

Linear axis

DGE-ZR/-SP



FESTO

en Operating
instructions

8075157
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[8075159]

Identification of hazards and instructions on how to prevent them:



Danger

Immediate dangers which can lead to death or serious injuries



Warning

Hazards that can cause death or serious injuries



Caution

Hazards that can cause minor injuries

Other symbols:



Note

Material damage or loss of function



Recommendations, tips, references to other documentation



Essential or useful accessories




Information on environmentally sound usage

Text designations:

- Activities that may be carried out in any order
- 1. Activities that should be carried out in the order stated
 - General lists
- ➔ Result of an action/References to more detailed information

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1 Control sections and connections

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

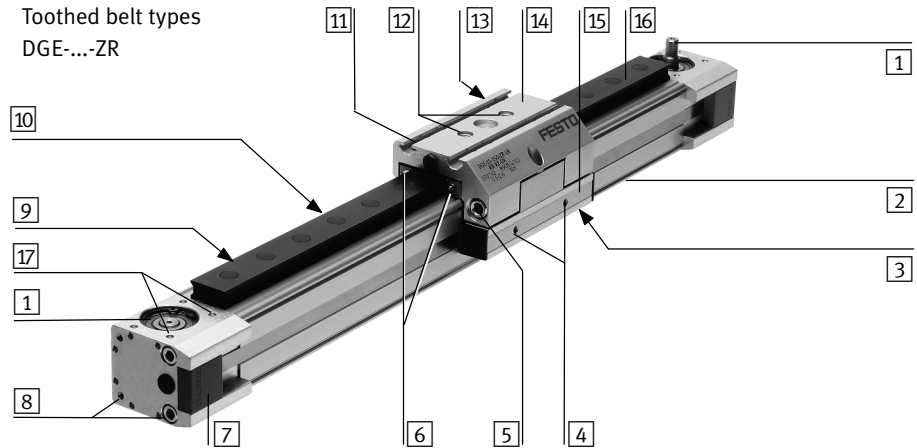


Fig. 1

- | | |
|---|---|
| 1 Drive shaft (with one, two or no shaft extension(s), depending on order) | 9 Groove for (item) slot nuts (for DGE-40/63) |
| 2 Corner profile for mounting of central supports (with DGE-8 ... 25) | 10 Groove with recess for proximity sensor |
| 3 Hole in the driver for mounting the effective load (only with DGE without guide) | 11 Grooves for mounting the effective load (only DGE-...-KF) |
| 4 Thread for mounting the effective load | 12 Centring recesses with mounting thread for effective load (only DGE-...-KF) |
| 5 Slide screws (only with DGE-...-KF) | 13 Mounting thread for sensor switch lug (only with DGE-18 ... 63-KF) |
| 6 Lubrication nipple for slide bearing (for DGE-...-KF) | 14 Slide (only with DGE-...-KF) |
| 7 Clamping device for cover band | 15 Driver |
| 8 Female thread for mounting the axis | 16 Guide rail (with DGE-...-KF) |
| | 17 Mounting thread for motor mounting kit |

Spindle types
DGE-...-SP

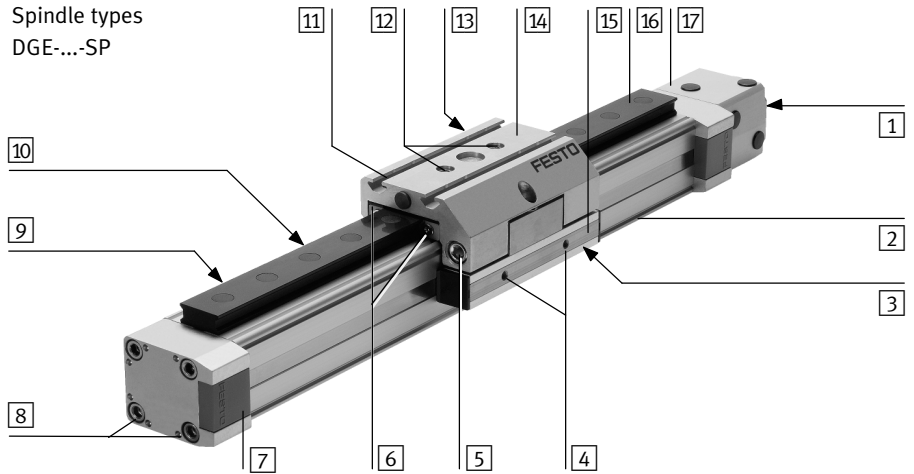


Fig. 2

- | | |
|--|--|
| 1 Drive shaft | 10 Groove with recess for proximity sensor |
| 2 Corner profile for mounting of central supports (with DGE-8 ... 25) | 11 Grooves for mounting the effective load (only DGE-...-KF) |
| 3 Hole in the driver for mounting the effective load (only with DGE without guide) | 12 Centring recesses with mounting thread for effective load (only DGE-...-KF) |
| 4 Thread for mounting the effective load | 13 Mounting thread for sensor switch lug (only with DGE-18 ... 63-KF) |
| 5 Slide screws (only with DGE-...-KF) | 14 Slide (only with DGE-...-KF) |
| 6 Lubrication nipple for slide bearing (for DGE-...-KF) | 15 Driver |
| 7 Clamping device for cover band | 16 Guide rail |
| 8 Female thread for mounting the axis | 17 Motoranbausatz (Zubehör) |
| 9 Groove for (item) slot nuts (for DGE-40/63) | |

2 Function and application

An internal actuator converts the rotary movement of a motor into a linear movement. The actuator moves the internal slide backwards and forwards.

Design of the actuator:

- DGE-...-ZR: Rotating toothed belt
- DGE-...-SP: Rotating spindle

Through a fixed connection, the driver also moves. The slot in the cylinder barrel required for this is covered by a band system. With the DGE-...-KF designs a slide is fastened to the driver. The slide has its own guide.

The DGE is intended for exact positioning of masses. It is approved for operation in slide mode and yoke mode (cantilever mode).

Designs with toothed belt (DGE-...-ZR) are not permitted for application conditions in which vegetable and water-soluble greases or oils can penetrate into the axis.

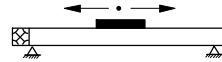


Fig. 3: Slide mode



Fig. 4: Yoke mode

Note

The DGE linear axis is not automatic locking: When input torque is not applied, the slide can be moved freely. Generally, a latching function of the complete system can be achieved with motors with an integrated holding brake or other suitable means, such as clamping systems, motors with high gear ratios or automatic-locking gear units. Which measure is appropriate to select basically depends on the application and the safety requirements.

