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Operating instructions 8038418
1406b
[8038420]

Original: de

Toothed belt axis ELGR/ELGG English

→ **Note**

Special, pre-configured axis/motor and controller combinations are available with the OMS system (Optimized Motion Series → www.festo.com).

→ **Note**

Installation and commissioning must be carried out only by properly qualified personnel in accordance with these operating instructions.

1 Operating elements

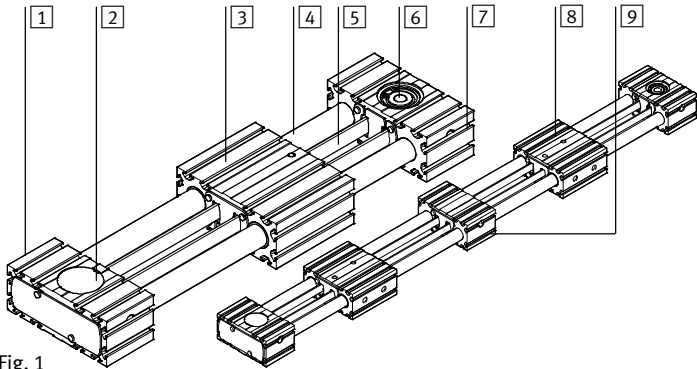


Fig. 1

- | | |
|----------------------|--|
| 1 Bearing cap | 7 Slot for slot nuts and foot mounting |
| 2 Cover plate | 8 Slide, operates in opposite directions (ELGG only) |
| 3 Slide | 9 Central support, optional (ELGG only) |
| 4 Guide rod | |
| 5 Toothed belt | |
| 6 Drive hollow shaft | |

2 Function and application

A toothed belt on a drive hollow shaft converts the rotation of a motor into a linear motion. The slide unit [3]/[8] will then move backwards and forwards. The reference position of the slide can be queried by means of an inductive proximity sensor, switch lug and sensor bracket (→ 10. Accessories). The toothed belt axis ELGR/ELGG is intended for positioning payloads. It is approved for slide operating mode. The ELGR/ELGG is not approved for operating conditions where water soluble grease or oils can be transferred to the toothed belt.

→ **Note**

The ELGR/ELGG toothed belt axis is not self-locking: If the input torque is not applied, the slide is freely movable. Generally, a latching function of the complete system can be achieved with motors with an integrated holding brake or with high gear ratios or self-locking gear design (e.g. for vertical operation).

- Select the corresponding Festo motor from our catalogue (→ Catalogue specifications, www.festo.com/catalogue and the “Positioning Drives” sizing software → www.festo.com).

3 Transport and storage

⚠ **Warning**

During vertical transport, an unsecured slide unit can fall down (crushing).

- Transport the product with the transport packaging horizontally on the guide rods with a secured slide.
- Take the product's weight into account. It weighs up to 30 kg.
- Ensure storage conditions as follows:
 - Short storage times and
 - Store in cool, dry, well-shaded locations that do not present a risk of corrosion.
 - No oils, greases or grease-dissolving vapours.
 In this way you ensure the performance of the toothed belt.

4 Requirements for product use

⚠ **Warning**

Unexpectedly fast payloads can harm people or property (risk of crushing). Apply power to the drive motor, at first limited to low speeds and torques. Free-running toothed belts can catch objects (injuries).

- Make sure that no objects, such as hair or clothing can be pulled into the toothed belt axis by the free-running toothed belt (e.g. through a cover).

- Compare the limit values in these operating instructions with those of your application (e.g. forces, torques, temperatures, loads, speeds). Operation of the product in compliance with the relevant safety regulations is contingent on adherence to the load limits.
- Take into consideration the ambient conditions at the location of use. Corrosive environments reduce the service life of the product (e.g. ozone).
- Comply with the regulations of the trade association, the German Technical Control Board (TÜV) or corresponding national regulations.
- Remove transport packaging such as films and cardboard. The packaging is intended for recycling.
- Use the product in its original status, without any unauthorised product modifications.
- Note the warnings and instructions on the product and in the relevant operating instructions.
- Take the tolerance of the tightening torques into account. Unless otherwise specified, the tolerance is ±20 %.

