

Insolis 4

Linear actuator



Operating instructions

Please take care of the operating instructions!



Translation from the original German version.

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1 General

1.1 Information on the Assembly Manual

The contents structure is based on the life stages of the linear actuator (hereinafter referred to as "device").

The manufacturer reserves the right to make changes to the technical data stated in this Assembly Manual. In individual cases they may deviate from the respective device version without the information being categorically changed or losing validity. The current state of the technical data can be obtained from the manufacturer at any time. Any claims arising herefrom may not be asserted. Deviations from the text and image statements are possible and are dependent on the technical development, equipment and accessories of the device. The manufacturer shall provide information on any deviant details on special versions via the sales documentation. Other details shall remain unaffected by this.



1.2 Standards and guidelines

During the design of the device the fundamental requirements for health and safety were applied and provision was made for the appropriate legislation, industrial standards and regulations.

The safety element is confirmed by the Declaration of Incorporation (see chapter "Declaration of Incorporation"). All information on safety in this Assembly Manual refers to legislation and regulations currently valid in Germany. All information in this Assembly Manual must be complied with at all times and to the full extent. In addition to the safety notices in this Assembly Manual, the regulations applicable at the place of installation with regard to accident prevention, environment protection and occupational safety must be observed and adhered to. The guidelines and standards for safety evaluation can be found in the Declaration of Incorporation.

1.3 Intended use

The device is intended for use in solar tracking systems. Its purpose is position adjustment in solar tracking systems. Other fields of application must be agreed in advance with the manufacturer.

The device must not be used in areas where there is a risk of injury to personnel or in rooms in potentially explosive environments.

If a direct or indirect hazard to personnel cannot be ruled out, additional measures (e.g. covers, barriers, etc.) must be taken in order to minimise the potential risk accordingly.

The operator alone is liable for all damage arising from the non-intended use of the device. The manufacturer assumes no liability for personal injury and material damage caused through misuse or procedural errors, improper use and commissioning.

The device must only be operated by trained and authorised specialist staff who comply with all safety instructions.

The safe and error-free use and operating safety of the device can only be guaranteed on the basis of the intended use according to the information in this Assembly Manual.

Intended use includes observation of and adherence to all safety instructions specified in this Assembly Manual, as well as all applicable regulations of professional associations and the valid legislation regards environment protection. Adherence to the operating rules prescribed in this Assembly Manual also form part of the intended use.

1.4 Foreseeable misuse

Installation different from the intended purpose approved by the manufacturer is considered foreseeable misuse.

1.5 Warranty and liability

In principle, the General Terms & Conditions of Sale and Delivery of the manufacturer apply. The Terms & Conditions of Sale and Delivery form part of the sales documentation and are transferred to the operator upon delivery. Liability claims for personal injury and material damage shall be excluded if they are the result of one or more of the following causes:

- Opening of the device by the customer (breaking the seal)
- Non-intended use of the device
- Improper assembly, commissioning or operation of the device
- Changes to the design and construction of the device without written permission from the manufacturer
- Operating the device with improperly installed connections and defective or improperly installed safety and protective equipment

- Non-compliance with safety regulations and notices in this Assembly Manual
- Exceeding the limits of the specified technical data

1.6 Customer Service - manufacturer

The device must only be repaired by the manufacturer in the event of a fault. The address to send the device to customer service can be found on the inside of the back page.

If you have not purchased the device directly from elero, please contact the manufacturer of the machine or the supplier of the device.

Mechanically secure the system before disassembling the device. The device must not be separated from the system by force.



The serial number must be on hand at the request of customer service. This can be found on the type plate in the upper right half.

2 Safety




2.1 General safety notices

This Assembly Manual contains all safety notices that must be observed to avoid and prevent risks when working with the device in the individual life cycles. Safe use of the device is guaranteed when all the specified safety notices are adhered to.



2.1.1 Structure of the safety notices

The safety notices in this document are identified with safety symbols and designed in accordance with the SAFE principle. They contain information on the type and source of risk, the possible consequences, as well as the prevention of the risk.



