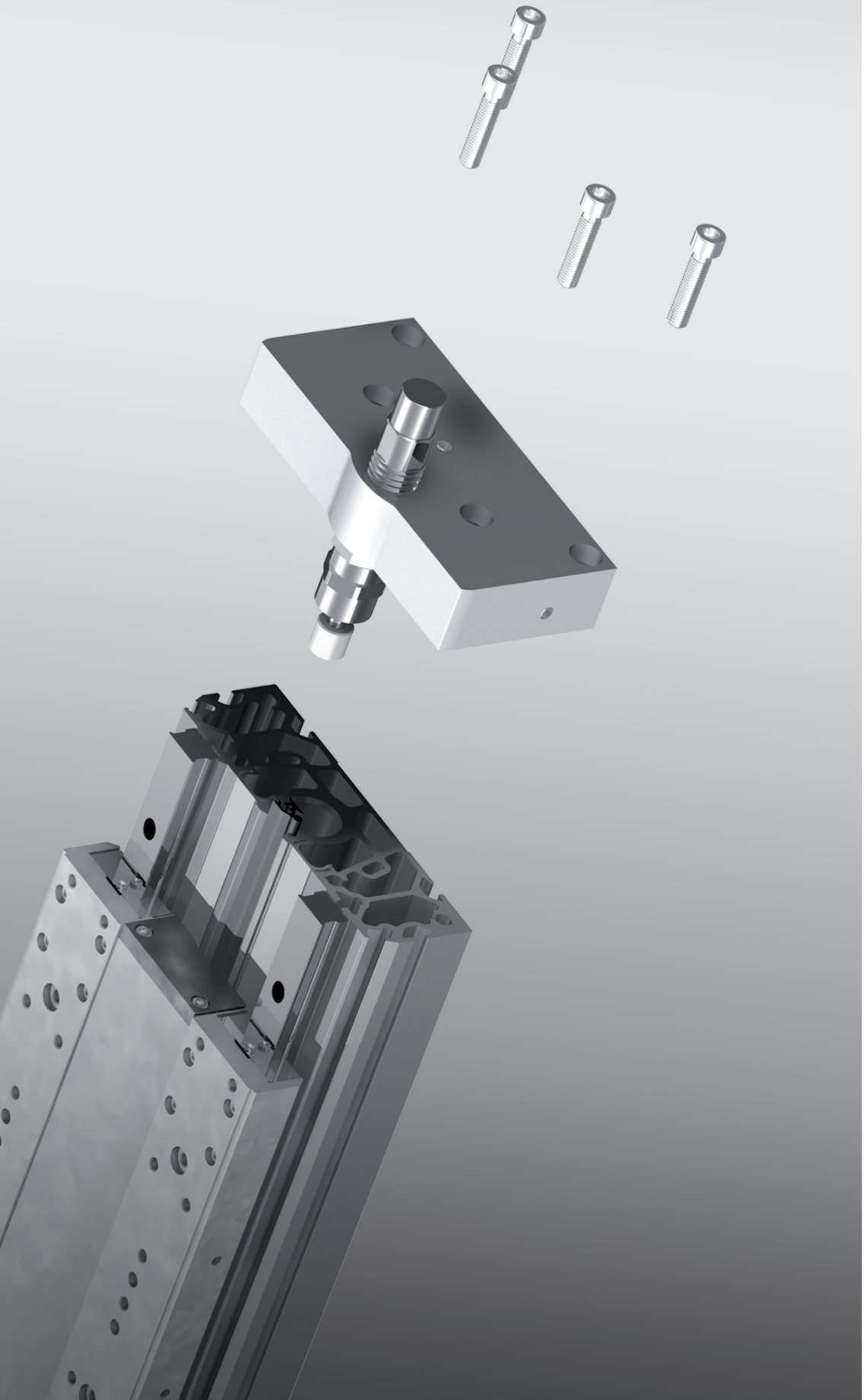
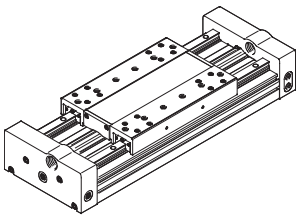
Linear actuator

DGC-18 / 25 / 40-...-HD-...



FESTO

Repair instructions (en)



7DGC-HDa_en

About this magazine

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Foreword

These repair instructions are valid for the linear drives listed on the title page to the exclusion of any liability claims.

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

These repair instructions have been prepared with care.

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

More detailed information on this can be found in Chapter 7 “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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Table of contents

1 Important information

1.1 About these repair instructions

This document contains important information about the professional repair of the linear drive type DGC-...-HD.

The DGC-...-HD linear drive is largely repairable.

At any rate, the costs of carrying out a repair must be considered in the case of larger defects.

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

For reasons of clarity, these repair instructions do not contain complete detailed information. The following documents should therefore also be available while doing repair work on the linear drive:

- **Operating instructions**
  Contains information about the control parts and connections for the linear drive, as well as information about function, construction, application, installation, commissioning, care and maintenance, etc. It can be found on the Festo website (www.Festo.com).
- **Spare parts documentation**
  Contains an overview of the spare and wearing parts as well as information on their installation. These can be found in the online spare parts catalogue on the Festo website (spareparts.festo.com).
- **Assembly aids**
  Contain an overview of available assembly aids such as lubricating greases, locking agents, maintenance tools, etc. (aids for assembly and maintenance). 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).

1.2 Pictograms used in these repair instructions

Warning
... means that serious injury to people and damage to property can occur if this warning is not heeded.

Caution
... means that injury to people and damage to property can occur if this warning is not heeded.

Note
... means that damage to property can occur if this warning is not heeded.

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:
Information on the environmentally friendly use of Festo products.

1.3 General safety information

Warning

The linear drive must only be repaired by authorised and trained persons in accordance with the specifications in the technical documentation and using original spare parts.

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

Repairs must only be carried out in conjunction with these repair instructions as well as 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.

Environment

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

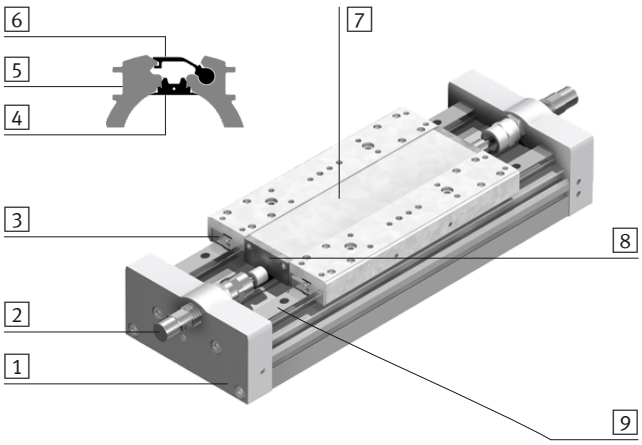
2 General product description

2.1 Functional description

When the compressed air ports are pressurised alternately, the internal slide moves backwards and forwards in the cylinder barrel. By means of a rigid connection between the internal slide and the slide, the slide also moves. The slot in the cylinder barrel required for this is covered by a band system. The slide is bearing mounted. The reference position of the slide can be detected using proximity sensors in the slots.

The linear drive DGC-...-HD is intended for positioning effective loads with large loads. It is approved for the slide and yoke operating modes (observe load limits).

The graphic provides you with an overview of the construction of the linear drive.



1 Connection / end cap
2 Shock absorber
3 Roller carriage
4 Sealing band
5 Basic profile
6 Cover strip
7 Slide
8 Blanking plate
9 Guide rail

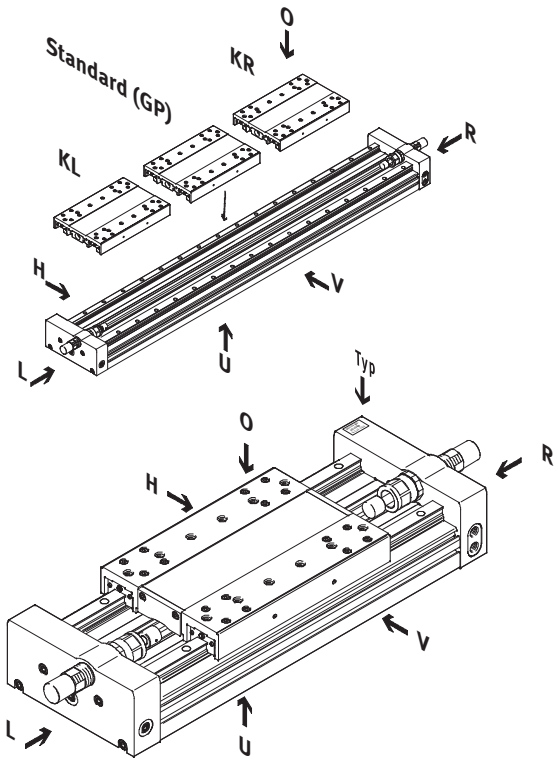
2.2 Types and part numbers

Type	Part number
DGC-18-...-HD	567547
DGC-25-...-HD	567548
DGC-40-...-HD	567549

The complete overview of features, accessories, type codes, technical data and dimensions for the DGC-...-HD linear drives can be found in the product catalogue or on the Festo website (www.Festo.com).