- Please select the appropriate motors from our catalogue www.festo.com/catalogue.
You will then be operating mating devices which are especially adapted to each other.
- Observe the limit values for forces, torque and speeds
➔ chapter 12 “Technical data”.

3 Transport and storage

- Take into account the weight of the DGE-...
The DGE weighs up to 150 kg, depending on the design.
- Ensure the following storage conditions are met:
 - Short storage times
 - Cool, dry, shaded storage locations protected from corrosion
 - No oils, greases or fat-solvent fumes.

In this way you will maintain the performance of the toothed belt and the axis.

4 Requirements for product use



Warning

Unexpectedly fast moving masses can harm people or property (crushing).

- Apply power to the drive motor, at first limited to low speeds and torques.



Note

Malfunctions will occur if the device is incorrectly used.

- Be sure to always comply with the specifications in this chapter. In this way, the product will perform as intended.
- Compare the limit values specified in these operating instructions with your 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.
- Observe also the regulations of the trade association, German Technical Control Board (TÜV), the VDE or relevant national regulations.



- Remove the packaging, such as foils, caps, cardboard and protective wax. The packaging is intended for recycling (except for: oiled paper = other waste).
- Use the DGE in its original state without undertaking any unauthorised modifications.
- Note the warnings and instructions on the product and in the relevant operating instructions.
- Avoid damaging the DGE or getting it excessively dirty.
Otherwise damage might occur to the toothed belt or ball screw drive. This will impair operational safety, operational reliability and service life of the DGE-...

5 Installation

Mechanical installation

- Do not modify the screws and threaded pins if not directly requested to do so in these operating instructions.
- Mount the motor onto the axis in accordance with the assembly instructions for the motor mounting kit recommended in the catalogue.

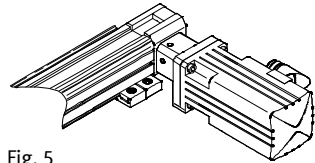


Fig. 5

If mounting in a vertical or diagonal position:



Warning

Falling masses can cause personal injury and material damage (crushing). In case of a power failure or broken actuator, the movable mass falls down.

- Make sure that you only use motors with an integrated spring-loaded holding brake.
- Check whether external safety measures are also necessary to prevent damage from a broken actuator (e.g. toothed latches, moving bolts or an emergency buffer).

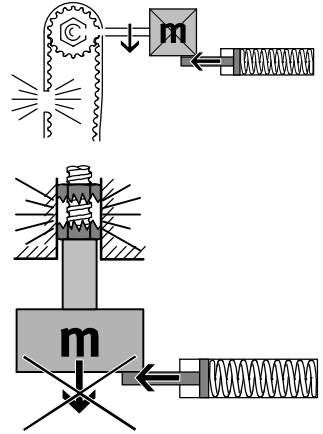


Fig. 6

Installing the product:

- Check the necessary mounting position.

	Protection against the penetration of drops (greases, oils, water) and particles (dust)	
	Low	Medium
Mounting position	Vertical, diagonal or horizontal with cover band upwards	Diagonal or horizontal with cover band downwards

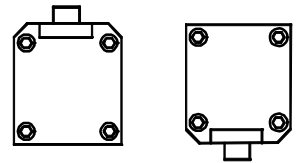


Fig. 7

Fig. 8

- Place the DGE so that all the operating parts are accessible.

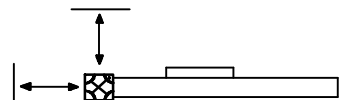


Fig. 9

- Make sure that the device is installed free of mechanical stress and distortion (evenness of mounting surface: 0.2 mm / 30 cm).

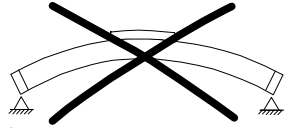


Fig. 10



Note

Tensile loads on the cover screws that are too high cause them to be pulled out.

- In case of heavy loads, ensure that the axis is not fastened by the front cover alone.

Articles with long stroke lengths:

- Use the central support MUP-...

Fig. 13 shows the distances between supports necessary for the MUP.

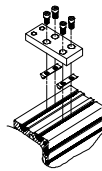
When attaching central supports:

- Position the central supports at equal distances over the complete axis length, not only over the stroke path.
- Fasten the centre supports with slot nut on the DGE as shown in Fig. 11.

When the slot nuts are tilted, they glide into any position of the profile in the groove.

- Tighten the mounting screws evenly.
- Make sure that the central supports are situated outside the positioning range of the slide by pushing the slide once over the complete positioning path.

