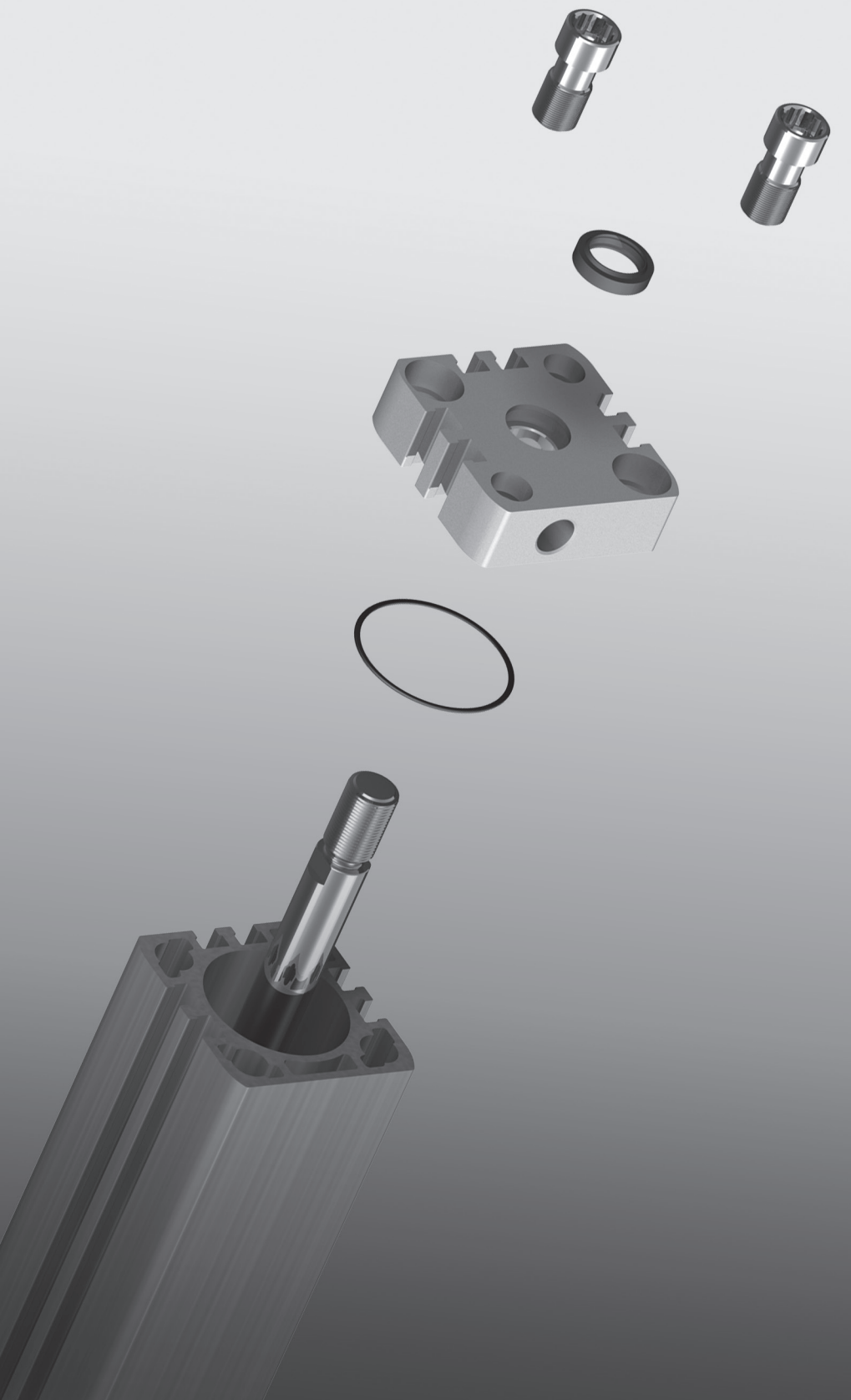
Cylinder with piston rod

Compact cylinder

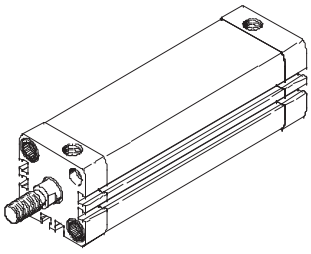
ADN / AEN, to ISO 21287 and

ADNGF, standard hole pattern



FESTO

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.

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 before carrying out the repair and take the differences into consideration if necessary.

These repair instructions have been prepared with care.

Festo SE & Co. KG does not, however, accept any 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 11 “Liability”.

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

FESTO

Table of Contents

1 Important information

1.1 About these repair instructions

This document contains important information about professional repair of the cylinder with piston rod of the type ADN / ADNGF / AEN.

The cylinder with piston rod ADN / ADNGF / AEN 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**

  Contain information about the operating elements and connections of the cylinder with piston rod, as well as information about function, structure, application, installation, commissioning, maintenance and care, etc. This information is also 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. This can be found in the online spare parts catalogue on the Festo website (➔ www.festo.com/spareparts).
- **Assembly aids**

  Contain an overview of available assembly aids, e.g. lubricating greases, locking agents, maintenance tools, etc. (“Accessories, resources and tools” information brochure). The brochure can be found in the online spare parts catalogue on the Festo website (➔ Tools and repair accessories.pdf).

1.2 Pictograms used in these repair instructions

This description contains notes on possible hazards which can occur if the product is used improperly. These notes are identified by a signal word (Warning, Caution, etc.), are shaded and are additionally marked by a pictogram. A differentiation is made between the following hazard information:

Caution

... means that ignoring this caution can result in injury to persons and / or damage to property.

Note

... means that ignoring this information can result in damage to property.

Marking special information

The following pictograms mark passages in the text which contain special information.

Information:

Recommendations, tips and references to other sources of information.

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.

1.3 Text designations used in these repair instructions

- Activities that can be carried out in any order.

1. Activities which should be carried out in the specified order.

➔ Reference to further information

– General list

Underlined, blue text indicates a cross-reference or hyperlink that you can click on in the PDF.

2 General safety instructions

Caution

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.

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

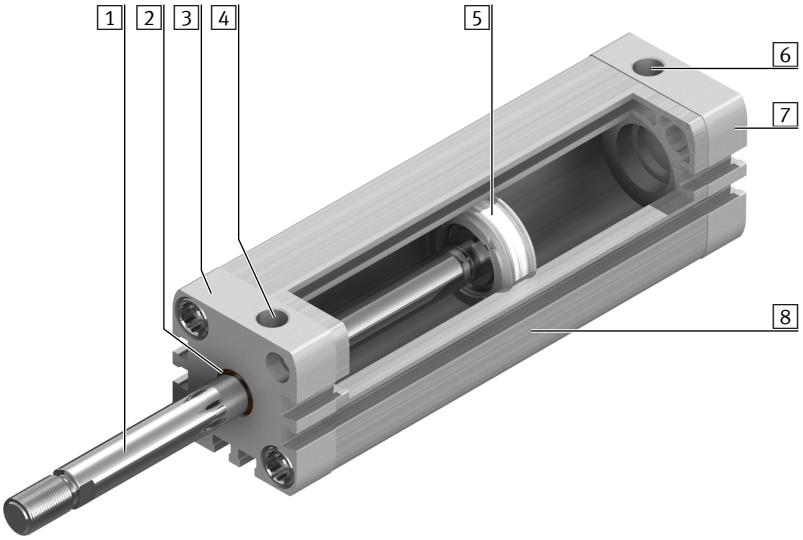
Components and equipment replaced during repair must be disposed of in accordance with the relevant local environmental protection regulations.

3 General product description

3.1 Functional description of ADN and ADNGF

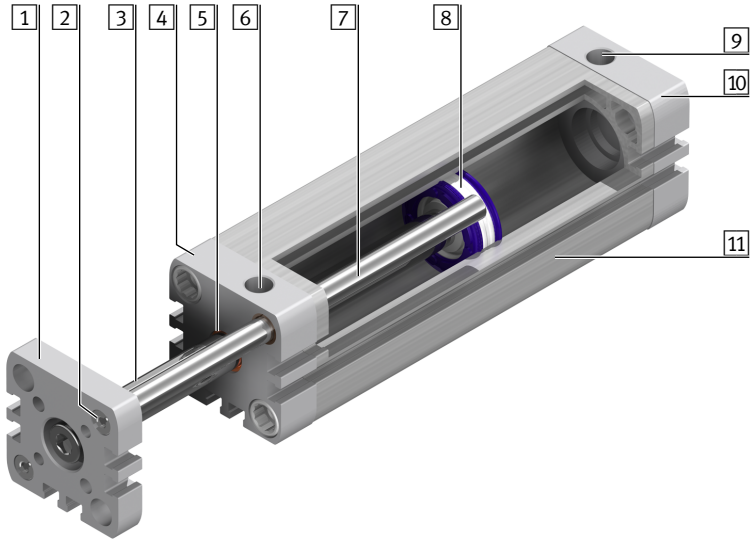
The piston moves in the cylinder barrel when the cylinder chamber is pressurised. The piston rod transfers the movement to the outside. The advanced piston rod is retracted again when the other cylinder chamber is pressurised.

