

Mounting instructions

Linear actuator Mini

Models: 0, 01, 1, 2 & 3



Please read before carrying out any assembly work!



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© Framo Morat GmbH
 Franz-Morat-Strasse 6
 D – 79871 Eisenbach

Phone: +49 (0)7657 - 880
 Fax: +49 (0)7657 - 88333

E-Mail: info@framo-morat.de
 Internet: www.framo-morat.de

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2 General



NOTICE!

The installation described in these mounting instructions, as well as the modes of operation and application possibilities, are identical for all sizes.

2.1 Mounting instructions

The mounting instructions provide all necessary information for safe and efficient handling and mounting of the linear actuator. It is an integral part of the linear actuator and must be kept at hand, in order to be accessible at any time for the operating staff.

Compliance with all safety information and operating instructions of this manual is a prerequisite for a safe work with the linear actuator. For this reason the staff is to read thoroughly and understand these operating instructions before carrying out any work.

Furthermore, all local accident prevention regulations and general safety provisions in force at the place of operation of the equipment are to be complied with.

2.2 Symbols, abbreviations, terminology

This document uses symbols, abbreviations and terms having the following meaning:

- Explanation about situations
- List
- List
- 1 Position number
- 1. Operation step



Refers to a document included in the supplied documentation. The location of the document is given in italics behind the symbol.

2.3 Explanation of symbols

Warnings and safety instructions

The warning and safety instructions in this manual are indicated with pictograms and highlighted with a grey background.

In addition, warning and safety instructions that indicate fundamental hazards begin with signal words indicating the extent of the damages. They are structured as follows:

SIGNAL WORD!

Origin of the hazard.

Consequences in case of ignorance of the hazard.

- Behaviour instructions to prevent the hazard.

- ▶ Comply imperatively with all warning and safety instructions!
- ▶ When working, always act carefully to avoid accidents, injury to persons and damages to materials!

The pictograms combined with the signal words have the following meanings:



WARNING!

...indicates a hazardous situation which could lead to injuries or material damages if it is not prevented



CAUTION!

...indicates a hazardous situation which could lead to minor injuries if it is not prevented



BEWARE!

...indicates a hazardous situation which could lead to material damages if it is not prevented

Hints and recommendations



NOTICE!

...highlights hints and recommendations for efficient and trouble-free operation.

Particular safety instructions

The following pictograms are used together with safety instructions to indicate particular hazards:



... hazards due to hot surfaces.

Risk of burns and skin injuries due to heat in case of non compliance with the safety instructions.

2.4 Limitation of liability

All information and instructions in this manual have been compiled taking account of the applicable standards and regulations, the latest state of technology and our many years of experience.

The manufacturer shall not be liable for damages due to:

- ▶ Non-compliance with the operating instructions
- ▶ Unintended use
- ▶ Operation by non properly trained and instructed personnel
- ▶ Modifications carried out by the user
- ▶ Technical changes
- ▶ Use of non-approved spare parts

The obligations agreed upon in the delivery contract, the General Terms and Conditions, the delivery conditions of the manufacturer and the legal regulations in force at the time of the conclusion of the contract apply.

Warranty

The manufacturer guarantees the correct functioning of the process technology used and the performance parameters identified.

The guarantee period begins at the fault-free handover.

Dismantling or opening the actuator will result in the loss of the warranty.

Wear parts

The wear parts are all components that are in direct contact with the application in case of normal intended use.

These components are excluded from the warranty and from claims for defects, since their signs of wear are due to normal operation.

2.5 Customer service

Our customer service is at your disposal for technical information. You can reach it at the phone number 0160 – 94184444 (please note that the usual fee will arise!) around the clock.

You can get information about the contact partner in charge of your region by phone; he can be reached at any time by telefax, e-mail or via the Internet.

2.6 Copyright protection

This document is protected by copyright.