DGE-40...63



DGE-8...25



Fig. 11

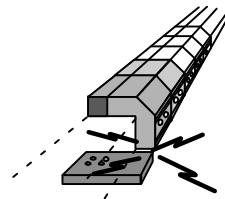


Fig. 12

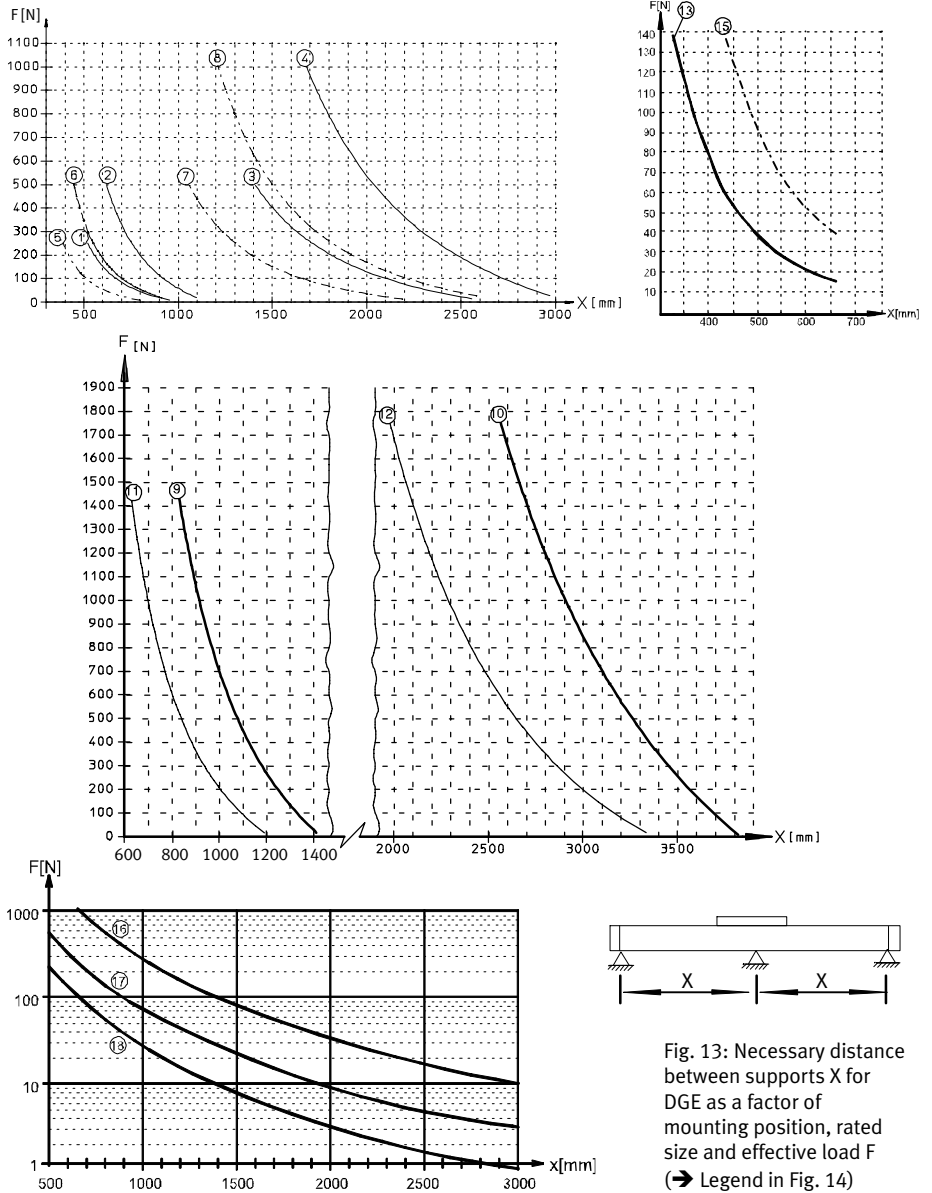


Fig. 13: Necessary distance between supports X for DGE as a factor of mounting position, rated size and effective load F (→ Legend in Fig. 14)

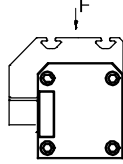
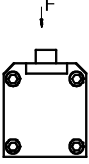
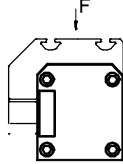
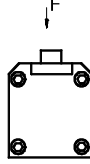
Type:	Spindle axis		Toothed belt	
	DGE-...-SP-KF	DGE-...-SP	DGE-...-ZR-KF	DGE-...-ZR
Load factor:				
Ø 8	-	-	⑱	⑱
Ø 12	-	-	⑰	⑰
Ø 18	⑮	⑬	⑯	⑯
Ø 25	①	⑤	③	⑦
Ø 40	②	⑥	④	⑧
Ø 63	⑨	⑪	⑩	⑫
Curve numbers in the diagram (Fig. 13)				

Fig. 14: Legend for Fig. 13

Installing the effective load

With all applications:

- Place the effective load so that the tilting torque of force F parallel to the movement axis and lever arm “a” remains low.
- To design the DGE-..., use the Festo design software “Positioning Drives” → www.festo.com.

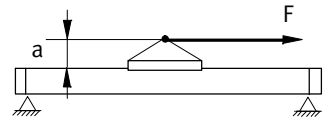


Fig. 15

- Leave the blue plastic cover caps fitted on the end caps. These protect the clamping device of the band system from external influences.

Effective loads with their own guide

- Adjust the guides of the effective load and of the DGC so that they are exactly parallel.

Only in this way can you avoid overloading on the slide (permitted forces → chapter “Technical data”).

Only in this way will the service life of the DGE fulfil expectations.

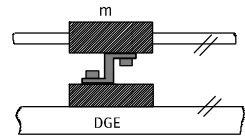


Fig. 16

With hard and stiff effective loads (steel):



Note

If the aluminium slide becomes bent against a buckled effective load, the service life of the guide will be reduced.

- Make sure that the mounting surface of the effective load is not bent more than as follows:
 - GF: $b \leq 0.03 \text{ mm}$
 - KF: $b \leq 0.01 \text{ mm}$

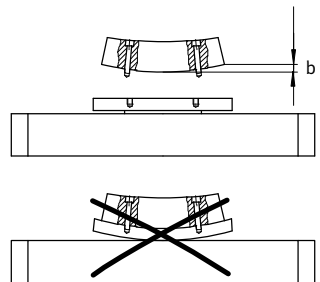


Fig. 17

To mount the effective load:

- Mount the effective load in one of the following ways:
 1. on the slide: with slot nuts NSTL-... in the grooves (11 in Fig. 1).

NSTL	25	40	63
L	100	166	229
A	13	25	30
B	15	20	35
M	M5	M5	M8

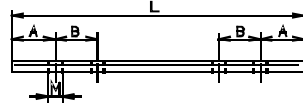


Fig. 18

Fig. 19: Dimensions of the slot nuts NSTL-...

2. On the slide: with centring sleeves/pins (accessories) at the centring recesses (12 in Fig. 1).
The screw-in depth must be less than the threaded holes.

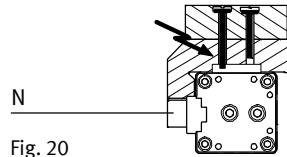


Fig. 20

3. For DGE without slide:
On the through holes of the driver ("N" in Fig. 20).

With mass geometries with projection in the longitudinal direction of the slide:

- Make sure that the effective load does not strike against the motor mounting kit or the motor.

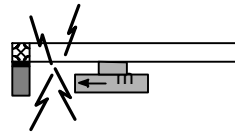


Fig. 21

Installing external accessories

Preparations for installing the external accessories

- Check to see which interrogation variant is required for your application.

