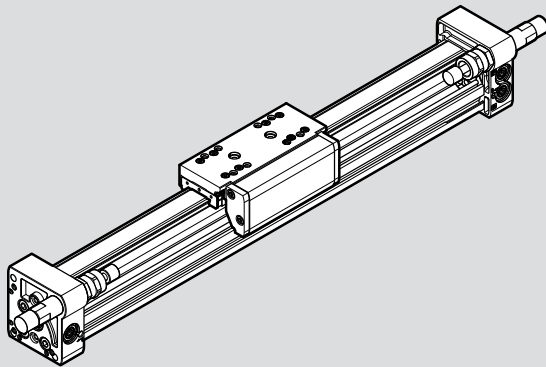


DGC-...-G/-GF/-KF
Linear drive

FESTO

Operating instruction



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Original instructions

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1 Applicable documents



All available documents for the product → www.festo.com/sp.

2 Safety

2.1 Safety instructions

- Take into account the ambient conditions at the location of use.
- Only use the product in its original condition without unauthorised modifications.
- Observe the identifications on the product.
- Store the product in a cool, dry environment protected from UV and corrosion. Keep storage times short.
- Before working on the product, switch off the compressed air supply and lock it to prevent it from being switched on again.
- Have the product repaired by the Festo repair service only.
- Observe the tightening torques. Unless otherwise specified, the tolerance is $\pm 20\%$.

2.2 Intended use

The linear drive DGC is used for space-saving transport of masses. The linear drive is approved for the slide operation and yoke operation operating modes within the load limits.

Unpressurised movement of the slide is permitted only for fault clearance and at low speeds. If the speed is too high, the negative pressure that occurs can pull the sealing band into the piston chamber. This can lead to:

- High leakage.
- Impermissible accelerations, e.g. with vertical mounting position.

2.3 Training of qualified personnel

Work on the product may only be carried out by qualified personnel who can evaluate the work and detect dangers. The qualified personnel have skills and experience in dealing with pneumatic (open-loop) control technology.

3 Additional information

- Contact the regional Festo contact if you have technical problems
→ www.festo.com.
- Accessories and spare parts → www.festo.com/catalogue.

4 Product overview

4.1 Product design

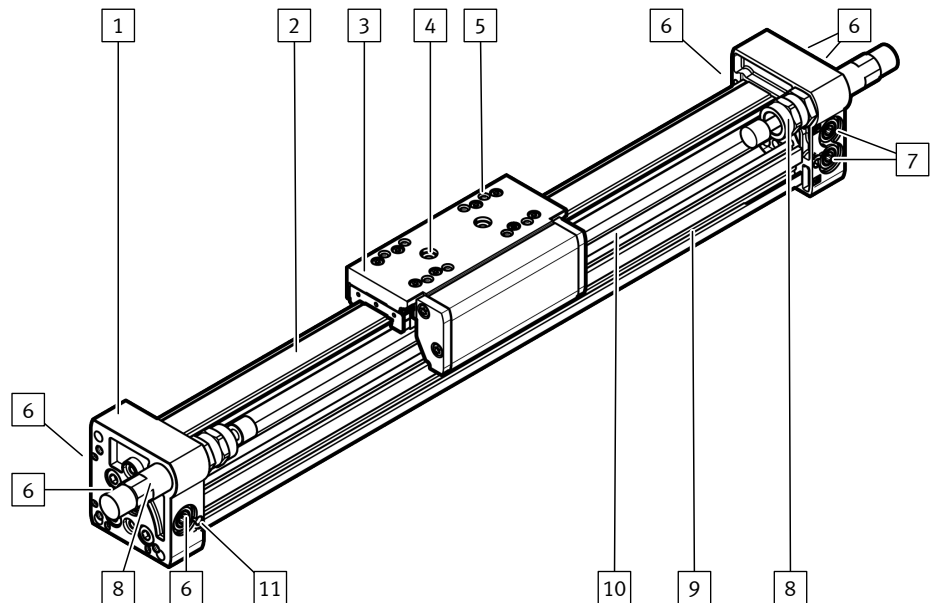


Fig. 1: Product design, example DGC-25-KF

- 1

End cap with thread for mounting
- 2

Guide rail
- 3

Slide
- 4

Centring hole
- 5

Mounting hole
- 6

Compressed air connections, alternative
- 7

Compressed air connections, ex works

8

Shock absorbers or elastomeric dampers

9

Cylinder barrel with slots

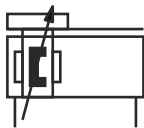
10

Cover strip

11

Setting screw for end-position cushioning, optional

4.2 Function



Alternately pressurisation of the compressed air connections moves the piston moves back and forth in the cylinder barrel. The slide is mechanically coupled to the piston. The slot in the cylinder barrel is sealed by a sealing system.

Position sensing

The piston is fitted with a magnet. The position of the piston and thus the slide can be sensed with proximity switches. There are corresponding slots for proximity switches in the cylinder barrel.

Operating modes

Symbol	Operating mode
	Slide operation
	Yoke operation (cantilever axis), observe load limits

Tab. 1: Operating modes

5 Transport

- Take the weight of the linear drive into account. Depending on the version the linear drive weighs over 150 kg.
- Position the conveyors at the permissible support distances for transport
→ 12.3 Technical data, characteristics.

6 Mounting

6.1 Assembly information

- Do not press on or apply suction to the sealing band.
Damage to the sealing band will reduce operating reliability. Jerky movement of the unpressurised slide may result in negative pressure that sucks the sealing band into the piston chamber.
- DGC-...-G/-GF: remove the protective cover from the guide rail.
- The guide rail is greased at the factory. Do not damage the grease film, apply more grease if necessary.
- Provide sufficient space for pneumatic connections and tubing.
- Mount only approved stop elements and cushioning components.
- When mounting the linear drive, note that the stops KYC and the intermediate position modules DADM-DGC protrude extend beyond the contour of the cylinder barrel.