The unauthorised transfer of the manual to third parties, copies of any kind and form, even as excerpts, as well as the use and/or disclosure of the contents without the written consent of the manufacturer is not permitted.

Infringements will lead to compensation. We reserve the right to further claims.

3 Safety

This section presents all safety aspects for the protection of the user and of the operator against any possible hazard and for the safe and trouble-free operation of the equipment.

Significant risks may appear in case of non-compliance with the stated operating instructions, warnings and safety instructions.

3.1 Intended use

The linear actuator is intended exclusively for the following purpose of use in the industry:

The linear actuator Mini may be used exclusively for mounting in plants or machines as a driving system of machines and devices.

**WARNING!****Hazard due to use for non-intended purposes!**

Any use other than the intended use of the appliance may lead to hazardous situations.

- Use by principle the linear actuator only according to its intended use, as stated in this document, complying especially with the operating limits stated in the Technical Specifications.
- Any further or different use of the linear actuator is forbidden.
- Remodelling, refitting, overloading, blocking or changing the structure or single parts of the equipment with the intention to alter the functionality or scope of use of the linear actuator is forbidden.

- ▶ Claims of any kind due to damages caused by use for non-intended purposes are excluded.
- ▶ Only the user will be liable for any damages caused by use for non-intended purposes.

3.2 Rationally foreseeable misuse



WARNING!

Risk of injury due to misuse!

A misuse of the linear actuator may lead to hazardous situations for persons and to serious property damages.

- Refrain from any misuse of the appliance.

3.3 Responsibility of the operator

Operator

The operator is any natural or legal person using the linear actuator or making it accessible to third parties for use, and who is responsible during the use for the safety of the user, of the personnel or of the third parties.

Obligations of the operator

The linear actuator is used in the industry. Therefore, the operator of the linear actuator is subject to the legal obligations concerning occupational safety.

In addition to the warnings and safety instructions of this manual, the safety, accident prevention and environmental protection provisions applicable to the field of operation of the appliance must be adhered to.

The operator must in particular:

- ▶ inform himself about the applicable occupational safety regulation.
- ▶ implement the necessary rules of conduct for the operation of the linear actuator at the place of installation by means of operating instructions.
- ▶ during the whole usage time of the linear actuator, the operator must check regularly whether the operating instructions created by him correspond to the current status of the regulations.
- ▶ if necessary, adapt the operating instructions to the new provisions, standards and conditions of use.
- ▶ determine the responsibilities for the installation, operation, maintenance and cleaning of the linear actuator in a clear and unambiguous way.
- ▶ make sure that all staff working with or at the linear actuator have read and understood the operating instructions. Furthermore, he has to train the staff periodically for the handling of the appliance and to inform them about the possible risks.
- ▶ provide the staff in charge of working with or at the linear actuator with the mandatory and recommended protective equipment.

The operator is also responsible for keeping the linear actuator always in perfect technical condition.



WARNING!
Install safety devices!

If the application does not allow excluding direct or indirect endangering of persons (due in particular to the linear movement), the operator is to take mechanical protection measures.

3.4 Responsibility of the personnel

The linear actuator Mini is used for industrial purposes. Therefore, the personnel are subject to the legal obligations concerning occupational safety.

In addition to the warnings and safety instructions of this manual, the safety, accident prevention and environmental protection provisions applicable to the field of operation of the appliance must be adhered to.

The personnel must in particular:

- ▶ inform themselves about the applicable occupational safety regulation.
- ▶ comply with the rules of conduct for the operation of the linear actuator at the place of installation stated in the operating instructions.
- ▶ adhere to the responsibilities defined for the installation, operation, maintenance and cleaning of the linear actuator.
- ▶ have read entirely and understood the operating instructions before starting any work.
- ▶ use the mandatory and recommended protective equipment.

Furthermore, any person working with or at the linear actuator is responsible for keeping it always in perfect technical condition.

3.5 Personnel requirements

Basics

Only persons able to carry out their work in a correct and reliable way and meeting the requirements applicable to the respective case are authorised to perform any activity with or at the linear actuator.