Variant:	1. The controller requires a separate reference point	2. The controller does not require a separate reference point	Additional to points 1 and 2 independent of the control type
The following are necessary:	1 reference point switch 2 hardware limit switches	only 2 hardware limit switches (HW)	always 2 safety limit switches
Installation requirement:	Reference point switch overlaps with a hardware limit switch. The hardware limit switch overlaps with the safety limit switches.	1 hardware limit switch as reference point switch. Both hardware limit switches overlap with the safety limit switches (→ “Commissioning”).	with safety distance from mechanical end position

Fig. 22

- Use interrogation elements with the following features:

Element	Design	Purpose	Note
Safety limit switch	External mechanical roller switch with switching function: N/C contact	Triggering of the EMERGENCY STOP function	As per accident prevention regulation; only prevents consequential damages
Hardware limit switch	External inductive or magnetic limit switch with switching function: N/C contact	Triggering the maximum braking (emergency ramp)	Enables damage-free braking in the event of programming errors
Software limit switch	–	Limiting the positioning range by parametrisation in the controller	Are not overtravelled in normal situations
Reference point switch	Switching function: N/O contact	Definition of a point of reference	Regular position checks are recommended

Fig. 23

To secure a controlled braking path:

- Make sure that this condition is always observed: $s \succ n$.
Only in this way can you avoid states with undefined positions after incorrect programming of the article (e.g. overtravelling of the proximity switches).
 - **Switching travel s** of the SME-8-... or of the SIE-... if the original switch lugs are used (→ Fig. 24).
 - **Braking distance n**, which can be achieved at the maximum speed (determination of the braking distance: empirically under load or calculated from the motor braking torque)

Toothed belt types			Spindle types		
DGE-...-ZR	SME-8...	SIE-...	DGE-...-SP	SME-8...	SIE-...
...-8-...	7.4 mm	–	...-18-...	7.2 mm	77 mm
...-12-...	9.9 mm	–	...-25-...	7.0 mm	97 mm
...-18-...	7.0 mm	77 mm	...-40-...	12.0 mm	159 mm
...-25-...	14.0 mm	97 mm	...-63-...	20.0 mm	222 mm
...-40-...	22.0 mm	159 mm			
...-63-...	26.0 mm	222 mm			

Fig. 24: Switching travel s of the proximity sensor at room temperature

Deviations with $s < n$:

- Use proximity switches and switching lugs (accessories).
- Observe that the switching travel s depends on the length of the magnet if magnetic proximity sensors are used. If necessary, use inductive proximity sensors and switching lugs.

If the magnetically actuated proximity sensors are positioned correctly, the slide will not overtravelled them. This will prevent incorrect circuits at the article.

If inductive or mechanical limit switches are used:

- Use switching lugs of length d (→ Fig. 29).

If inductive or magnetic limit switches are used:

- Avoid external influence caused by magnetic or ferritic parts in the vicinity of the reference point switches and limit switches.

With use of inductive proximity sensors SIE-... :

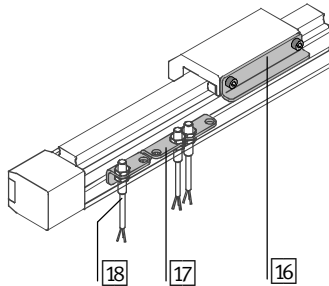


Fig. 25

- 16 = switch lug
- 17 = sensor bracket
- 18 = proximity sensor

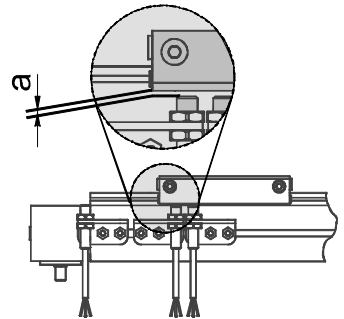


Fig. 26

With small sizes, hammer head screws (accessories) can be used for fastening the sensor bracket in the groove.

These use the cut-out in the cover as a guide channel.

A 90° turn will bring the hammer head screw into its holding position.

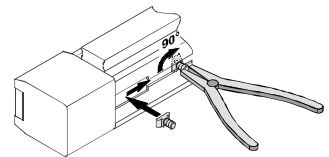


Fig. 27

If magnetic proximity sensors SME-... are used :

- Use the grooves in accordance with Fig. 28.
- Place the proximity switches with nominal sizes 8/12/18 with the cable outlet facing the centre of the stroke.

For DGE-...-SP:

- Observe that the magnet is situated asymmetrically on the inner slide (on the side facing away from the motor).
- Avoid external influence caused by magnetic or ferrite parts in the vicinity of the proximity sensors (10 mm distance from the slot nuts).

For DGE-25-SP:

- Place the proximity sensor only in the side grooves. The magnetic field is very weak in the lower groove.

For DGE-40-SP:

- Place the proximity sensor SMT-8 (high response sensitivity) only in the side grooves. In the top grooves, the magnetic field is very strong (danger of multiple switching).

In this way you can ensure that the switches function faultlessly.

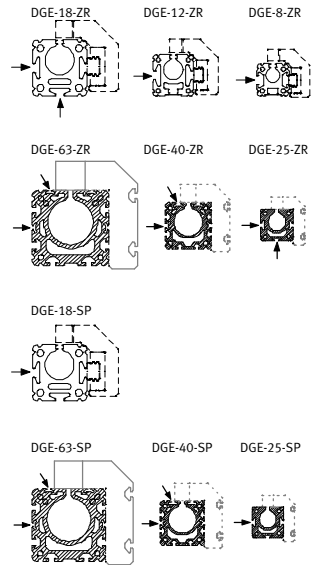


Fig. 28

Increased protection against consequential damages:

- Use shock absorbers or fixed stops of sufficient size outside the safety limit switches.

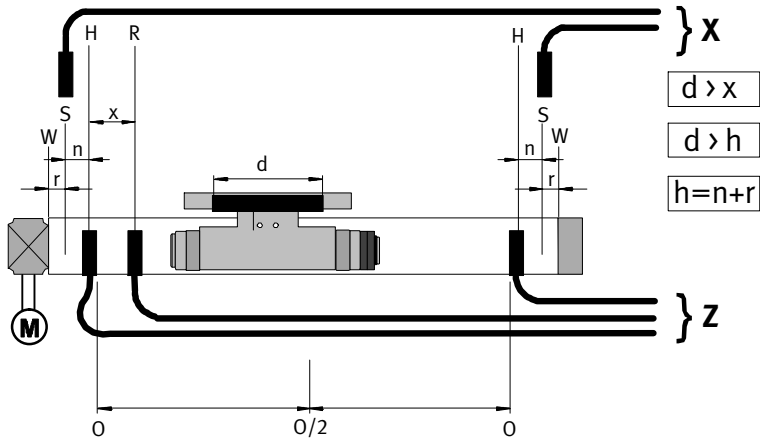
The effective stroke of the product may be shorter, depending on the mounting situation.

Carrying out the installation of external accessories

For placement of the proximity sensors:

1. Place the **safety limit switches** in the mechanical end positions (W) as shown in Fig. 29.
2. Place the **hardware limit switches** near the mechanical end positions.
At first, the limit switches can still be shifted in the longitudinal direction (cable reserve; for accurate positioning → chapter “Commissioning”).
3. If necessary, place a **reference point switch** between both hardware limit switches (exact positioning: → chapter “Commissioning”).