6.2 Determine support spacing

The number and distance of the support points for mounting must be determined as a function of the payload, mounting position, size and stroke length.

- Measure the support distance and from the result calculate the number of support points → 12.3 Technical data, characteristics.
 - Support distance greater than stroke length:
Foot mounting or profile mounting possible.
 - Support distance less than stroke length:
Profile mounting or foot mounting with additional profile mountings at the support points required. Position support points for profile mountings evenly over the entire drive length, not just over the stroke distance.

6.3 Installing profile mounting

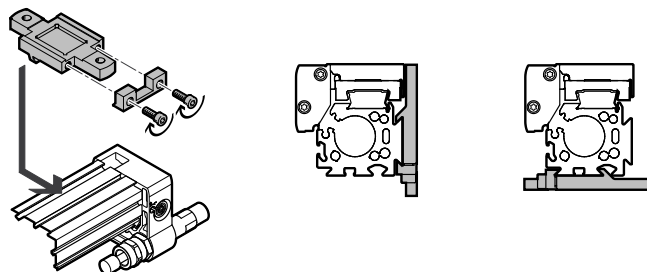


Fig. 2: Mounting variants

Mounting profile
mounting MUC and drive

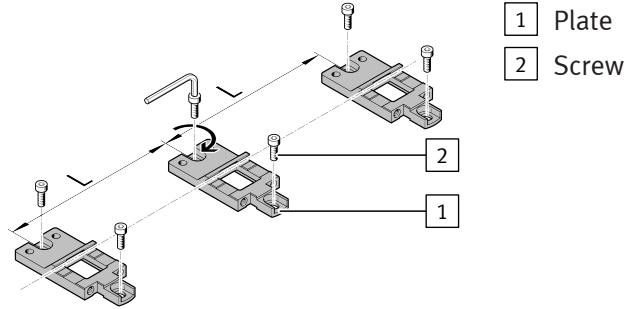


Fig. 3: Mounting plate

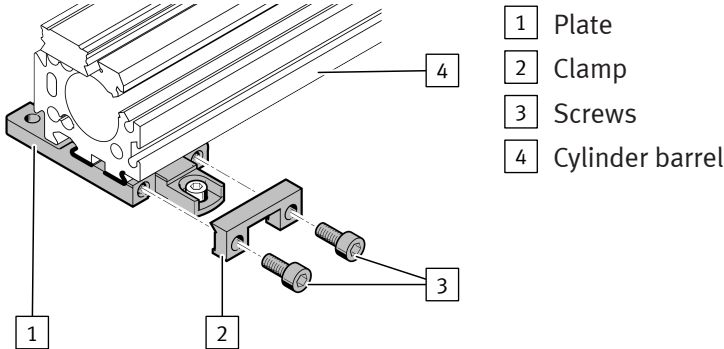


Fig. 4: Position cylinder barrel and fasten clamp

1. Fasten the plates to the support points with suitable screws.

MUC	-8/-12	-18	-25/32	-40	-50/-63
Screws	M3	M5	M5	M6	M7

2. Position the cylinder barrel on the plates.
3. Position the clamps on the plates and cross-tighten the screws symmetrically.

MUC	-8/-12	-18	-25/-32	-40	-50/-63
Screw	M3 x 8	M4 x 12	M5 x 12	M6 x 16	M8 x 25
Strength class	8.8	10.9			
Tightening torque [Nm]	1.2	4.1	8.3	14	20

6.4 Mounting foot mounting

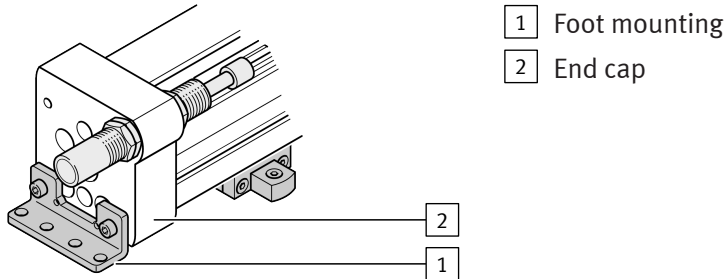


Fig. 5: Mounting foot mounting

Requirement:

- The end caps are sufficient as support points.
If additional support points are required between the end caps, mount additional profile mountings at the support points → 6.3 Installing profile mounting.
1. Mount the foot mountings on the end caps of the linear drive with the supplied screws.

- Mount the foot mountings of the linear drive at the operation location with suitable screws.

HPC		-8	-12/-18	-25	-32/-40	-50	-63
Tightening torque	[Nm]	0.8	1.6	2	4.5	15	23

6.5 Mounting payload

Mounting variants:

- Payload without separate guide: payload mounted directly on the slide.
- Payload with separate guide with DGC-...-G: payload mounted on lug.
- Payload with separate guide with DGC-...-GF and DGC-...-KF: payload mounted on the slide. Align guides exactly parallel.

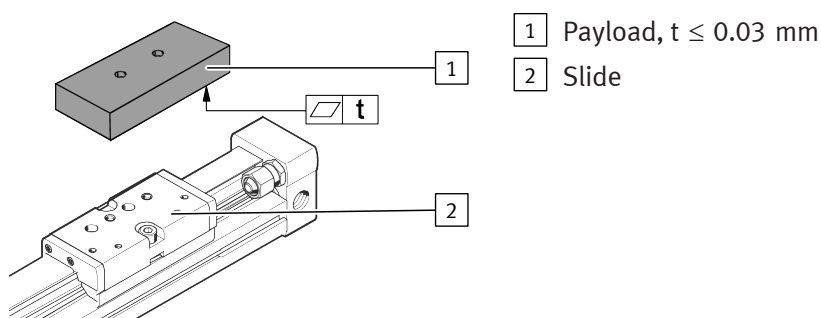


Fig. 6: Fastening payload

Requirement:

- The support surface of the payload must have the specified flatness (t) to prevent overloads and resulting reduced service life due to additional forces on the slide: $t \leq 0.03 \text{ mm}$
 - Take the profile mountings into account when mounting the payload. The payload must not collide with profile mountings.
 - Observe the maximum screw-in depth when installing the payload.
- If necessary, use centring pins or centring sleeves to align the payload accurately.
 - Mount the payload on the slide with suitable screws.