- ▶ Persons whose reaction capability is impaired, e.g. through drugs, alcohol or medication are not allowed to carry out whatever work.
- ▶ During work, always adhere to the age and profession-specific provisions in force at the work site.

Qualification



WARNING!

Risk of injury in case of insufficient qualification!

Improper working may lead to injury to persons and damages to materials.

- Whatever activity may only be performed by persons having the required training, the necessary knowledge and the experience.

Trained personnel

Trained personnel means persons who have been informed in a comprehensive and verifiable way by the operator about the tasks entrusted to them and about the possible risks

Specialised personnel

Specialised personnel means persons who, due to their professional training, knowledge and experience, and to their knowledge of the applicable provisions, are able to carry out correctly the work they are entrusted with, to recognise possible risks on their own and to avoid injury to persons or damage to property.

Specialised electricians

Any work at the electrical equipment may by principle be carried out only by specialised electricians.

Specialised electricians means persons who, due to their professional training, knowledge and experience, and to their knowledge of the applicable provisions, are able to carry out correctly work at the electrical equipment, to recognise possible risks on their own and to avoid injury to persons or damage to property due to electricity.

Unauthorised persons



WARNING!

Risk of injury for unauthorised persons!

Non-trained persons do not know the risks in the working area and are considered as unauthorised persons.

- Keep unauthorised persons away from the working area, in case of doubt approach these persons and instruct them to leave the working area.
- Interrupt the work activities as long as unauthorised persons are present in the working area.

3.6 Personal protection equipment

Wearing safety shoes is necessary when mounting the linear actuator.

3.7 Hazards

The linear actuator has undergone a risk assessment. The identified hazards have been eliminated as far as possible and the detected risks have been reduced. Nevertheless, the inspection system showed residual risks, which are described in the following section.

- Comply imperatively with the warnings and safety instructions of this section and of the operating sections in order to avoid possible damages to health and hazardous situations.

3.7.1 Risks due to thermal hazards

Hot surfaces



CAUTION!

Risk of burns due to hot surfaces!

Contact with hot components may cause burns.

- Before starting any work, make sure that the linear actuator cooled down/heated up to ambient temperature.

3.7.2 Risks due to mechanical hazards



WARNING!

Risk of injury due to the loss of the self-locking!

Self-locking IS NOT intended to satisfy safety-relevant characteristics!

Use the brake or backstop offered optionally.

3.8 Spare parts



WARNING!

Risk of injury due to wrong spare parts!

Faulty spare parts may affect seriously safety and lead to damages, malfunctions, and up to the total breakdown.

- Use exclusively original spare parts.

Original spare parts can be purchased from representatives or directly from the manufacturer.

3.9 Labelling

The following symbols and information labels are placed on the motor to indicate possible risks.



Montageanleitung beachten!
Observe installation instructions!
Observez les instructions de montage!



WARNING!

Rick of injury due to illegible labels!

Illegible labels lead to unrecognisable risk sources and may lead to hazardous situations for persons or to damages to property.

- Keep the labels clean and legible at any time.
- Replace defective labels immediately.

4 Technical specifications

Please also refer to the separated specific data sheet in addition to the technical specifications.

4.1 Operating conditions

Item	Value	Unit
Temperature range	0 to + 40	°C
Relative air humidity	0 to 60 Without condensation	%
	Avoid direct moisture, dust accumulation and frost. Do not operate in strong electrical and magnetic fields! Do not operate in a potentially explosive environment!	
Duty cycle	see nameplate	



WARNING!

Risk of explosion due to sparking!

The drive shall in principle not be operated in areas subject to explosion hazards.