- Take into account the following plan for positioning the proximity switches:



M Motor

X Interface to emergency stop circuit

Z Interface to controller

W Mechanical end position

S Switching point of the safety limit switches

S Switching point of the hardware limit switches

R Reference point position

O Positioning limits of the software controller

O/2 Stroke centre

d Length of the switching lug

h Stroke reserve: $h = n + r$

n Controlled braking path

r Distance of the switching point of the safety limit switches from the mechanical end position.

x Distance of the reference point switch from the end of the stroke reserve

Fig. 29: Schematic distribution of the proximity switches

If proximity sensors are used as proximity switches:

- Use proximity sensors with normally-closed function (N.C.= normally closed). These will protect a DGE with a broken proximity sensor cable from overtravelling the end position.

Fig. 30



To prevent contamination:

- Use cover rails (accessories) in all unused grooves.

Electrical installation

- Connect the electric control elements as follows: (refer to the relevant operating instructions):
 - Connect the motor (M) to the controller (Z) and to the main power supply via an intermediately switched power amplifier.
 - Connect the reference point switch to the controller power supply and to the controller (Z).
 - Connect the safety limit switch to the power supply and to the separately switched EMERGENCY STOP mechanism (X). (→ chapter “Mechanical installation”)
 - Connect the hardware limit switch to the controller power supply and to the controller (Z).

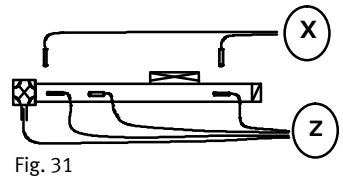


Fig. 31

Installing circuitry



Note

Additional measures are required for use in safety-related applications; in Europe, for example, the standards listed under the EC Machinery Directive must be observed.

Without additional measures in accordance with statutory minimum requirements, the product is not suitable for use in safety-related sections of control systems.

6 Commissioning

Preparing for commissioning



Warning

Moving masses can cause personal injury and material damage (crushing).

- Make sure that, in the positioning range,
 - nobody can place his/her hand in the path of the moving components (e.g. by use of a protective crate),
 - there are no foreign objects.
- It should not be possible to touch the DGE... until the mass has come to a complete standstill.

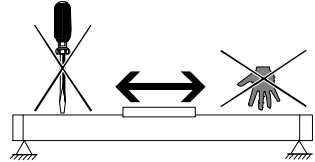


Fig. 32



Note

Incorrect default values of the braking ramp in STOP conditions (e.g. EMERGENCY STOP and quick stop) result in overloading of the linear axis and can damage it or drastically reduce its service life.

- Check the settings for all braking ramps on your controller or the higher-order controller (deceleration values and jerking).
- Taking the travel speed, moveable load and mounting position into account, make sure that the delay values (brake delay and delay times) are set in such a way that the maximum drive torque or feed force of the linear axis used is not exceeded.
- Use the “PositioningDrives” sizing software to design the linear axis
→ www.festo.com.



Note

Block-step acceleration profiles (without smoothing) cause high peaks in the motive force that can lead to drive overload. In addition, positions outside the permissible range may occur as a result of overswing effects. A jolt-limited acceleration specification reduces vibrations in the entire system and has a positive effect on stress in the mechanical system.

- Check which controller settings may be adapted (e.g. jolt limitation and smoothing of the acceleration profile).

Positioning the limit switches:

1. Push the slide at first into a mechanical end position (W).
2. Position the slide the distance of the stroke reserve h away from the mechanical end position (→ also Fig. 29).

Stroke reserve h ($h = n + r$)		
DGE-...	SP	ZR
8	–	27.5 mm
12	–	36.5 mm
18	6.5 mm	46.5 mm
25	10 mm	63 mm
40	20 mm	100 mm
63	30 mm	172 mm

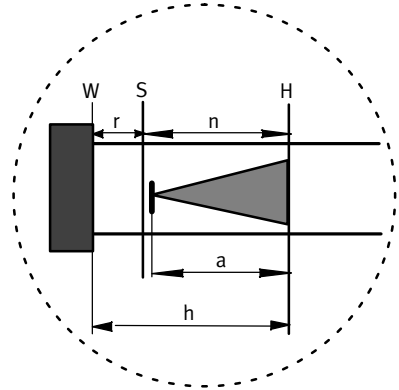


Fig. 33: Stroke reserve h

**Note**

Distance r only needs to be large enough to ensure reliable switching of the safety limit switches.

If the required braking path a together with the distance r in your application is greater than the stroke reserve intended by Festo ($a + r > h$), you must increase the stroke reserve at the cost of the effective stroke.

- Shift the **hardware limit switch** for the relevant end position up to its switching point in the direction of the slide.

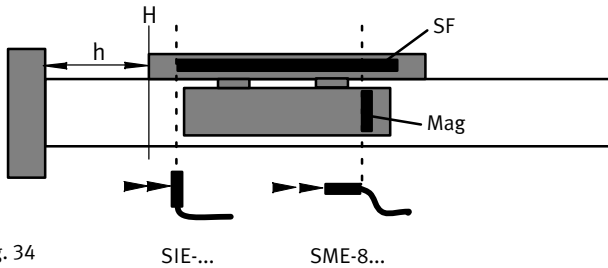


Fig. 34

SF = Switching lug
Mag = Magnet

- Fasten the hardware limit switch exactly at this point.

If magnetic proximity sensors SME-... are used :

- Note that the switching magnet on the inner slide is arranged asymmetrically. As a result, the proximity sensors are distributed asymmetrically on the DGE.
- Repeat the last four points in the other end position.
 - Push the slide into the end positions.
You can then check whether the hardware limit switches function correctly and whether the switching lug (if available) is seated free of play.
 - Fasten the **safety limit switches** at point S between the relevant mechanical end position (W) and the nearby hardware limit switch.

The following then applies:

- A braking path of length n remains between the response point of the hardware limit switch and the response point of the safety limit switch.
- The response ranges (grey bars in Fig. 35) of the safety limit switch (SS) and the hardware limit switch (HW) overlap. In this way you can avoid undefined operating states when the axis is switched on.
- In spite of the defined end position S being overrun, the safety limit switches remain actuated up to the mechanical end position.
- If the slide is set correctly, it will brake completely when overrunning a hardware limit switch before the safety limit switch responds.