3.1.1 Functional description of ADN



1 Piston rod
2 Piston rod seal
3 Bearing cap
4 Front compressed air port
5 Piston (one-piece)
6 Rear compressed air port
7 End cap
with S2: rear bearing cap
8 Cylinder barrel

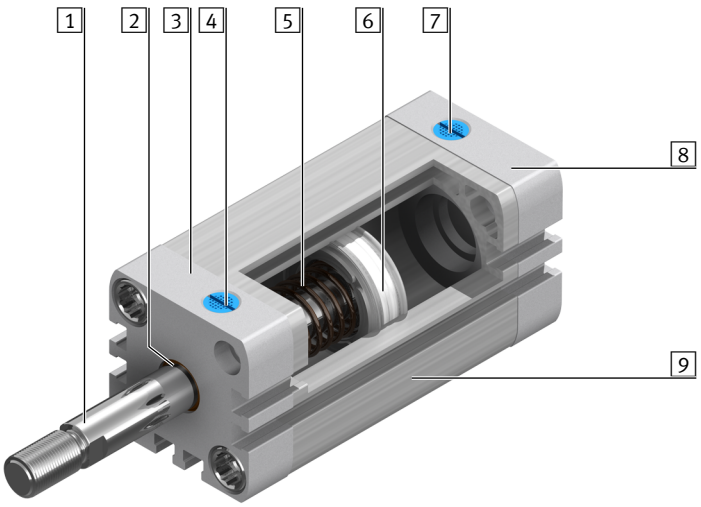
3.1.2 Functional description of ADNGF



1 Piston rod
2 Slotted nut
3 Moment compensator
4 Bearing cap
5 Piston rod seal
6 Front compressed air port
7 Guide rod
8 Piston (one-piece)
9 Rear compressed air port
10 End cap
with S2: rear bearing cap
11 Cylinder barrel

3.2 Functional description of AEN

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 by means of a compression spring when the cylinder chamber is depressurised.



1 Piston rod
2 Piston rod seal
3 Bearing cap
4 Filter nipple
5 Compression spring
6 Piston (one-piece)
7 Filter nipple
8 End cap
9 Cylinder barrel

3.3 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

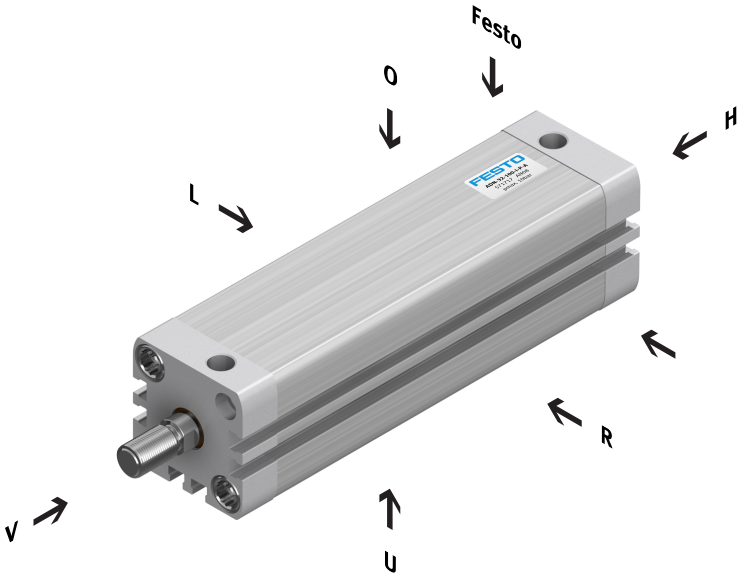
The type code on this rating plate provides the following information:

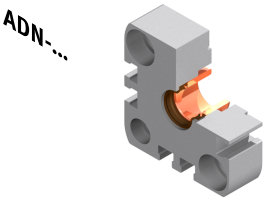
ADN Cylinder of the type ADN (double-action)
32 Piston diameter 32 mm
100 Stroke 100 mm
I Female thread
P Elastic cushioning rings/pads, at both ends
A Sensing option (magnetic piston)

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).

3.4 Orientation designations and bearing cap variants

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

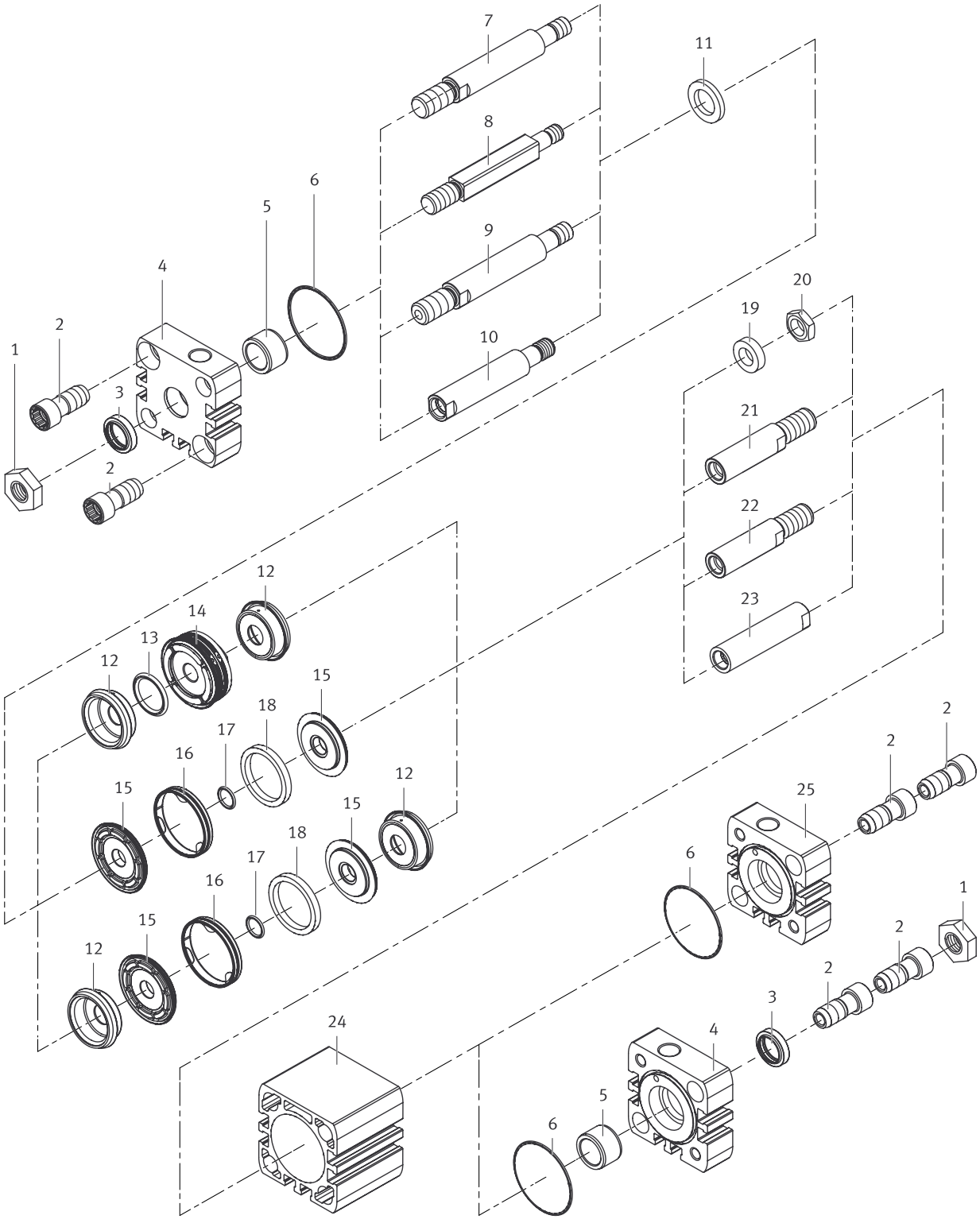




Orientation:
Festo=Product identification (rating plate) as reference point
O = top
U = underneath
R = right
L = left
V = front
H = rear

