

## 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 therefore particularly robust and equipped with many safety facilities. All installation positions are permissible.

The special technical features are:

Complete steel tube jacket which protects all mechanical and electrical parts (including terminal board), so that only the connecting cables and the movable piston tube must be brought out.

### 2 Piston tube

The steel piston tube is hard chrome-plated and ground. Stainless steel pistons ("Nirosta") can be supplied on request (at extra cost). The piston is not locked to prevent torsion. It is up to the customer to provide such a locking facility with the part that is not be moved.

### 3. Motors

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

Depending on the size, the motors are available for three-phase current, alternating current and direct current. Many special voltages are possible. With exception of the direct current motor, all motors are fitted with a thermoprotection 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 3x230 or 3x400 V, depending on the type ordered. Optionally, the star point can be brought out.

Separate power tables are available for D.C. actuators.

### 4. Duty cycle

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

### 5. Gears, stroke lengths

The installation of 1-stage to 3-stage planetary gears allows 12 different stroke speeds (0,5 to 181 mm/s) to be selected for every type. There is a sufficient stock of standard travel lengths. Depending on size, special travel lengths of 10 mm up 1000 mm are possible.

### 6. Spindle

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

### 7. Limit switching

A limit switch is incorporated for each end position. The Mini 01 to 3 models are also equipped with a safety limit switch (forced separator) which protects the actuator against destruction if it is connected wrongly 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 alternating-current actuators should be equipped with a brake because of their tendency to overrun (see the notes in the separate table with regard to D.C. actuators).

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 (operating current-actuated braking process effected by electromagnet) is available for the drive size Mini 0, while a spring-loaded single-disc brake (safety brake, braking operation effected by spring pressure) can be supplied for the sizes Mini 01 to 3.

### 9. Connection cables

The standard actuators are supplied with external connection cables about 1 m long. Longer cables or special cables (e.g. for low temperatures or with shielding) are also available on request (at extra cost).

### 10. Fixing options, connection heads

Flange, foot and attachment bolts can be supplied in addition to standard attachment configuration A (attachment eyes at the front and back of the drive). The drive can be delivered with different connection heads as well (see dimensional drawings).

## 11. Lacquering

The housing (tubular steel) is lacquered with a special alkyd resin lacquer (RAL 7031, bluish grey), which is also suitable for use as a primer for other lacquers (synthetic or acrylic lacquer). A thick layer of lacquer can be provided in order to increase corrosion protection.

## 12. Reliability and quality assurance

Every single actuator is produced to order in accordance with the customer's requirements and is 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 customers' requirements to a very large extent. All the individual parts and sub-assemblies are generally kept in stock and are obtained for product assembly with the help of an EDP-controlled warehousing system.

## 13. Conditions of use

It is a condition of sale that MORAT components shall not be used for the movement of loads whereby persons can be directly or indirectly endangered. The application of MORAT linear actuators in equipment which is intended for the transport of passengers is only permissible after prior written consultation and the agreement of the manufacturer MORAT or their representatives. We would refer users of actuators to safety rules, regulations and laws governing the protection of personnel working in the area of moving equipment and to the need for protective guards or barriers. Similarly-protective measures are required where suspended loads are involved.

## 14. Special safety instructions

It is possible to bring the linear actuators to a high safety standard by using the following options:

1. elastic connection head
2. force dependant switch-off

Generally the gear size chosen should be sufficiently enough.

### 14.1 Self-locking ability

The self-locking ability of a trapezoidal spindle depends on the lead angle, the surface quality of the spindle/nut, the sliding speed, the lubricant and the surrounding temperature. We differentiate between dynamic self-locking (out of motion) and static self-locking (stationary).

Vibrations can cause micro-movements between spindle and nut and may eliminate the self-locking characteristics of a spindle. A certain combination of influences like lubrication, sliding speed and load can also cause the linear actuator (with theoretically self-locking spindle) to back-drive.

Morat linear actuators, under no condition should be considered to hold a load when at rest. If safety is involved, a positive brake should be used

## 15. Options

The following options allow individual applications:

1. **Force-dependent switch-off** (as protection for block movement or if a preset stroke force is exceeded)
2. **Elastic connecting head** (for imprecise travel changes or approaching a permanent stop)
3. **Adjustable connection head** (for small changes to the attachment position)
4. **Adjusting ring on piston tube** (for simple travel changes by changing the stroke position)
5. **Brake** (for precise switch-off and non-self-locking drive)
6. **Bellows** (for protecting the piston tube against dirt and corrosion)
7. **Mounting angles** in combination with fixing version D (attachment bolts)
8. **Integrated helical potentiometer** (for travel monitoring and position control)
9. **Rotary pulse generator** (for digital pulse processing for position and speed control)
10. **Different fixing possibilities** (installation conditions can be taken into account)
11. **Thick seal coating** of tube (to improve the protection against corrosion)
12. **Humidification-seal coating** of rotor and stator and/or condensation hole (if there is a danger of condensation forming in the drive).
13. **Piston tube made of high-quality steel** No. 14301 DIN 2462 (stainless)
14. **Connection cable** motor and/or helical potentiometer - shielded (for frequency converter operation etc.)