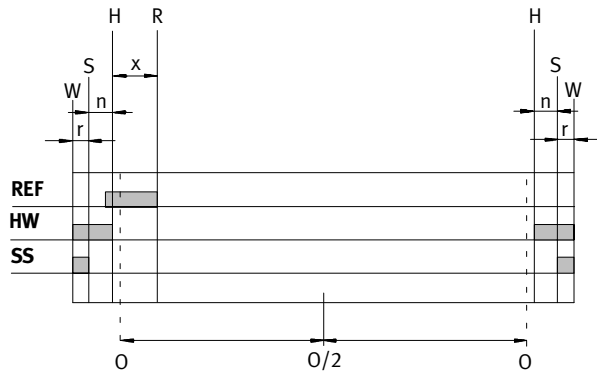


Fig. 35

REF = Reference point switch
 HW = hardware limit switch
 SS = safety limit switch

8. Fasten the **reference point switch** (if necessary) between the hardware limit switches under the following condition:
 There must be a point at which both the reference point switch as well as the hardware limit switch near the motor respond simultaneously ($x < d$, → Fig. 29).

Checking the functions:

1. Push the slide into a mechanical end position.
 2. Check whether the safety limit switches and the reference point switches function correctly and whether the switching lug is seated free of play.
- Repeat the points 1 – 2 in the other end position.

Carrying out commissioning

1. Check travel	2. Homing	3. Test run
Determining the approach direction of the motor	Comparing the real situation with the image in the controller	Checking the overall behaviour

Fig. 36: Definitions

1. Start **check travel** limited to low dynamics.
In spite of equal control, motors of the same type sometimes turn in the opposite direction due to the circuitry.
The DGE-...-SP has a clockwise-rotating spindle: When the drive shaft is rotated clockwise, the slide moves in the direction of the motor.
2. Start **homing** in accordance with the operating instructions for your motor drive system limited to low dynamics up to the reference switch.
3. Start a **test run** and limit it to low dynamic response.
4. Check whether the DGE-... fulfils the following conditions:
 - The slide must be able to move through the complete intended positioning cycle.
 - The slide must stop as soon as it reaches a limit switch.
5. If the proximity sensors do not respond:
→ chapter 11 “Eliminating malfunctions” and the operating instructions for the proximity sensors.

In the case of deviations from the nominal behaviour:

- Check these points on your installation:
 - Motor
 - Mechanical mounting
 - Electrical connections
 (→ also chapter “Eliminating malfunctions”).

7 Operation



Warning

- Make sure that, in the positioning range of the article
 - nobody can place his/her hand in the path of the moving components (e.g. by providing a protective screen)
 - there are no foreign objects.

It must not be possible to touch the DGE until the mass has come to a complete standstill.

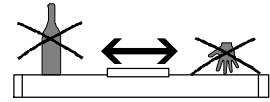


Fig. 37

If mounting in a vertical or diagonal position:



Warning

Falling masses can cause personal injury and material damage (crushing). In case of a power failure or broken actuator, the movable mass falls down.

- Make sure that you only use motors with an integrated spring-loaded holding brake.
- Check whether external safety measures are also necessary to prevent damage from a broken actuator (e.g. toothed latches, moving bolts or an emergency buffer).

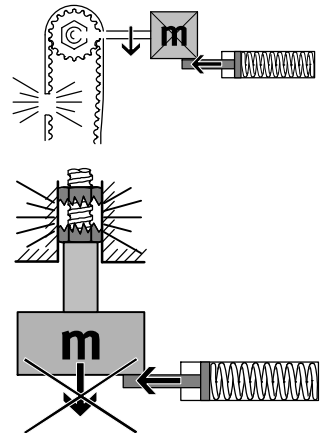


Fig. 38



Note

A motor from Festo with spring-loaded holding brake holds masses at standstill securely in position.

This type of brake is not suitable for braking masses in movement. Frequent braking increases wear.

If the motor turns in the wrong direction:



Note

When the motor is dismantled (e.g. turning the motor), the reference position is lost.

- Start homing as detailed in the chapter “Commissioning” in order to set the new reference position.

8 Service and maintenance



Warning

Controller signals can cause the DGE to make unintentional movements.

- Switch off the controller for all maintenance work on the DGE and secure it to prevent it from being switched back on unintentionally.

- Do not change screws and threaded pins if there is no direct request to do this in these operating instructions.
- If necessary, clean the cover band with a soft cloth.
The following cleaning agents are permitted: all non-abrasive cleaning agents.
- Grease the surfaces of the guide rail or cover band if they no longer have a layer of grease.
Grease: in accordance with Fig. 41.
In this way you will renew the protection against humidity.
- Recommendation:
Return the DGE-...-ZR to Festo for inspection after every 5000 kilometres run.

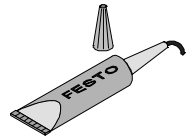
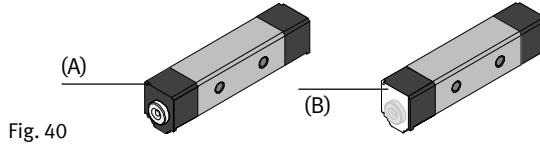


Fig. 39

Lubricating the roller bearing guides DGE-...-KF:

- Observe the lubricating intervals:
 - With roller bearing cassettes of the old design (A): every 400 kilometres run



- With roller bearing cassettes of the new design (B), the lubricating intervals depend on the lubricant used:

Lubricant type	1 st interval	2 nd ... n th interval
Festo special grease LUB-KC1	5000 km	400 km
Rhenus Norlith STM 2 (Rhenus Lub GmbH & Co. KG)	5000 km	DGE-8 ... 18: 400 km DGE-25 ... 63: 5000 km
Gearmaster LXG 00 (Fuchs Lubritech GmbH)	5000 km	DGE-8 ... 18: 5000 km DGE-25 ... 63: not permitted

Fig. 41: Lubrication types and intervals

- Note that lubrication intervals must be shortened in the case of:
 - Dusty and contaminated environment
 - With rated strokes > 2000 mm or < 50 mm
 - At speeds of > 2 m/s
 - If the DGE is more than 3 years old
- Grease the slide bearings at all lubrication nipples [6]. Special grease and grease gun with needle pointed nozzle: see chapter “Accessories”.
- Move along the entire path of travel while greasing so that the grease is distributed evenly.

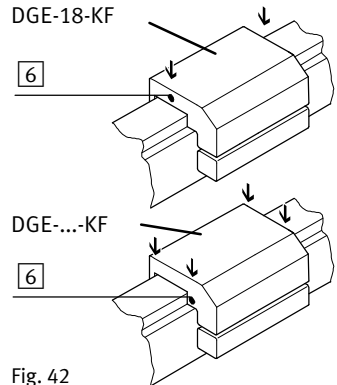


Fig. 42

Each time maintenance is carried out:

- Make sure that the slide is set free of play and distortion.
Fig. 43 shows the critical points.