DGC		-8	-12	-18	-25	-32	-40	-50	-63
Tightening torque									
M4 screws	[Nm]	DGC-...-G: 2 DGC-...-KF: 2.5		–	–	–	–	–	–
M5 screws	[Nm]	–	–	3.5	3.5	3.5	3.5	–	–
M6 screws	[Nm]	–	–	–	6.5	6.5	6.5	6.5	6.5
M8 screws	[Nm]	–	–	–	–	–	–	10	10
Max. screw-in depth									
M4 screws	[mm]	4.3	5	–	–	–	–	–	–
M5 screws	[mm]	–	–	6.7	10	10	10.5	–	–
M6 screws	[mm]	–	–	–	8	8	8.5	13.5	13.6
M8 screws	[mm]	–	–	–	–	–	–	13.5	15.8

6.6 Designing stops and cushioning

Options and accessories Various ordering options for stops and cushioning are available depending on the guide and size.

Order option

- Elastic cushioning P
- Pneumatic cushioning PPV
- Shock absorber, with integrated stop, self-adjusting YSR-DGC
- Shock absorber, with integrated stop, self-adjusting, progressive YSRW-DGC

Accessories

- Mechanical end-position limiter on one or both sides
- 1, 2, or 3 intermediate positions

Dimensioning cushioning

Dimension the cushioning at the end positions to ensure operation without hard impacts. Operation without cushioning is not permitted.

The permissible piston speed can be found in the respective characteristic curve for the cushioning variants available as an order option as a function of the payload and centre of gravity distance → 12.3 Technical data, characteristics.

If the operating conditions are outside the specified range of the cushioning variant, the moving mass must be intercepted at the centre of gravity by suitable devices, e.g. external shock absorbers and stops.

6.7 Adjusting end positions

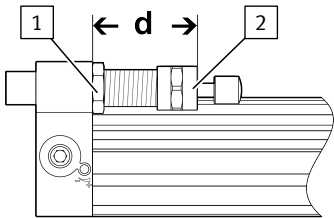
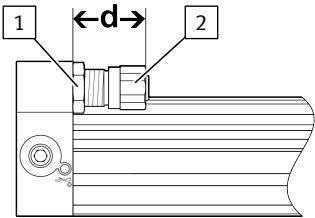
Travel to the end positions must always be against a stop, e.g. to shock absorbers with stop sleeves or on the elastic cushioning at the end caps.

The end positions of the DGC-8/-12-G or DGC-...-KF can be precisely adjusted with the following stop and cushioning options in the end caps:

- Elastic cushioning
- Shock absorber YSR(W)

When changing payload or dynamics:

- Check whether other cushioning elements are required.

Shock absorber	Stop with elastic cushioning
	

Tab. 2: Adjusting end positions

1. Loosen the lock nut [1].

2. Screw or unscrew the stop and cushioning component [2].

For reasons of stability do not exceed the distance "d", see the following table.

Note restrictions: additional masses and speed must be reduced for combinations marked with "(*)".

DGC	-G -GF-P/PPV -KF-P/PPV	-GF-YSR(W)	-KF-YSR(W)	-KF-P/PPV-GP
Size	Distance d [mm]			
-8	11.3 ... 16.3	12.8 ... 22.8	12.8 ... 22.8	–
-12	12.7 ... 17.7	14 ... 24	14 ... 24	–
-18	13.8 ... 15.8 *)	14.5 ... 24.5	14.5 ... 24.5	16.9 ... 18.9 *)
-25	21.1 ... 25.1 *)	22.5 ... 32.5	22.5 ... 32.5	23.6 ... 27.6 *)
-32	25.2 ... 30.2 *)	27.3 ... 37.3	27.3 ... 52.3	25.2 ... 30.2 *)
-40	28.7 ... 33.7 *)	31 ... 41	31 ... 56	34.7 ... 39.7 *)
-50	28.7 ... 33.7 *)	31 ... 56	31 ... 56	–
-63	38.8 ... 43.8 *)	41 ... 76	41 ... 76	–

3. Lock the position with a lock nut.

DGC	-8	-12	-18	-25	-32	-40	-50	-63
Guide	Tightening torque [Nm]							
-GP/YSR(W)	2	–						
-GF-YSR(W)	–		3	5	8	20	35	60
-KF-YSR(W)	2		5	20	20	35	35	60

6.8 Mounting accessories

Mounting accessories and attachments

Slots are provided on the cylinder barrel for mounting attachments and proximity switches.

– S: sensor slot for proximity switches

– N: slot for slot nuts with DGC-25 ... -63

Depending on the application, a slot cover can be used to prevent dirt in sensor slots.