2.3 Mounting directions

The graphic provides you with an overview of the mounting directions and slide variants of the linear drive using the DGC-25-...-HD as an example.



Versions:

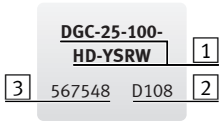
Standard = standard slide
GP = protected standard slide (not DGC-18)
KL = additional slide on left
KR = additional slide on right

Type = product designation (rating plate)
O = top
U = underneath
R = right
L = left
V = front
H = rear

2.4 Type codes (ascertaining the features of a linear drive)

The precise features of the linear drive can be ascertained with the help of the rating plate on the linear drive. The type designation is located directly beneath the Festo logo and describes the linear drive features separated by a hyphen (-).

Example:



1 Type designation
2 Serial number
3 Part number

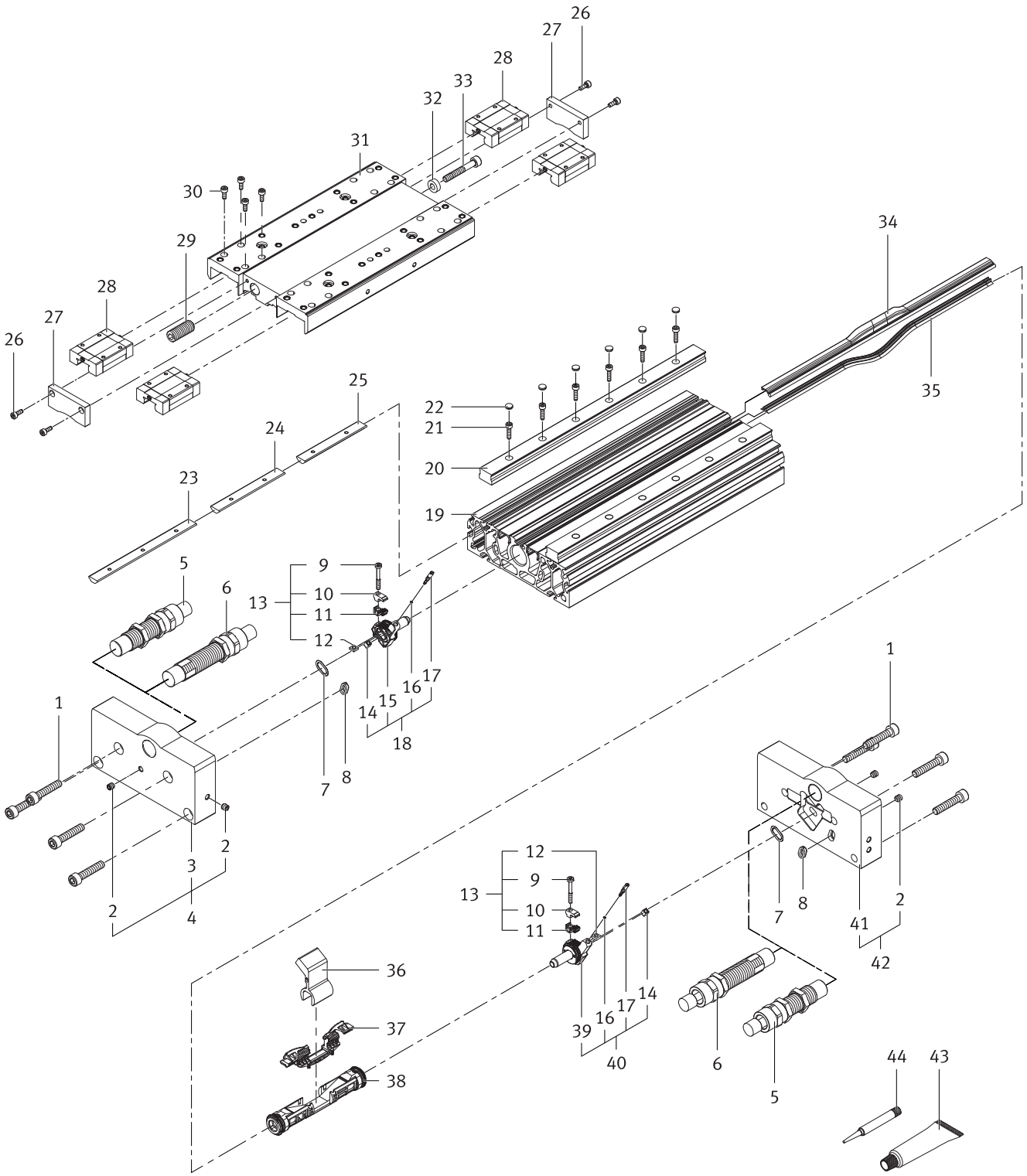
The type designation on this rating plate provides the following information:

DGC	Linear drive type DGC
25	Piston diameter 25 mm
100	Stroke 100 mm
HD	Heavy-duty guide HD
YSRW	Progressive shock absorber, self-adjusting

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

3 Component overview

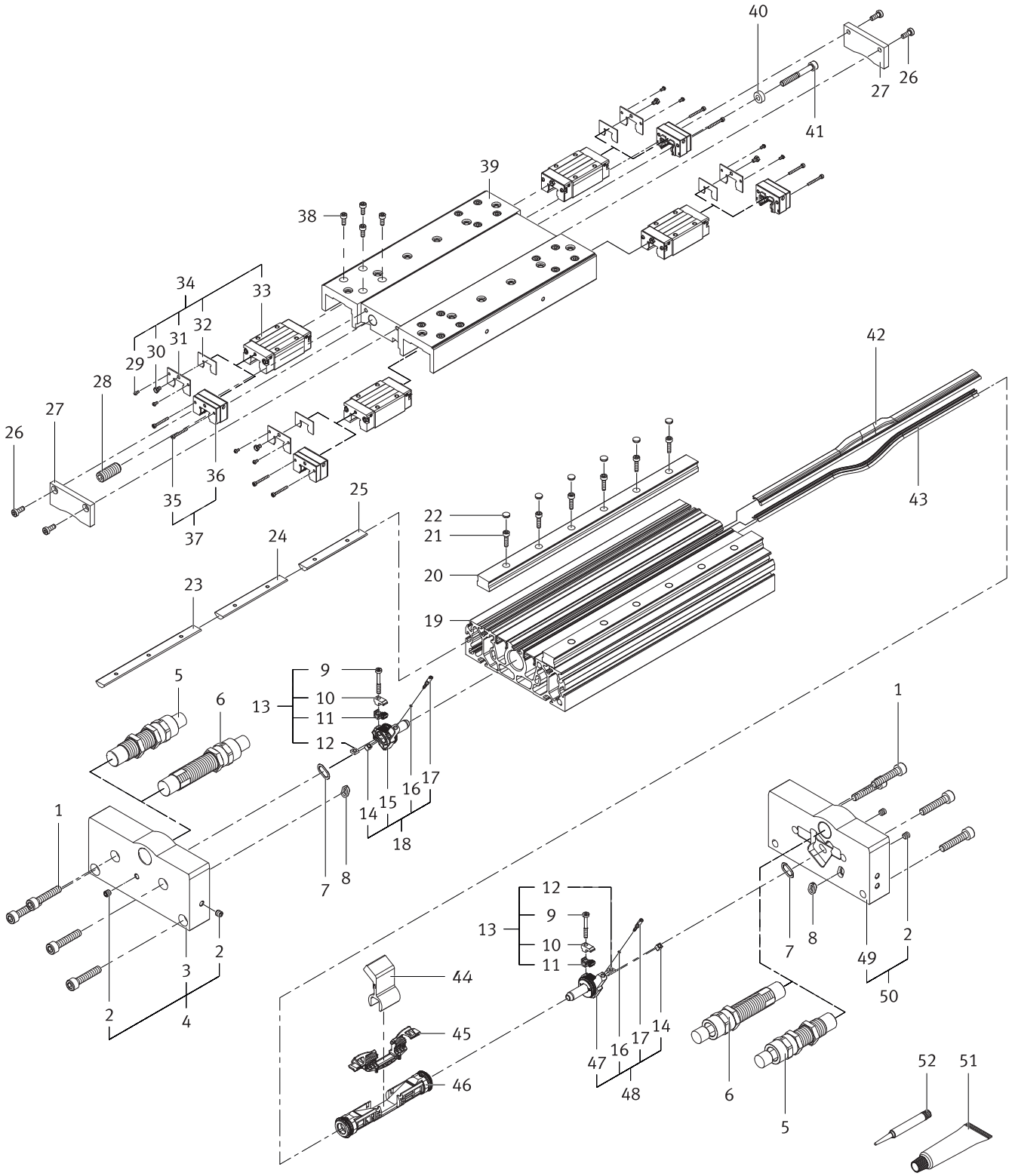
3.1 DGC-18-...-HD



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).