4 Components list

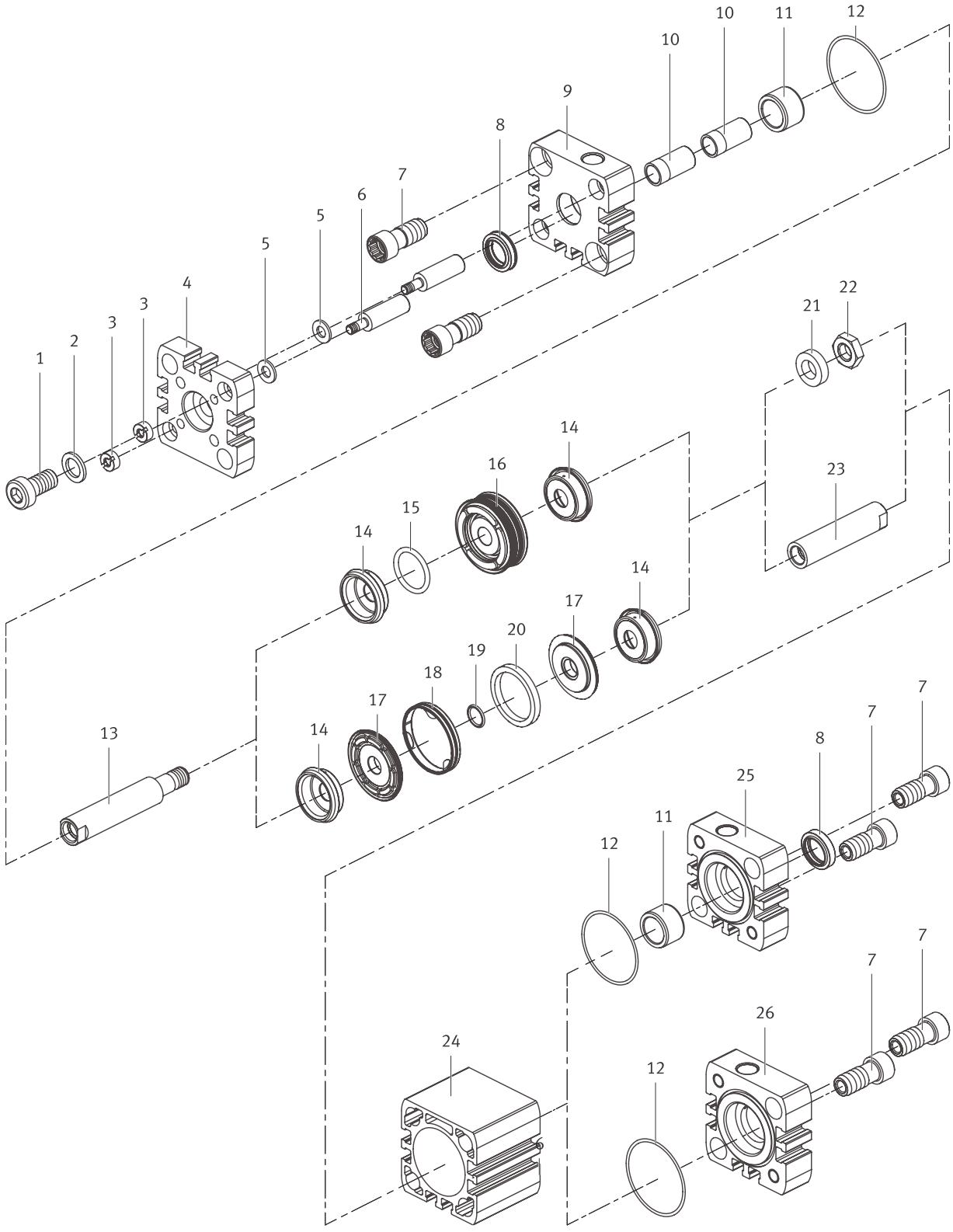
4.1 ADN compact cylinder, ISO 21287



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 (➔ www.festo.com/spareparts).

Item	Designation	Note
1	Hex nut	
2	Flange screw	
2	Socket head screw	Only ADN-80 / 100 / 125
3	Piston rod seal	
4	Bearing cap	
5	Bearing	
6	O-ring	
7	Piston rod, male thread	Only ADN-...-...-A-...
8	Piston rod, square	Only ADN-...-Q
9	Piston rod, hollow throughout	Only ADN-...-S20
10	Piston rod, female thread	Only ADN-...-I-...
11	Washer	Only ADN-40 / 50 / 63 / 80 / 100-...-Q
12	Cushioning boss	Only ADN-32 / 40 / 50 / 63 / 80-...-PPS
13	O-ring	Only ADN-32-...-PPS
14	Piston	Only ADN-32
15	Piston washer	
16	Guiding band	
17	O-ring	
18	Magnet	
19	Washer	Not S2 / S20
20	Hex nut	Not S2 / S20
21	Piston rod, male thread	Only ADN-...-A-...-S2
22	Piston rod, hollow throughout	Only ADN-...-S20
23	Piston rod, female thread	Only ADN-...-I-...S2
24	Cylinder barrel	
25	End cap	Not S2 / S20

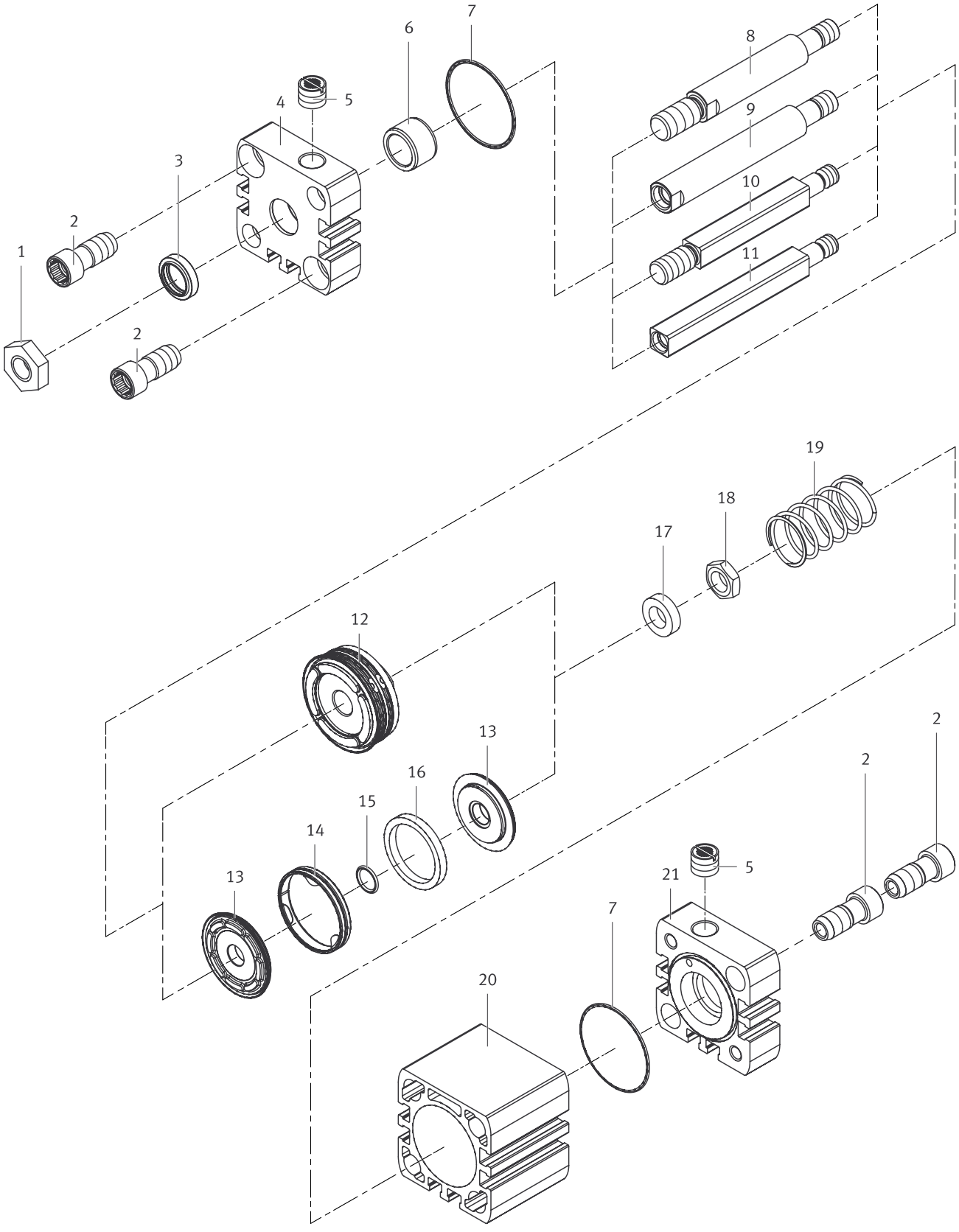
4.2 Compact cylinder ADNGF, standard hole pattern



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 (➔ www.festo.com/spareparts).