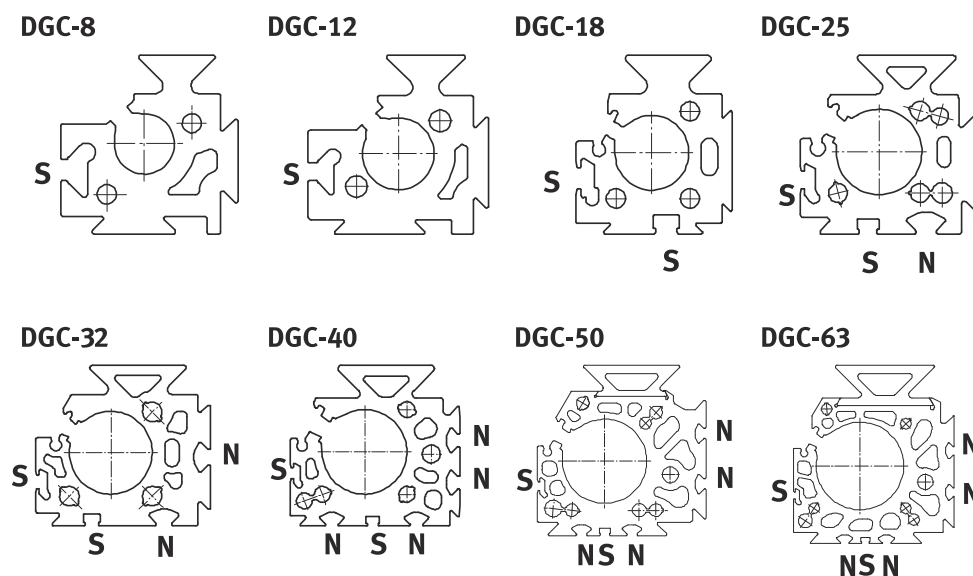


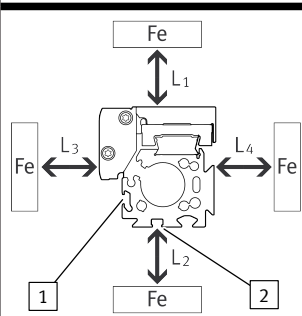
Fig. 7: Layout of the slots on the cylinder barrel, basic representation

Mounting proximity switch on the linear drive

- Use the slots (S) for mounting the proximity switches SME/SMT. The proximity switch cables can be routed through the slot.
- To avoid incorrect switching, maintain minimum distances between ferritic masses and the proximity switches.
- If there is a continuous signal, check whether the proximity switch has been installed upside down.

Minimum distances for proximity switches

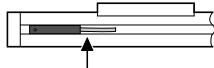
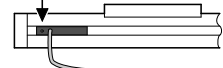
Ferritic materials in the immediate vicinity of the proximity switches can lead to malfunctions. The following safety distances are required depending on the position of the proximity switch.

Dimension	Position	DGC				
		-8	-12	-18	-25	-32 ... -63
	L1	[1]	0	0	0	0
		[2]	-	0	0	0
	L2	[1]	20	10	10	0
		[2]	-	25	25	25
	L3	[1]	30	25	25	25
		[2]	-	10	25	0
	L4	[1]	0	0	0	0
		[2]	-	0	0	0

Tab. 3: Minimum distances for proximity switches

Positioning of proximity switches with DGC-8/-12

The switching magnet is positioned asymmetrically on the left of the piston.

Position	SME-10/SMT-10F-KL (-SL)	SME-10/SMT-10F-KQ (-SQ)
End position left	Cable outlet to the centre of the cylinder required 	Retaining screw points to the end cap 
End position right	Any mounting position	Any mounting position

Tab. 4: Positioning proximity switch on DGC-8/-12

7 Installation

When mounted vertically or at an angle the slide moves down in the event of a pressure drop.

⚠ WARNING

Unexpected movement of components

Injury due to impact or crushing.

- Before working on the product: secure the slide to prevent unintentional movement.

- Take appropriate measures to ensure that the moving mass does not slip suddenly, e.g. install check valves HGL.
- Take safety measures to prevent slow lowering due to leakage, e.g. use linear drive with clamping unit 1H-PN. External devices such as toothed ratchets or movable bolts can also be used.

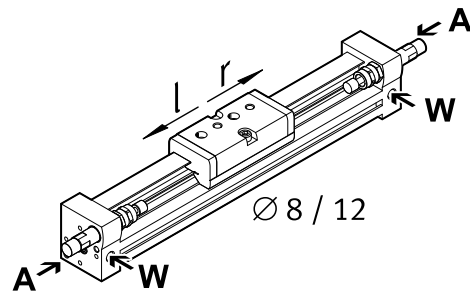


Fig. 8: Compressed air connections DGC-8/-12, with guide -KF as an example

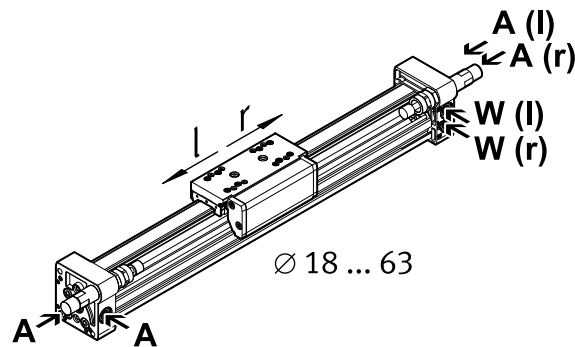


Fig. 9: Compressed air connections DGC-18 ... 63, with guide -KF as an example

Legend:

- W: compressed air connection ex works
- A: alternative connection
- (l): direction of motion left
- (r): direction of motion right

1. Select the position of the compressed air connections depending on the installation situation.
2. Close and secure compressed air connections that are not required with the plug screws.
3. If necessary, use one-way flow control valves to regulate the speed of the slide.
4. If necessary, use the on/off valve HEL for slow pressurisation of the linear drive.

8 Commissioning

8.1 Preparing for commissioning

Checking travel range

- Check that the complete travel range is free.
Slowly push the slide and the payload from end position to end position.

Overview of commissioning steps, depending on size, guide and ordering options

- Adjust one-way flow control valves, adjust the speed of the slide.
- If installed, adjust end-position cushioning PPV.
- Adjust end positions.
- Check the adjustment and function of the proximity switches.

Commissioning the complete system

- Recommendation: pressurise the complete system slowly, e.g. with an on/off valve HEL.

8.2 Adjusting slide speed



Permissible slide speed → 12.3 Technical data, characteristics.