4.2 Storage requirements

Storage conditions

Store by principle the linear actuator only under the following conditions:

- ▶ Do not store outdoors
- ▶ Store in a dry and dust-free place
- ▶ Do not expose to aggressive media
- ▶ Protect from direct sun light

- ▶ Avoiding mechanical shocks and vibrations
- ▶ Storage temperature 5 °C to 45 °C
- ▶ Relative air humidity max. 60 %

In case of storage longer than 3 months, check regularly the general condition of all elements and of the packaging.



NOTICE!

Adhere imperatively to the storage indications exceeding these requirements that are stated on the packages!

4.3 Equipment identification

The equipment identification is clearly visible on the nameplate of the linear actuator.

4.4 Disposal

Dispose of the linear actuator in compliance with the regulations, but not in the domestic waste. It must be noted that the used lubricant is considered as "not dangerous for the environment". Disposal must take place in compliance with the national environmental legislation. If, due to the national legislation, further services are required, this is to be taken into consideration accordingly.

5 Construction and function

The linear actuator Mini is made as a standard of a casing tube and of a piston tube onto which the connecting head is screwed.

The manufacturer assumes no responsibility for the mounting in compliance with the intended use. This responsibility lies with the sole manufacturer of the plant.

5.1 Scope of delivery

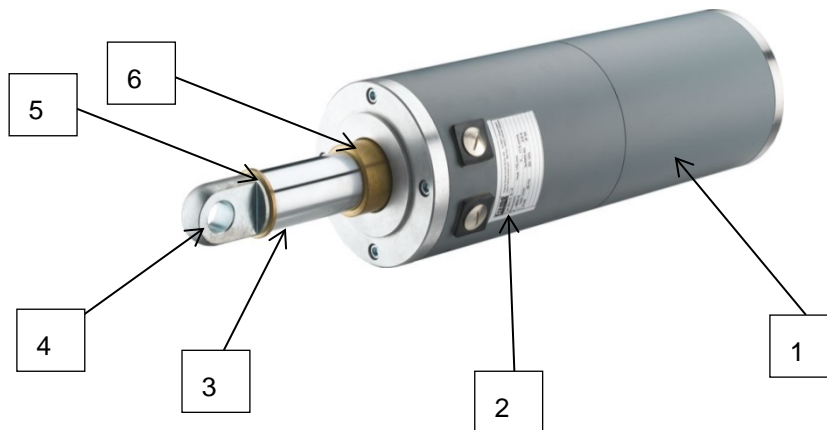
The linear actuator has been developed and manufactured under the sole responsibility of Framo Morat GmbH.

Scope of delivery:

Element	Quantity
Linear actuator	1
Mounting instructions	1
Technical data sheet	1
Electrical diagram	1

5.2 Linear actuator

All standard linear actuators have the same structure. For the sake of clarity, this manual will describe here the structure of the linear actuator MINI 3.



Ref.	Component
1	Casing tube
2	Nameplate
3	Piston tube
4	Connecting head
5	Thrust washer
6	Switching jack

6 Transportation



CAUTION! **Risk of injury!**

Risk of injury due to a transported item falling down. Wear safety shoes during transportation of the actuator.

6.1 Transportation inspection

Upon receipt of the delivery, check immediately the condition of the received items for completeness and damages.

In the event of externally recognizable transportation damages:

- ▶ Do not accept the delivery or only under reserve.
- ▶ Note the extent of the damages on the transportation documents and on the delivery note of the transport company.
- ▶ File a complaint.



NOTICE!

Claim any damage immediately upon receipt of the goods. Claims for transportation damages may only be filed within the reclamation periods in force.

6.2 Packaging materials

Handling of the packaging

The transported items are packaged in a safe and environmentally sound manner, according to the expected transport conditions. The packaging protects the components against damages and corrosion until the beginning of the assembly.

- ▶ Remove the packaging and transportation protections only before mounting.
- ▶ Dispose of the packaging material in compliance with the local provisions in force.



BEWARE! **Environmental damages due to improper disposal!**

Packaging materials are valuable raw materials that can be used again or reconditioned and recycled.

