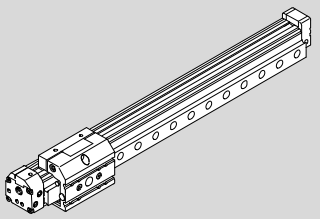
DGP(L)-...-B



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Operating instructions 8075222
Original instructions 2017-07i
[8075224]

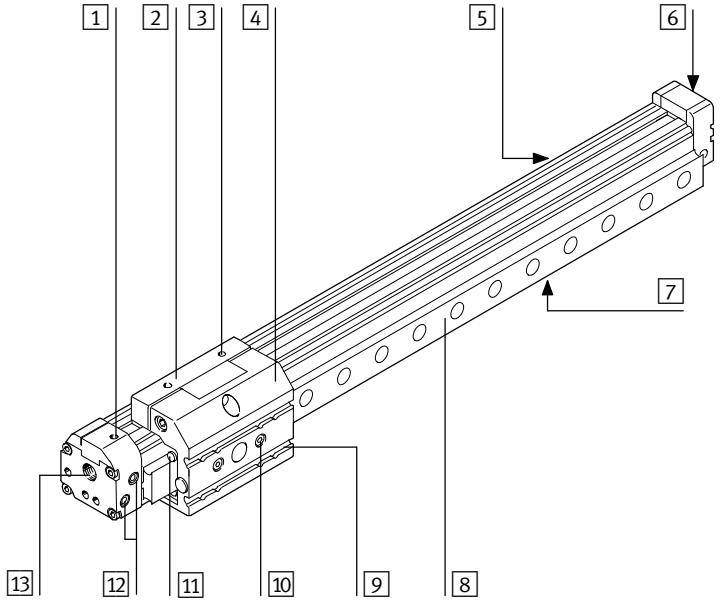
Linear drive DGP(L)-...-B ..... English

For all available product documentation ➔ www.festo.com/pk

Note

Fitting and commissioning is to be carried out only by qualified personnel in accordance with the operating instructions.

1 Control sections and connections



1 Adjusting screw for end position cushioning
2 Driver
3 Thread for effective load (not for DGPL)
4 Slides
5 Groove with recess for proximity switch
6 Thread for fastening the DGP(L) (4x)
7 Groove without recess for sliding blocks
8 Guide rail (DGPL only)
9 Groove for fastening the effective load
10 Thread for effective load and centring
11 Lubricating nipple (DGPL-...-KF only)
12 Compressed air port indirect (not for ...-D2)
13 Compressed air port direct

Fig. 1

2 Function and application

When the compressed air ports are pressurized alternately, the piston moves backwards and forwards in the tubing. By means of a rigid connection, the outer slide also moves. The slot in the cylinder barrel required for this is covered by a band system.
This product has been designed for transporting mass loads.
Pressureless movement of the slide is only approved when eliminating faults and at a low speed. If excessive speed is used, the vacuum which results can pull the sealing band into the piston chamber. This can lead to:
– high leakage and
– non-permitted acceleration (e. g. when installed vertically).
The following distinctions are made:
– as cylinder:
  In normal operation the slide traverses the complete stroke from one end position to the other.
– as servopneumatic positioning axis:
  When controlled by a controller, the slide can move to any intermediate position in normal operation.

Using the DGP(L) as a servopneumatic positioning axis:

Note

- Omit the sections which are marked “Only cylinder”. Otherwise positioning problems will occur.
- Observe the instructions in the manuals for the positioning controller used (e.g. SPC11/SPC200).

3 Transport and storage

- Consider the weight of the DGP(L).
  Depending on the design, the DGP(L) can weigh over 80 kg.