Position	Designation	Type	Note
1	Self-tapping screw	M6×30-10.9	Tightening torque 12 Nm
2	Threaded pin	DIN 913, M5×5-45H	Use LOCTITE 243
3	End cap		
4	Cover module		
5	Shock absorber module	YSR	Tightening torque 20 Nm
6	Shock absorber	YSRW	Tightening torque 20 Nm
7	O-ring	ISO 3601, B-9,5×1.5-N-NBR70	On mounting, grease with LUB-KC1 (silicone free).
8	Sealing ring		On mounting, grease with LUB-KC1 (silicone free).
9	Socket head screw	DIN 7984, M3×23-8.8	Tightening torque 0.2 Nm
10	Clamp		
11	Clamp, sealing band		
12	Square nut	DIN 562, M3	
13	Clamping component		
14	Buffer sleeve		
15	Buffer subassembly		On mounting, grease with LUB-KC1 (silicone free).
16	O-ring	ISO 3601, B-1×0,6-N-NBR70	On mounting, grease with LUB-KC1 (silicone free).
17	Regulating screw		On mounting, grease with LUB-KC1 (silicone free).
18	Buffer subassembly		
19	Cylinder barrel		On mounting, grease with LUB-KC1 (silicone free).
20	Roller track		On mounting, grease with LUB-KC1 (silicone free).
21	Socket head screw	DIN 912, M3×12-12.9	Tightening torque 2 Nm
22	Cover cap		
23	Slot nut		
24	Slot nut		
25	Slot nut		
26	Socket head screw	DIN 912, M3×8-12.9	Tightening torque 1 Nm, use LOCTITE 243
27	Stop plate		
28	Bearing cartridge		
29	Pin	M10×1×25	Tightening torque 3 Nm, use LOCTITE 243
30	Socket head screw	DIN 912, M3×8-12.9	Tightening torque 2.5 Nm, use LOCTITE 243
31	Slide module		
32	Washer		
33	Socket head screw	DIN 912, M5×35-10.9	Tightening torque 5 Nm, use LOCTITE 243
34	Cover strip		On mounting, grease with LUB-KC1 (silicone free).
35	Sealing band		On mounting, grease with LUB-KC1 (silicone free).
36	Coupling		
37	Belt reverser		On mounting, grease with LUB-KC1 (silicone free).
38	Piston module		On mounting, grease with LUB-KC1 (silicone free).
39	Buffer subassembly		On mounting, grease with LUB-KC1 (silicone free).
40	Buffer subassembly		
41	Connection cap		
42	Cover module		
43	Lubricating grease	LUB-KC1, silicone free 20 ml	
44	Adhesive locking agent	LOCTITE 243, 1 ml	

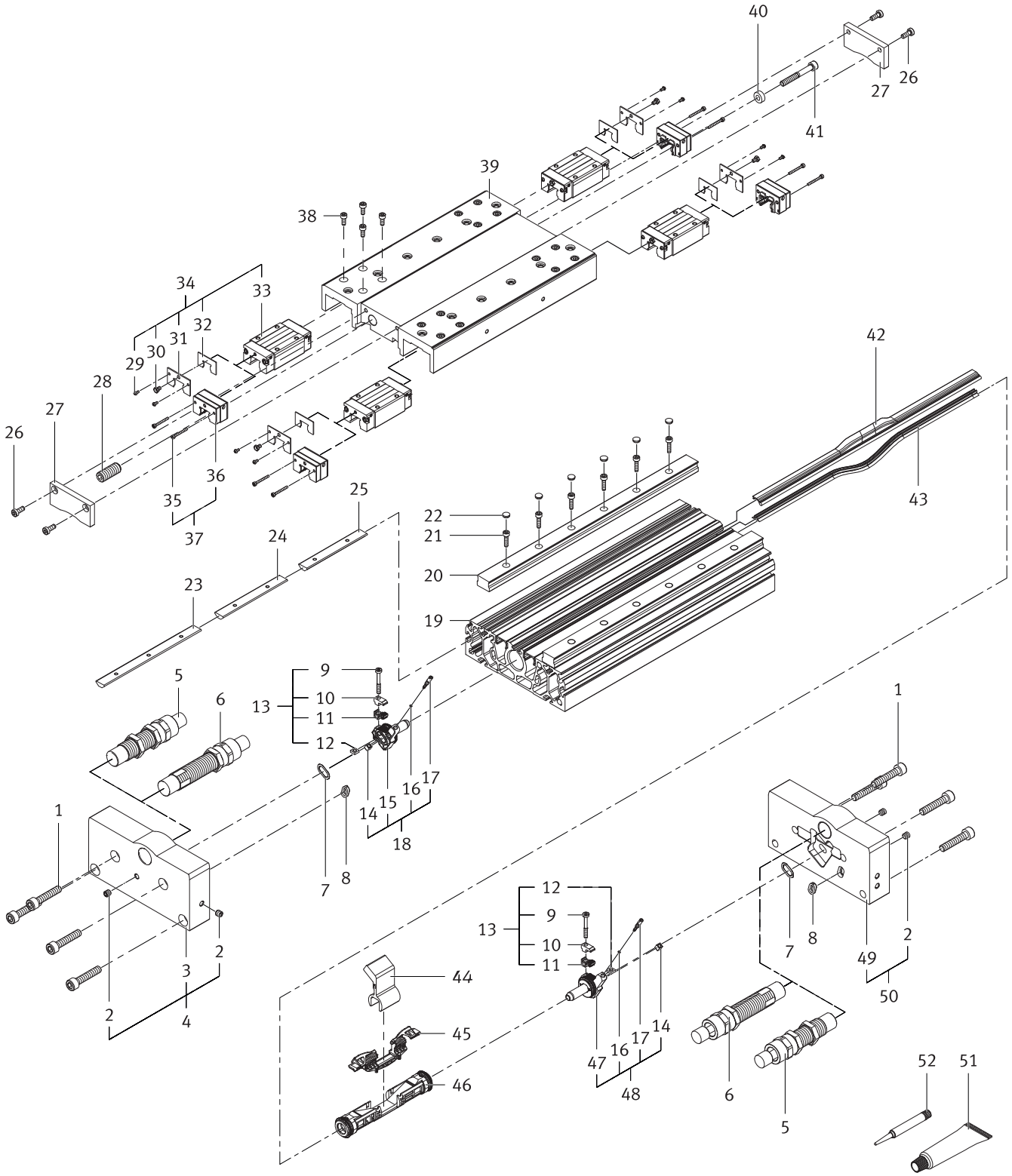
3.2 DGC-25-...-HD



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).

Position	Designation	Type	Note
1	Self-tapping screw	M6×40-10.9	Tightening torque 12 Nm
2	Plug screw		
3	End cap		
4	Cover module		
5	Shock absorber module	YSRC	Tightening torque 35 Nm
6	Shock absorber	YSRW	Tightening torque 35 Nm
7	O-ring	ISO 3601, B-12×1.5-N-NBR70	On mounting, grease with LUB-KC1 (silicone free).
8	Sealing ring		On mounting, grease with LUB-KC1 (silicone free).
9	Socket head screw	DIN 7984, M3×30-8.8	Tightening torque 0.4 Nm
10	Clamp		
11	Clamp, sealing band		
12	Square nut	DIN 562, M3	
13	Clamping component		
14	Buffer sleeve		
15	Buffer subassembly		On mounting, grease with LUB-KC1 (silicone free).
16	O-ring	2.2×1-S-NBR75	On mounting, grease with LUB-KC1 (silicone free).
17	Regulating screw		On mounting, grease with LUB-KC1 (silicone free).
18	Buffer subassembly		
19	Cylinder barrel		On mounting, grease with LUB-KC1 (silicone free).
20	Roller track		On mounting, grease with LUB-KC1 (silicone free).
21	Socket head screw	DIN 912, M4×14-12.9	Tightening torque 4.7 Nm
22	Cover cap		
23	Slot nut		
24	Slot nut		
25	Slot nut		
26	Socket head screw	DIN 6912, M4×10-8.8	Tightening torque 2 Nm, use LOCTITE 243
27	Stop plate		
28	Pin	M10×1×25	Tightening torque 3 Nm, use LOCTITE 243
29			
30	Lubrication nipple		
31			
32			
33			
34	Bearing cartridge		
35	Socket head screw	DIN 912, M4×10-10.9	Tightening torque 5 Nm
36			
37	Lubrication adapter		
38	Socket head screw	DIN 912, M4×10-10.9	Tightening torque 5 Nm, use LOCTITE 243
39	Slide module		
40	Washer		
41	Socket head screw	DIN 912, M5×40-10.9	Tightening torque 6 Nm, use LOCTITE 243
42	Cover strip		On mounting, grease with LUB-KC1 (silicone free).
43	Sealing band		On mounting, grease with LUB-KC1 (silicone free).
44	Coupling		
45	Belt reverser		On mounting, grease with LUB-KC1 (silicone free).
46	Piston module		On mounting, grease with LUB-KC1 (silicone free).
47	Buffer subassembly		On mounting, grease with LUB-KC1 (silicone free).
48	Buffer subassembly		
49	Connection cap		
50	Cover module		
51	Lubricating grease	LUB-KC1, silicone free 20 ml	
52	Adhesive locking agent	LOCTITE 243, 1 ml	

3.3 DGC-40-...-HD



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).