Item	Designation	Note
1	Socket head screw	
2	Washer	Only ADNGF-80 / 100
3	Slotted nut	
4	Moment compensator	
5	Shim ring	Not ADNGF-80 / 100-
6	Guide rod	
7	Flange screw	
8	Piston rod seal	
9	Bearing cap	
10	Guide bearing	
11	Bearing	
12	O-ring	
13	Piston rod, female thread	
14	Cushioning boss	Only ADNGF-...-PPS
15	O-ring	Only ADNGF-32-...-PPS
16	Piston	Only ADNGF-32
17	Piston washer	
18	Guiding band	
19	O-ring	
20	Magnet	
21	Washer	Not S2
22	Hex nut	Not S2
23	Piston rod, female thread	Only ADNGF-...-S2
24	Cylinder barrel	
25	Bearing cap, rear	Only ADNGF-...-S2
26	End cap	Not S2

4.3 AEN compact cylinder, ISO 21287



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 (➔ www.festo.com/spareparts).

Position	Designation	Note
1	Hex nut	
2	Flange screw	
2	Socket head screw	Only AEN-80 / 100
3	Piston rod seal	
4	Bearing cap	
5	Filter nipple	
6	Bearing	
7	O-ring	
8	Piston rod, male thread	Only AEN-...-...-A-...
9	Piston rod, female thread	Only AEN-...-...-I-...
10	Piston rod, square, male thread	Only AEN-...-...-A-...-Q
11	Piston rod, square, female thread	Only AEN-...-...-I-...-Q
12	Piston	
13	Sealing piston	
14	Guiding band	
15	O-ring	
16	Magnet	
17	Washer	
18	Hex nut	
19	Compression spring	
20	Cylinder barrel	
21	End cap	

5 Repair steps

This chapter describes how to dismantle, repair and assemble the cylinder with piston rod. Note that the cylinder with piston rod does not need to be fully dismantled for all repair work.

Depending on the cause of the defect to be eliminated, it may be necessary to replace several components. The cause of a defect must therefore always be determined before starting a repair.

The repair should preferably be carried out on a stable and flat work surface with storage for small parts.

5.1 Preparatory measures

Caution

Risk of injury due to sudden, uncontrolled flying off of the bearing cap!

The cylinder with piston rod must be completely depressurised before each repair.

Remove the check valves and tubing connection from the cylinder, to completely depressurise the cylinder.

Note

To prevent damage to sealing rims or guide surfaces, do not use pointed or sharp-edged assembly aids. Keep your working environment clean and tidy.

Note

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

Only use the specified spare parts and assembly aids (grease, locking agent, etc.).

5.2 Visual inspection

Check the cylinder for visible damage that could impair its function, such as warping of the piston rod as well as deposits and scoring. The entire linear actuator must be replaced if there are signs of significant damage.

5.3 ADN-... cylinder

Cylinders of the type ADN-... with the following features can be repaired:

Des.	Description
A	Male thread
I	Female thread
P	Elastic cushioning rings/plates at both ends
PPS	Pneumatic cushioning at both ends, self-adjusting
A	External position sensing
Q	Internal position sensing at both ends
S1	Reinforced piston rod
S2	Through piston rod
S20	Through, hollow piston rod
K2	Extended piston rod with male thread

Des.	Description
K5	Piston rod with special thread
K8	Extended piston rod
K10	Smooth anodised piston rod
S6	Heat-resistant seal max. 120 °C
S10	Slow speed (constant motion)
S11	Low friction
R3	High corrosion protection
R8	Dust protection
TL	Captive rating plate
TT	Low temperature -40°C to +80°C

The repair steps are described in Chapter 6 “Repairing ADN and ADNGF cylinders”.

5.4 ADNGF-... cylinder

Cylinders of the type ADNGF-... with the following features can be repaired:

Des.	Description
P	Elastic cushioning rings/plates at both ends
PPS	Pneumatic cushioning at both ends, self-adjusting
A	External position sensing

Des.	Description
S2	Through piston rod
S6	Heat-resistant seal max. 120 °C
TL	Captive rating plate

The repair steps are described in Chapter 6 “Repairing ADN and ADNGF cylinders”.

5.5 Cylinders AEN (pushing)

Cylinders of the type AEN with the following features can be repaired:

Des.	Description
A	Male thread
I	Female thread
P	Elastic cushioning rings/plates at both ends
A	External position sensing
Z	Single-acting, pulling (see note)
Q	Internal position sensing at both ends

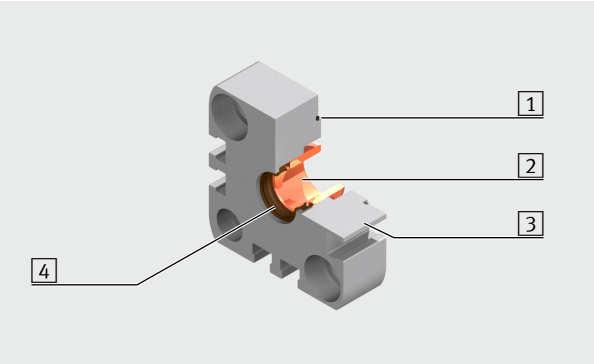
Des.	Description
K2	Extended piston rod with male thread
K5	Piston rod with special thread
K8	Extended piston rod
K10	Smooth anodised piston rod
S6	Heat-resistant seal max. 120 °C
TL	Captive rating plate

Please contact Festo for repair of AEN-...-Z (**pulling**) cylinders.

The repair steps are described in Chapter 7 “Repairing cylinder AEN (pushing)”.

6 Repairing ADN and ADNGF cylinders

6.1 Structure of the bearing cap

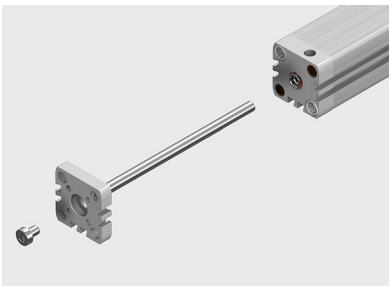


1 O-ring
2 Bearing
3 Bearing cap
4 Piston rod seal

6.2 Removing the bearing and end caps

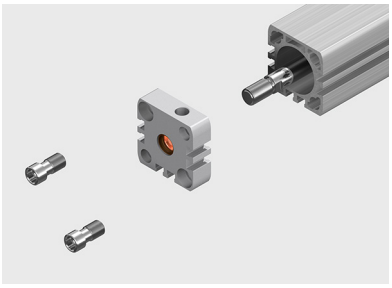
Carry out steps 1 to 5 for ADNGF only

1. Unscrew the socket head screw which connects the moment compensator to the piston rod.
2. Remove the washer (only used on the ADNGF-80 / 100).
3. Clean the thread of the piston rod and socket head screw to remove any locking agent residue.
4. Pull the moment compensator, together with the guide rods, from the cylinder.
5. Clean the guide rods, see Chapter 8.1 “Cleaning”.



Repair of the moment compensator unit is described in Chapter 6.6 “Repairing the moment compensator unit of the ADNGF”.

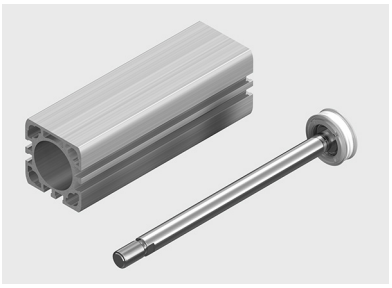
6. Unscrew the flange screws or socket head screws (ADN / ADNGL-80 / 100 / 125 only) in the bearing and end caps (in the rear bearing cap of cylinders with through piston rod (S2/20)).
7. Pull the bearing and end caps off the cylinder barrel and piston rod.
8. Clean the thread of the screws to remove any locking agent residue.



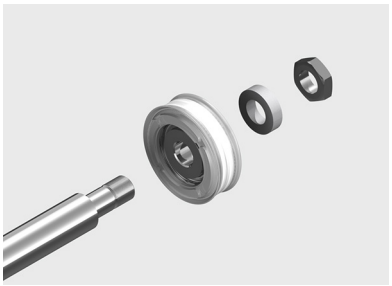
6.3 Replacing the piston components

1. Pull the piston rod out of the cylinder barrel.
2. Inspect 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.



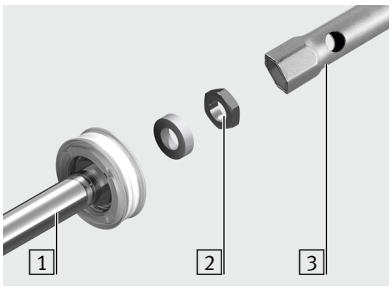
3. Unscrew the hex nut and the washer or rear part of the piston rod (on cylinders with through piston rod (S2 / 20)) from the piston rod.