4 Requirements for product use

Note

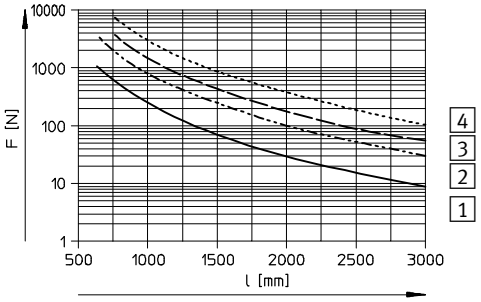
Malfunctions will occur if the device is incorrectly used.
- Be sure to always comply with the specifications in this chapter.
- Note the warnings and instructions on the product and in the relevant operating instructions.

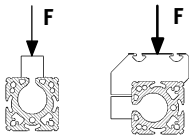
- Compare the maximum values specified in these operating instructions with your actual application (e.g. forces, torques, temperatures, masses).
  Only compliance with the load limits allows operation of the product in compliance with the relevant safety regulations.
- Take into consideration the ambient conditions at the location of use.
  Corrosive elements in the environment (e.g. ozone) will reduce the service life of the product.
- Please comply with national and local safety laws and regulations.
- Use the product in its original condition without any unauthorised modifications.
- Remove all transport packing such as foils, caps, cardboard.
  Exception: adhesive labels on compressed air ports (danger of dirt entering the tubing)
  The packing is intended for recycling (except for: oiled paper = other waste).
- Leave the blue plastic cover caps fitted on the end caps. These protect the clamping device of the band system from external influences.
- Ensure that the compressed air is properly prepared ➔ Technical data.
- Take the tolerance of the tightening torques into account. Unless otherwise specified, the tolerance is ±20 %.

5 Installation

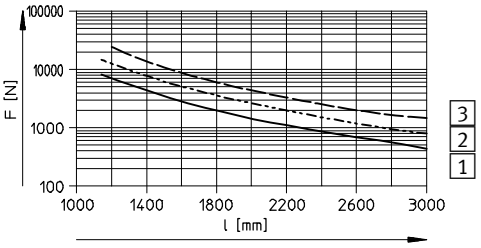
5.1 Mechanical installation

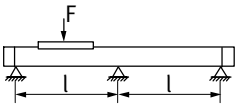
- Avoid damaging the band system.
  Damage to the band system can cause leakage and reduce the efficiency of the DGP(L).
- Avoid the sealing band being pressed and/or sucked in.
  Damage to the sealing band reduces operational reliability. Sudden movement of the unpressurised slide can create a vacuum which sucks the sealing band into the piston chamber.
- Leave all screws and threaded bolts in their original states, unless you are requested to modify them in these instructions.
- Make sure that the device is fitted free of mechanical stress and distortion.
- Use the central support (profile mounting) MUP with the following gaps between supports (l) (➔ Fig. 2).





1 DGP...-18
2 DGP...-25
3 DGP...-32
4 DGP...-40





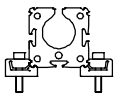
1 DGP...-50
2 DGP...-63
3 DGP...-80

Fig. 2 : Necessary gaps between supports

Fitting central supports MUP:

1. Place the profile fastenings equally over the entire length of the drive, and not just over the stroke length.
2. Place the DGP(L) so that all the operating parts are accessible.
3. Place the central support on the DGP(L) in accordance with Fig. 3.
   When the slot nuts (size 32 ... 80) are tilted, they slide into the groove at each point on the profile.

DGP(L)-18 ... 25



DGP(L)-32 ... 80

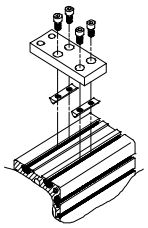


Fig. 3

4. Tighten the clamping screws evenly.

Tightening torques [Nm]					
MUP-18/25	**MUP-32**	**MUP-40**	**MUP-50**	**MUP-63**	**MUP-80**
3	4.5	5.5	18	18	18

Fig. 4

5. Make sure the central support does **not** collide with the slide or the effective load (especially with lateral attachment). In order to do this, push the slide with the effective load once over the entire positioning path.