Position	Designation	Type	Note
1	Self-tapping screw	M8×55-10.9	Tightening torque 30 Nm
2	Plug screw		
3	End cap		
4	Cover module		
5	Shock absorber module	YSRC	Tightening torque 60 Nm
6	Shock absorber	YSRW	Tightening torque 60 Nm
7	O-ring	ISO 3601, B-19×2-N-NBR70	On mounting, grease with LUB-KC1 (silicone free).
8	O-ring	ISO 3601, B-11,5×1.5-N-NBR75	On mounting, grease with LUB-KC1 (silicone free).
9	Socket head screw	DIN 912, M4×45-8.8	Tightening torque 1 Nm
10	Clamp		
11	Clamp, sealing band		
12	Square nut	DIN 562, M4	
13	Clamping component		
14	Buffer sleeve		
15	Buffer subassembly		On mounting, grease with LUB-KC1 (silicone free).
16	O-ring	ISO 3601, B-3×1.2-N-NBR70	On mounting, grease with LUB-KC1 (silicone free).
17	Regulating screw		On mounting, grease with LUB-KC1 (silicone free).
18	Buffer subassembly		
19	Cylinder barrel		On mounting, grease with LUB-KC1 (silicone free).
20	Roller track		On mounting, grease with LUB-KC1 (silicone free).
21	Socket head screw	DIN 912, M6×20-12.9	Tightening torque 15.7 Nm
22	Cover cap		
23	Slot nut		
24	Slot nut		
25	Slot nut		
26	Socket head screw	DIN 912, M4×12-10.9	Tightening torque 2 Nm, use LOCTITE 243
27	Stop plate		
28	Pin	M10×1×25	Tightening torque 5 Nm, use LOCTITE 243
29			
30	Lubrication nipple	DIN 3405, AM6	
31			
32			
33			
34	Bearing cartridge		
35	Socket head screw	DIN 912, M6×12-10.9	Tightening torque 18 Nm
36			
37	Lubrication adapter		
38	Socket head screw	DIN 912, M6×12-10.9	Tightening torque 18 Nm, use LOCTITE 243
39	Slide module		
40	Washer		
41	Socket head screw	DIN 912, M8×70-10.9	Tightening torque 20 Nm, use LOCTITE 243
42	Cover strip		On mounting, grease with LUB-KC1 (silicone free).
43	Sealing band		On mounting, grease with LUB-KC1 (silicone free).
44	Coupling		
45	Belt reverser		On mounting, grease with LUB-KC1 (silicone free).
46	Piston module		On mounting, grease with LUB-KC1 (silicone free).
47	Buffer subassembly		On mounting, grease with LUB-KC1 (silicone free).
48	Buffer subassembly		
49	Connection cap		
50	Cover module		
51	Lubricating grease	LUB-KC1, silicone free 20 ml	
52	Adhesive locking agent	LOCTITE 243, 1 ml	

4 Repair steps

4.1 Preparation for dismantling the linear drive

Before starting the repair, remove any attachments in accordance with the instructions in the accompanying operating instructions.

Keep your working environment tidy.

Only use the spare parts and assembly aids (grease, locking agent, etc.) provided in the components list, see Chapter 3 “Component overview”.

Before dismantling the linear drive, it is imperative that the cause of the failure is investigated to prevent, for example, repeated and premature failure. A linear drive which has been used as intended will not exhibit any premature signs of failure.

This is not necessary in the case of non-premature failure (fatigue time).

The condition of the slide (e.g. noticeable bearing clearance, faulty sliding performance and increased sliding noises etc.), the piston with all components in the piston chamber (e.g. piston seals, sealing band, cover strip, covers) and all sealing rings should also always be assessed. In case of uncertainty, it is recommended to replace all the components mentioned so as to rule out reciprocal effects during later operation. If the linear drive suffers premature failure, the operating conditions must be examined more closely.

The following possibilities should be considered among others:

- **Overloading**

  In case of overloading the application parameters (moving mass, speed, operating pressure, operation medium) must be adjusted accordingly.
- **Ambient conditions/material resistance**

  Ensure that the ambient conditions are within the permitted range.

  Check the chemical and physical ambient conditions for hazardous substances, such as dust, abrasive particles, cooling lubricants, solvents, ozone, radiation, water-soluble greases and oils, etc.

Caution

Make sure that the connection cap and end cap cannot suddenly fly off.

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

Please note

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

Once the linear drive is dismantled, the piston module, shock absorber subassembly and the roller carriages can be replaced, see from page 18.

The wearing parts are ordered from the online spare parts catalogue (spareparts.festo.com) quoting the appropriate part number (dependent on the size of the linear drive).

The part number is an x-stroke part number. This means that you must specify the stroke of the linear drive in addition to the part number when ordering. The stroke can be determined from the type codes on the rating plate of the linear drive. Using this information, you can calculate the necessary length or sealing band/cover strip, see page 22.

4.2 Visual inspection

Check the linear drive for visible damage that might impair its function, such as deposits and scoring. The entire linear drive must be replaced if the cylinder barrel and/or roller tracks are showing signs of significant damage.

4.3 Dismantling the linear drive DGC-...-HD

This chapter describes how to completely dismantle the linear drive and the individual components or subassemblies.

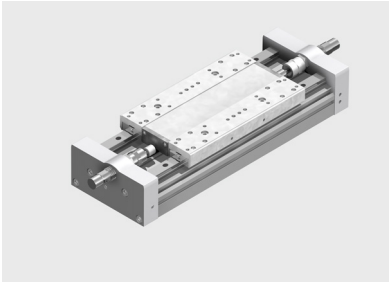
The linear drive does not need to be completely dismantled for every fault in order to replace faulty components.

The complete dismantling process described here is designed to provide a complete overview of the components and how they are accessed in case they need to be replaced.

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

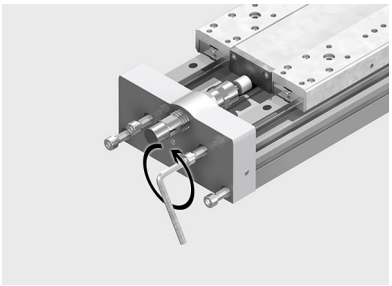
Steps for dismantling the linear drive

- Place the linear drive as shown on the work surface with the slide facing upwards.



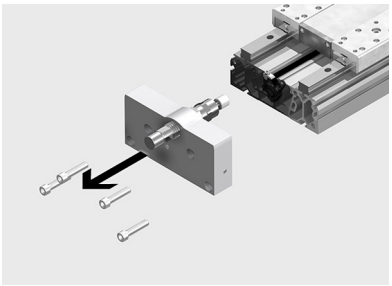
- Unscrew the self-tapping screws from the connection cap and end cap.

The basic principle of self-tapping screws means they have a high level of holding force and require greater exertion of force when unfastening them.



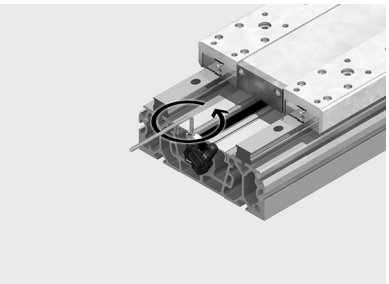
- Remove the connection cap and end cap from the cylinder barrel.

When removing the connection cap and end cap, ensure that the O-ring does not fall out and get lost.



If only the roller carriages need to be replaced or relubricated, the two buffer subassemblies do not need to be dismantled. The corresponding steps can therefore be skipped.

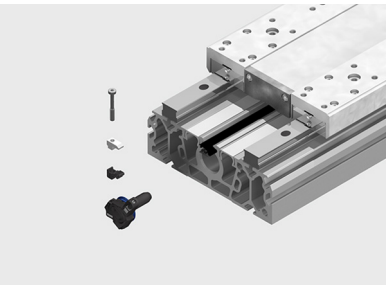
- Remove the locking paint from the socket head screw on both buffer subassemblies using a screwdriver or similar tool.



When removing the socket head screw and the clamping plates, ensure that the square nut does not get lost.

- Unscrew the socket head screw of the band clamping completely on the two buffer subassemblies and remove the clamping plates from the cover strip / sealing band.
- Remove the square nut from the buffer.

- Unscrew the buffer subassembly from the cylinder barrel at both ends of the linear drive.

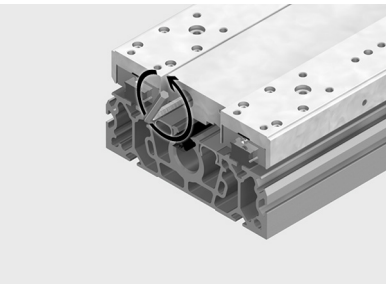


Please note

The slide module with piston must never be pushed down from the linear drive, as the ball bearings could fall out of the recirculating system.

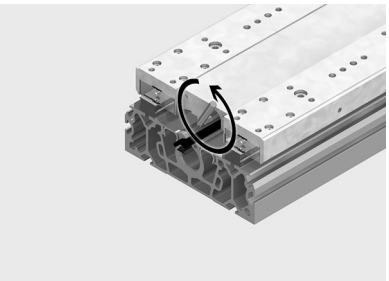
- Unscrew the socket head screws of both stop plates from the slide plate.
- Remove both stop plates.