Adjusting slide speed with one-way flow control valves and cushioning PPV

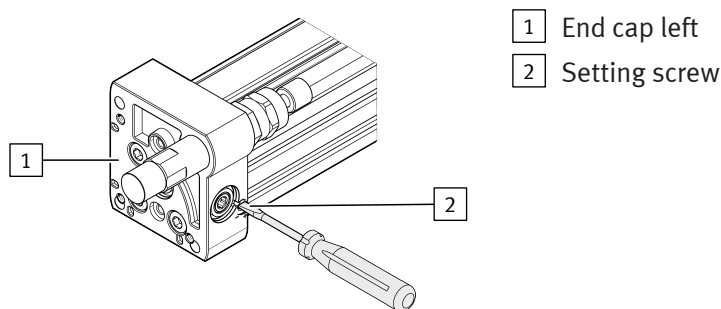


Fig. 10: Adjusting cushioning PPV

1. Close the one-way flow control valves almost completely to ensure slow slide movement.
2. Completely tighten the setting screws for the internal end-position cushioning PPV on both sides and then unscrew them one revolution.
3. Pressurise the linear drive simultaneously at both sides.
⇒ The slide moves slightly to a point of balance.
4. Exhaust the linear drive on one side.
⇒ The slide moves to the opposite end position.
5. Start the test run: move the slide alternately back and forth.
6. Slowly open the one-way flow control valves between the travel movements until the desired slide speed is reached.
7. Slowly unscrew the setting screws for the internal end position cushioning PPV between the travel movements. The slide should reach the end position without a hard impact or bouncing.

Adjusting slide speed with one-way flow control valves with fixed stops or shock absorbers

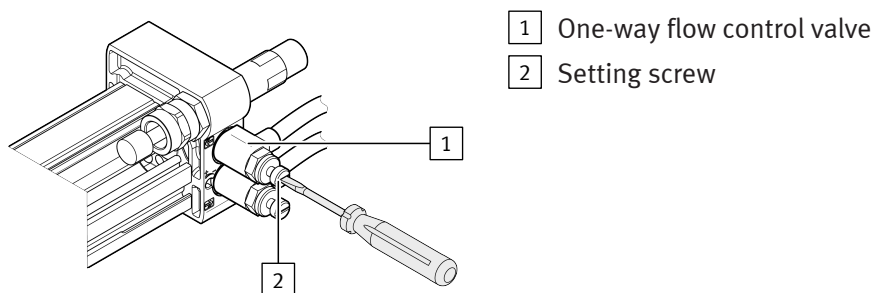


Fig. 11: Adjusting one-way flow control valve

1. Close the one-way flow control valves on both sides.
2. Open the one-way flow control valve on both sides one revolution.
3. Start the test run: move the slide alternately back and forth.
4. Slowly open the one-way flow control valves between the travel movements until the desired slide speed is reached.

8.3 Adjusting end positions

- Check the position of the end positions under dynamic load and adjust as required → 6.7 Adjusting end positions.

9 Operation

- Check the cushioning characteristics and position of the end positions regularly during operation and re-adjust if necessary. Replace worn cushioning components.

10 Maintenance

10.1 Adjusting guide backlash

DGC-...-GF

After extended operation wear may occur on the sliding guide of the linear drive DGC-...-GF. The guide backlash on the sliding guide can be reduced by adjusting the adjusting screws with a face spanner.

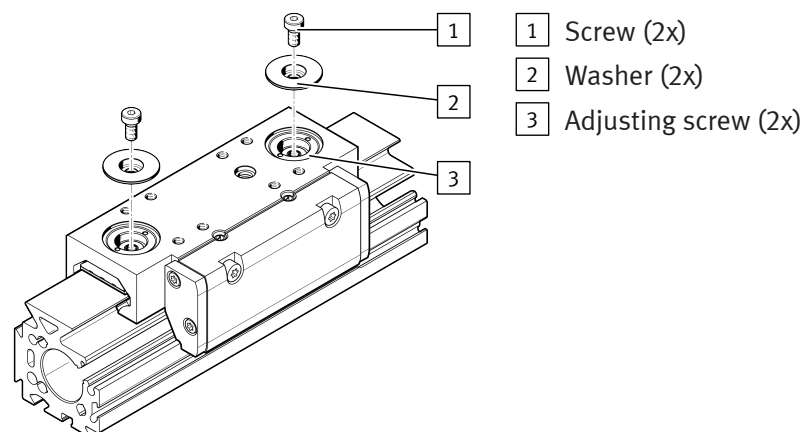


Fig. 12: Adjusting guide backlash

DGC-...-GF	-18	-25	-32	-40	-50	-63
Tightening torque of screw [Nm]	0.7	2		3	6	

Tab. 5: Tightening torque of screw

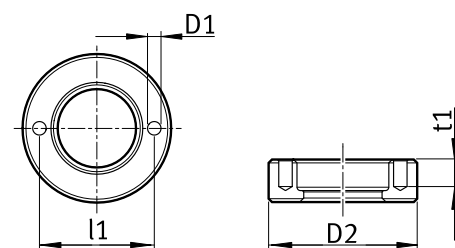


Fig. 13: Adjusting screw

DGC-...-GF	-18	-25	-32	-40	-50	-63
Drilled hole diameter D1 [mm]	2			3	5	
Thread D2	M18x1	M22x1		M30x1.5	M48x1.5	
Hole distance l1 [mm]	14.4	17		24	37	
Hole depth t1 [mm]	2.5	4		5		

Tab. 6: Dimensions of adjusting screw

1. Loosen and unscrew the screws.
2. Remove the washers.
3. Turn the adjusting screws clockwise with a suitable face spanner until the desired reduction in guide backlash is reached.
4. Check the sliding resistance by moving the slide manually while depressurized or with compressed air at minimum operating pressure → 12.2 Technical data, pneumatic. If the carriage is hard to move, the two adjusting screws must be turned back accordingly.
5. Insert the washers.
6. Screw in the screws → Tab. 5 Tightening torque of screw.