5 Installation

5.1 Mechanical installation

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

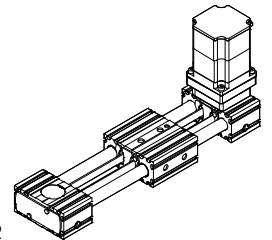


Fig. 2

For installation in a vertical or inclined position:

⚠ **Warning**

Falling loads can cause personal injury and material damage (crushing). If there is a power failure or the toothed belt breaks, the work load will drop down.

- Make sure that you only use motors with an integrated spring-loaded holding brake.
- Check whether additional external safety measures against damage due to breaking of the toothed belt are required (e.g. toothed latches or moveable bolts).

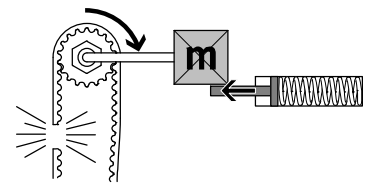


Fig. 3

- Ensure an installation without distortions and bends (evenness of the bearing surface ≤ 0.05 % of the stroke length; max. 0.5 mm).
- Place the ELGR/ELGG so that the operating elements are accessible.
- Observe the maximum sag → Chapter 12. Technical data.



Note

Unsuitable mounting techniques can reduce the service life of the ELGR/ELGG considerably.

- Make sure that the mounting components are outside the positioning range of the slide (e.g. projecting slot nuts).

- Take into account the asymmetric geometry of the ELGR/ELGG. Depending on the orientation, the slide unit or bearing cap projects beyond the contour by the dimension l (observe position X of the proximity sensor).

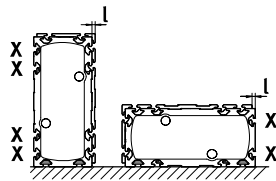


Fig. 4

- Observe the screw-in depth t_{max} when using slot nuts (→ Fig. 7).
- Attach the ELGR/ELGG and, if available, the central support (→ Fig. 6).

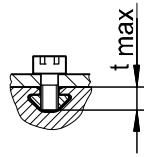


Fig. 5

- Please select the corresponding accessories from our catalogue (→ www.festo.com/catalogue)

- Place the payload so that the pull-out torque from the force (parallel to the axis of motion) and lever arm remains low.
- Fasten the payload to the slide with 4 screws and slot nuts as well as centring elements, if needed. (Tightening torque → Fig. 7).

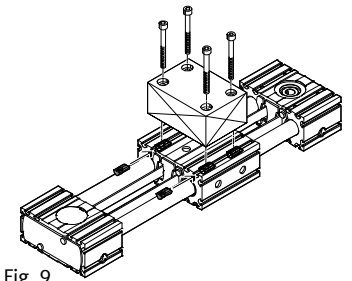


Fig. 9

For load geometries with projection in the longitudinal direction of the slide:

- Make sure that the payload does not strike against the motor or bearing cap and, in the case of the ELGG, against the central support.

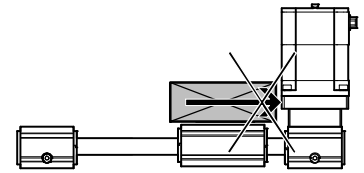


Fig. 10

5.3 Electrical installation

To protect the end positions against uncontrolled overtravel:

- Check whether additional hardware proximity sensors are necessary.

If inductive proximity sensors are used as hardware limit switches:

- Use proximity sensors with normally-closed function. The normally closed function protects the ELGR/ELGG against overrunning the end position if the proximity sensor cable is broken.
- Use proximity sensors that correspond to the input of the controller being used. If proximity sensors are used as reference switches:

- Attach the kit with switch lug (S) and sensor bracket (L) according to the assembly instructions (→ Catalogue specifications, www.festo.com/catalogue).