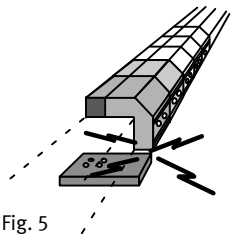


Fig. 5

With hard and stiff effective loads:

Note

If the slide is bent due to a buckled effective load, it will reduce the service life of the guide.

- Make sure the mounting surface of the effective load exhibits the following evenness (t):
  - GF: t ≤ 0.03 mm
  - KF: t ≤ 0.01 mm

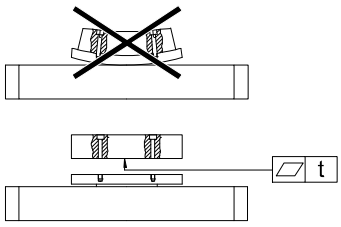


Fig. 6

To mount the effective load:

- Select a mounting option:

DGP	DGPL
1. Through holes and threaded holes in the driver (➔ Fig. 1)	1. Slot nuts NSTL on the slide 2. Threaded holes and centring elements (➔ 9 Accessories) on the slide

Fig. 7

- When designing your screw connection for mounting the effective load, observe the following maximum tightening torques:

Tightening torques [Nm]							
DGP(L)		**18**	**25**	**32**	**40**	**50**	**63**	**80**
DGP	M5	3.5	3.5	3.5	–	–	–	–
	M6	–	–	–	6	–	–	–
	M8	–	–	–	–	12	12	–
	M12	–	–	–	–	–	–	30
DGPL	M5	4.5	4.5	4.5	5	–	–	–
	M8	–	–	–	–	15	15	15

Fig. 8

- If the mounting option with DGPL is used, the screws must be shorter than the threaded hole.

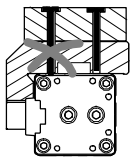


Fig. 9

Effective loads with their own guide:

- Adjust the guides of the effective load and the DGP(L) so that they are exactly parallel.
  Only in this way can you avoid overloading on the slide ➔ 11Technical data: permitted forces.

5.2 Fitting pneumatic components

For installation in a vertical or sloping position:

Warning

If there is a power failure, the work mass will slide down. Danger of crushing!

- Read the manuals for the positioning controller used (e.g. SPC11/SPC200). There you will find pneumatic circuit diagrams with which the moving mass can be prevented from sliding down (only with servopneumatic positioning).
- Check whether non-return valves HGL are required here (only if used as a cylinder). In this way, you can prevent the work mass from sliding down suddenly.
- Check whether safety measures are necessary to prevent the mass from sinking down slowly as a result of leakage (e.g. toothed latches or moveable bolts).

- Select the compressed air ports.
  In addition to the compressed air ports provided at the factory (A), there are also the alternative ports (B, C). These are fitted with plug screws.
  A = Compressed air ports provided at the factory
  B, C = Alternative ports

  With variant **...-D2** (with bilateral air ports) the air cannot be supplied on one side only.

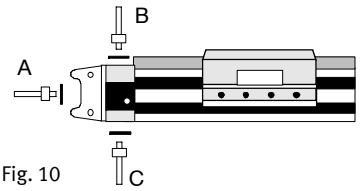


Fig. 10

Setting the speed (cylinder only):

- Only use one-way flow control valves of type GRLA.

For stroke lengths > 500 mm:
If the DGP(L) is controlled by the SPC11 or SPC200, the compressed air must be provided on both sides (variant **...-D2**).
Only bilateral air supply will guarantee optimum dynamics.

5.3 Installing the electric components

If you are using proximity switches to scan positions:

- Make sure that the minimum distance L between static or moving ferritic masses and the proximity switches corresponds to the values specified in the table Fig. 11.
  In this way you will avoid incorrect switching as a result of external influences.