The following table provides a description of the degrees of risk with possible physical injury, as they are used in this Assembly Manual.

Symbol	Key word	Meaning
	DANGER	Warns of an accident that will occur if the instructions are not followed, which may lead to life-threatening, irreversible injuries or death.
	WARNING	Warns of an accident that may occur if the instructions are not followed, which may lead to serious, perhaps life-threatening, irreversible injuries or death.
	CAUTION	Warns of an accident that may occur if the instructions are not followed, which may lead to minor, reversible injuries.

The following table describes the symbols used in the present Assembly Manual, which are used for the graphic display of danger situations in connection with the symbol for the degree of risk.

Symbol	Meaning
	Risk of electrical voltage or electrical shock: This symbol refers to risks associated with electrical currents.
	Risk of crushing and killing persons: This symbol refers to dangers associated where the entire body or individual limbs may become crushed or suffer injury.

The following table describes the situations used in this Assembly Manual where damage may occur to the product or refers to important facts, states, tips and information.

Symbol	Key word	Meaning
	<i>CAUTION</i>	This symbol warns of possible material damage.
		This symbol refers to important facts and states, as well as to further information in this Assembly Manual. Furthermore, it refers to specific instructions which give additional information on or provide assistance in performing a process in a simpler manner.

The following is an example of the structure of a safety notice:



DANGER

Type and source of hazard

Explanation of the type and source of hazard

- Measures to avoid danger.

2.2 Safety principles

The device is built according to state-of-the-art technology and the generally accepted safety standards. The device is safe to operate. During the design of the device, the fundamental requirements for health and safety were applied and provision was made for the appropriate legislation, industrial standards and regulations. The safety of the device is confirmed in the Declaration of Incorporation.

All details pertaining to safety relate to the regulations from the European Union, which are valid at this time. In other countries the operator must ensure that the appropriate laws and national regulations are adhered to.

In addition to the safety notices in this Assembly Manual, the generally applicable regulations regarding accident prevention and environmental protection must be observed and complied with.

The device must only be used when in perfect working order, for its intended use, and in compliance with the safety notices in this Assembly Manual. The device is designed for the application stated in the chapter "Intended use". In the event of non-intended use, injury to the life and limbs of the user or a third party may result or the device may be impacted or other material damage caused. Accidents or near misses during use of the device which led or could have led to personal injuries and/or damage in the work environment must be reported directly to the manufacturer with immediate effect.

All safety notices specified in the Assembly Manual and on the device must be adhered to. In addition to these safety notices, the operator must ensure that all national and international regulations applicable in the respective country of use, as well as other binding regulations on operational safety, accident prevention and environment protections, are complied with. All work on the device must only be performed by trained and authorised personnel who have received the appropriate safety instructions.

2.3 General duties of the operator

- ❑ The operator is obliged to only operate the device in a good and operationally safe working condition. He must ensure that, in addition to the safety notices in the Assembly Manual, the generally accepted safety and accident prevention regulations, the specifications of DIN VDE 0100 and the provisions on environment protection in the respective country of application, are observed and complied with.
- ❑ The operator is responsible that all work with the device is performed by trained and authorised personnel who have received the appropriate safety instructions.
- ❑ Ultimately responsible for accident-free operation is the operator of the device or the personnel authorised by the operator.
- ❑ The operator is responsible for compliance with technical specifications, in particular for the compliance with static loads.

Non-compliance of static loads may cause loss of the support or holding function.

2.4 Requirements of the personnel

- ❑ Each person who is commissioned to work with the device must read and understand the Assembly Manual in its entirety before he/she carries out the respective work. This also applies if the assigned person has previously worked on such a device or was trained to do so.
- ❑ All work on the device must only be performed by trained and authorised personnel who have received the appropriate safety instructions. Before starting any operations, personnel must be made aware of the hazards involved in handling the device.
- ❑ All persons must only perform work according to their qualifications. The areas of responsibility of the respective personnel must be clearly specified.
- ❑ Any personnel who have been commissioned to work with the device must have no physical limitations, limitations on attention or judgement, whether temporary or permanent (e.g. due to overtiredness).
- ❑ Minors or persons who are under the influence of alcohol, drugs or medication, are prohibited from working with the device, as well as performing all assembly, disassembly and cleaning work.
- ❑ Personnel must wear the suitable personal protective gear appropriate to the work and present work environments.