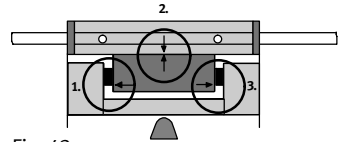


Fig. 43

Increasing the tension of the cover band for guaranteeing the IP protection class (if necessary with a second person):

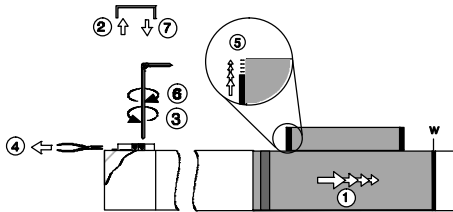


Fig. 44

1. Push the slide into an end position.
2. Remove the cover cap (if present) from the opposite side (→ Fig. 44).
3. Unscrew the threaded pins a little.
4. With the aid of flat pliers, pull the cover band until it just begins to lift up the black wiper strip.
5. Tighten the threaded pins again.

Rated \varnothing	Tightening torque
8/12/18	1 Nm
25/40	2 Nm
63	3 Nm

6. Press the cover cap tight again.

9 Repair



Note

For DGE-...-ZR:

Retensioning of the toothed belt reduces its service life considerably.

In addition, the technical specifications, e.g. the feed constant, will be modified.

- Make sure that the toothed belt has not been retensioned.
The toothed belt is pretensioned so that it does not have to be retensioned during its life.
- Recommendation: Return the DGE to our repair service.
The necessary fine adjustments and tests will then be taken especially into account.
- Information on spare parts and aids can be found under:
www.festo.com/spareparts

10 Accessories



Note

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

Designation	Type	Part number/manufacturer
Grease gun with pointed nozzle	LUB-1	647 958 *)
Lubrication adapter (if little space)	LUB-1-TR-L	647 960 *)
Special grease (silicone-free)	LUB-KC1	from Festo *)
Special grease (silicone-free)	Rhenus Norlith STM 2	Rhenus Lub GmbH & Co. KG
Special grease (silicone-free)	Gearmaster LXG 00	Fuchs Lubritech GmbH
*) → Spare-parts catalogue under www.festo.com/spareparts		

11 Eliminating malfunctions

Malfunction	DGE-...	Possible cause	Remedy
Inaccurate positioning	SP, ZR	Axial play on the slide	Tighten axial slide screws (2)
	ZR	Tooth skipped due to high inertial forces	Reduce dynamic loading, new homing, if necessary return the DGE to Festo
	SP	Thrust bearing worn	
	ZR	Toothed belt damaged	
	SP, ZR	Reference point switch loose	Fasten reference point switch
	SP	Spindle nut worn	Send in the DGE
	SP, ZR	Outside the axis	Check peripherals (e.g. motor, controller...)
Heavy abrasion on the cover band	SP, ZR	Cover band tensioned too tightly	Re-tensioning the cover band
Loud running noises	SP, ZR	Axial play in the fixed bearing; wear on the drive shaft	Return the DGE to Festo
	SP, ZR	Insufficient lubrication (of the slide bearing)	Lubricate again, if necessary return the DGE to Festo
	ZR	Toothed belt damaged	Return the DGE to Festo

Malfunction	DGE-...	Possible cause	Remedy
Missing or undefined switching functions	SP, ZR	Proximity sensor or cable defective	Install new proximity sensor or replace cable
		Switching magnet loose or broken	Return the DGE to Festo
		Proximity switch installed in impermissible groove	Use permissible groove
		Sensing distance set incorrectly	Readjust
		Incorrect switch or incorrect connection	Use correct switch or connection
	25-SP	Proximity sensors do not switch in the lower groove	Place proximity sensors in the side groove
40-SP	Proximity sensors switch multiple times in the upper groove	Place proximity sensors in the side groove	
Rotary movement of motor is not transferred to the DGE-...	SP, ZR	Clamping hub of the coupling spins	Check installation of the motor mounting kit (coupling)
	SP	Spindle nut loose	Return the DGE to Festo
	ZR	Toothed belt broken	
Cover band lifts up	SP, ZR	Incorrect tensioning of the cover band	Re-tension cover band
Cover band damaged or bent	SP, ZR	External influences, mechanical overloading	Return the DGE to Festo
Slide jams	SP	Spindle nut worn	
	SP	Ball screw drive blocked in case of continuous reversing operation with short strokes.	Occasionally run the maximum stroke to achieve even distribution of the balls in the spindle nut again.

12 Technical specifications (not valid for DGE-...-RF)

Toothed belt type DGE	-8-ZR	-12-ZR	-18-ZR	-25-ZR	-40-ZR	-63-ZR
Design	Electrical linear unit with circulating toothed belt					
Permitted temperature range	-10 ... +40 °C (storage/operation)					
Mounting position	Any					
Permissible effective load:						
horizontal	1.5 kg	3 kg	6 kg	20 kg	50 kg	120 kg
vertical	0.5 kg	1.3 kg	2.4 kg	10 kg	25 kg	60 kg
Protection class **)	IP40 (cover band on top/lateral), IP42 (cover band underneath)					
Feed constant ***)	32 mm/rev	38 mm/rev	52 mm/rev	63 mm/rev	100 mm/rev	176 mm/rev
Max. permitted torque *)	0.076 Nm	0.18 Nm	0.5 Nm	2.6 Nm	9.7 Nm	42.0 Nm
Max. feed force (theoretical)*)	15 N	30 N	60 N	260 N	610 N	1500 N
Max. radial force on the drive shaft *****)						
Stability calculation:	103 N	77 N	290 N	307 N	984 N	2600 N
For 5000 km operation:	56 N	96 N	117 N	235 N	370 N	840 N
For 10,000 km operation:	40 N	70 N	80 N	140 N	170 N	400 N
Max. permitted slide speed *)	1 m/s	1.5 m/s	2 m/s	5 m/s (3 m/s)		
Permitted linear acceleration *)	depends on mass					