ADN / ADNGF-...-A

Only ADN / ADNGF-...-PPS

A special tubular box wrench [3] (see Chapter 10.2 “Special tools”) is required to undo the hex nut [2] on the piston rod [1].



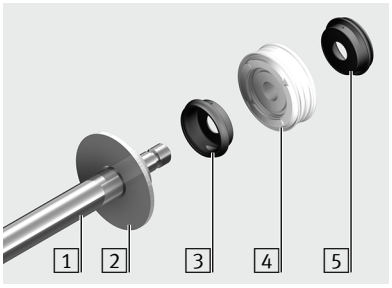
ADN / ADNGF-...-PPS

It is advisable to note the order and orientation of the piston components for assembly of the piston components on the piston rod later.

4. Remove the piston components from the piston rod.
5. Clean the thread of the piston rod and hex nut (the thread of the rear part of the piston rod in cylinders with through piston rod (S2 / 20)) to remove any locking agent residue.
6. Replace the components contained in the set of wearing parts.
7. Re-assemble the piston components on the piston rod in the correct order and orientation.

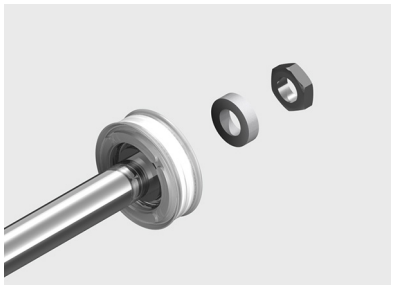
Carry out steps 8 to 11 for ADN / ADNGF-...-PPS only

A centring tool [2] is required to install the front cushioning boss [3] (see Chapter 10.2 “Special tools”)



8. Push the centring tool [2] onto the piston rod [1], with its convex side facing the rear end of the piston rod [1].
9. Push the front cushioning boss [3] onto the piston rod [1], with the concave side facing the centring tool [2].
10. Reassemble the piston components [4] on the piston rod in the correct order.
11. Push the rear cushioning boss [5] onto the piston rod [1], with the concave side facing the rear end of the piston rod [1].

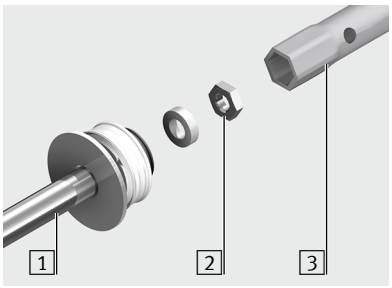
12. Place the washer on the piston rod (the washer is not used on cylinders with through piston rod (S2 / 20)).
13. Wet the inside of the hex nut or the rear part of the piston rod (in cylinders with through piston rod (S2 / 20)) with **high-strength** locking agent.
14. Tighten the hex nut on the piston rod or the rear part of the piston rod (in cylinders with through piston rod (S2 / 20)) with the appropriate tightening torque (see table).



ADN / ADNGF-...-A

Carry out steps 15 to 18 for ADN / ADNGF-...-PPS only

15. Use the centring tool to align the front cushioning boss with the middle of the piston rod.
16. Place the washer on the piston rod (the washer is not used on cylinders with through piston rod (S2 / 20)).



ADN / ADNGF-...-PPS

> **Note**
>
> Use a special tubular box wrench 3 to tighten the hex nut 2 on the piston rod 1 (see Chapter 10.2 “Special tools”), because in addition to the size of the wrench, the wall thickness of the tubular box wrench used is decisive for assembly of the cushioning boss without damage.

17. Wet the inside of the hex nut or the rear part of the piston rod (in cylinders with through piston rod (S2 / 20)) with **high-strength** locking agent.
18. Tighten the hex nut on the piston rod or the rear part of the piston rod (in cylinders with through piston rod (S2 / 20)) with the appropriate tightening torque (see table).

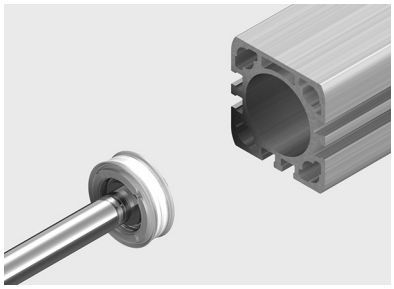
Type	Tightening torque
ADN-32, ADNGF-32	9.2 Nm
ADN-32-...-A-PPS-A-S2	6 Nm
ADN-40, ADNGF-40	13.5 Nm
ADN-40-...-A-PPS-A-S20	12 Nm
ADN-50, ADNGF-50	30 Nm
ADN-40-...-A-PPS-A-S20	18.5 Nm
ADN-63, ADNGF-63	32 Nm
ADN-63-...-A-PPS-A-S20	18.5 Nm
ADN-80	45.5 Nm
ADN-80-...-I-PPS-A-S2	46 Nm
ADN-80-...-I-PPS-A	46 Nm
ADN-80-...-A-PPS-A-S20	33 Nm
ADN-80-...-A-PPS-A-S2	46 Nm
ADN-80-...-Q	23 Nm
ADN-80-...-A-PPS-A	46 Nm
ADNGF-80	46 Nm
ADN-100, ADNGF-100	45.5 Nm
ADN-125	72 Nm

6.4 Inserting the piston rod into the cylinder barrel

1. Clean the inside surface of the cylinder barrel as described in Chapter 8.1 “Cleaning”.
2. Grease the following parts with the grease included in the set of wearing parts:

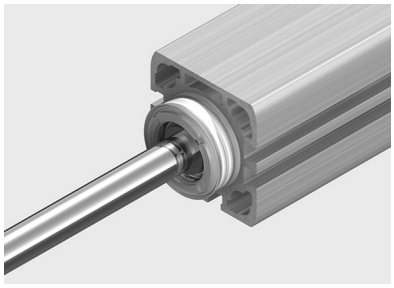
Component	Greasing
Inside surface of cylinder barrel	Apply a thin film[1)] of grease
Surface of piston rod	Apply a thin film[1)] of grease
Piston seal lip rings	Apply a thin film[1)] of grease on the outside
Piston surface between lip rings (grease reservoir[1)])	Fill 2/3 with grease
Cushioning boss	Apply a thin film[1)] of grease

[1)] see Chapter 8.2 “Greasing”



3. Position the piston flat against the front side of the cylinder barrel.
4. Insert the lip ring in the cylinder barrel by tilting and turning the ring slightly.

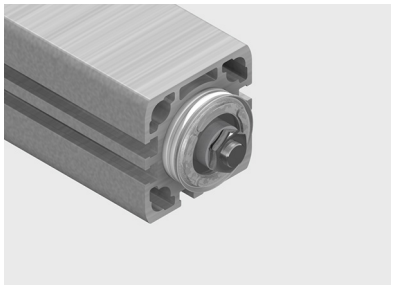
   The sealing lip must not fold back against the inside of the piston.



Note

Use a flat, **blunt**-edged object to insert the lip ring into the cylinder barrel without damage.

5. Insert the piston fully into the cylinder barrel.
6. Push the piston into the cylinder barrel until the first lip ring protrudes slightly at the other end of the cylinder barrel.
7. Pull the piston rod back again until the piston sits fully in the cylinder barrel.

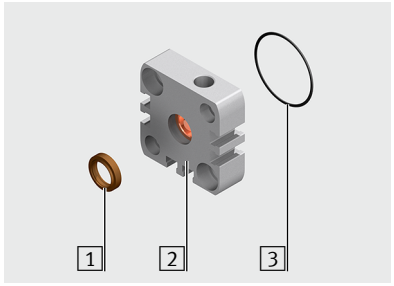


Note

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

6.5 Repairing and attaching the bearing and end caps

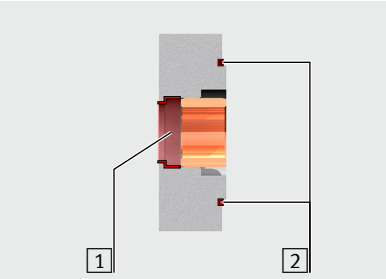
1. Remove the piston rod seal [1] from the bearing cap [2] (the front and rear bearing caps on cylinders with through piston rod (S2/20)).
2. Remove the O-ring [3] from the slot of the bearing cap and end cap (the rear bearing cap of cylinders with through piston rod (S2/20)).