2.5 Safety notices on technical condition

- ❑ The device must be checked before installation for damage and proper condition.
- ❑ The operator is obliged to only operate the device in a good and operationally safe working condition. The technical condition must always comply with legal requirements.
- ❑ If risks to persons or changes in the operational behaviour are detected, the device must be shut down immediately and the incident reported to superiors or operator.
- ❑ The device may only be connected to the energy supply lines intended and designed for this purpose. The permissible type of voltage and operating voltage are stated on the type plate.
- ❑ No changes, extensions or retrofitting may be performed to the device without the approval of the manufacturer.
- ❑ If wear is detected on the trapezoidal or ball screw spindle or on the spindle nut, the device must be brought to the manufacturer for maintenance.

2.6 Safety notices on transport, assembly, installation

Responsibility for the transport of the device principally rests with the respective transport company. The following safety requirements must be complied with during transport, assembly and installation of the device.

- ❑ When transporting the device, it should be secured according to the instructions accompanying the means of transportation employed.
- ❑ For the transport, only hoisting gear and lifting devices must be used that are dimensioned in such a way that you can safely accept the forces during loading, unloading and assembly of the device.
- ❑ Only the points defined on the pallet and device can be used as lifting and hoisting points.
- ❑ If work is required on high parts or work units, these must be secured against falling with suitable equipment. Work equipment for lifting loads must secure the loads against undesired displacement or free falling or unintentional unhooking.
- ❑ Standing under suspended loads is prohibited.
- ❑ A protective helmet must be worn when loading with hoisting gear.
- ❑ In principle, assembly and installation may only be conducted by trained and qualified personnel.

2.7 Safety instructions for operation

- ❑ The operator of the device is obligated to ensure the safe and proper state of the device before the initial commissioning.
- ❑ This is also necessary during the operation of the device at regular intervals determined by the operator.
- ❑ In the event of a fault, misuse and/or if control components are not connected correctly, this can cause the supporting and retaining function of the device to be impaired.
- ❑ No radial and/or torsional forces must be allowed to act on the device.



2.8 Safety notices on electrical installation

- ❑ All work on electrical connections must only be performed by authorised electricians in accordance with the applicable regulations and provisions of the trade association, in particular the specifications in accordance with DIN VDE 0100. Furthermore, the national statutory regulations of the respective country of application must be observed.
- ❑ In the event of defects such as loose connections or defective or damaged cables, the device must not be operated.
- ❑ In the event of faults with the electrical equipment, the device must be shut down immediately.
- ❑ The device must be switched off before inspection, assembly and disassembly work.
- ❑ The device must not be hosed down with a high-pressure cleaner or a steam blaster.

The following must be checked before connecting the device to the power supply:

- ❑ Are all electrical connections, safety devices, safeguards, etc. properly installed, connected and earthed?
- ❑ Is the intended power connection designed according to the specifications in the electrical circuit diagram (voltage type, voltage level)?
- ❑ Has the supply line been isolated?

3 Product description

3.1 General

The device is an electromechanical linear actuator. It performs linear movements.

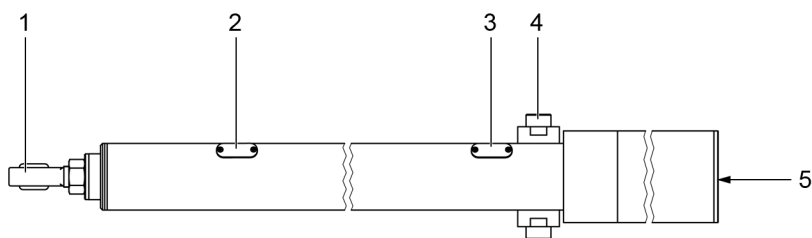


Abb. 1 Components of the device

- | | |
|---|--|
| 1 | Fastening on the piston side (head of toggle link) |
| 2 | Limit switch extended |
| 3 | Limit switch retracted |
| 4 | Fixing on the housing (articulated lug) |
| 5 | Connection cable |

3.2 Technical Specifications



All information in this chapter refers to an ambient temperature of 20 °C.