- Unscrew the pin of the coupling clamping on the left side of the slide plate.

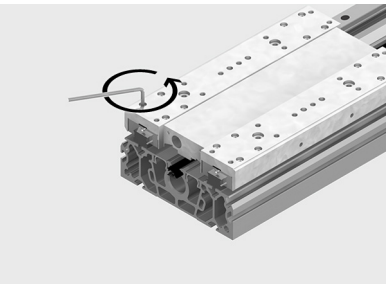


When removing the socket head screw, ensure that the spacer sleeve on the socket head screw does not get lost.

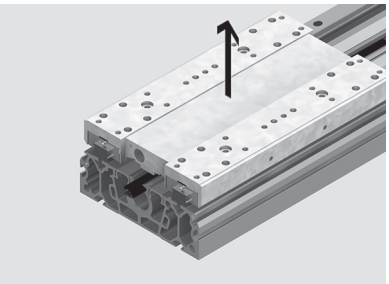
- Unscrew the socket head screw of the coupling clamping on the right side of the slide plate and remove it.



- Unscrew the socket head screws (16 screws) and remove them.



- Remove the slide plate upwards out of the roller carriages.

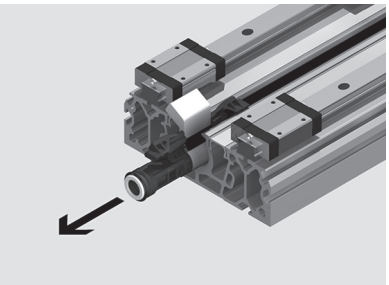


If the roller carriages need to be relubricated, ensure that they are not pushed from the guide ways, see Chapter Chapter 4.5.3 “Lubricating the recirculating ball bearing guide”. Any ball bearings that fall out of the recirculating system must be re-inserted.

If only the roller carriages are replaced and the piston module and cover strips remain assembled, the steps to disassemble and dismantle the piston and bands and to replace the shock absorber subassembly can be skipped.

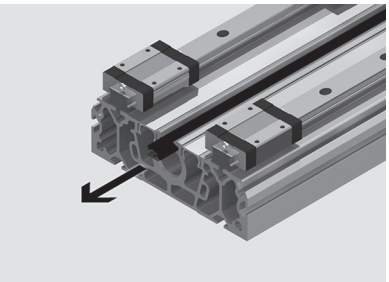
Replacement of the roller carriages is described in Chapter “Replacing the roller carriages”.

- Carefully push the piston module out of the cylinder barrel.



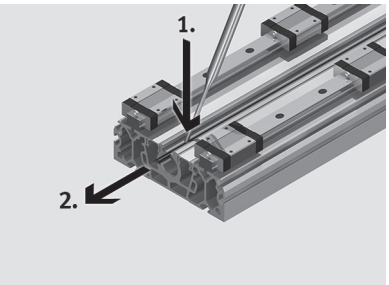
Dismantling and repair of the piston module is described in Chapter 4.4 “Dismantling and repairing the piston module”.

- Pull the cover strip from the cylinder barrel.
- If necessary, clean the cover strip with a soft cloth.



Check the cover strip for cracks after dismantling. If there is damage, the cover strip must be replaced.

- Push the sealing band inwards (1) and out of the guide groove with a blunt object and pull it out of the cylinder barrel (2).
- Clean the sealing band with a soft cloth.



Check the sealing band for cracks after dismantling. If there is damage, the sealing band must be replaced. Cracks in the sealing band prevent smooth sealing and restrict the functioning of the drive.

- Clean the cylinder barrel with a soft cloth.
- Check the bearing surface of the piston in the cylinder barrel for deep scoring or defects.

Deep scoring or defects restrict the functioning of the linear drive as the seals on the piston can no longer provide adequate sealing and air can penetrate the other cylinder chambers.

If deep scoring or defects are visible, the entire linear drive must be replaced.

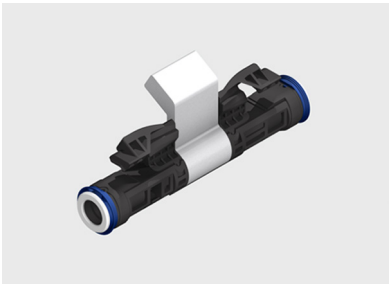
4.4 Dismantling and repairing the piston module

4.4.1 Dismantling the piston module

If the piston is still installed in the linear drive, this must first be dismantled and the linear drive disassembled, see from page 14.

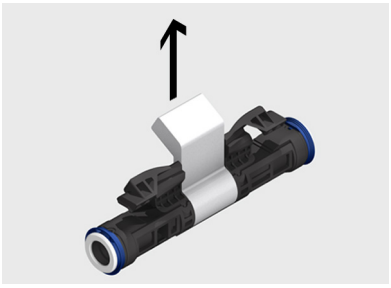
Please note

If there are signs of wear or damage, Festo recommends replacing the entire piston module, consisting of coupling, band reverser and piston.

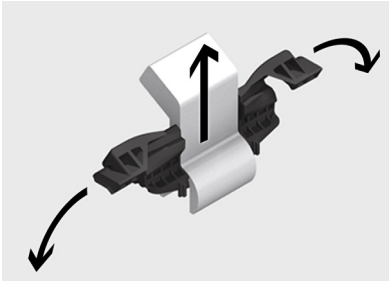


- Remove the coupling, together with the band reverser, from the piston.

When removing the coupling from the piston, a certain amount of force is required.

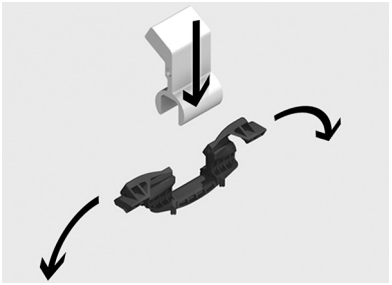


- Bend the band reverser slightly apart and pull it off the coupling.
- Check both parts for wear.



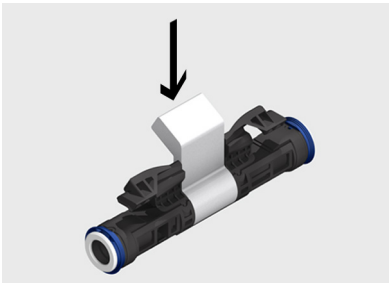
4.4.2 Assembling the piston module

- Slightly bend the band reverser and clip it into the coupling.



Please note
Ensure that the band reverser faces the coupling (see figure).

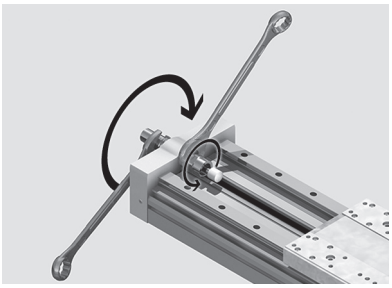
- Connect the coupling with the band reverser to the piston.
- Grease the sealing rings and the band reverser. Observe the greasing instructions in the table in Chapter 4.6.1 “Lubricating during assembly”.
- Assemble the linear drive as described in Chapter 4.7 “Assembling the linear drive DGC-...-HD”.



4.5 Replacing the shock absorber module

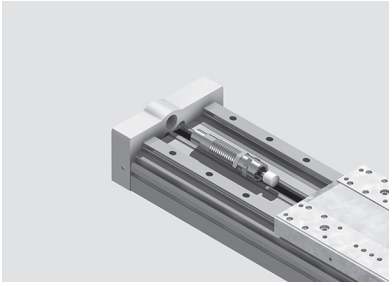
If it is not possible to dismantle the shock absorber subassembly with mounted connection caps and end caps, e.g. because the stroke of the cylinder is too low, the connection cap / end cap with the faulty shock absorber must be removed from the cylinder barrel.
For dismantling of the connection cap / end cap, see page 15.

- Loosen the lock nut of the shock absorber subassembly.
- Unscrew the shock absorber subassembly from the connection caps / end caps.



- Install the new shock absorber subassembly once again in reverse order and tighten the lock nuts with the appropriate tightening torque.

Type	Tightening torque
DGC-18-...-HD	20 Nm
DGC-25-...-HD	35 Nm
DGC-40-...-HD	60 Nm



Replacing the roller carriages

Festo recommends, as a basic principle, that you always replace the entire linear drive if a defect occurs in the linear recirculating ball bearing guide system.

Replacement of the roller carriages is possible, but is undertaken by users at their own risk.

If there is a fault in the guide rails, please contact Festo.

The linear recirculating ball bearing guide system consists of two guide rails and the associated four rows of recirculating ball bearing units (roller carriages) with ball bearing chain. The guiding system is set based on the ball bearing size with the preload class V1 and cannot be changed.

It might be necessary to replace the linear drive under the following circumstances, for example:

The end of the linear recirculating ball bearing guide system's service life has been reached as a result of material fatigue and wear. Signs of fatigue appear on the material areas of the rolling components. Fine cracks, pores and pits (depending on the wear condition) as well as deformation of the roller bodies occur. Pitting on the bearing surface of the guide rail can be observed visually as the bearing surface is noticeably uneven. This can result in perceptible bearing clearance, impaired roll-off and increased operating noise, etc.