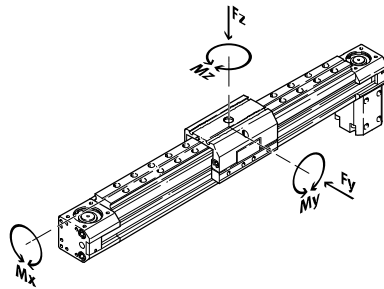
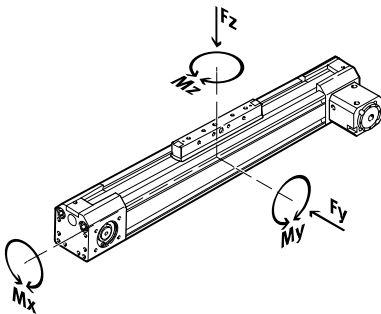
Toothed belt type DGE	-8-ZR	-12-ZR	-18-ZR	-25-ZR	-40-ZR	-63-ZR
Mass moments of inertia [kgmm²]	Mass moment of inertia J_A related to drive shaft: $J_A = J_0 + H \cdot J_H + J_K + m \cdot J_L + i \cdot J_W$ Stroke length (H), effective load (m), number of additional slides (i)					
for zero stroke (J_0)	0.56 (2.451)	1.45 (5.81)	6.376 (24.72)	38 (81)	234 (525)	2560 (5070)
per metre stroke (J_H)	0.342	0.877	2.101	7.8	45	360
per kg work load (J_L)	25.91	36.54	68.48	100	253	785
of the coupling (J_K)	0.13		0.47	6.06	42.3	417
per additional slide (J_W)	–	–	(17)	(38)	(268)	(2434)
Repetition accuracy as per DIN 230, part 2 {R = ±2s}	±0.08 mm (for stroke lengths < 1,000 mm)			±0.1 mm (for stroke lengths < 2000 mm)		
<p>() Values in brackets apply to DGE-...-KF Specifications without additional parenthesized value apply to DGE without guideand DGE-...KF</p> <p>*) for expected service life</p> <p>**) for stroke lengths < 660 mm with DGE-8-...; otherwise for stroke lengths < 1000 mm</p> <p>***) This is a nominal value and varies due to component tolerances.</p> <p>****)- The point of application of the radial force is at the journal end - The values refer to a radial force on a journal - The radial force for the corresponding operation performance is determined by the basic load rating of the bearing.</p>						

Spindle types DGE	-18-SP	-25-SP	-40-SP	-63-SP
Design	electrical linear unit with driven spindle			
Permitted temperature range	0 ... +40 °C (storage/operation)			
Mounting position	Any			
Permissible effective load: horizontal vertical	6 kg 3 kg	25 kg 10 kg	50 kg 25 kg	150 kg 75 kg
Protection class **)	IP40 (cover band on top/lateral), IP42 (cover band underneath)			
Feed constant ***)	4 mm/rev	10 mm/rev	20 mm/rev	30 mm/rev
Max. permitted torque *)	0.1 Nm	0.45 Nm	2.1 Nm	8.5 Nm
Max. feed force (theoretical) *)	140 N	250 N	600 N	1600 N
Max. radial force on the drive shaft *****)	40 N	75 N	250 N	800 N
Max. permitted slide speed *)	0.2 m/s	0.5 m/s	1.0 m/s	1.2 m/s
Max. permitted linear acceleration *)	6 m/s ²			

Spindle types DGE	-18-SP	-25-SP	-40-SP	-63-SP
Mass moments of inertia [kgmm²]	Mass moment of inertia J_A related to drive shaft: $J_A = J_0 + H \cdot J_H + J_K + m \cdot J_L + i \cdot J_W$ Stroke length (H), effective load (m), number of additional slides (i)			
for zero stroke (J_0)	0.74 (0.83)	2.87 (3.95)	36.4 (48)	315 (388)
per metre stroke (J_H)	3.1	12.1	100	667
per kg work load (J_L)	0.405	2.53	10.1	22.8
of the coupling (J_K)	0.13	6.06	6.06	42.3
per additional slide (J_W)	(0.1)	(0.96)	(10.7)	(70.7)
Repetition accuracy as per DIN 230 part 2 {R = ±2s}	±0.02 mm			
<p>() Values in brackets apply to DGE-...-KF Specifications without additional parenthesized value apply to DGE without guide and DGE-...KF</p> <p>*) for expected service life</p> <p>**) for stroke lengths < 1000 mm</p> <p>***) This is a nominal value and varies due to component tolerances.</p> <p>****) The point of application of the radial force is at the journal end.</p>				

Materials DGE-...	18-SP	25 ... 63-SP	8 ... 18-ZR	25 ... 63-ZR
Piston	Al	Al	PA	Al
Slide, cylinder barrel, cover	Al			
Ball bearing, stop, sliding blocks, roller cassette, cover band	St			
Buffer, wiper strip, O-rings	Perbunan, AU	POM, AU	Perbunan	Rubber, POM, AU
Guide rings, band guide	POM-PE			
Lead screw spindle	St, POM, MS	St	–	–
Guide rail	Steel (25 ... 40: corrosion resistant, coated)			
Toothed belt	–	–	Polychloroprene, nylon, GF	
Toothed discs	–	–	St	

Forces and torques



[N] / [Nm]

DGE-...-SP*	18	25	40	63
Fz _{max.}	1.8	2	15	106
My _{max.}	0.8	1.5	4	18
Mx _{max.}	0.5	1	4	8
Mz _{max.}	0.8	1.5	4	18
* without guide $\frac{My}{My_{max}} + \frac{Mz}{Mz_{max}} + \frac{Fz}{Fz_{max}} \leq 1$ $\frac{Mx}{Mx_{max}} \leq 1$ $Fy = 0$				

DGE-...-ZR*	8	12	18	25	40	63
Fz _{max.} [N]	38	59	120	330	800	1600
My _{max.} [Nm]	2	4	11	20	60	120
Mx _{max.} [Nm]	0.15	0.3	0.5	1	4	8
Mz _{max.} [Nm]	0.3	0.5	1	3	8	24
* without guide $\frac{Mz}{Mz_{max}} \leq 1$ $\frac{Fz}{Fz_{max}} \leq 1$ $Fy = 0$ $\frac{My}{My_{max}} + \frac{Mx}{Mx_{max}} + 0.2 \times \frac{Mz}{Mz_{max}} + 0.4 \times \frac{Fz}{Fz_{max}} \leq 1$						

DGE-...-ZR-KF	8	12	18	25	40	63
DGE-...-SP-KF	-	-	18	25	40	63
Fz _{max.} Fy _{max.}	255	565	930	3080	7300	14050
Mz _{max.} My _{max.}	3.5	9	23	85	330	910
Mx _{max.}	1	3	7	44.5	170	580
Vmax 3 m/s $\frac{My}{My_{max}} + \frac{Mx}{Mx_{max}} + \frac{Mz}{Mz_{max}} + \frac{Fy}{Fy_{max}} + \frac{Fz}{Fz_{max}} \leq 1$						

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