3.2.1 Configuration of technical parameters

Technical Specifications	Direct voltage (DC)	Alternating voltage (AC)
Rated voltage	24 V DC	230 V AC, 50 Hz
Peak demand, dynamic (N)	25.000	
Load peak statically retracted (N)	up to 80.000 ¹⁾	
Load peak statically extended (N)	up to 25.000	
Stroke speed (mm/s)	approx. 1.3	
Stroke lengths (mm)	up to 1000	
Rated current	7 A ²⁾	2.2 A ²⁾
Power	168 W	506 VA
Duty cycle	KB 14 min	
Fastening on piston rod	Head of toggle link	
Fixing on housing	Articulated lug	
Housing and piston material	Aluminium, anodised	
Length of connection cable	1.50 m ³⁾	
Protection class	IP 65	
Operating temperature range	-20 °C to +60 °C	
Airborne noise emission	< 70 dB(A) ⁴⁾	
Weight	up to 40 kg	

Tab. 1 Technical parameters

- 1) Special model with dimension B = 155 mm up to 60,000 N only
- 2) If voltage surge protection devices are used, the exact current draw of the unit must be calculated prior to installation.
- 3) Depending on the customer's requirement - between 1.5 m and 5.0 m is possible.
- 4) 1 m distance; 1.6 m above unit; nominal operation; measuring tolerance 10 %

3.2.2 Information on self-locking



WARNING

Risk of injury through loss of self-locking.

Crushing and fatal injuries possible.

- Use device with brakes.



CAUTION

Possible damage to the device or customer system through loss of self-locking.

- Use device with brakes.

There is a difference between dynamic and static self-locking for the devices. Dynamic self-locking consists of movement and static self-locking consists of the shutdown of the device. Self-locking of the devices is dependent on different factors, such as:

- Angle of elevation of spindle and nut
- Surface roughness of flanks of spindle and nut
- Sliding speed.

Self-locking can be negatively influenced by a number of factors. For example:

- Shocks or vibrations
- Load
- Heating.

In theory, a self-locking spindle can not replace a brake. For this reason, it is excluded to assume warranty obligations regarding the self-locking.

Self-locking does NOT meet the relevant safety standards.

Observe the usual duty of care for technical products to minimise further risks.

4 Assembly



WARNING

Risk of injury by weather conditions.

Skin may suffer frostbite or burns.

- Wear personal protective gear.



WARNING

Risk of injury through incorrectly dimensioned receptors.

Crushing and fatal injuries possible.



- Use only fixing material suitable for the dimension of the receptors.
- The counter receptors (customer) must be at least designed for the forces for which the device was designed.



WARNING

Risk of injury through loss of support and holding function.

Crushing and fatal injuries possible.



- Observe static loads.



WARNING

Risk of injury by electrical current.

Electric shock possible.



- Electrical work must only be performed by an authorised electrician.



WARNING

Risk of life-threatening injury caused by faulty electrical connection.

Electric shock possible.



- Check the proper connection of the PE cable before the initial commissioning.



CAUTION

Damage to the device through radial and/or torsional forces.

- No radial and/or torsional forces must be allowed to act on the device.



CAUTION

Damage to the device through blocking of the piston rod.

- The linear pathway of the piston must always be freely moveable.
 - The pivoting range of the device must be kept free.
-



CAUTION

Damage to device through loss of support and holding function.

- Observe static loads.
-



The device was manufactured with the circuit diagram ordered by you. The designation can be found in the sales documentation or the circuit diagram enclosed with the delivery.



In the standard delivery (tool setting), the piston rod is already slightly extended. The minimum and maximum dimensions are available on the dimension drawing (see chapter "General dimension drawing").

4.1 Fastening on piston side



CAUTION

Damage to device through torsional forces.

- No torsional forces must impact on the device.
 - Do not adjust the head of the toggle link.
-



CAUTION

Damage to the device through too small screw-in depth of head of toggle link.