Note

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

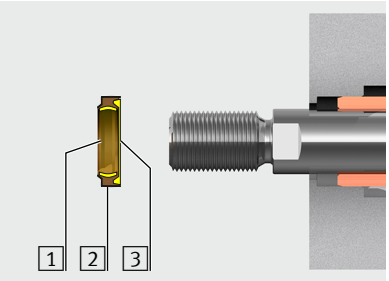
3. Clean the seat of the piston rod seal [1].
4. Clean the seat of the O-ring [2].



5. Grease the new piston rod seal (one per bearing cap on cylinders with through piston rod (S2 /20)) as follows:

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

[1)] see Chapter 8.2 “Greasing”

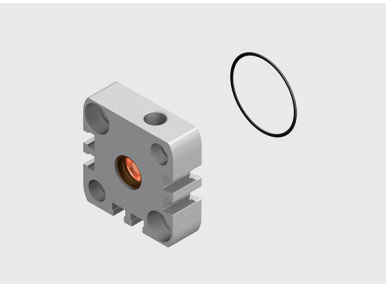


6. Insert the piston rod seal into the bearing cap (into both bearing caps of cylinders with through piston rod (S2/20)).

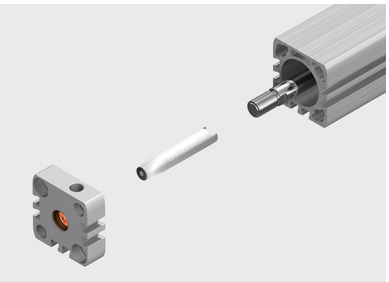
Note

Note the installation direction (individual sealing lip facing the outside).

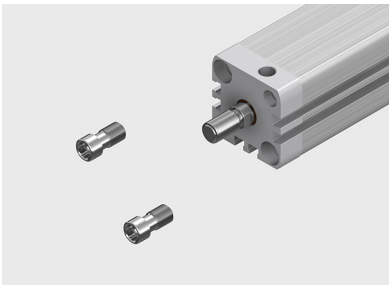
7. Grease new O-rings.
8. Insert the greased O-rings into the slots in the bearing cap and end cap (the rear bearing cap of cylinders with through piston rod (S2/20)).



9. Position the matching mounting sleeve (see Chapter 10.2 “Special tools”) on the thread of the piston rod to protect the bearing and seals from damage.
10. Push the bearing cap (both bearing caps of cylinders with through piston rod (S2/20)) over the mounting sleeve (see Chapter 10.2 “Special tools”) onto the piston rod up to the cylinder barrel.
11. Position the rear end cap on the cylinder barrel.



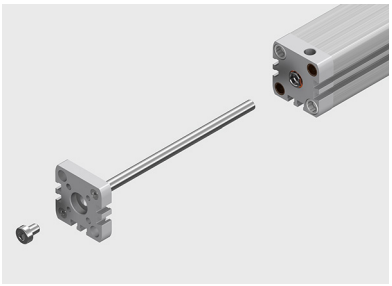
12. Wet the flange screws or socket head screws (ADNGL-80 / 100 / 125 only) with the locking agent included in the set of wearing parts.
13. Screw in the screws through the bearing and end caps and into the cylinder barrel.
14. Align the end bearing and caps flush with the cylinder barrel.
15. Tighten the screws with the appropriate tightening torque (see Table):



Type	Tightening torque
Flange screw	
ADN-32, ADNGF-32	27 Nm
ADN-40, ADNGF-40	27 Nm
ADN-50, ADNGF-50	35 Nm
ADN-63, ADNGF-63	35 Nm
Socket head screw	
ADN-80, ADNGF-80	8 Nm
ADN-100, ADNGF-100	9 Nm
ADNGF-100-...-P-A	8 Nm
ADN-125	24 Nm

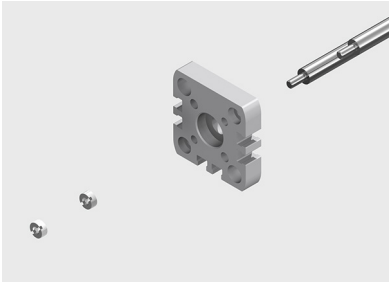
Carry out steps 16 to 20 for ADNGF only

16. Apply a thin film of grease on the guide rods of the moment compensator.
17. Push the moment compensator together with the guide rods into the guide bearing of the cylinder.
18. Place the washer (on ADNGF-80 / 100 only) on the socket head screw.
19. Wet the thread of the socket head screw, which connects the moment compensator to the piston rod, with the locking agent included in the set of wearing parts.
20. Tighten the socket head screw with the appropriate tightening torque (see Table):



Type	Tightening torque
ADNGF-32	10 Nm
ADNGF-40	10 Nm
ADNGF-50	20 Nm
ADNGF-63	20 Nm
ADNGF-80	39 Nm
ADNGF-100	39 Nm

6.6 Repairing the moment compensator unit of the ADNGF



Removing the moment compensator unit

1. Use a slotted screwdriver (see Chapter 10.2 “Special tools”) to unscrew the slotted nuts from the guide rods.
2. Pull the guide rods together with the shims (on ADNGF-32 / 40 / 50 / 63 only) from the moment compensator.
3. Clean the threads of the slotted nuts and the guide rods to remove any locking agent residue.

Assembling the moment compensator unit

1. Place the shims (on ADNGF-32 / 40 / 50 / 63 only) on the threads of the guide rods.
2. Insert the threads of the guide rods into the locating holes of the moment compensator.

Note

The side of the moment compensator with the three cylindrical countersinks must point towards the front.

3. Wet the thread of the slotted nuts with the locking agent included in the set of wearing parts.
4. Use a slotted screwdriver (see Chapter 10.2 “Special tools”) and the appropriate tightening torque (see Table) to tighten the slotted nuts on the guide rods:

Type	Tightening torque
ADNGF-32	2.9 Nm
ADNGF-40	2.9 Nm
ADNGF-50	5.9 Nm
ADNGF-63	5.9 Nm
ADNGF-80	5.9 Nm
ADNGF-100	5.9 Nm

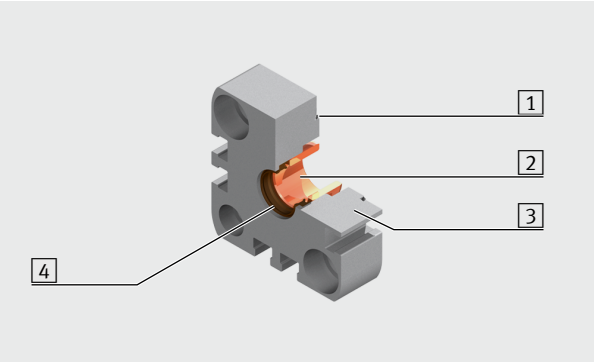
5. Apply a thin film of grease on the guide rods of the moment compensator (see Chapter 8.2 “Greasing”).

6.7 Commissioning

Perform a functional test or commission the repaired cylinder in accordance with the operating instructions (enclosed with the cylinder or can be found on the Festo website (➔ www.festo.com)).

7 Repairing cylinder AEN (pushing)

7.1 Structure of the bearing cap



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

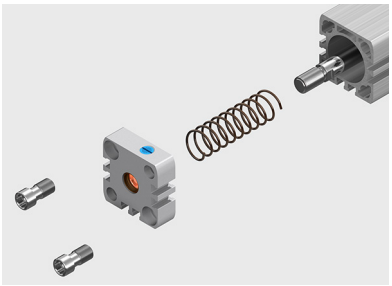
7.2 Removing the bearing and end caps

Caution

The compression spring of the AEN compact cylinder is pretensioned; during dismantling the bearing or end cap can be spun off and cause injuries.

A suitable support device can be used to prevent the bearing or end cap from being spun off.

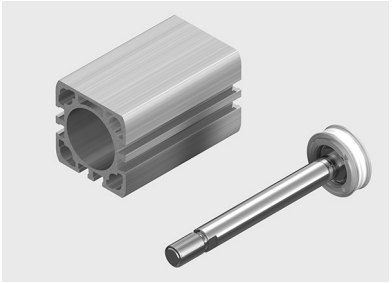
1. Mount the support device.
2. Unscrew the flange screws or socket head screws (AEN-80 / 100 only) from the bearing cap and end cap.
3. Dismantle the support device carefully and at the same time pull the bearing and end caps from the cylinder barrel and the piston rod.
4. Clean the threads of the screws to remove any locking agent residue.