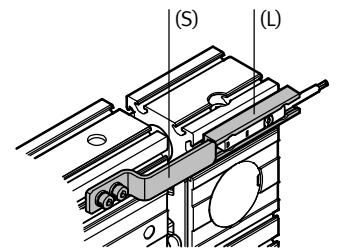


Fig. 11

- Avoid external influences from magnetic or ferritic parts in the vicinity of the proximity sensors (minimum distance of 3 mm).

To avoid contamination:

- Select the appropriate slot covers from our catalogue (→ Catalogue specifications, www.festo.com/catalogue).

| Profile mounting with MUE | Slot nut mounting with NST | Central support with MUE/NST (ELGG only) |
|------------------------------------|-----------------------------------|---|
| | | |
| | | |
| Profile mounting in the groove [7] | Slot nut mounting in the slot [7] | Profile or slot nut mounting in the slot [7] 1) |

1) Attach the central support centrally, otherwise the stroke will reduce
Fig. 6

- Tighten the mounting screws evenly. The tightening torque is summarised in the following table.

| ELGR/ELGG... | 35 | 45 | 55 |
|-------------------------------------|----------|----------|----|
| Screw | M3 | M5 | |
| Centring sleeve | ZBH-7 | | |
| Slot nut | NST-3-M3 | NST-5-M5 | |
| Screw-in depth t_{max} (→ Fig. 5) | [mm] 3.8 | 6 | |
| Projection l (→ Fig. 4) | [mm] 2 | | |
| Tightening torque | [Nm] 1 | 5 | |

Fig. 7

5.2 Installation of the payload



Note

If the aluminium slide is bent against a curved payload, the service life of the guide will be reduced.

- Make sure that the mounting surface of the payload is even to within $t \leq 0.01$ mm.

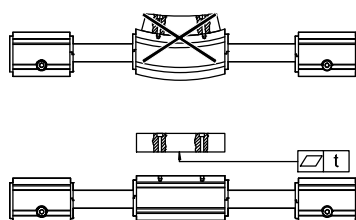


Fig. 8



Warning

Payloads can cause personal injury and material damage (risk of crushing).

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

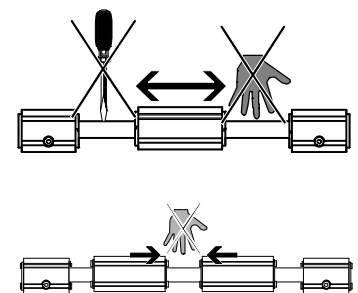


Fig. 12



Note

Incorrect specification values of the braking ramp in STOP situations (e.g. EMERGENCY STOP, Quick Stop) result in an overloading of the linear axis and can destroy it or drastically reduce its service life.

- Check the settings for all braking ramps in the controller or the higher-order control system (deceleration values and jerk).
- 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 "Positioning Drives" sizing software from Festo to design the linear axis (→ www.festo.com).



Note

Block-shaped acceleration profiles (without jolt limitation) cause high peaks in the motive force that can lead to an overloading of the drive. 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 closed-loop controller settings can be adapted (e.g. jerk limitation, smoothing of the acceleration profile).



Note

The elasticity of the toothed belt delays the acceleration behaviour of the ELGR/ELGG and results in larger acceleration values than those set on the controller (spring effect).

- Take into account possible deviations from the acceleration values set on the controller.

| 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. 13 : Definitions

1. Start **check travel** with low dynamic response.
In spite of equal control, even motors of the same type sometimes turn in the opposite direction due to the circuitry.
2. Start **homing** in accordance with the operating instructions for your motor drive system with low dynamic response to the reference switch.
3. Start a **test run** with low dynamic response.
4. Check whether the ELGR/ELGG fulfils the following requirements:
 - 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. In the event that the proximity sensors fail to respond: → Chapter 11 “Fault clearance” and the operating instructions for the proximity sensors.