- Default screw-in depth of the head of the toggle link must not be changed.
-

The position of the fastening on the piston side (head of the toggle link) is sealed and must not be changed.

4.2 Installation environment



CAUTION

Damage to the device by exceeding standard tolerances.

- The steel construction must be designed to conform to the tolerances according to DIN ISO 2768-1/-2 and ISO 13920 (B).

If the deviation in the steel construction is greater than the tolerances according to DIN ISO 2768-1/-2 and ISO 13920 (B), this will require the deviation to be compensated as follows by suitable building design measures by installation of the device at the latest:

1. Mount the device in the steel construction in table position.
2. Increase the distance of the two top pick-up positions (e.g. fork) and install a longer bolt.
3. Fix the completely retracted device to the pivot mounting first and then to the joint rod head.
4. Use the wide design of the top fastening to compensate for a centre offset over the wider fork on the building with a longer bolt.

4.3 Electrical connection variants

Variants 230 V AC	Variants 24 V DC
WS 9902	GS 9805
WS 9905	GS 9806

Tab. 2 Electrical connection variants

4.3.1 Electrical connection for variants with 230 V 1 AC



WARNING

Risk of life-threatening injury caused by faulty electrical connection.
Electric shock possible.



- Check the proper connection of the PE cable before the initial commissioning.



CAUTION

Damage to the device through faulty electrical connection.

- Do not connect connection N to 230 V/50 Hz.
- Avoid simultaneous application of voltage to conductors „R“ and „V“.



CAUTION

Damage to the device through overload of the potential-free outputs.

- The potential-free outputs for the response of the end positions can only be operated with maximum 24 V DC/1 A ohmic load.



Valid signals for response only arise after applying the operating voltage.

Drive position	Signal of response outputs
Device switched off	Both closed "1"
Device retracts or extends	Both open "0"
Device moves to retracted end position	Retracted, closed "1", extended, open "0"
Device moves to extended end position	Retracted, open "0", extended, closed "1"

Tab. 3 Function of the response contacts

4.3.2 Electrical connection for variants with 24 DC



CAUTION

Damage to the device through overload of the potential-free outputs.

- The potential-free outputs for the response of the end positions can only be operated with maximum 24 V DC/1 A ohmic load.

The rated voltage of 24 V DC must be applied at connection cable W1 as continuous voltage. The device can be extended by application of 24 V DC at the „forward direction“ input. The device is retracted by application at the „reverse direction“ input.

Σ
Σ



Valid signals for response only arise after applying the operating voltage.

Drive position	Signal of response outputs
Device switched off	Both open „0“
Device retracts or extends	Both open "0"
Device moves to retracted end position	Retracted, closed "1", extended, open "0"
Device moves to extended end position	Retracted, open "0", extended, closed "1"

Tab. 4 Function of the response contacts

4.3.3 Optional shaft encoder



CAUTION

Damage to the device through incorrect connection or overstepping of rated voltage of transmitter.

- The two tracks are loaded with max. 50 mA.
- The shield of the connection cable must be fitted by the customer.

The integrated shaft encoder supplies information about the movement of the connecting rod. Please refer to the following table for the parameters necessary for operation.

Electrical parameters	
Output switching	Push-pull
Rated voltage (U_B)	5 – 24 V DC
Current consumption (no load)	max. 50 mA
Permissible load per channel	max. 50 mA
Signal level high	min. $U_B - 2.5$ V
Signal level low	max. 0.5 V
Rise time t_r	max. 1 μ s
Fall time t_f	max. 1 μ s
Short-circuit resistant outputs	Yes
CE conformity in compliance with EN 50081-2 and EN 55011 class B	