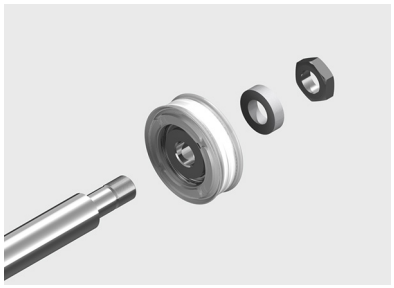
7.3 Replacing the piston components

1. Pull the piston rod out of the cylinder barrel.
2. Inspect 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.



3. Unscrew the hex nut and the washer from the piston rod.



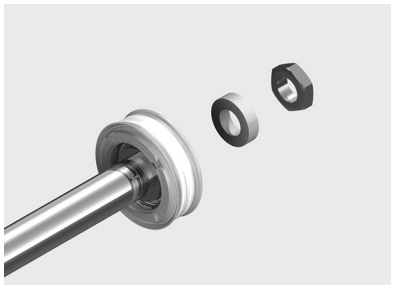
It is advisable to note the order and orientation of the piston components for assembly of the piston components on the piston rod later.

4. Remove the piston components from the piston rod.
5. Clean the threads of the piston rod and hex nut to remove any locking agent residue.
6. Replace the components contained in the set of wearing parts.

Note

The position of the slot for the compression spring on the piston must be noted in the case of the compact cylinders AEN-....

7. Re-assemble the piston components on the piston rod in the correct order and orientation.

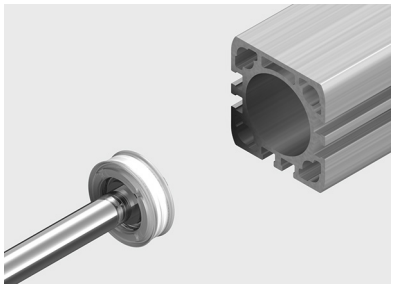


8. Place the washer on the piston rod.
9. Wet the hex nut with **high-strength** locking agent.
4. Tighten the hex nut with the appropriate tightening torque (see Table):

Type	Tightening torque
AEN-32	9.2 Nm
AEN-40	13.5 Nm
AEN-50	30 Nm
AEN-63	32 Nm
AEN-80	46 Nm
AEN-100	45.5 Nm

7.4 Inserting the piston rod into the cylinder barrel

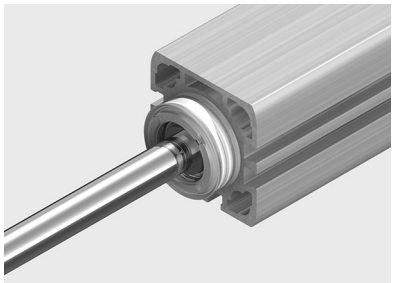
1. Clean the inside surface of the cylinder barrel as described in Chapter 8.1 “Cleaning”.
2. Grease the following parts with the grease included in the set of wearing parts:



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[1])	Fill 2/3 with grease

[1] see Chapter 8.2 “Greasing”

3. Position the piston flat against the front side of the cylinder barrel.
4. Insert the lip ring in the cylinder barrel by tilting and turning the ring slightly.



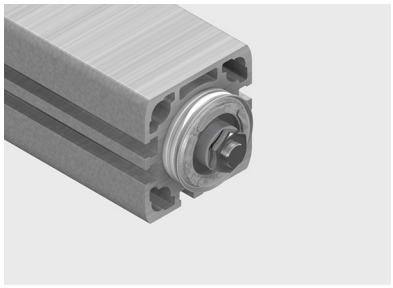
The sealing lip must not fold back against the inside of the piston.

Note

Use a flat, **blunt**-edged object to insert the lip ring into the cylinder barrel without damage.

5. Insert the piston fully into the cylinder barrel.

6. Push the piston into the cylinder barrel until the first lip ring protrudes slightly at the other end of the cylinder barrel.
7. Pull the piston rod back again until the piston sits fully in the cylinder barrel.

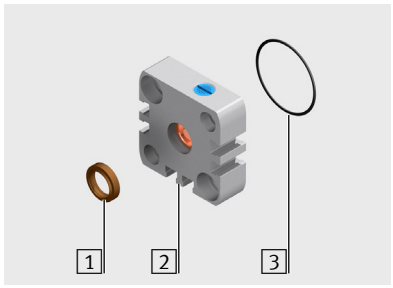


Note

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

7.5 Repairing and attaching the bearing and end caps

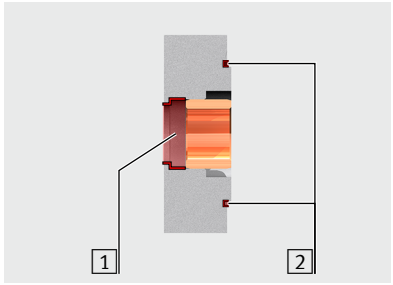
1. Remove the piston rod seal [1] from the bearing cap [2].
2. Remove the O-ring [3] from the slot of the bearing cap and end cap.



Note

Check the plain bearing in the bearing cap for visible damage that can impair its function, such as deposits and scoring. The entire bearing cap must be replaced if the plain bearing is showing significant damage.

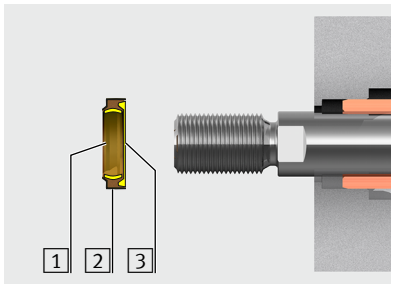
3. Clean the seat of the piston rod seal [1].
4. Clean the seat of the O-ring [2].



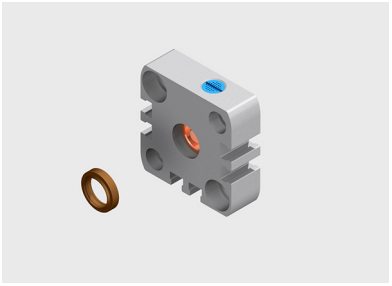
5. Grease the new piston rod seal as follows:

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

[1)] see Chapter 8.2 “Greasing”



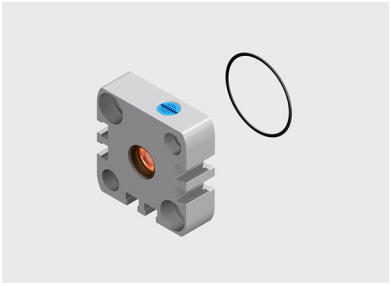
6. Insert the piston rod seal in the bearing cap.



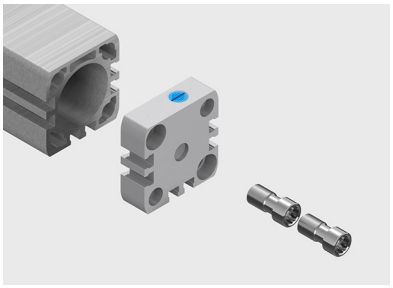
Note

Note the installation direction (individual sealing lip facing the outside).

7. Grease new O-rings:
8. Insert the greased O-rings in the grooves in the bearing cap and in the end cap.

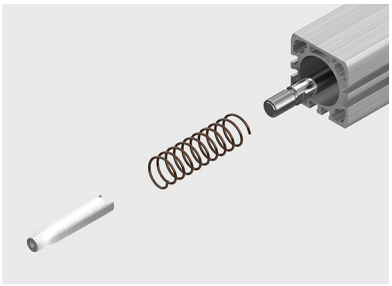


9. Position the rear end cap on the cylinder barrel.
10. Wet the flange screws or socket head screws (only AEN-80 / 100) with the locking agent in the wearing part set.
11. Screw the screws through the end cap and into the cylinder barrel.
12. Align the end cap flush with the cylinder barrel.
13. Tighten the screws with the appropriate tightening torque (see Table):



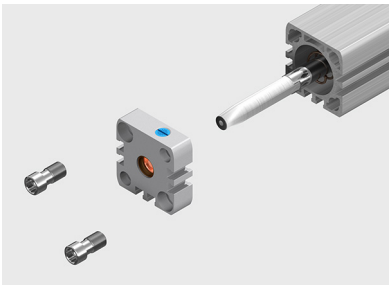
Type	Tightening torque
Flange screw	
AEN-32	27 Nm
AEN-40	27 Nm
AEN-50	35 Nm
AEN-63	35 Nm
Socket head screw	
AEN-80	8 Nm
AEN-100	9 Nm

14. Push the piston rod with the piston into the cylinder barrel until it stops.
15. Insert the compression spring in the seat of the piston.
16. Position the matching mounting sleeve (see Chapter 10.2 “Special tools”) on the thread of the piston rod to protect the bearing and seals from damage.



Note

The compression spring must be fixed in the seat of the bearing cap.