7 Operation



Warning

Payloads can cause personal injury and material damage (risk of crushing).

- Make sure that:
 - nobody can place his/her hand in the path of the moving components (e.g. through a protective guard),
 - there are no foreign objects in the path of the moving components.

It should not be possible to touch the ELGR/ELGG until the load has come to a complete standstill.

If the motor turns in the wrong direction:



Note

When a motor with absolute value encoder is dismantled (e.g. when turning the motor around), the reference position is lost.

- Start homing in accordance with the chapter “Commissioning” to re-reference the positioning cycle.

For the ELGR with the OMS variant (Optimized Motion Series), the previous parameter set of the OMS system is invalid when moving the motor. A new parameter set is essential.

- Load the new parameter set according to the new motor position (M) into the controller (→ www.festo.com).
- Repeat the commissioning process with the new parameter set. Commissioning with the OMS identification number specified on the product is no longer possible.

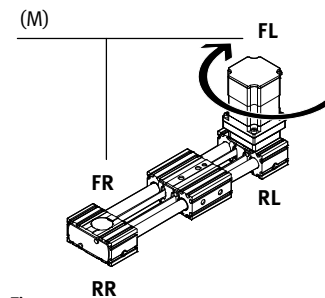


Fig. 14

8 Maintenance and care



Warning

Payloads can cause personal injury and material damage (risk of crushing). If a toothed belt breaks in combination with a vertically or diagonally fitted ELGR/ELGG, the work load will fall down.

- If there is evidence of wear, return the ELGR/ELGG to Festo for repair.

Signals from the control system can cause unintentional movement of the ELGR/ELGG.

- Switch off the control system when conducting any work on the ELGR/ELGG and secure it from being restarted accidentally.

Cleaning and maintenance:

- Clean the ELGR/ELGG as required with a soft cloth.
Any media which will not damage the material may be used as cleaning agents. Relubrication of the ELGR/ELGG is not permissible.
- Regularly check the play in the plain-bearing guide according to your application. Depending on the load, the guide backlash rises with increasing duration of operation.

9 Disassembly and repair



Note

Retensioning of the toothed belt reduces its service life considerably. In addition, the technical data, e.g. the feed constant, change.

- Make sure that the toothed belt is not retensioned.
The pretension of the toothed belt is designed in such a way that it does not need to be retensioned over its service life.
- Recommendation: Send the ELGR/ELGG to our repair service.
This way the required fine tuning and tests will be taken into special consideration.
- Information about spare parts and accessories can be found at: www.festo.com/spareparts

10 Accessories



Note

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

11 Fault clearance

| Malfunction | Possible cause | Remedy |
|---|--|---|
| Squeaking noises, vibrations or rough running | The coupling is mounted too tight | Comply with the permissible coupling distances (→ Assembly instructions for the motor mounting kit) |
| | Tension | Install the ELGR/ELGG so it is free from tension (observe the evenness of the bearing surface → Chapter 5.1 Mechanical installation) Modify travel speed |
| | Incorrect regulator settings | Modify the regulator parameters |
| | Defective bearing Toothed belt or slide elements worn | Return the ELGR/ELGG to Festo for repair |
| Slide does not move | Loads too high | Reduce load mass |
| | Guide jammed | Reduce torques |
| | Clamping hub spins | Check mounting of the motor mounting kit (coupling) |
| Slide travels beyond the end position | The proximity sensors do not react | Check the mounting level of the proximity sensors, connections and controller |
| Toothed belt jumps off | Toothed belt pretensioning too low | Return the ELGR/ELGG to Festo for repair |
| | Incorrect regulator settings | Change the regulator parameters |
| | Loads too high | Reduce load mass Reduce travel speed |
| Stroke of ELGG too low | Incorrect position of the central support | Attach the central support at the exact central position |