Please note

Incorrect default values for the braking ramp during STOP statuses (e.g. emergency off, quick stop) result in overloading of the linear drive and can destroy it or dramatically reduce its service life.

- Check the settings for all braking ramps in the controller or the higher-order control system (deceleration values and jerk).
- Make sure that the deceleration values (braking deceleration, deceleration times) for the speed, the load to be moved and the installation position (horizontal/vertical) as well as the maximum driving torque or the feed force correspond to the linear drive used.
- Use the Festo "Positioning Drives" engineering software, available via the Festo website (www.festo.com), to size the linear drive.

The application must be checked for the following causes in the event of premature failure due to increased wear:

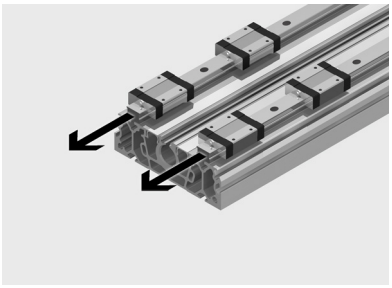
- Lack of lubrication; lubrication interval not adhered to (unlubricated operation).
- Use of a lubricating grease not contained in the specification.
- Dirty and corrosive ambient conditions (dust, etc.).
- Impact and vibration.
- Technical limit data exceeded (torques, forces, speed, temperature range, etc.).
- Flatness of the attachments screwed onto the slide, setpoint value ‹0.01 mm (distortion).
- For applications with parallel drives, the following must be checked:
  - Parallelism of the guide rails with one another
  - Height misalignment between the slides

  If there is a deviation, this can lead to tension in the recirculating ball bearing guide and thus overloading of the guiding system. An assessment of the parallelism and height misalignment based on the displacement force is not possible. The alignment should be performed based on measurement. An additional adjusting device may be installed as a constructive option for aligning the axes of the linear drives with one another.

4.5.1 Dismantling the roller carriages

If the connection cap / end cap as well as the slide plate are not yet mounted, these first have to be dismantled, see from page 14.

The recirculating ball bearing guide system is pre-tensioned. Individual ball bearings can therefore easily fall out of the recirculating system and get lost when pushing the roller carriages from the guide rail. For this reason, only push down the roller carriages off the guide rail when replacing them.



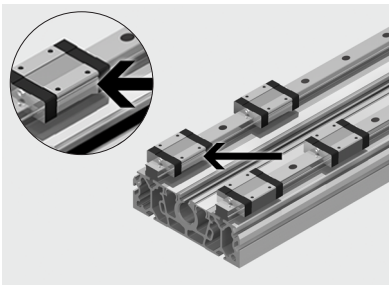
- Carefully push the roller carriages off the guide rail.

4.5.2 Assembling the roller carriages

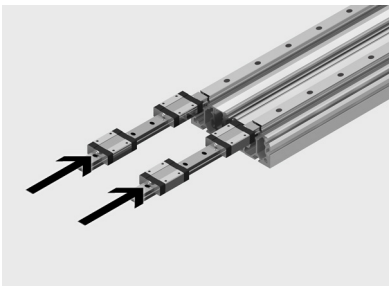
Please note

New roller carriages must be greased before commissioning the linear drive, see Chapter 4.5.3 “Lubricating the recirculating ball bearing guide”. Non-compliance can lead to unlubricated operation and thus failure of the linear drive before the next specified regreasing interval.

Pay attention to the installation position when positioning the new roller carriages. The ground surface at all 4 roller carriages faces inwards, towards the sealing band and cover strip.

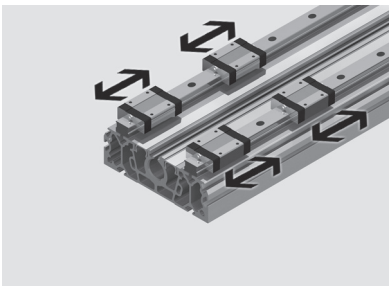


- Position the roller carriages with the transport rail directly at the guide rail of the linear drive.
- Slowly push the roller carriages onto the guide rail, ensuring that no ball bearings fall out of the roller carriages.



Ball bearings that have come out of the roller carriages must be replaced in the corresponding roller carriages.

- Check the guide backlash and the displacement resistance by moving the roller carriages several times.



The roller carriages must move smoothly and without jerking on the guide rail. There must be **no** guide backlash.

The backlash of the roller carriages is not adjustable. If the operating behaviour is not correct, check the guide rail and replace the entire linear drive if necessary.

4.5.3 Lubricating the recirculating ball bearing guide

The recirculating ball bearing guides have to be lubricated with a grease gun before commissioning and in certain intervals.

Lubrication intervals:

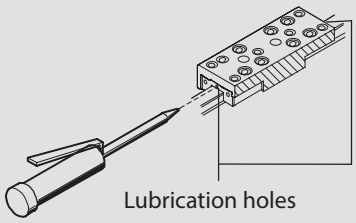
The roller carriages should be relubricated with Festo LUB-KC1 after 3 years or a corresponding operating distance (load-dependent).

The lubrication intervals are halved under the following operating conditions:

- Ambient temperatures › 40 °C
- Nominal strokes › 2000 mm
- Speeds › 2 m/s
- Increased dirt in the environment (e.g. grinding dust, etc.)
- Positioning profile ≙ delta operation (frequent acceleration and braking)
- If the DGC-18 / 25 / 40-...-HD is more than 3 years old.

Please note

The roller carriages must be moved forwards and backwards on the guide rail during lubrication so that the grease penetrates all the spaces in the roller carriages. The lubricant must be inserted into both lubrication holes on the front side as the two roller carriages do not share lubricant.



Festo offers a one-hand high-pressure grease gun with a suitable pinpoint nozzle for greasing the lubricating holes, see Chapter 6.2 “Special tools”.

4.6 Preparation for assembling the linear drive

When assembling the linear drive, wearing parts such as the sealing band, cover strip, seals and the piston module can be replaced.

The wearing parts are ordered from the online spare parts catalogue (spareparts.festo.com) quoting the appropriate part number (dependent on the size of the linear drive).

The part number is an x-stroke part number. This means that you must specify the stroke of the linear drive in addition to the part number when ordering. The stroke can be determined from the type codes on the rating plate of the linear drive. Using this information you can calculate the necessary length or sealing band/cover strip.

4.6.1 Lubricating during assembly

When assembling the linear drive, various components have to be greased in accordance with the table below.

Component	Lubricant	Lubrication regulation
Cylinder barrel	Festo LUB-KC1[1)]	Apply a layer of grease to the slot and all around and along the entire length of the cylinder bore.
Sealing band	Festo LUB-KC1[1)]	Apply a layer of grease all around and along the entire length.
Cover strip	Festo LUB-KC1[1)]	Apply a layer of grease all around and along the entire length.
Piston	Festo LUB-KC1[1)]	Grease all around.
Seal, piston exterior	Festo LUB-KC1[1)]	Grease all around.
Seal, piston, inside	Festo LUB-KC1[1)]	Grease all around.
Cushioning boss	Festo LUB-KC1[1)]	Grease all around.
Seal, buffer	Festo LUB-KC1[1)]	Grease all around.
Belt reverser	Festo LUB-KC1[1)]	Grease in the deflection area.

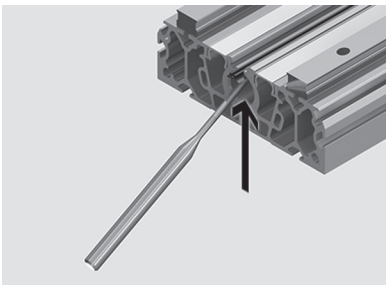
[1)] See “Assembly aids” in the online spare parts catalogue on the Festo website (www.Festo.com).

4.7 Assembling the linear drive DGC-...-HD

- Grease the cylinder barrel and the sealing band and cover strip in accordance with the instructions.

Observe the lubrication regulation, see Chapter 4.6.1 “Lubricating during assembly”.

- Insert the sealing band in the cylinder barrel so that approximately 10 mm of the sealing band protrudes from one end of the cylinder barrel.

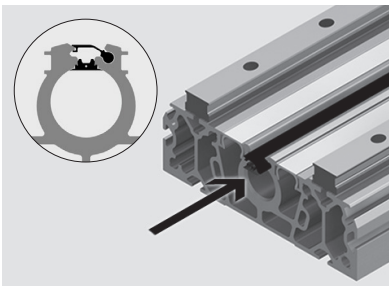


Please note

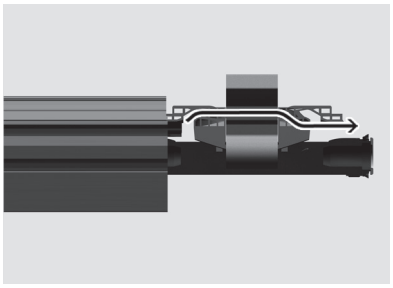
The sealing band must never be pressed into the guide groove with a sharp object, as this could damage the sealing band.

- Use your finger or a blunt object to press as much of the sealing band as possible into the guide groove of the cylinder barrel from inside.