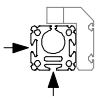
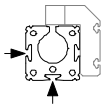
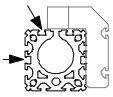
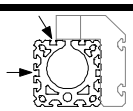
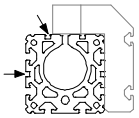
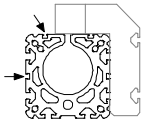
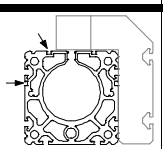
Minimum distances L [mm]				
DGP(L)	**18**	**25**	**32**	**40**
POS				
L	40	4.2	4.8	5.6
DGP(L)	**50**	**63**	**80**	
POS				
L	11.4	14	5	

Fig. 11 (POS = position of proximity switch)

- Use slot covers to prevent contamination in the sensor slots.

6 Commissioning

6.1 Commissioning the complete system

- Slowly pressurise the complete system. In this way you will prevent sudden uncontrolled movements.
  For slow start-up pressurization, use safety start-up valve type HEL.

6.2 Preparing for commissioning

In the case of heavy or medium effective loads or at high and medium slide speeds:

- Use cushioning elements of sufficient size.
  Without external cushioning devices the DGP(L) will withstand maximum speeds and effective loads as per catalogue specifications.

Warning

Without external cushioning devices the DGP(L) may be damaged if the limit values specified in the catalogue are exceeded.

- Even in the event of faults, the limit values must not be exceeded.

Before each commissioning procedure and in operation:

Warning

Make sure that, in the positioning range,
– nobody can place his/her hand in the path of the moveable mass (e. g. by providing a protective grill).
– there are no foreign objects.

It should not be possible to touch the DGP(L) until the mass has come to a complete standstill.

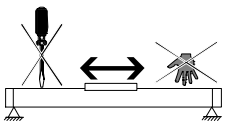


Fig. 12

6.3 Carrying out commissioning

Commissioning the DGP(L) as a servopneumatic positioning axis:

Note

- Complete commissioning in accordance with the specifications for your positioning system.

Commissioning the DGP(L) as a cylinder:

1. Close the one-way flow control valves
   – for both sides at first completely,
   – then open one rotation.

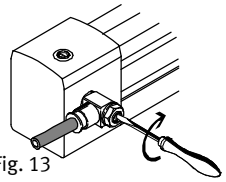


Fig. 13

Using the internal end position cushioning:

2. Close the adjusting screws for the internal end position cushioning
   – on both sides at first completely,
   – then open one rotation.

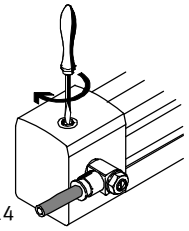


Fig. 14

3. Pressurize the DGP(L) as follows:
   – at first on both sides simultaneously. The slide will then move slightly to a centre of equilibrium.
   – Then exhaust the DGP(L) on one side. In this way you can avoid peak loadings on the DGP(L) and in the compressed air network.
4. Start a test run.
5. Check whether the speed of the slide has to be modified.

For mass geometries with projection:

Warning

Risk of collision!

- Note that the adjusting screws of the DGP(L) may only be turned when the slide is at a standstill.

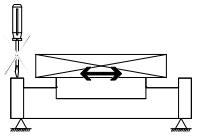


Fig. 15

6. Open up the one-way flow control valves slowly until the desired slide speed is reached.
7. Open the adjusting screws for the internal end position cushioning.
   The slide should reach the end position without striking hard against it or bouncing back.

7 Maintenance and care

Maintaining the band system:

- Clean the band system if required with a soft cloth.
  Cleaning agents: all non-abrasive cleaning agents.
- Lubricate the surface of the band system if it no longer has a layer of grease.
  Grease type: LUB-KC1.

Lubricating guide type **KF**:

1. Make sure that the lubrication intervals in accordance with Fig. 16 are observed.

Lubrication intervals and types	
First interval	5 000 km
Subsequent interval with special grease LUB-KC1 (silicone-free)	400 km
or: Subsequent interval with special grease Rhenus Norlith STM 2 (silicone-free) (Rhenus Lub GmbH & Co. KG)	5 000 km

Fig. 16

Note

The lubrication interval depends on the product load.

