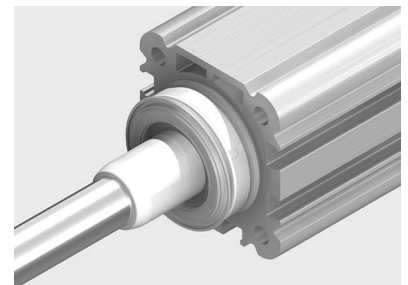
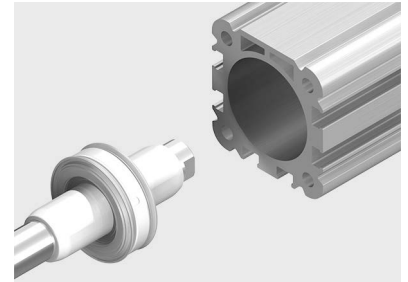
If necessary use a flat and blunt-edged object to insert the lip ring into the cylinder barrel.

- Insert the piston fully into the cylinder barrel.
- Push the piston far enough into the cylinder barrel so that the first lip 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.



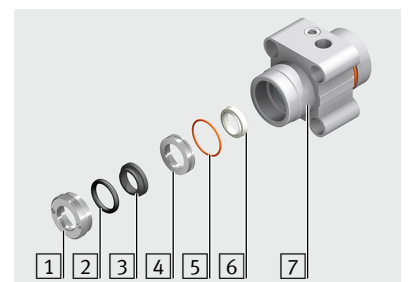
Note

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

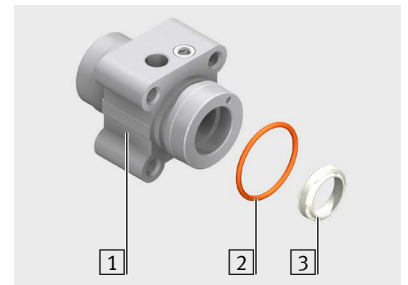


4.5.5 Repairing and attaching the bearing and end caps

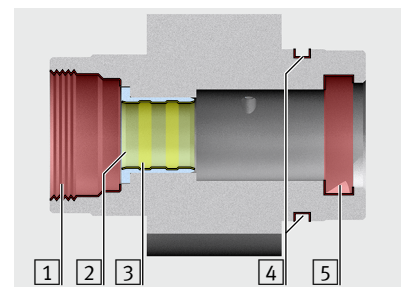
- Unscrew the screwed insert [1] from the bearing cap [7] (the front and rear bearing caps on cylinders with through piston rod (S2 / S20)).
- Remove the excluder [3] and the O-ring [2] from the screwed insert [1].
- Remove the insert sleeve [4] with the wiper seal [6] and the O-ring [5] from the bearing cap [7] (the front and rear bearing caps on cylinders with through piston rod (S2 / S20)).
- Separate the wiper seal [6] and the O-ring [5] from the insert sleeve [4].



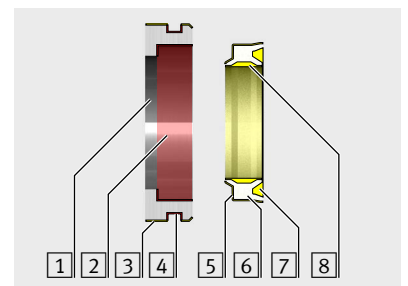
- Remove the O-ring [2] from the bearing cap [1] and the end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).
- Remove the cushioning seal [3] from the bearing cap [1] and the end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).



- Clean the thread of the bearing cap [1] and the screwed insert to remove any screw locking agent residue.
- Clean the seat of the insert sleeve beneath the thread [1].
- Wet the sliding surfaces of the cylinder bearing [2] with a thin film of the grease included in the set of wearing parts.
If there is a grease reservoir in the cylinder bearing [3], fill it 2/3 full with the grease included in the set of wearing parts.
- Clean the seat of the cushioning seal [5] and the O-ring [4].