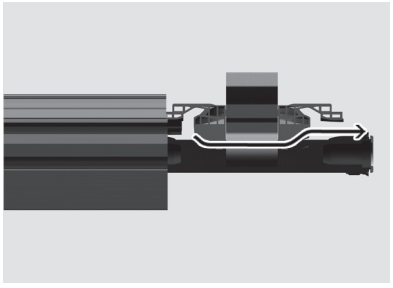
- Insert the cover strip in the cylinder barrel so that approximately 10 mm of the cover strip protrudes from one end of the cylinder barrel.



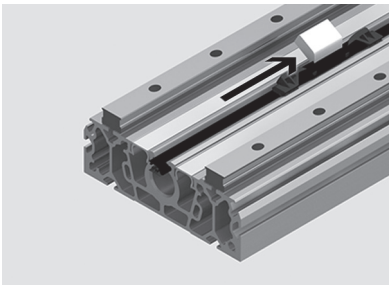
- Grease the piston and band reverser in accordance with the instructions, see Chapter 4.6.1 “Lubricating during assembly”.
- Insert the piston into the cylinder barrel until the excess cover strip and the excess sealing band can be pressed into the respective guides.
- Push the cover strip into the upper sliding notch of the band reverser using a blunt object.



- Push the sealing band into the lower sliding notch of the band reverser using a blunt object.



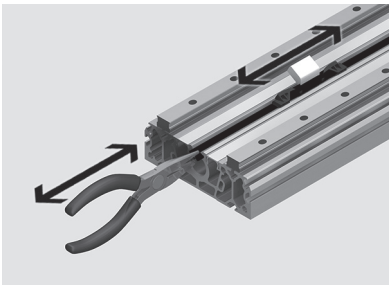
- Insert the piston fully into the cylinder barrel.



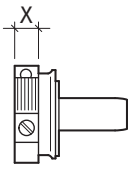
When inserting the piston, the right sealing lip could bend. So that this can be re-positioned correctly, the piston must be inserted until it reaches the other end of the cylinder barrel and the sealing lip emerges out of the cylinder barrel and can be folded over. When moving the piston along the length of the cylinder barrel, the sealing band is also fixed in the slot.

- Push the piston until it reaches the other end of the cylinder barrel and the sealing lip emerges.
- Insert the piston back into the cylinder barrel.

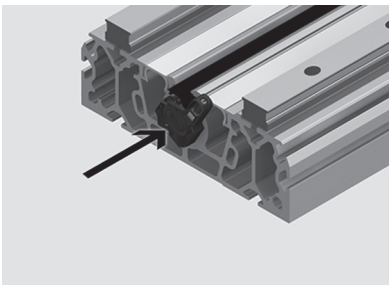
- Adjust the excess sealing band and cover strip by moving the piston back and forth and pulling or pushing the respective bands at the same time so that the excess band is no greater than the width of the contact surface (X) on the buffer (see table).



Type	Width of the contact surface X
DGC-18-...-HD	6 mm
DGC-25-...-HD	7 mm
DGC-40-...-HD	9 mm



- Grease the first buffer in accordance with the instructions, see Chapter 4.6.1 “Lubricating during assembly”.



Please note

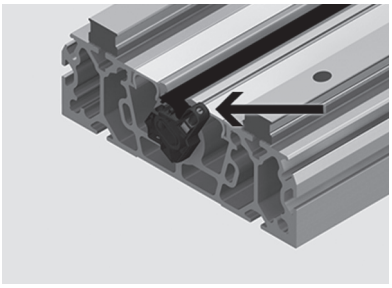
When pressing the buffer, ensure that the sealing lip is not damaged. Never use a sharp object to press the object into the cylinder barrel.

The sealing band and cover strip must not protrude beyond the buffers. Otherwise the connection cap / end cap cannot form an air-tight seal and may have an adverse effect on the functioning of the linear drive. The sealing band and cover strip must be shortened so that they seal off flush with the outer edge of the two buffers. However, it is better if they are slightly short of the buffers.

- Press the buffer into the cylinder barrel and position it so that the band clamping in the buffer is aligned with the sealing band and cover strip.

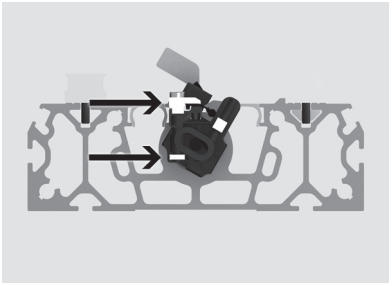
When using shock absorbers at the end connection / end caps, the regulating screw for the end-position cushioning must be fully open.

- Unscrew the screw of the end-position cushioning until the screw head is flush with the buffer.
- Grease the sealing ring and insert it into the buffer.



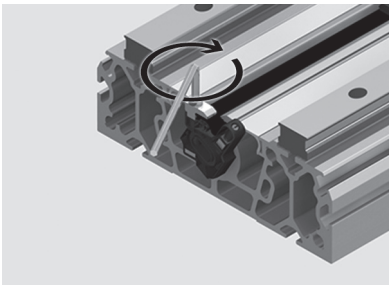
Please note

Residues of the old screw locking agent in the threads make it difficult to tighten the screws. As a result, they cannot be tightened with the specified tightening torque and can therefore be damaged. The thread of the screw and the nut must consequently be re-threaded.



- Re-thread the thread of the screw and the nut.
- Insert the square nut into the buffer.
- Insert both clamping plates into the buffer.

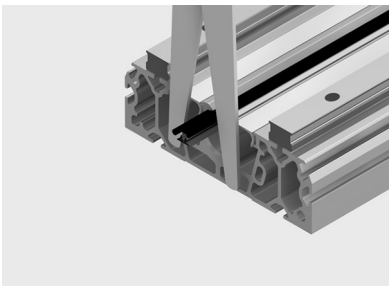
- Apply Loctite 243 to the socket head screw and tighten it using the appropriate torque (see table).



Type	Tightening torque
DGC-18-...-HD	0.2 Nm ±10 %
DGC-25-...-HD	0.4 Nm ±10 %
DGC-40-...-HD	1.0 Nm ±10 %

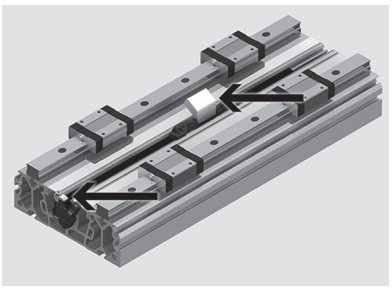
- Insert the second buffer analogously to the first buffer and assemble it.

If, after assembly of the second buffer, the cover strip or sealing band protrudes over one of the two buffers, the buffer must be dismantled again and the bands shortened so that they are flush with or slightly short of the buffer. Protruding bands prevent the connection cap / end cap from being evenly positioned. This can cause air to escape and the function of the linear drive can be seriously disrupted.



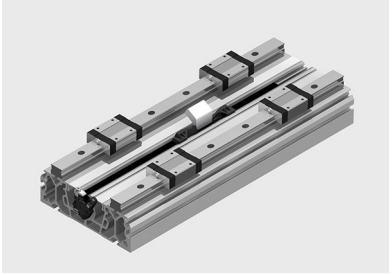
- Shorten the cover strip / sealing band with a sturdy general purpose scissors or metal shears.

- Place the linear drive on the working surface so that the clamping screw of the cover strip and sealing band and the coupling point towards the rear.



The graphic has been provided in Chapter 2.3 “Mounting directions” as an orientation aid.

- Move the piston and roller carriages so that the coupling of the piston is located approximately in the centre of the roller carriages. This means that the coupling will be in the lower recess of the slide plate when the slide plate is positioned.

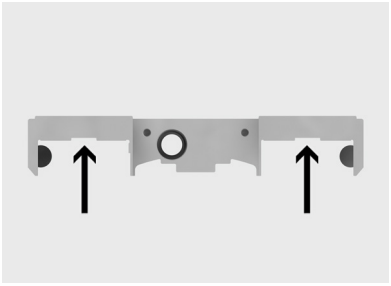


Please note

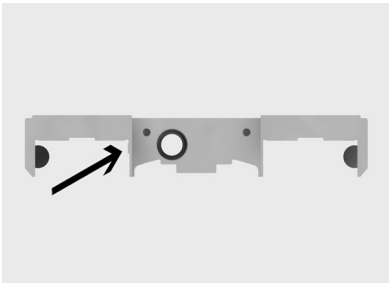
Residues of the old screw locking agent in the threads make it difficult to tighten the socket head screws and pin. As a result, they cannot be tightened with the specified tightening torque and can therefore be damaged. The thread must consequently be re-threaded.

- Re-thread the thread of the socket head screw and the pin as well as the two threads in the slide plate.
- Re-thread the screw of the mounting screws (16 screws) and the roller carriages.

