

# Technical description



Subject to technical changes

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## **Technical description**

### **1. Design**

Framo linear actuators are electromechanical drives which convert the rotating motion of the integrated electric motor into a linear forward or backward motion.

Framo actuators are primarily designed for industrial use. They are particularly robust and equipped with many safety standards. All installation positions are permissible.

Special technical features are:

Complete stainless steel housing (for type Mini 0, 01 and 1) which protects all mechanical and electrical parts (including terminal board). Only the connecting cables and the movable piston rod needs to be retracted.

### **2. Piston rod**

The stainless steel piston rod is ground (except for Mini 3).

The piston rod is not locked to prevent torsion. The customer must provide a locking facility with the part that is moved.

Radial forces are generally not allowed.

### **3. Motors**

The built-in electric motor has a hollow rotor shaft which permits the lifting spindle and the piston rod to be guided through it and therefore allows particularly short dimensions.

Depending on the size, the motors can be delivered with three-phase, single-phase or direct current (special voltage on request). With the exception of the direct current motor, all motors are fitted with a thermal protection switch (trigger temperature +125°C. The motor winding is ISO class B. Standard protection class: IP 54. The three-phase motors can be connected to 3 x 230 or 3 x 400 V AC.

#### **3.1 DC actuators**

Separate power tables are available for DC actuators (only Mini 0).

If the DC motor operates as an individual unit, a suitable EMC interference suppressor shall be provided close to the motor terminal drive. For unit installation, the unit has to be suppressed.

For this reason direct interference elimination is not always necessary and the interference suppressor is not located in the drive, therefore the customer has to plan for this possible requirement.

### **4. Duty cycle**

The indicated duty cycles relate to a maximum load time of 10 minutes, a maximum ambient temperature of 40°C and a maximum installation height of 1000 m above sea level.

### **5. Gears, stroke lengths**

Implementation without gears or the installation of 1- to 3-stage planetary gears allows the selection of different stroke speeds for every type (0.5 to 136 mm/s). Depending on the type, special travel lengths of 10 to 800 mm are possible.

### **6. Spindle**

Framo Mini actuators with a rolled acme lead screw are predominantly dynamically self-locking.

## 7. Limit switches

A limit switch is incorporated for each stroke-end position. The Mini 01 up to Mini 3 are also equipped with a safety limit switch (forced separator) which protects the actuator against destruction in case of faulty wiring or if a limit switch fails. The limit switches are installed in a fixed position and cannot be adjusted.

## 8. Brake

At stroke speeds of more than 20 mm/s, three-phase and single-phase actuators should be equipped with a brake because of their tendency to overrun (DC actuators see performance table notes).

We also recommend that a brake is installed if the drive has a spindle that is not self-locking and if the demands on disconnection accuracy are exacting. A magnetic-electric single-disc brake is available for all sizes.

## 9. Connection cables

The standard actuators are supplied with external connection cables (1m length). Longer or special cables are available upon request, e.g. for low temperatures or with shielding.

## 10. Fixing options, connection heads

Flange, foot and attachment bolts can be supplied in addition to standard attachment configuration A (attachment eye to eye). The drive can also be delivered with different connection heads (see dimensional drawings).

## 11. Paint coating (only Mini 2 and 3)

The standard drive housing (tubular steel) is sprayed with a special acrylic resin lacquer (RAL 7031, bluish grey) which is also suitable as primer for other lacquers (artificial or acrylic).

## 12. Reliability and quality assurance

Every actuator is produced according to order and tested under nominal load conditions. A proven modular system makes it possible to produce a large number of different models and to adapt them to customer requirements. All individual parts and sub-assemblies are generally kept in stock.

## 13. Conditions of use



The conditions of actuator use prohibit the movement of loads whereby persons can be directly or indirectly endangered.

The application of actuators in equipment intended to transport passengers is not permitted without first consulting the manufacturer (or responsible representative).

In this context we refer to EU Machinery Directive 98 / 37 / EC and the Act on Technical Equipment (Equipment Safety Act) where the user is responsible for the implementation of "protective guards/barriers" to prevent touching (crushing hazard) during operation.

This also applies for the application of actuators with suspended loads where persons can be endangered.

## 14. Safety option

It is possible to bring the actuators of size 01, 1 and 2 to a higher safety standard by using the force-dependent shut-off.

Generally, enough safety features should be included when choosing the actuator size.

## 15. Self-locking ability



The self-locking ability depends on the spindle pitch, the surface quality of the spindle/nut, the sliding speed, lubrication and temperature. We distinguish between dynamic (out of motion) and static (stationary) self-locking.