Tab. 5 Electrical parameters of the shaft encoder

Signal	0 V	+ U_B	A	B
Conductor colour	WH	BN	GN	GE

Tab. 6 Connection assignment of the shaft encoder

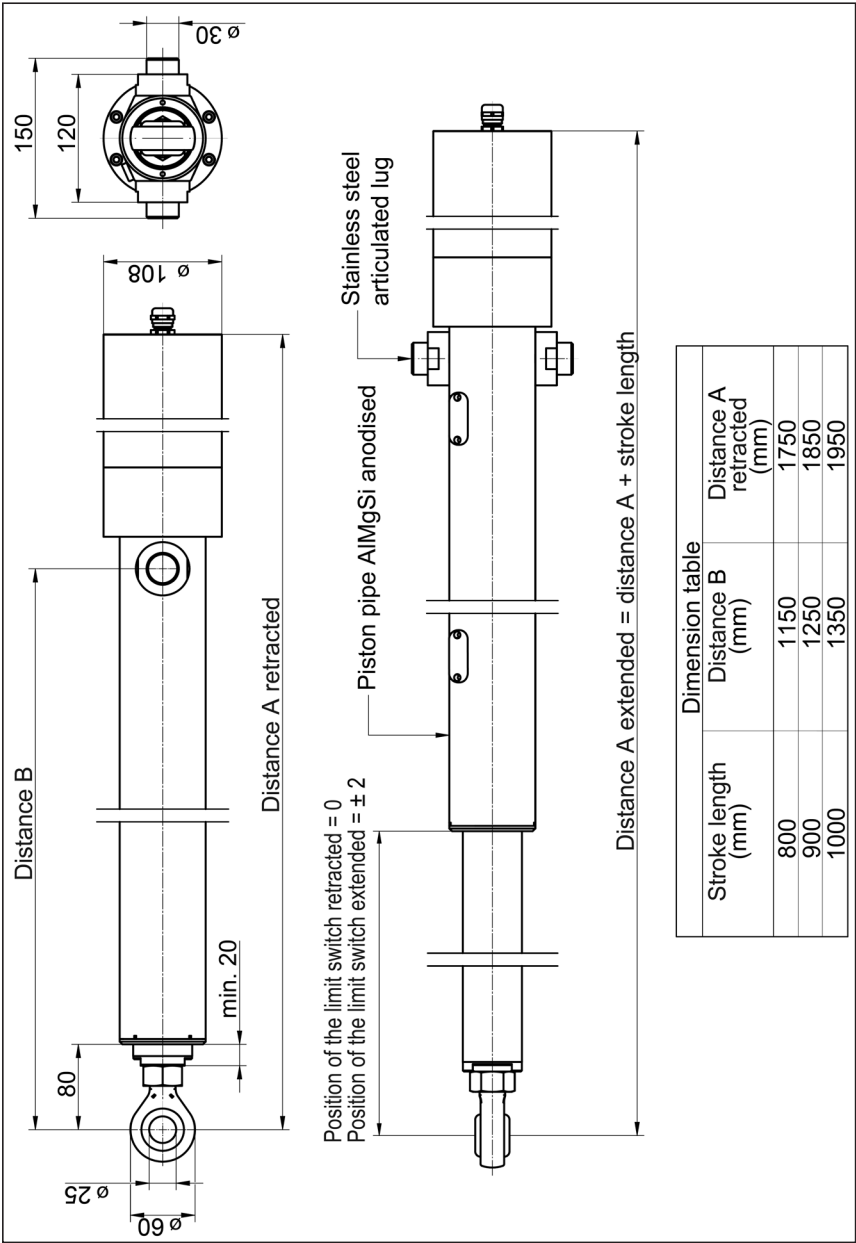


All unused conductors have to be insulated before start of operation.



The screening must be applied by the customer.

4.4 General dimension drawing



5 Declaration of Incorporation



The complete declaration of incorporation can be downloaded from our website:
www.elero-linear.de/downloads.

6 Waste disposal

6.1 Scrapping

When scrapping the device, adhere to the international, national and local rules and regulations valid at the time of scrapping.



Ensure that material reusability, removal and separation of materials and sub-assemblies are also taken into consideration as there are also risks to the environment and health during recycling and disposal.

Material groups, such as plastics and metals of different types, must be sorted before submitting to the recycling and disposal process.

6.2 Disposal of electrical and electronic components

Disposal and recycling of electrical and electronic components must be carried out in accordance with the relevant laws and national directives.

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