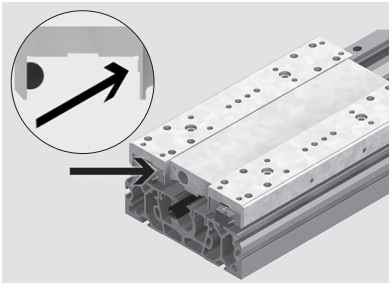
The mounting surfaces of the slide plate for the roller carriages must not have any surface defects such as burrs, chips, scoring etc. and no residue from screw locking agents.



The milled contact surface of the slide plate for the roller carriages must not exhibit any surface defects such as burrs, chips, scoring etc. and no residue from screw locking agents.

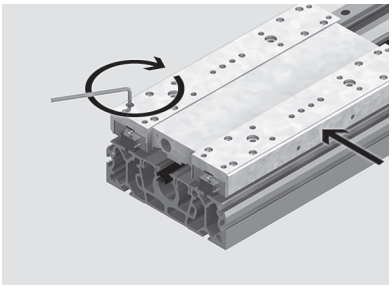


- Position the slide plate on the roller carriages so that the contact surface of the slide plate lies against both rear ground surfaces of the roller carriages.



The drill hole for the pin of the coupling clamping is located on the left, while the drill hole for the socket head screw of the coupling clamping is located on the right.

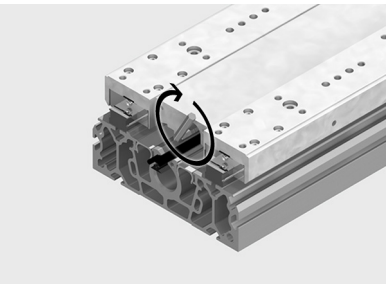
- Align the roller carriages with the slide plate so that the drill holes are in line with one another.
- Apply Loctite 243 to the socket head screws (16 screws) and screw them into the roller carriages. Do not tighten the socket head screws yet.
- Press the contact surface of the slide plates in the direction of the arrow against the slotted surface of the roller carriages.
- Tighten the socket head screws slightly and evenly.
- Tighten the socket head screws using the appropriate torque.



Type	Tightening torque
DGC-18-...-HD	2.5 Nm
DGC-25-...-HD	5 Nm
DGC-40-...-HD	18 Nm

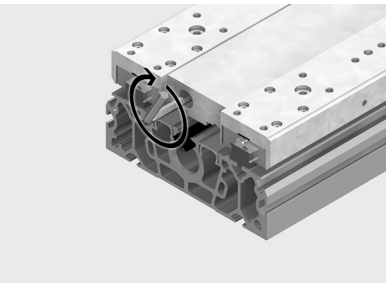
- Slide the spacer sleeve onto the socket head screw.
- Apply a small amount of Loctite 243 to the socket head screw for clamping the coupling.
- Tighten the socket head screw using the appropriate torque.

Type	Tightening torque
DGC-18-...-HD	5 Nm
DGC-25-...-HD	6 Nm
DGC-40-...-HD	20 Nm



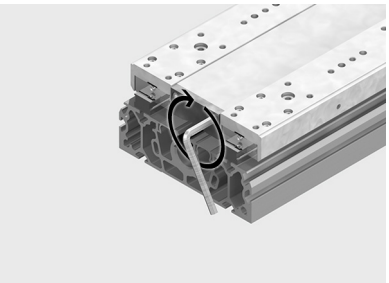
- Apply a small amount of Loctite 243 to the pin for clamping the coupling.
- Tighten the pin using the appropriate torque.

Type	Tightening torque
DGC-18-...-HD	3 Nm
DGC-25-...-HD	3 Nm
DGC-40-...-HD	5 Nm

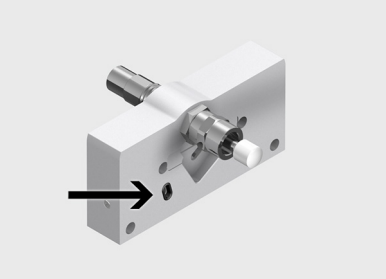


- Apply a small amount of Loctite 243 to the socket head screws of both limit stop plates.
- Place the two limit stop plates on the slide plate and tighten the socket head screws using an appropriate tightening torque.

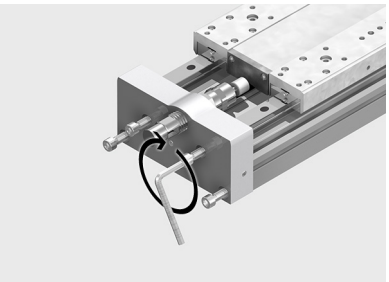
Type	Tightening torque
DGC-18-...-HD	1 Nm
DGC-25-...-HD	2 Nm
DGC-40-...-HD	2 Nm



Before placing the connection / end caps on the cylinder barrel, check again whether the O-ring is actually in the connection / end cap and that it has not fallen out.

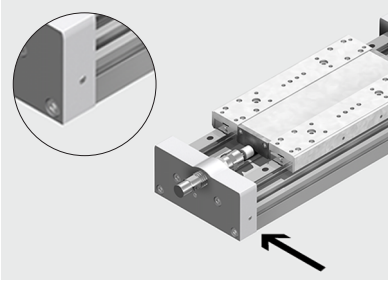


- Place the connection / end caps on both ends of the cylinder barrel and loosely screw the self-tapping screws into the cylinder barrel. No **not** tighten the self-tapping screws yet.



- Align the rear and bottom edge of the connection / end caps so that they are flush with the cylinder barrel.
- Tighten the self-tapping screws of the connection / end cap using the appropriate tightening torque.

Type	Tightening torque
DGC-18-...-HD	12 Nm
DGC-25-...-HD	12 Nm
DGC-40-...-HD	30 Nm



5 Maintenance

This chapter contains key technical information about how to carry out maintenance work on the linear drive. A detailed description of the steps for care and maintenance can be found in the operating instructions.

Additional information on assembly aids and lubricants can be found on the Festo website (www.festo.com).

5.1 Recirculating ball bearing guide

To relubricate the recirculating ball bearing guides, the slide plate must be dismantled, see from page 14.

5.1.1 Lubrication intervals

The roller carriages should be relubricated with Festo LUB-KC1 after 3 years or a corresponding operating distance (load-dependent).

The lubrication intervals are halved under the following operating conditions:

- Ambient temperatures › 40 °C
- Nominal strokes › 2000 mm
- Speeds › 2 m/s
- Increased dirt in the environment (e.g. grinding dust, etc.)
- Positioning profile ≙ delta operation (frequent acceleration and braking)
- If the DGC-18 / 25 / 40-...-HD is more than 3 years old.

Please note

The roller carriages must be moved forwards and backwards on the guide rail during lubrication so that the grease penetrates all the spaces in the roller carriages. The lubricant must be inserted into both lubrication holes on the front side as the two roller carriages do not share lubricant.

5.2 Maintenance of the band system

Caution

Festo recommends Loctite 7063 and Loctite 7070 for cleaning.

When using other cleaning agents, ensure that the sealing band and cover strip is not damaged. In case of doubt, check the resistance of the seals using the data on the Festo website www.Festo.com.

- Grease the band system superficially with LUB-KC1 type grease.

6 Tools

This chapter provides an overview of the tools and aids required to repair and maintain the linear drive DGC-HD.

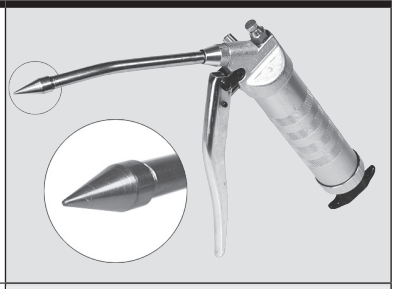
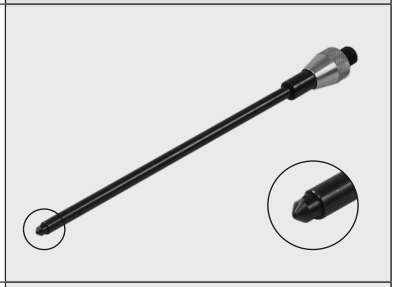
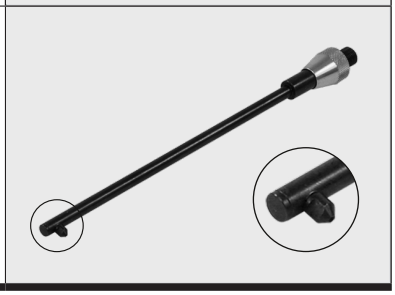
6.1 Standard tools

The following standard tools are required for repair and maintenance:

- Internal hex screwdriver
- Screwdriver
- Torque wrench
- Torque screwdriver
- Flat pliers
- Sturdy general purpose scissors or metal shears

6.2 Special tools

The following special tools are required for repair and maintenance:

Designation	Additional information	Festo order no.	Illustration
One-hand grease gun LUB-1	Pinpoint nozzle for miniature funnel-shaped lubrication nipple and lubricating holes	647958	
Lubrication adapter LUB-1-TR-I	Lubrication adapter (nozzle pipe Ø 6x200 axial)	647959	
Lubrication adapter LUB-1-TR-L	Lubrication adapter (nozzle pipe Ø 6x200 lateral)	647960	

Further information on the special tools is included in the information brochure **"Accessories, equipment and tools"** (7Accessories_a_en). These 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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