- Always dispose of the packaging material in an environmentally friendly way.
- Adhere to the local provisions, if necessary assign a specialized firm for the disposal.

7 Mounting

The linear actuator may be mounted exclusively by specialised electricians.

Mount the actuator without tension, shocks or impacts.



WARNING!

Risk of injury for unauthorised persons!

Non-trained persons do not know the risks in the working area and are considered as unauthorised persons.

- Keep unauthorised persons away from the working area, in case of doubt approach these persons and instruct them to leave the working area.
- Interrupt the work activities as long as unauthorised persons are present in the working area.



Danger!

Risk of injury due to electrical current!

Possible serious injuries due to electrical current.

- Only connect the motor to a network equipped with operating circuit breakers.



CAUTION!

Risk of burns due to hot surfaces!

Contact with hot components may cause burns.

- Do not touch the motor while it is in operation. (temperatures up to 90 degrees!)
- Before starting any work, make sure that the components cooled down/heated up to ambient temperature.



Beware!

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

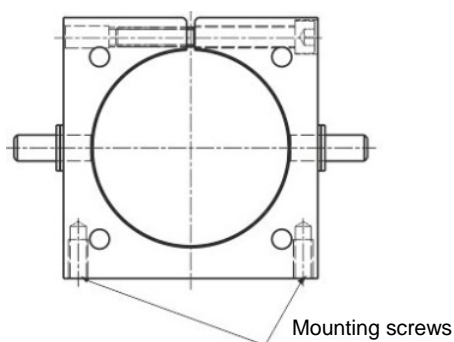
Radial forces are generally not allowed.

Fastening torques when mounting the linear actuator with a clamping flange



NOTICE!

The strength class of the fastening screws must be at least 8.8 when mounting the linear actuator using a flange (fastening D, E, F). The correct torque and screwing depth in the housing can be found in Table 1.



BEWARE!

Respect the correct screw length, since a wrong length would damage the housing.

Type	Screw	Tightening torque	Min. screwing depth	Max. screwing depth
Mini 0	2 x M6	8 Nm	8 Nm	12 mm
Mini 01	2 x M8	14 Nm	12 mm	16 mm
Mini 1	2 x M12	30 Nm	18 mm	24 mm
Mini 2	2 x M12	30 Nm	18 mm	24 mm
Mini 3	2 x M20	70 Nm	30 mm	40 mm

(Table 1)



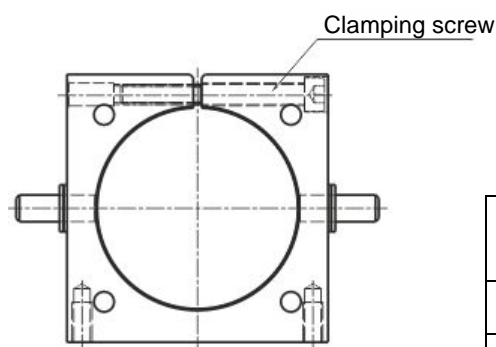
BEWARE!

Risk of damages to the bearings and securing rings

- Do not mount attachments such as couplings or chain wheels with the help of impacts or shocks.

Mounting

Tightening torque for adjusting the clamping flange



Adhere to the following tightening torques when adjusting the clamping flange:

Type	Screw	Tightening torque
Mini 0	1 x M6	6 Nm
Mini 01	1x M8	10 Nm
Mini 1	1x M12	25 Nm
Mini 2	2x M12	55 Nm
Mini 3	2x M16	110 Nm

(Table 2)

7.1 Electrical commissioning



NOTICE!

Use the attached electrical diagram to carry out the electrical connections.



NOTICE!

When carrying out the electrical connection, make sure to use the right operating voltage (see the nameplate).

Connect all external control and power cables as shown on the electrical diagram.

Check the direction of the stroke in inching mode. To reverse the direction of the stroke, swap two phases of the mains cable for AC motors or swap the "+ pole" and the "- pole" for DC motors.