- Clean the seat of the wiper seal [2] and the O-ring [4] on the insert sleeve [1].
- Grease the outside [3] of the insert sleeve [1].
- Grease the new wiper seal [6] (one per bearing cap on cylinders with through piston rod (S2 / S20)) as follows:



Area	other cylinders
[5] External surface facing insert sleeve	apply a thin film ¹⁾ of grease
[7] Grease reservoir ²⁾ for bearing	Fill 2/3 with grease
[8] Grease reservoir ²⁾ for piston rod	Fill 2/3 with grease

¹⁾ See Chapter 5.2.2 “Thin grease film”

²⁾ See Chapter 5.2.3 “Grease reservoir”

- Insert the greased wiper seal into the insert sleeve.



Note

Note the mounting direction (protruding sealing lip facing out, grease reservoir facing in).

- Apply the grease included in the set of wearing parts to the new O-ring and insert it into the outer groove of the insert sleeve.
- Insert the insert sleeve into the bearing cap.



Note

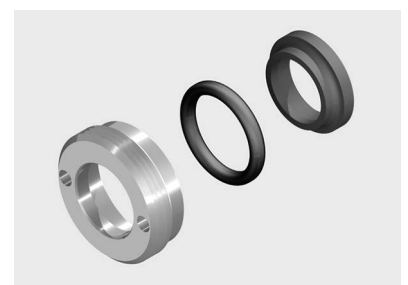
Note the mounting direction (chamfer facing the bearing cap).

- Apply the grease included in the set of wearing parts to the excluder and O-ring and insert them both together in the screwed insert.



Note

Note the mounting direction and order (O-ring between screwed insert and excluder).



- Screw the screwed insert into the bearing cap (the front and rear bearing caps on cylinders with through piston rod (S2 / S20)) and tighten it to the appropriate torque (see table).

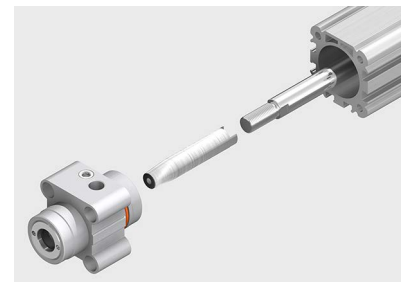
Type	Torque
DNC-32	4 Nm
DNC-40	8 Nm
DNC-50	11 Nm
DNC-63	11 Nm
DNC-80	15 Nm
DNC-100	15 Nm



- Apply a thin film of the grease included in the wearing parts kit to the cushioning seals on the front side facing the sealing surface and insert them into the bearing cap and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).
- Apply the grease included in the wearing parts kit to the new O-rings and insert them into the groove of the bearing cap and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).



- 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 up to the cylinder barrel.
- Place the rear end cap on the cylinder barrel.



- Wet the screws with the screw locking agent included in the set of wearing parts to the screws.
- Turn the screws through the bearing and end caps 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
DNC-32	7 Nm
DNC-40	7 Nm
DNC-50	13 Nm
DNC-63	13 Nm
DNC-80	35 Nm
DNC-100	35 Nm



- Carry out a functional test or start up the repaired cylinder as described in the operating instructions (enclosed with the cylinder or can be found on the Festo website (www.Festo.com)).

4.6 Repairing the cylinder DNC-...-R8

The description in this chapter can be used to repair cylinders of the type DNC-...-R8 with the following features:

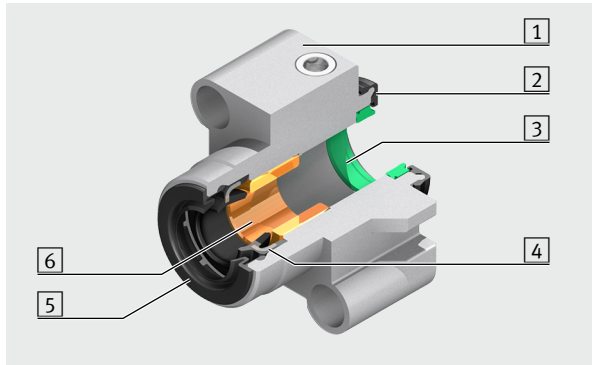
Des.	Description
P	Elastic cushioning discs
PPV	Adjustable pneumatic cushioning
A	Position sensing option