17. Push the bearing cap over the mounting sleeve (see Chapter 10.2 “Special tools”) onto the piston rod.

Caution

The compression spring of the AEN compact cylinder is tensioned during assembly of the bearing or end cap and can accidentally spin out the bearing or end cap and thus cause injuries.

A suitable support device can be used to prevent the bearing or end cap from being spun off.

18. Use a suitable support device to press the bearing cap onto the front end of the cylinder barrel.
19. Wet the flange screws or socket head screws (only AEN-80 / 100) with the locking agent in the wearing part set.
20. Screw the screws through the bearing cap and into the cylinder barrel.
21. Align the bearing cap flush with the cylinder barrel.
22. Tighten the screws with the appropriate tightening torque (see Table):

Type	Tightening torque
Flange screw	
AEN-32	27 Nm
AEN-40	27 Nm
AEN-50	35 Nm
AEN-63	35 Nm
Socket head screw	
AEN-80	8 Nm
AEN-100	9 Nm

23. Remove the support device.

7.6 Commissioning

Perform a functional test or start-up the repaired cylinder in accordance with the operating instructions (enclosed with the cylinder or can be found on the Festo webpage (➔ www.festo.com)).

8 Cleaning and Greasing

8.1 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.

All non-abrasive cleaning agents are permissible.

Note

Regular removal of the lubricant on the surface of the piston rod reduces its service life.

Note

- Clean with a soft, lint-free cloth and non-abrasive cleaning agents.
- Check the compatibility of the cleaning agent with the materials to be cleaned.

8.2 Greasing

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

Note

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.

8.2.1 Definition of terms

Grease reservoir

A defined quantity of grease is enclosed between two edges or in an enclosed ring volume.

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 paint brush, a fine bristle brush or similar.

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 excess grease.

9 Maintenance and care

Use a soft cloth to remove contamination from the piston rod.

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.

10 Tools

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

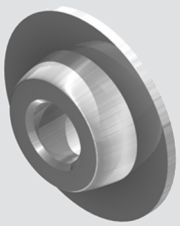
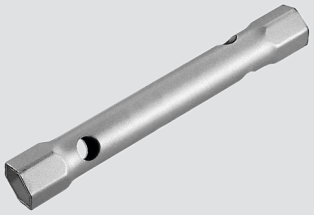
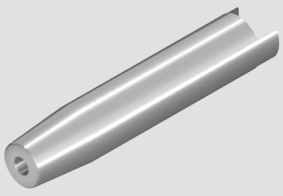
10.1 Standard tools

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)

10.2 Special tools

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

Designation	Used for	Order No.	Illustration
Slotted screwdriver M4, (DIN 546)	ADNGF-32/40	384354	
Slotted screwdriver M5, (DIN 546)	ADNGF-50–100	384355	
Centring aid for the cushioning boss	ADN / ADNGF-32-...-PPS	1356097	
	ADN / ADNGF-40-...-PPS	1437387	
	ADN / ADNGF-50-...-PPS	1437415	
	ADN / ADNGF-63-...-PPS	1437415	
	ADN / ADNGF-80-...-PPS	1441528	
	ADN / ADNGF-100-...-PPS	2585245	
Tubular box wrench		Wall thickness	
	ADN / ADNGF-32-...-PPS	1,6 mm	
	ADN / ADNGF-40-...-PPS	1,6 mm	
	ADN / ADNGF-50-...-PPS	2,3 mm	
	ADN / ADNGF-63-...-PPS	2,3 mm	
	ADN / ADNGF-80-...-PPS	2,3 mm	
	ADN / ADNGF-100-...-PPS	2,3 mm	
	The wall thickness of the tubular box wrench used together with the size of the wrench are key for ensuring that the installation is completed without damaging the cushioning boss.		
Mounting sleeve for piston rod	The mounting sleeve for piston rods for protecting the piston rod seal and the bearing in the bearing cap while the repair is being carried out must be produced by the customer. The schematic diagram is included in the information brochure **“Tool and repair accessories”**.		

Documents

Further information on the special tools and schematic diagrams is included in the information brochure **“Tool and repair accessories”**. The brochure can be found in the online spare parts catalogue on the Festo website (➔ Tools and repair accessories.pdf).

11 Liability

The general terms and conditions of business (Allgemeinen Geschäftsbedingungen - AGB) of Festo SE & Co. KG apply; these can be read on the Festo website (➔ www.festo.com).

Conditions of use for “Electronic documentation”

I. Patent rights and scope of use

The file of your choice is subject to protective provisions. Festo or third parties have patent rights to this electronic documentation, which Festo provides both on portable data storage media (diskettes, CD ROM, removable discs) as well as on the Internet and/or intranet (hereinafter referred to as the Electronic Documentation). In so far as third parties have a whole or partial right of access to this Electronic Documentation, Festo has the appropriate rights of use. Festo permits the user to use the Electronic Documentation under the following conditions:

1. Scope of use

a) The user of the Electronic Documentation is allowed to use this documentation for his own, exclusively company-internal purposes on any number of machines within his business premises (location). This right of use includes exclusively the right to save the Electronic Documentation on the central control units (machines) used at the location.

b) The Electronic Documentation may be printed out on a printer at the location of the user as often as desired, providing this printout is printed with or kept in a safe place together with these Conditions of Use and other user instructions.

c) With the exception of the Festo logo, the user has the right to use pictures and texts from the Electronic Documentation for creating his own machine and system documentation. The use of the Festo logo requires written consent from Festo. The user is responsible for ensuring that the pictures and texts used match the machine/system or the product.

d) Further uses are permitted within the following framework:

Copying exclusively for use within machine and system documentation compiled from electronic documents of all documented supplier components. Demonstrating to third parties exclusively under guarantee that no data material is stored wholly or partly in other networks or other data storage medium or can be reproduced there.

Passing on printouts to third parties not covered by the regulation in item 3 is forbidden, as is any other form of processing or other use.

2. Copyright notice

Every “Electronic Document” contains a copyright notice. This notice must be included on every copy and every printout.

Example: E 2003, Festo SE & Co. KG,

73734 Esslingen, Germany

3. Transferring the authorisation

of use

The user can transfer the authorisation of use entirely to a third party in the scope of and with the limitations of the conditions in accordance with items 1 and 2. The third party must be made explicitly aware of these Conditions of Use.

II. Exporting the electronic documentation

When exporting the Electronic Documentation, the licence holder must observe the export regulations of the exporting country and those of the purchasing country.

III. Warranty

1. Festo products are being continuously developed with regard to hardware and software. The hardware status and, where applicable, the software status of the product can be found on the rating plate of the product. If the Electronic Documentation, in whatever form, is not supplied with the product, i.e. is not supplied on a data storage medium (diskettes, CD ROM, removable disc) as a delivery unit with the relevant product, Festo cannot guarantee that the Electronic Documentation corresponds to every aspect of the product‘s hardware and software. In this case, only the printed documentation from Festo accompanying the product is decisive for ensuring that the hardware and software of the product matches that in the Electronic Documentation.

2. The information included in this Electronic Documentation can be amended by Festo without prior notice and does not constitute any obligation on the part of Festo.

IV. Liability/limitations on liability

1. Festo provides this Electronic Documentation to assist the user in creating his machine and system documentation.

If a product is not accompanied by Electronic Documentation in the form of data storage media (diskettes, CD ROM, removable disc), i.e. said Electronic Documentation is not automatically supplied together with that product, Festo cannot guarantee that the Electronic Documentation available/supplied separately matches the product actually used by the user.

The latter applies particularly to extracts of the documents for the user’s own documentation. The guarantee and liability for separately available/supplied portable data storage media, i.e. with the exception of Electronic Documentation provided on the Internet/intranet, are limited exclusively to proper duplication of the software, whereby Festo guarantees that, in each case, the relevant portable data storage medium or software contains the latest status of the documentation. There is no guarantee that the Electronic Documentation available on the Internet/Intranet will have the same version status as the last printed edition.

2. Furthermore, Festo cannot be held liable for the lack of economic success or for damage or claims by third parties resulting from the use of the documentation by the user, with the exception of claims arising from infringement of the patent rights of third parties concerning the use of the Electronic Documentation.

3. The limitations on liability as per paragraphs 1 and 2 do not apply if, in cases of intent or gross negligence or lack of warranted quality, a compulsory liability exists. In such cases, Festo‘s liability is limited to the damage discernable by Festo when the concrete circumstances are made known.

V. Safety guidelines/documentation

Warranty and liability claims in conformity with the aforementioned regulations (points III. and IV) may be raised only if the user has observed the safety guidelines of the Documentation in conjunction with the use

of the machine and its safety guidelines.

The user himself is responsible for ensuring that Electronic Documentation not supplied with the product matches the product actually used by the user.