- Halve the lubricating interval (➔ Fig. 16) if one of the following situations arises:

– dusty and contaminated environment
– Nominal stroke > 2 m/s
– Ambient temperature > 40 °C
– If the product has been in operation for > 3 years.

If several situations are present at the same time, the lubrication interval is to be divided into quarters.

2. Exhaust the DGPL.
3. Lubricate the roller bearings via the holes 10.
   For this purpose use a grease gun with pinpoint nozzle or alternatively a disposable syringe with needle.
   - Push the slide backwards and forwards during lubrication. Otherwise the grease cavities will not be filled to an equal extent.

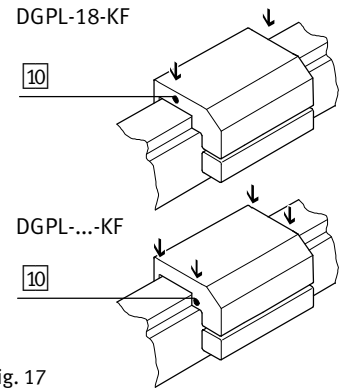


Fig. 17

4. Lubricate the surface of the band system if it no longer has a layer of grease (grease type ➔ Fig. 16).

Alternatively, Festo offers a service inspection which includes lubrication.
Otherwise the DGP(L) does not require any maintenance.

8 Repair

- Recommendation: Return the product to our repair service for overhaul. This ensures that special attention will be paid to the necessary fine adjustments and inspections.
- Information about spare parts and aids can be found at:
  ➔ www.festo.com/spareparts

9 Accessories

Please select the appropriate accessories from our catalogue
➔ www.festo.com/catalogue/DGP

10 Troubleshooting

Malfunction	Possible cause	Remedy
Uneven movement of the slide	One-way flow control valve not fitted correctly	If possible reduce the exhaust (not the supply air)
	Guide rail not greased	Lubricate guide rail ➔ 7 Maintenance and care
Faults in position scanning	Ferritic parts in the vicinity of the proximity sensor	Use parts consisting of non-magnetic materials or observe minimum clearances ➔ 5.3 Fitting electric components
Heavy leakage	Cylinder is distorted	Fasten the cylinder to a flat base.
	Seal worn	Replace worn parts: – yourself with wearing parts kit – by returning to Festo for repairs
	Sealing band pressed/sucked in	Avoid creating a vacuum in the piston chamber (e.g. only move the unpressurised slide slowly)
Cylinder does not reach the desired speed	Air volume not sufficient	– Select tubing with larger diameter – Switch volume upstream
	High friction or counteracting force	Observe maximum limits

Fig. 18

11 Technical data

DGP(L)			18	25	32	40	50	63	80
Pneumatic connection			M5	G1⁄8	G1⁄8	G1⁄4	G1⁄4	G3⁄8	G1⁄2
Mode of operation			Double-acting						
Mounting position			Any (Recommendation for stroke lengths > 2 000 mm and horizontal installation: Install the DGP(L) with the sealing band facing down)						
Operating medium	Use as cylinder:		Compressed air as per ISO 8573-1:2010 [7:–:–]						
	Use as positioning axis:		Compressed air as per ISO 8573-1:2010 [6:4:4]						
Operating pressure		[bar]	2 ... 8			1.5 ... 8			
Ambient temperature		[°C]	–10 ... +60						
Theoretical force at 6 bar		[N]	153	295	483	754	1 178	1 870	3 016
Speeds DGPL (min ... max)	GF	[m/s]	0,05 ... 1						
	KF	[m/s]	0.2 ... 3						
	GA	[m/s]	–	0.2 ... 3				–	–
Cushioning length	PPV	[mm]	16	18	20	30	30	30	85
Cushioning	PPV		Pneumatic cushioning, adjustable at both ends						
Max. energy			Diagrams ➔ Catalogue specifications						
Materials									
End cap/profile			Anodised aluminium						
Cover strip			Steel						
Driver			Anodised aluminium						
Slide			Anodised aluminium						
Guide rail	GF		Anodised aluminium						
	KF		Steel	Corrosion-resistant steel					
Seals			Nitrile rubber, polyurethane						