10.2 Cleaning

- Clean the outside of the product with a soft cloth as required.
- Avoid cleaning media that attack the PU cover strip. Vigorous rubbing or grease-dissolving cleaning media, such as detergent, will damage the grease coating. If the cover strip does not have a coating of grease after cleaning, grease the surface with grease LUB-KC1 or LUB-E1 for DGC-...-H1.

10.3 Lubrication

DGC-8-G/-GF

Grease the guide rail with LUB-KC1 or LUB-E1 (Fuchs Lubritech GmbH):

- When there is no longer a grease coating.
- At least every 3000 km or 3 years.

Reduce the lubrication interval in the following cases:

- Working stroke < 50 mm.
- Dusty and dirty environment.
- Ambient temperatures > 40 °C.

DGC-12 ... 63-G/-GF

The linear drives are maintenance-free. Relubrication with LUB-KC1 (Fuchs Lubritech GmbH) is permitted.

DGC-...-KF

Lubricate the slide:

- According to lubrication interval S_{int} . The lubrication interval S_{int} must be set based on the load on the guide.
- At least every 3 years. With option -H1 at least every 2 years.
- With lubrication adapter -C: see the information in the specific section.
- With protected guide -GP: lubrication of the slide is not possible. After cleaning lightly grease the guide rail.

The product can also be inspected and lubricated by Festo Service.

Type of grease:

- DGC-8/12-KF: Gearmaster LXG 00 (Fuchs Lubritech GmbH)
- DGC-18 ... 63-KF: LUB-E1 (Rhenus Lub GmbH & Co. KG)
- DGC-8...63-KF-H1: ELKALUB VP 874 (Chemie-Technik GmbH)

Reduce the lubrication interval in the following cases:

- Working stroke < 50 mm.
- Speeds > 2 m/s.
- Ambient temperatures > 40 °C.

Setting lubrication interval for the guide KF

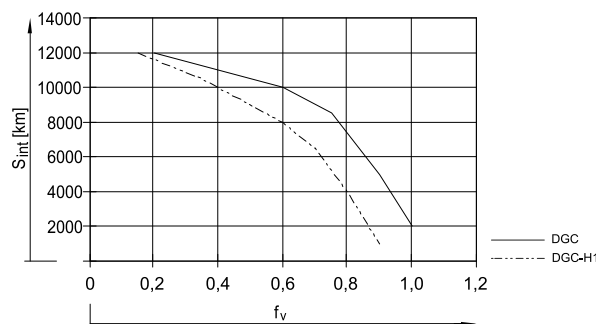


Fig. 14: Lubrication intervals

1. Calculate the load comparison factor f_v with the formula for combined loads
→ 12.3 Technical data, characteristics.
2. Take the lubrication interval S_{int} in km from the diagram.

Lubricating slide with guide KF

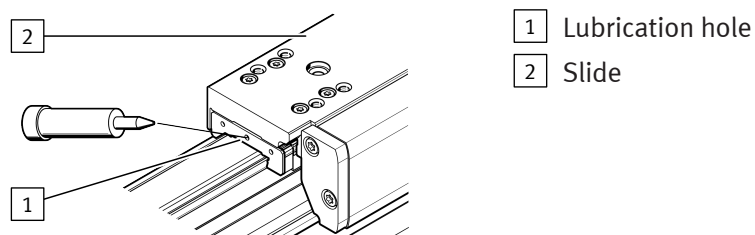


Fig. 15: Lubricating slide

1. Lubricate the roller bearings through the holes on both sides of the slide.
Apply the grease with a pressure grease gun with needle tip nozzle or alternatively with a disposable syringe with needle.
2. Move the slide back and forth during lubrication to fill the grease cavities evenly.

11 Fault clearance

Malfunction	Cause	Remedy
External damage after visual inspection	–	– Replace the device or send it to the Festo repair service.
The mounting is not secure	–	– Tighten the retaining screws.
Irregular movement of the slide	Incorrect installation	– Ensure flow control of exhaust air, not supply air, with one-way flow control valves.
	Grease layer flawed	– Grease the guide rail.
The slide does not reach the end position of the stroke	Incorrect adjustment of the end-position cushioning	– Open the setting screw for the end-position cushioning.
Malfunctions in position sensing	Magnetic materials	– Use only parts made of non-magnetic materials or maintain minimum distances.
Audible leakage	Cylinder installed distorted	– Mount the cylinder on a flat base.
	Seal worn	– Replace wearing part or send the device to the Festo repair service.
	Sealing band pressed/sucked in	– With the linear drive unpressurised move the slide by hand through the entire stroke twice. – If necessary, push the fixed stops to the end position. – Avoid negative pressure in the piston chamber by moving the slide slowly when unpressurised.
Cylinder does not reach the desired speed	Air volume insufficient	– Increase the connection cross-section, connect volume upstream.
	High friction or counteracting force	– Select a larger drive.