Vibrations can eliminate self-locking. A certain number of factors such as lubrication, sliding speed and load can also create such favorable sliding characteristics that the self-locking is negatively influenced. A theoretically self-locking spindle cannot therefore replace a brake. Therefore it is impossible to assume guarantee obligations regarding self-locking.



**Important:** Self-locking is not intended to satisfy security-related characteristics!

To minimize additional dangers, observe the usual care for technical products.

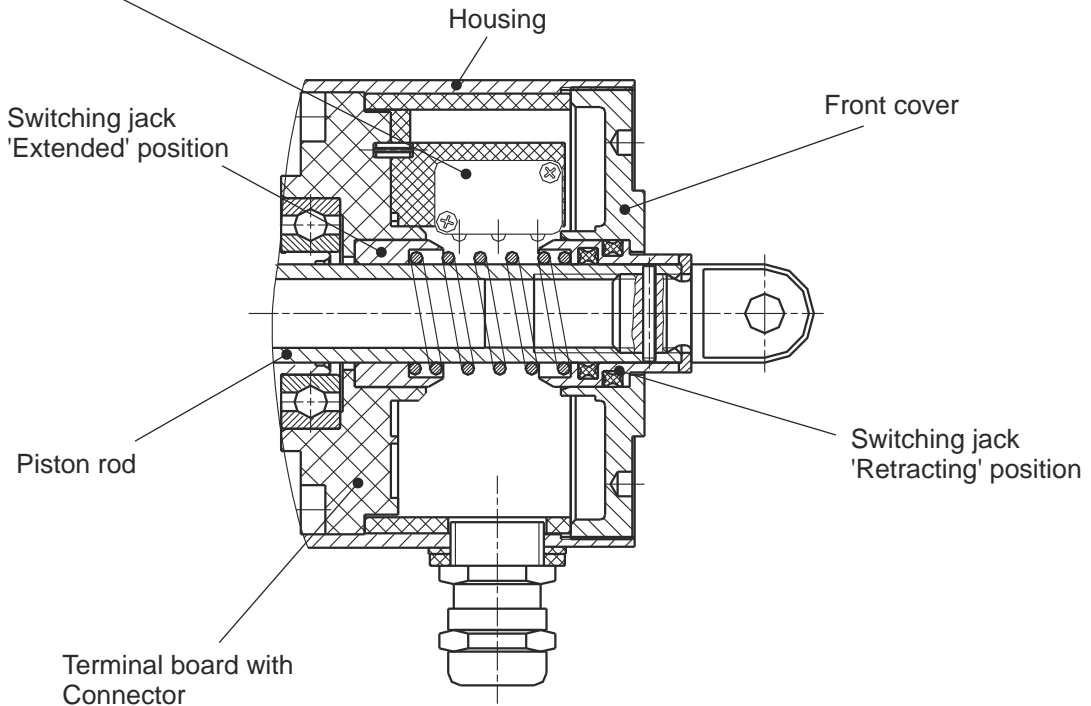
## 16. Options

The following options allow individual applications:

1. **IP 65** (water jet proof)
2. **Force-dependent shut-off** (as protection for block movement or if a preset stroke force is exceeded except Mini 0 and Mini 3)
3. **Adjustable connection head** (for small changes to the attachment position)
4. **Adjusting ring on piston rod** (for simple retracting position adjustment)
5. **Brake** (for precise switch-off and non-self-locking actuators)
6. **Integrated helical potentiometer** (for travel monitoring and/or position control)
7. **Rotary pulse encoder** (for digital pulse processing for position and speed control)
8. **Different fixing possibilities** (installation conditions can be taken into account)
9. **Humidification seal coating** of rotor and stator and/or condensation hole (if there is danger of condensation).
10. **Explosion proof** according to directive 94 / 9 / EG (ATEX 95)
11. **Connection cable** motor and/or helical potentiometer shielded (for frequency converter operation etc.)

**Limit switches**

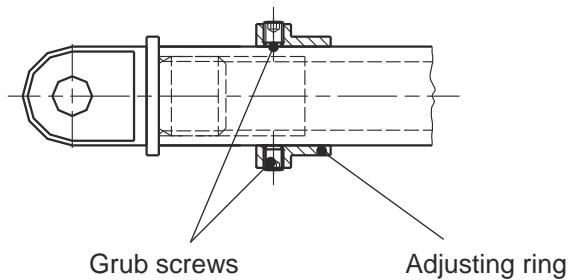
2 limit switches (two-way contact) arranged below 45° to each other.  
 Force separated safety limit switch (not for Mini 0) lying in-between



**System advantages:**

- No continuous contact of limit switch and piston rod
- Improved insulation and more stability, no switching grooves
- End of stroke damping through installed spring
- Better control of the piston rod

**Adjusting ring for retracted position**



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