Des.	Description
K3	Female piston rod thread
...K5	Piston rod with special thread
K7	Piston rod with external hexagon

Des.	Description
S2	Through piston rod
...K2	Extended male piston rod thread

Des.	Description
...K8	Extended piston rod

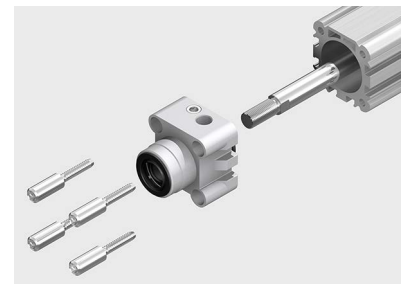
4.6.1 Structure of the bearing cap



- 1 Bearing cap
- 2 Cushioning disc
- 3 Cushioning seal (only on cylinders with adjustable cushioning PPV)
- 4 Piston rod seal with metal insert
- 5 Wiper seal
- 6 Bearing

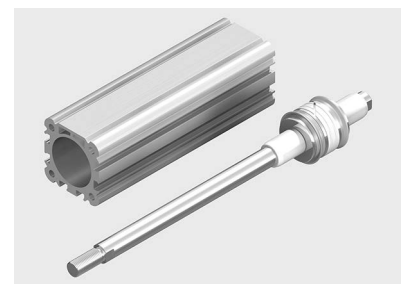
4.6.2 Removing the bearing and end caps

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

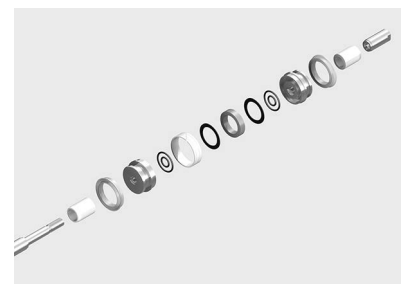


4.6.3 Replacing the piston components

- 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) shows signs of significant damage.

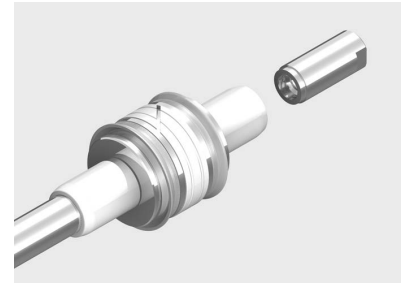


- Unscrew the threaded coupling (the rear part of the piston rod on cylinders with through piston rod (S2 / S20)) from the piston rod.
- Remove the piston components from the piston rod, noting the order and orientation.
- Clean the thread of the piston rod and threaded coupling to remove any screw locking agent residue.
- 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.



- Use the screw locking agent included in the set of wearing parts to wet the inside of the threaded coupling (the rear part of the piston rod on cylinders with through piston rod (S2 / S20)) and screw it onto the piston rod with the appropriate torque (see table).

Type	Torque
DNC-32	9 Nm
DNC-40	20 Nm
DNC-50	30 Nm
DNC-63	45 Nm
DNC-80	60 Nm
DNC-100	60 Nm
DNC-125	170 Nm



4.6.4 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	apply a thin film ¹⁾ of grease
Surface of piston rod	apply a thin film ¹⁾ of grease
Piston seal lip rings	apply thin film ¹⁾ of grease on the outside
Piston surface between lip rings (grease reservoir ²⁾)	Fill 2/3 with grease
Cushioning boss	apply thin film ¹⁾ of grease on the 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 lip ring into the cylinder barrel by tilting and turning it slightly.