Tab. 7: Fault clearance

12 Technical data

12.1 Technical data, general

DGC	-8	-12	-18	-25	-32	-40	-50	-63
Certificates, declaration of conformity	➔ www.festo.com/sp							
Ambient temperature [°C]	-10 ... +60							
	+5 ... +60 at DGC-8-G							
Theoretical force at 6 bar [N]	30	68	153	295	483	754	1178	1870
Velocities [m/s]	0.15 ... 1	0.1 ... 1.2	0.05 ... 3		0.04 ... 3		0.03 ... 3	0.02 ... 3
Cushioning length PPV [mm]	-		16.5	15.5	17.5	29.5	29.8	31.1
Max. energy	➔ For diagrams see catalogue information							
Cushioning								
P option	Elastic cushioning rings/plates on both sides		-					
PPV option	-		Pneumatic cushioning both sides, adjustable					
YSR option	Shock absorber, hard characteristics							
YSRW option	Shock absorber, soft characteristics							
Materials								
DGC	Wiper, belt reversal, cover: POM/PA							
	Piston seal, buffer seal, sealing band, cover strip: PU							
	Stops: steel, corrosion-resistant/coated							
	Cylinder profile: aluminium, anodised							
DGC-...-G	Cover: aluminium, coated							
	Guide rail, slide: aluminium, anodised							
DGC-...-GF	Slide, guide rail: aluminium, anodised							
DGC-...-KF	Guide rail: steel, corrosion-resistant/coated							
	Slide for DGC-8/-12: steel, high-alloy							
	Slide for DGC-18 ... -63: aluminium, anodised							

Tab. 8: Technical data DGC

12.2 Technical data, pneumatic

DGC		-8	-12	-18	-25	-32	-40	-50	-63
Pneumatic port		M5 With DGC-N M5 is suitable for 10-32 UNF			G 1/8 With DGC-N 1/8 NPT		G 1/4 With DGC-N 1/4 NPT		G 3/8 With DGC-N 3/8 NPT
Mode of operation		Double-acting							
Mounting position		Any							
Operating medium		Compressed air to ISO 8573-1:2010 [7:-:-]							
Operating pressure	[MPa]	0.25 ... 0.8		0.2 ... 0.8			0.15 ... 0.8		
	[bar]	2.5 ... 8		2 ... 8			1.5 ... 8		
	[psi]	36.25 ... 116		29 ... 116			21.75 ... 116		

Tab. 9: Technical data DGC

12.3 Technical data, characteristics

Support distance "l"

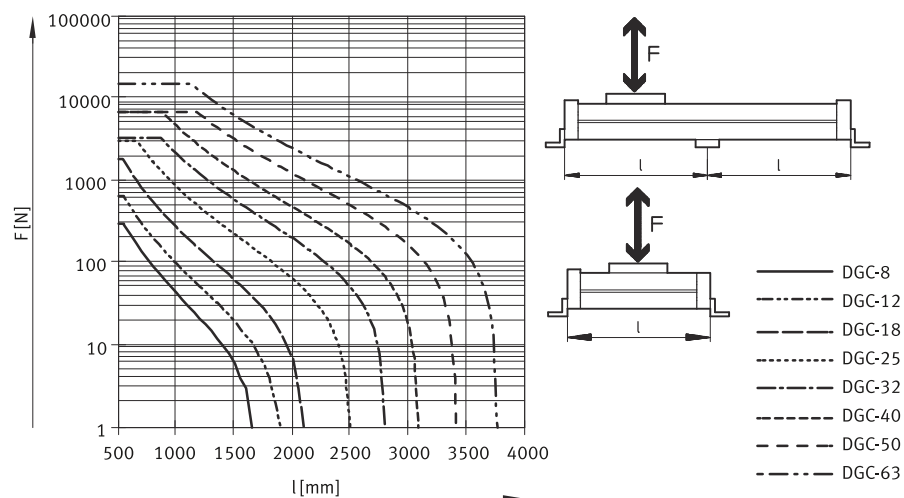


Fig. 16: Support distance "l", mounting position horizontal

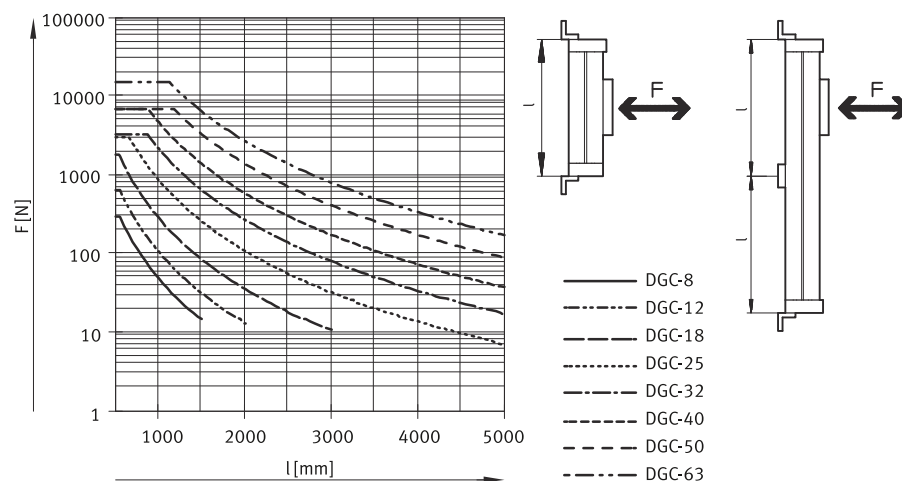
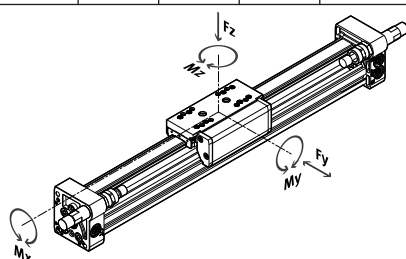


Fig. 17: Support distance "l", mounting position vertical

Load characteristics

Permissible force load and moment load			-8	-12	-18	-25	-32	-40	-50	-63
-G	F _y max	[N]	150	300	70	180	250	370	480	650
	F _z max	[N]	150	300	340	540	800	1100	1600	2000
	M _x max	[Nm]	0.5	1.3	1.9	4	9	12	20	26
	M _y max	[Nm]	2	5	12	20	40	60	150	150
	M _z max	[Nm]	2	5	4	5	12	25	37	48
-GF	F _y max	[N]	—	—	440	640	900	1380	1500	2300
	F _z max	[N]	—	—	540	1300	1800	2000	2870	4460
	M _x max	[Nm]	—	—	3.4	8.5	15	28	54	96
	M _y max	[Nm]	—	—	20	40	70	110	270	450
	M _z max	[Nm]	—	—	8.5	20	33	54	103	187
-KF	F _y max	[N]	300	650	1850	3050	3310	6890	6890	15200
	F _z max	[N]	300	650	1850	3050	3310	6890	6890	15200
	M _x max	[Nm]	1.7	3.5	16	36	54	144	144	529
	M _y max	[Nm]	4.5	10	51	97	150	380	634	1157