Fig. 15

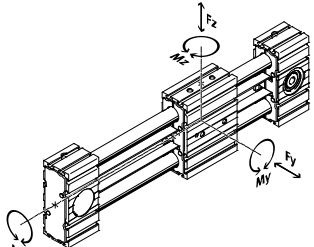
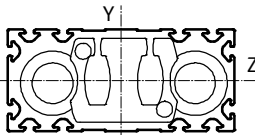
12 Technical data

| ELGR/ELGG-... ¹⁾ | | 35 | 45 | 55 | |
|--|---------------------|---|-------------|-------------|-------------|
| Design | ELGR | Electromechanical linear axis with toothed belt | | | |
| | ELGG | additionally with opposing slides | | | |
| Guide | - | Recirculating ball bearing guide | | | |
| | GF | Plain-bearing guide | | | |
| Installation position | | any | | | |
| Max. feed force F_x | [N] | 50 | 100 | 350 | |
| Max. driving torque | [Nm] | 0.46 | 1.24 | 5 | |
| Idle drive torque ²⁾ | ELGR [Nm] | 0.1 | 0.2 | 0.4 | |
| | ELGG [Nm] | 0.18 | 0.3 | 0.5 | |
| Max. speed | - [m/s] | 3 | | | |
| | GF [m/s] | 1 | | | |
| Max. acceleration | [m/s ²] | 50 | | | |
| Repetition accuracy | - [mm] | ±0.1 | | | |
| | GF [mm] | - | | | |
| Feed constant ³⁾ | [mm/rev] | 58 | 78 | 90 | |
| Max. deflection | [mm] | 0.5 | | | |
| Ambient temperature | - [°C] | -10 ... +50 | | | |
| | GF [°C] | 0 ... +40 | | | |
| Degree of protection | | IP20 | | | |
| Note on materials | | Contains PWIS (paint-wetting impairment substances) | | | |
| Materials | | | | | |
| - Cover, slide unit, profile | | Anodised aluminum | | | |
| - Guide, ball bearings, screws, retaining rings, clamping element | | Steel | | | |
| - Clamping component, clamping plates | | Beryllium bronze | | | |
| - Toothed belt | | Fibreglass-reinforced polychloroprene | | | |
| - Cover | | Polyamide/polystyrene | | | |
| Weight of ELGR/ELGG (with standard slide, without central support, without motor) | | | | | |
| - 0 mm stroke | - [kg] | 1.47 / 1.87 | 3.23 / 4.23 | 5.44 / 7.16 | |
| | GF [kg] | 1.36 / 1.89 | 3.07 / 4.28 | 5.08 / 7.24 | |
| - per metre of stroke | | [kg] | 2.45 / 4.88 | 5.00 / 10.0 | 7.80 / 15.6 |

- The following tool is available for sizing:
Positioning Drives sizing software → www.festo.com
- Measured at a speed of 0.2 m/s
- Nominal value, varies due to component tolerances

Fig. 16

Permissible forces and torque loading^{1) 2)}

| ELGR/ELGG-... | | 35 | 45 | 55 |
|---|--------------------|---------|---------|-----------|
| $F_{y\max} = F_{z\max}$ | - [N] | 50 | 100 | 300 |
| $M_{x\max}$ | - [Nm] | 2.5 | 5 | 15 |
| $M_{y\max} = M_{z\max}$ | - [Nm] | 8 | 16 | 48 |
| $F_{y\max} = F_{z\max}$ | GF [N] | 50 | 100 | 300 |
| $M_{x\max}$ | GF [Nm] | 1 | 2.5 | 5 |
| $M_{y\max} = M_{z\max}$ | GF [Nm] | 4 | 8 | 16 |
|  | | | | |
| Formula for combined loadings: ³⁾ | | | | |
| 2nd moment of area | | | | |
|  | | | | |
| - I_y | [mm ⁴] | 3 771 | 15 707 | 38 349 |
| - I_z | [mm ⁴] | 188 574 | 807 546 | 1 853 601 |