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



Note

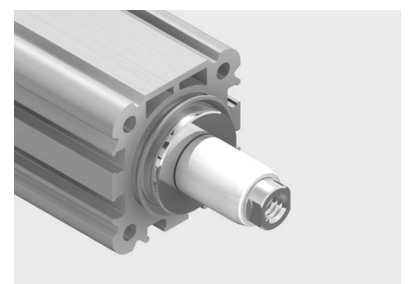
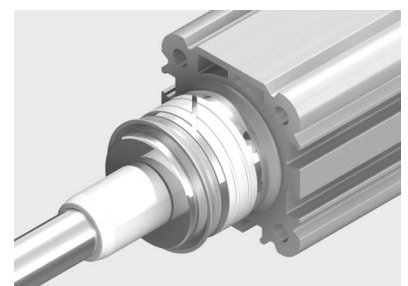
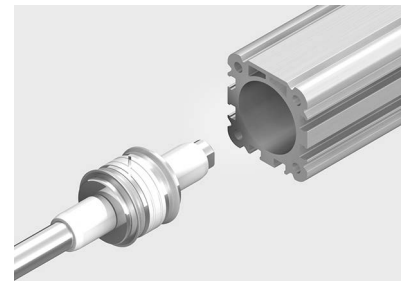
If necessary use a flat and blunt-edged object to insert the lip ring into the cylinder barrel.

- Insert the piston fully into the cylinder barrel.
- Push the piston far enough into the cylinder barrel so that the first lip 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.



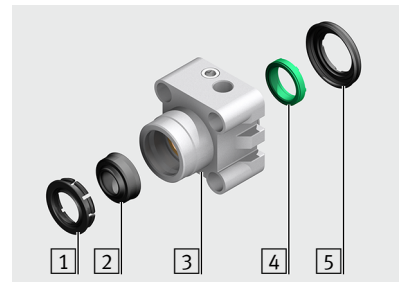
Note

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

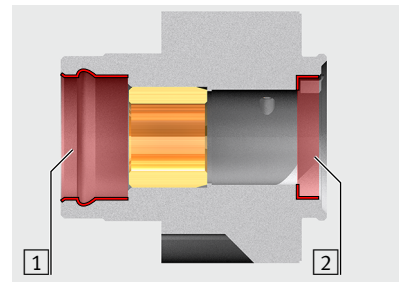


4.6.5 Repairing and attaching the bearing and end caps

- Remove the wiper seal [1] and the piston rod seal [2] from the bearing cap [3] (the front and rear bearing caps on cylinders with through piston rod (S2 / S20)).
- Pull the cushioning discs [5] off the bearing cap and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).
- Only on cylinders with adjustable cushioning (PPV)**
Remove the cushioning seal [4] from the bearing cap and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).



- Clean the seats of the piston rod seal [1].
- Only on cylinders with adjustable cushioning (PPV)**
Clean the seat of the cushioning seal [1].

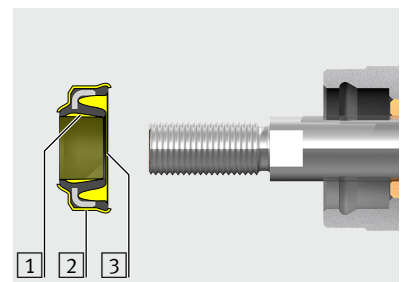


- Grease the new piston rod seal (one per bearing cap on cylinders with through piston rod (S2 / S20)) as follows:

Area	Greasing
[1] Grease reservoir ¹⁾ for piston rod	Fill 2/3 with grease
[2] External surface for bearing cap	apply a thin film ²⁾ of grease
[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"](#)



- Use a suitable thrust piece to insert the piston rod seal (in both bearing caps on cylinders with through piston rod (S2 / S20)).



Note

Note the mounting direction (individual sealing lips facing out).
Note the mounting position on cylinders with square piston rod.

- Place the wiper seal on the piston rod seal (in both bearing caps on cylinders with through piston rod (S2 / S20))



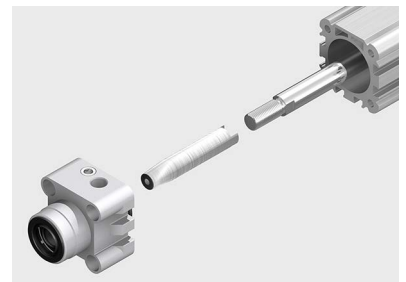
• **Only on cylinders with adjustable cushioning (PPV)**

Apply a thin film of grease on the front side of the new cushioning seals facing the sealing surface and insert them in the bearing cap and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).

- Place the new cushioning discs on the bearing cap and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).



