

# Technical Description

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Framo Morat GmbH & Co. KG  
Höchst 7 • D-79871 Eisenbach

Tel.: +49 (0) 7657 / 88-0  
Fax: +49 (0) 7657 / 88-333

[www.framo-morat.com](http://www.framo-morat.com)  
[info@framo-morat.com](mailto:info@framo-morat.com)

## **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.

The complete stainless steel housing protects all mechanical and electrical parts. Only the connecting cables and the movable piston rod needs to be retracted. IP 54 is the standard protection class for all Framo linear actuators.

### **2. Piston rod**

The stainless steel piston rod is ground.

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

Radial forces are generally not allowed.

### **3. Motors**

Depending on size, the motors can be delivered with three-phase, single-phase (special voltage on request, DC motors will be mounted with a special flange). 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 as y or delta wiring.

#### **3.1 DC actuators**

Separate power tables are available for DC actuators.

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 total cycle time (ON + OFF) 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**

The installation of 1- or 2-stage planetary gears allows the selection of different stroke speeds for every type (3 to 84 mm/s). Depending on type, special stroke lengths of 500 to 800 mm are possible.

### **6. Spindle**

LiMax actuators are delivered with a rolled acme lead screw. The spindle nuts are made of extreme wear resistant and self lubricating high-performance plastic. The following spindle types are available:

## LiMax 60

Spindle	Tr 12 x 2 Sd	Tr 12 x 3 Sd	Tr 12 x 4 Ss	Tr 12 x 6 So
Nominal diameter	12 mm	12 mm	12 mm	12 mm
Pitch	2 mm	3 mm	4 mm	6 mm
Self locking	dynamic	dynamic	static	without

## LiMax 80

Spindle	Tr 18 x 3 Sd	Tr 18 x 4 Ss	Tr 18 x 8 So
Nominal diameter	18 mm	18 mm	18 mm
Pitch	3 mm	4 mm	8 mm
Self locking	dynamic	static	without

### Attention!

As for the declaration about self locking we refer to chapter 14.

For precise positioning tasks, high stroke speeds, cycles and durability demands, LiMax-actuators are available with ball screw spindles and flanges for servo motor adaption.

### 7. Limit switches

A limit switch is incorporated for each stroke-end position. A safety limit switch is available optionally. The safety limit switches prevent fatal actuator damages in case of faulty wiring or if a limit switch fails. The limit switches are fully adjustable over the entire stroke length.

### 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 is not self-locking; the load takes effect while the actuator stands in idle position and the application requires a high positioning accuracy. A magnetic-electric single-disc pressure 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 actuator can also be delivered with different connection heads (see dimensional drawings).

### 11. 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.

## 12. 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 permission of the manufacturer.

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.

## 13. Special safety equipment

It is possible to bring the actuator to a higher safety standard by using the following options:

1. cushioned connection head
2. force-dependent shut-off

Generally, sufficient safety margin should be included when sizing the actuator.

## 14. 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 differentiate 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 create sliding characteristics that the self-locking is negatively influenced. Therefore a theoretically self-locking spindle cannot replace a brake. It is impossible to assume guarantee obligations regarding self-locking.

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

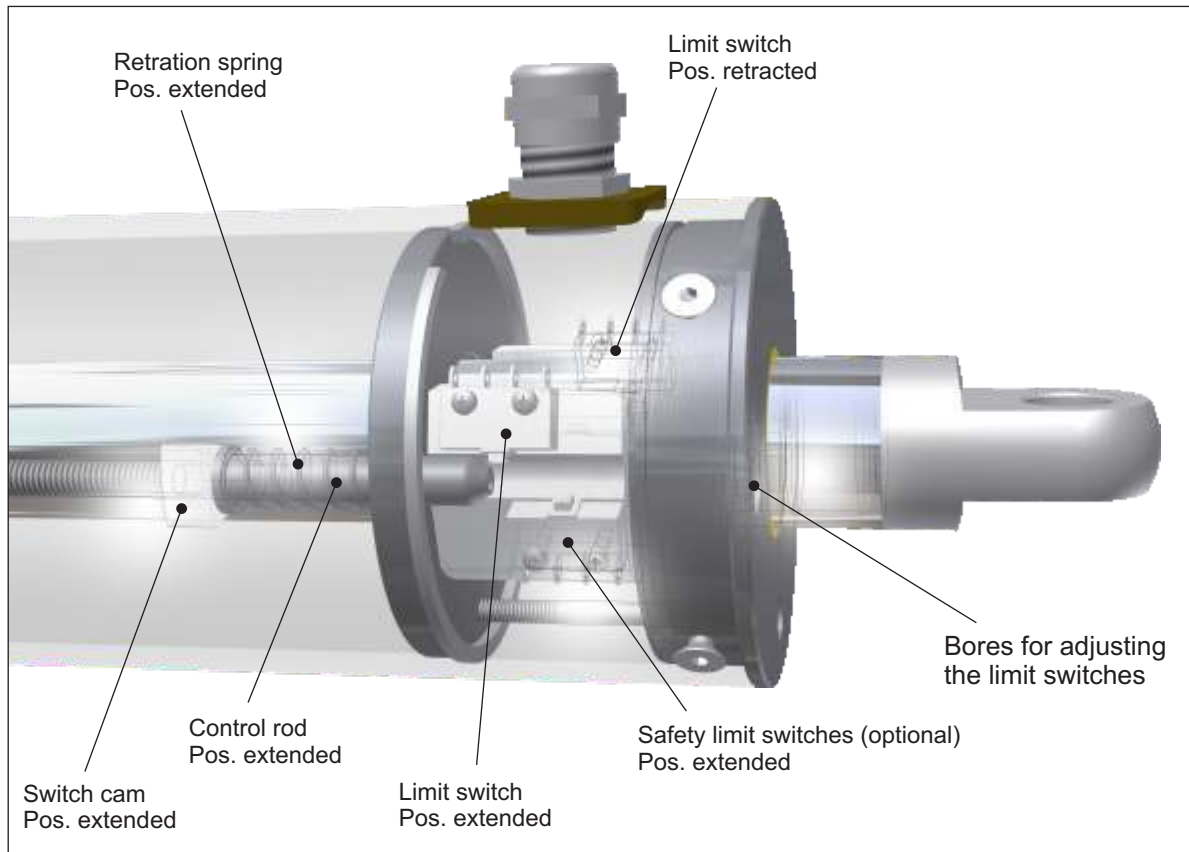
To minimize additional dangers, observe the usual care for technical products.

## 15. Options

The following options allow individual applications:

1. **IP65** (splash proof)
2. **Force-dependent shut-off** (as protection for block movement or if a preset stroke force is exceeded)
3. **Cushioned connecting head** (e.g. approaching a permanent stop)
4. **Adjustable connection head** (for small changes to the attachment position)
5. **Brake** (for precise switch-off and non-self-locking actuators)
6. **Mounting angles** in combination with fixing version D (attachment bolts)
7. **Integrated encoder** (for position and speed control)
8. **Different mounting 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 shielded** (for frequency converter operation etc.)

### Limit switches



### System advantages:

- Limit switches are free adjustable over the entire stroke length
- No direct contact of limit switch and piston rod
- Improved insulation and more stability, no switching grooves
- Conducting parts are separated from the lubricated part (spindle and nut)

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