- With a standard slide unit
- The following tool is available for sizing:
Positioning Drives sizing software → www.festo.com
- The load applies per slide for the ELGG with central support

Fig. 17

Speed v as a function of the rotational speed n

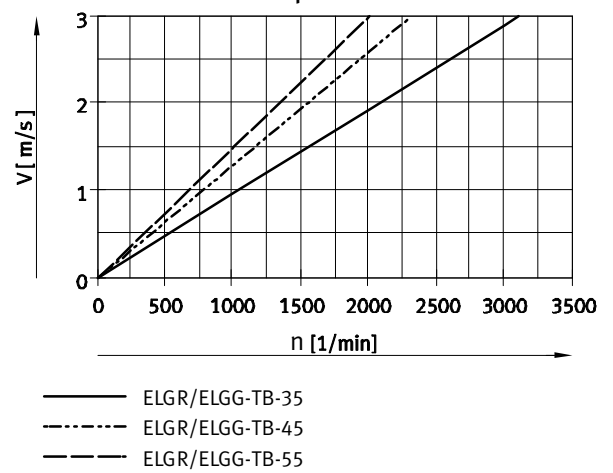


Fig. 18

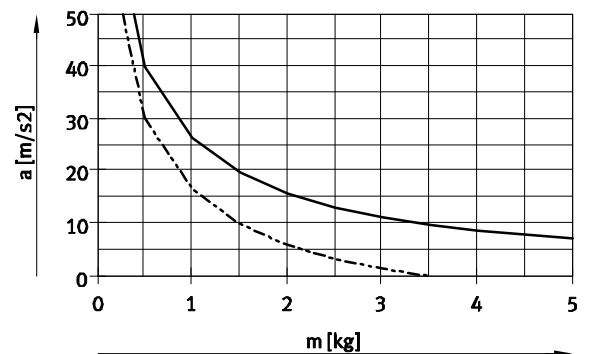
Acceleration a as a function of the payload m



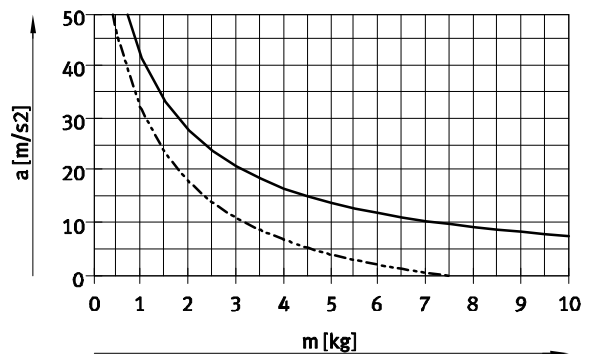
Note

For the plain-bearing guide (GF) it is recommended to reduce the acceleration to minimise overshings and increase positioning accuracy.

ELGR/ELGG-TB-35



ELGR/ELGG-TB-45



ELGR/ELGG-TB-55

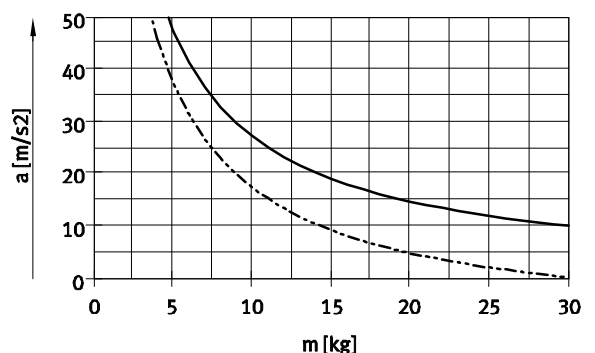


Fig. 19