Permissible force load and moment load										
DGC			-8	-12	-18	-25	-32	-40	-50	-63
-KF	Mzmax	[Nm]	4.5	10	51	97	150	380	634	1157
Formula for combined loads:										
$f_v = \frac{ M_x }{M_{x_{max}}} + \frac{ M_y }{M_{y_{max}}} + \frac{ M_z }{M_{z_{max}}} + \frac{ F_y }{F_{y_{max}}} + \frac{ F_z }{F_{z_{max}}} \leq 1$										
										

Tab. 10: Permissible force load and moment load

Maximum permissible slide speed *v* as a function of the payload *m* and the centre of gravity distance *d_{max}*

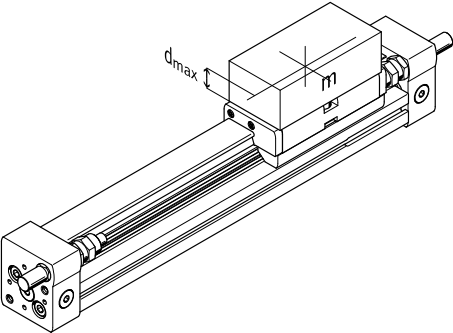
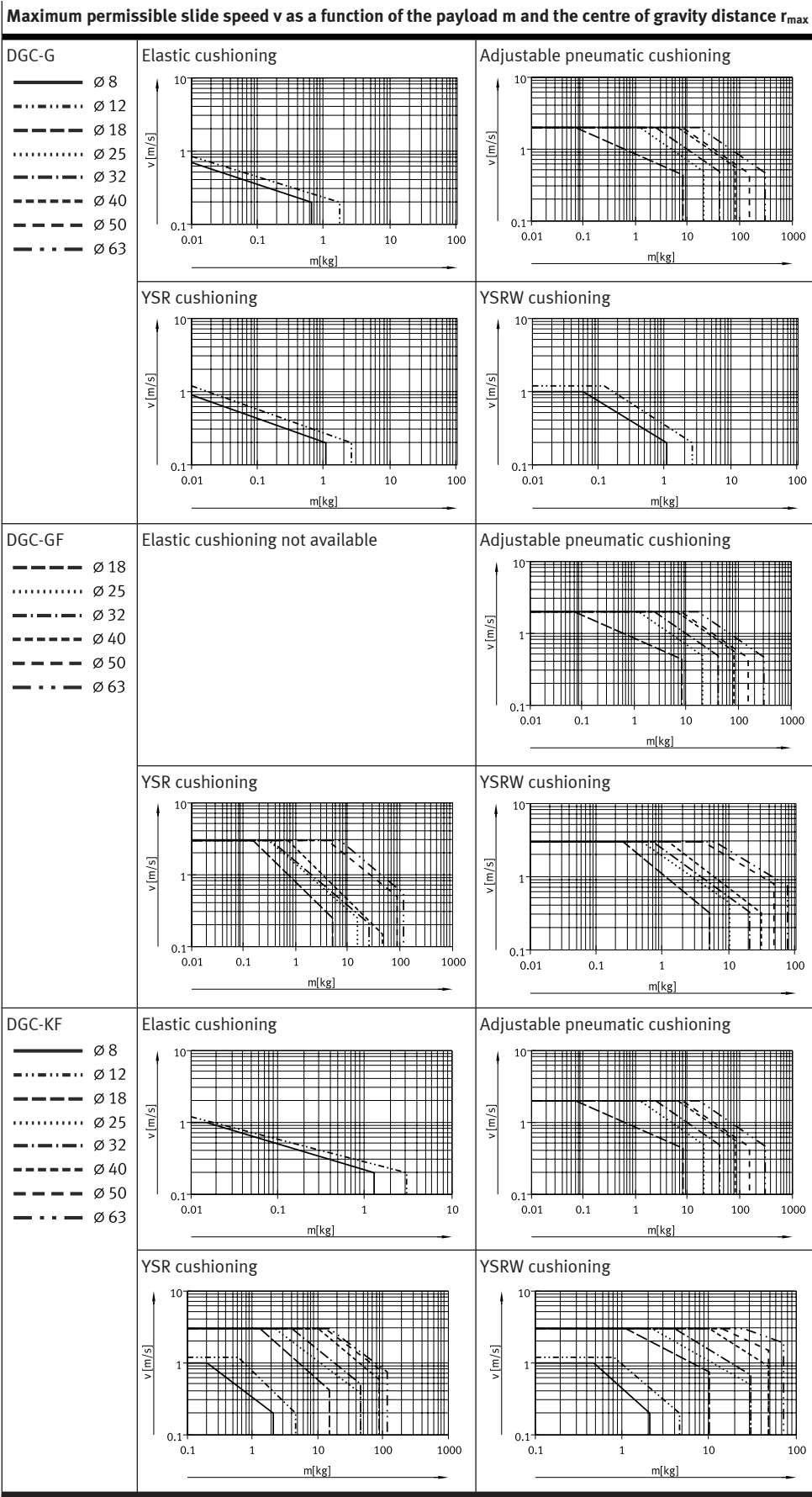


Fig. 18: Distance from the centre of gravity of the payload, here DGC-12-G

DGC		-8	-12	-18	-25	-32	-40	-63	-63
Distance d _{max}	[mm]	25	35	35	50	50	50	50	50

Tab. 11: Distance from centre of gravity, horizontal mounting position



Tab. 12: Maximum permissible slide speed

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