BEWARE!

Risk of damages to the motor.

- Always connect the limit switches and/or a thermal motor protection.

Connecting the thermal motor protection makes sure that the motor is switched off in the event of overheating.



Danger!

Risk of injury due to automatic restart!

Unintended restart of the linear actuator may lead to severe injuries.

The linear actuator switches on automatically when the temperature lowers (bimetal) or when the current is restored after a power failure.

- Make sure that the actuator cannot switch on on its own by securing the machine in which the actuator is integrated against automatic restarting.
- Only connect the motor to a network equipped with operating circuit breakers.



BEWARE!

Risk of damages to the motor.

- Braking the actuator by reversing the polarity of the mains cable reduces the service life of the linear actuator.

7.2 Setting



Risk of electric shock

- Work only at de-energized workplaces.
- Protect the workplace against unintentional switching-on of the power supply.
- Only connect the motor to a network equipped with operating circuit breakers.
- In case of AC power supply, make sure that the motor capacitor is energized also in the switched off state.
- Discharge the capacitor only through a suitable resistor.



BEWARE!

Risk of damages to the motor.

- Incorrectly connected limit switches lead to the destruction of the end position.
- Check the direction of the stroke in inching mode.

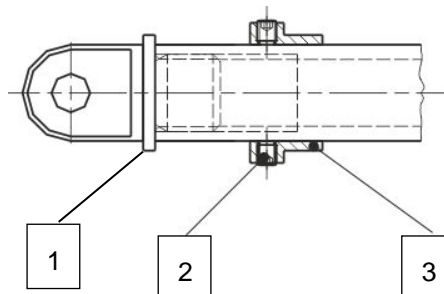


BEWARE!

Risk of damages to the motor.

- When using the optional integrated potentiometer, a rotation of the piston tube will lead to the destruction of the potentiometer.
- Always mount the piston tube straight.

The stroke length of the standard linear actuators Mini cannot be adjusted. Nevertheless, the option "adjustment ring" gives the possibility to shift the rear (retracted) end position towards the front, thus reducing the stroke. In this case, the adjustment ring, and not the thrust washer, actuates the switching jack.



1	Thrust washer
2	Headless set screw

3	Adjustment ring
---	-----------------

8 Operation

No specific operation is required for the linear actuator Mini, since it has been designed for integration in plants.

9 Maintenance

The linear actuator Mini is factory-provided with lifetime lubrication and is maintenance-free.

The service life of the linear actuator depends on its conditions of use (e.g. ambient temperature, thrust force, shocks, speeds, number of cycles, environmental effects, etc.).



NOTICE!

Clean the piston tube from time to time with an oiled cloth - synthetic oil - since dirt and deposits can affect the correct operation of the limit switching.

10 Failures



WARNING!

Danger of slipping due to loss of lubricant

Loss of lubricant can lead to the risk of slipping if grease gets onto the floor. Therefore:

- Secure the area around the location of the spill so as to prevent from slipping.
- Remove immediately the spilled lubricant without leaving any residue.



WARNING!

Contact danger

Loss of lubricant can lead to contact danger if grease gets onto the skin or close to the eyes. Therefore:

- Wear safety gloves to clean the area around the location of the spill.
- Do not touch your face and wash your hands thoroughly with suitable cleaners after having removed the lubricant.

10.1 What to do in case of failures

Basically:

1. Switch off all energy supplies and secure them against switching on again.
2. Inform the supervisor of the place of use.
3. Depending on the kind of failure, have the cause determined and eliminated by competent and authorised specialised personnel.

10.2 Failures table

Failure	Remedy	Subsequent step	Personnel
Loss of lubricant	Switch off the device in which the linear actuator is integrated.	Remove the linear actuator and inspect it - if necessary inform the manufacturer.	Specialised electrician

11 Annex

- ▶ Electrical diagram
- ▶ Technical data sheet
- ▶ Declaration of integration

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