- 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 up to the cylinder barrel.
- Place the rear end cap on the cylinder barrel.



- Wet the screws with the screw locking agent included in the set of wearing parts to the screws.
- Turn the screws through the bearing and end caps 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
DNC-32	7 Nm
DNC-40	7 Nm
DNC-50	13 Nm
DNC-63	13 Nm
DNC-80	35 Nm
DNC-100	35 Nm
DNC-125	40 Nm

- Carry out a functional test or start up the repaired cylinder as described in the operating instructions (enclosed with the cylinder or can be found on the Festo website (www.Festo.com)).

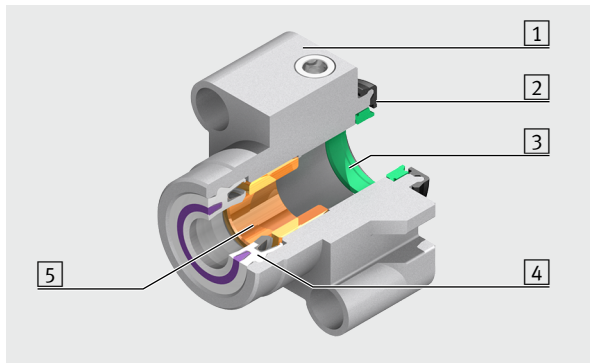
4.7 Repairing the cylinder DNC-...-A3

The description in this chapter can be used to repair cylinders of the type DNC-...-A3 with the following features:

Des.	Description
P	Elastic cushioning discs
PPV	Adjustable pneumatic cushioning
A	Position sensing option
Q	Square piston rod
S2	Through piston rod
S20	Through, hollow piston rod
...K2	Extended male piston rod thread

Des.	Description
K3	Female piston rod thread
...K5	Piston rod with special thread
K7	Piston rod with external hexagon
...K8	Extended piston rod
K10	Smooth anodised aluminium coated piston rod
R3	High corrosion protection

4.7.1 Structure of the bearing cap



- 1 Bearing cap
- 2 Cushioning disc
- 3 Cushioning seal (only on cylinders with adjustable cushioning PPV)
- 4 Piston rod seal (PE)
- 5 Bearing

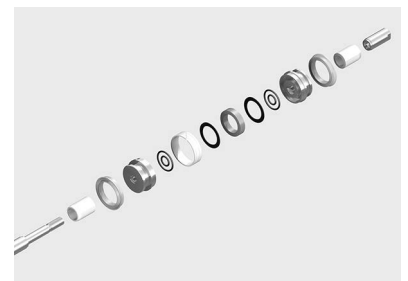
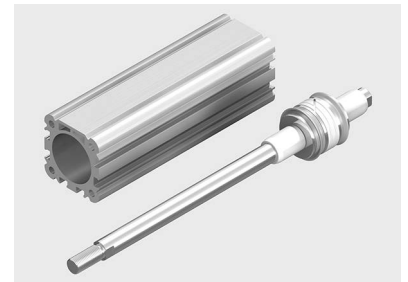
4.7.2 Removing the bearing and end caps

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



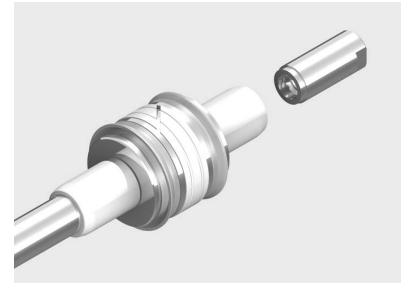
4.7.3 Replacing the piston components

- 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) shows signs of significant damage.
- Unscrew the threaded coupling (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.
- Clean the thread of the piston rod and threaded coupling to remove any screw locking agent residue.
- 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.



- Use the screw locking agent included in the set of wearing parts to wet the inside of the threaded coupling (the rear part of the piston rod on cylinders with through piston rod (S2 / S20)) and screw it onto the piston rod with the appropriate torque (see table).