Fig. 19

Permitted force and torque loading

DGP			18	25	32	40	50	63	80
GK	Fymax	[N]	–						
	Fzmax		120	330	480	800	1 200	1 600	5 000
	Mxmax	[Nm]	0.5	1	2	4	7	8	32
	Mymax		11	20	40	60	120	120	750
	Mzmax		1	3	5	8	15	24	140
GV	Fymax	[N]	–						
	Fzmax		120	330	480	800	1 200	1 600	–
	Mxmax	[Nm]	1	2	4	8	14	16	–
	Mymax		22	40	80	120	240	240	–
	Mzmax		2	6	10	16	30	48	–

Formula for combined loadings:

$$0,4 \times \frac{Fz}{Fz_{max.}} + \frac{Mx}{Mx_{max.}} + \frac{My}{My_{max.}} + 0,2 \times \frac{Mz}{Mz_{max.}} \leq 1$$

$$\frac{Fz}{Fz_{max.}} \leq 1$$

$$\frac{Mz}{Mz_{max.}} \leq 1$$

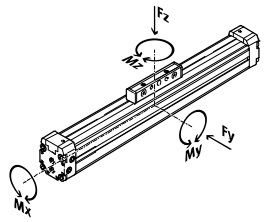


Fig. 20

Permitted force and torque loading

DGPL-GF			18	25	32	40	50	63	80
GK	Fymax	[N]	340	430	430	1 010	1 010	2 000	2 000
	Fzmax		340	430	430	1 010	1 010	2 000	2 000
	Mxmax	[Nm]	2.2	5.4	8.5	23	32	74	100
	Mymax		10	14	18	34	52	140	230
	Mzmax		10	14	18	34	52	140	230
GV	Fymax	[N]	330	400	395	930	870	1 780	–
	Fzmax		330	400	395	930	870	1 780	–
	Mxmax	[Nm]	2	5	8	21	28	66	–
	Mymax		18	25	30	58	83	235	–
	Mzmax		18	25	30	58	83	235	–

Formula for combined loadings:

$$\frac{Fy}{Fy_{max.}} + \frac{Fz}{Fz_{max.}} + \frac{Mx}{Mx_{max.}} + \frac{My}{My_{max.}} + \frac{Mz}{Mz_{max.}} \leq 1$$

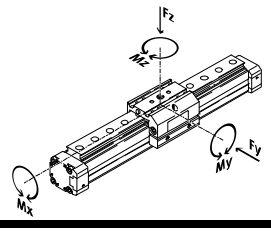


Fig. 21

Permitted force and torque loading

DGPL-KF			18	25	32	40	50	63	80
GK	Fymax	[N]	930	3 080	3 080	7 300	7 300	14 050	14 050
	Fzmax		930	3 080	3 080	7 300	7 300	14 050	14 050
	Mxmax	[Nm]	7	45	63	170	240	580	745
	Mymax		23	85	127	330	460	910	1 545
	Mzmax		23	85	127	330	460	910	1 545
GV	Fymax	[N]	930	3 080	3 080	7 300	7 300	14 050	–
	Fzmax		930	3 080	3 080	7 300	7 300	14 050	–
	Mxmax	[Nm]	7	45	63	170	240	580	–
	Mymax		45	170	250	660	920	1 820	–
	Mzmax		45	170	250	660	920	1 820	–

Formula for combined loadings:

$$\frac{Fy}{Fy_{max.}} + \frac{Fz}{Fz_{max.}} + \frac{Mx}{Mx_{max.}} + \frac{My}{My_{max.}} + \frac{Mz}{Mz_{max.}} \leq 1$$

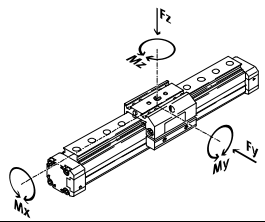


Fig. 22