Type	Torque
DNC-32	9 Nm
DNC-40	20 Nm
DNC-50	30 Nm
DNC-63	45 Nm
DNC-80	60 Nm
DNC-100	60 Nm
DNC-125	170 Nm



4.7.4 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	apply a thin film ¹⁾ of grease
Surface of piston rod	apply a thin film ¹⁾ of grease
Piston seal lip rings	apply thin film ¹⁾ of grease on the outside
Piston surface between lip rings (grease reservoir ²⁾)	Fill 2/3 with grease
Cushioning boss	apply thin film ¹⁾ of grease on the 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 lip ring into the cylinder barrel by tilting and turning it slightly.

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



Note

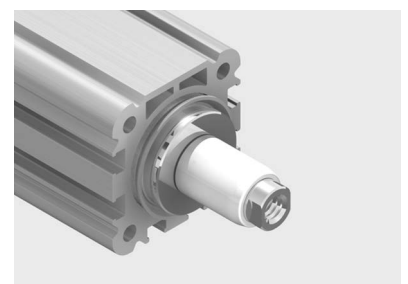
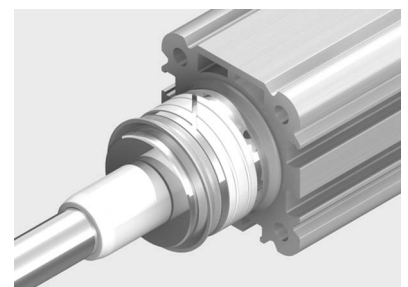
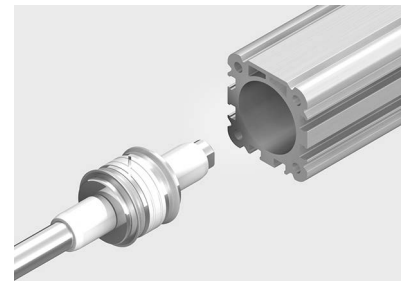
If necessary use a flat and blunt-edged object to insert the lip ring into the cylinder barrel.

- Insert the piston fully into the cylinder barrel.
- Push the piston far enough into the cylinder barrel so that the first lip 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.



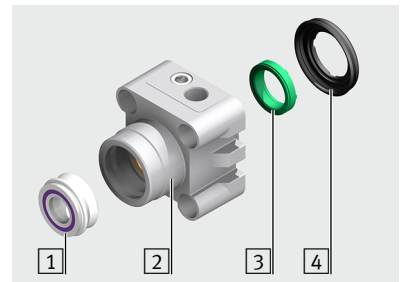
Note

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

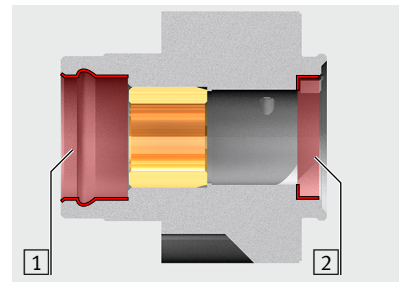


4.7.5 Repairing and attaching the bearing and end caps

- 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)).
- Pull the cushioning discs **4** off the bearing cap and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).
- **Only on cylinders with adjustable cushioning (PPV)**
Remove the cushioning seal **3** from the bearing cap and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).



- Clean the seat of the piston rod seal **1**.
- **Only on cylinders with adjustable cushioning (PPV)**
Clean the seat of the cushioning seal **4**.

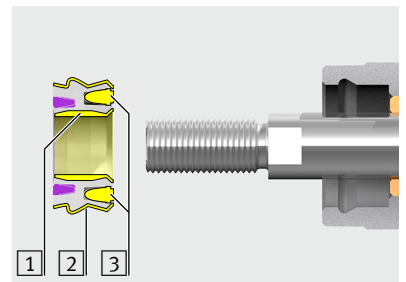


- Grease the new piston rod seal (one per bearing cap on cylinders with through piston rod (S2 / S20)) as follows:

Area	Greasing
1 Grease reservoir ¹⁾ for piston rod	Fill 2/3 with grease
2 External surface for bearing cap	apply a thin film ²⁾ of grease
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”](#)



Warning

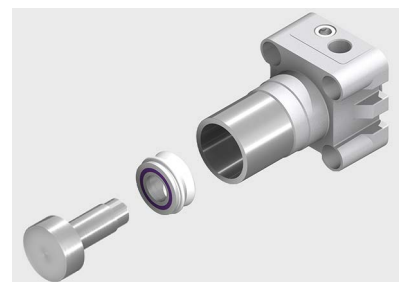
Do not insert the piston rod seal in the bearing cap without the matching mounting sleeve and corresponding thrust piece, as otherwise it will become damaged.

- Position the appropriate mounting sleeve for inserting the dry-running seal (A3) on the bearing cap. The centring seat must face the bearing cap.
- Use the appropriate thrust piece to press the dry-running seal (A3) into the bearing cap (both bearing caps on cylinders with through piston rod (S2)).



Note

Note the mounting direction (purple silicone ring facing out).
Note the mounting position on cylinders with square piston rod.



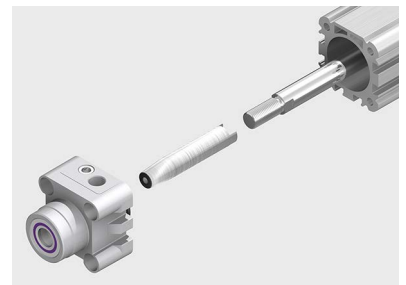
- **Only on cylinders with adjustable cushioning (PPV)**

Apply a thin film of grease on the front side of the new cushioning seals facing the sealing surface and insert them in the bearing cap and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).

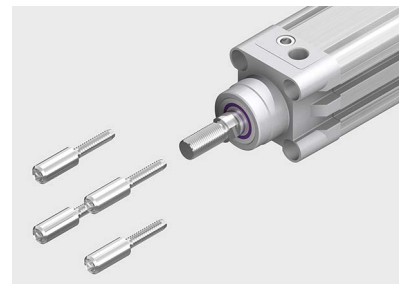
- Place the new cushioning discs on the bearing cap and end cap (the rear bearing cap on cylinders with through piston rod (S2 / S20)).



- 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 up to the cylinder barrel.
- Place the rear end cap on the cylinder barrel.



- Wet the screws with the screw locking agent included in the set of wearing parts to the screws.
- Turn the screws through the bearing and end caps 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
DNC-32	7 Nm
DNC-40	7 Nm
DNC-50	13 Nm
DNC-63	13 Nm
DNC-80	35 Nm
DNC-100	35 Nm
DNC-125	40 Nm

- Carry out a functional test or start up the repaired cylinder as described in the operating instructions (enclosed with the cylinder or can be found on the Festo website (www.Festo.com)).

5 Cleaning and Greasing

5.1 Cleaning

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



Warning

Festo recommends use of Loctite 7063 or Loctite 7070 for cleaning.

When using other cleaning agents, make sure that they do not corrode the seals of the cylinder with piston rod. If in doubt check the resistance of the seals with the help of the information 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 ensure life-time lubrication, after greasing the piston rod with assembled piston and piston seals must be moved several times along the entire stroke of the cylinder barrel to produce a uniform lubricant film.

5.2.1 Extremely thin grease film

A barely continuous film of grease covers the bearing surface. The grease may 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 by wiping once with the respective 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 component 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. The cylinders are also maintenance-free due to their life-time lubrication. 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.

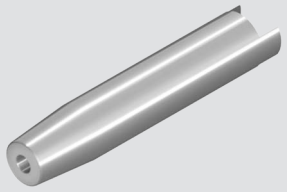
7.1 Standard tools

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

- Screwdriver
- Wrench
- Flat pliers
- Torque spanner (see tables in the corresponding repair steps for values)
- Face pin wrench (only for cylinders with piston rod with the feature "TT" (low temperature))

7.2 Special tools

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

Designation	Additional information	Figure
Mounting sleeve for piston rod	The mounting sleeve for the piston rod 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**" (7Hilfsmittel_a_de). This can be found in the online spare parts catalogue on the Festo website (http://spareparts.festo.com/xdki/data/SPC/0/PDF_SAFE/Fitting%20aids.pdf).

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