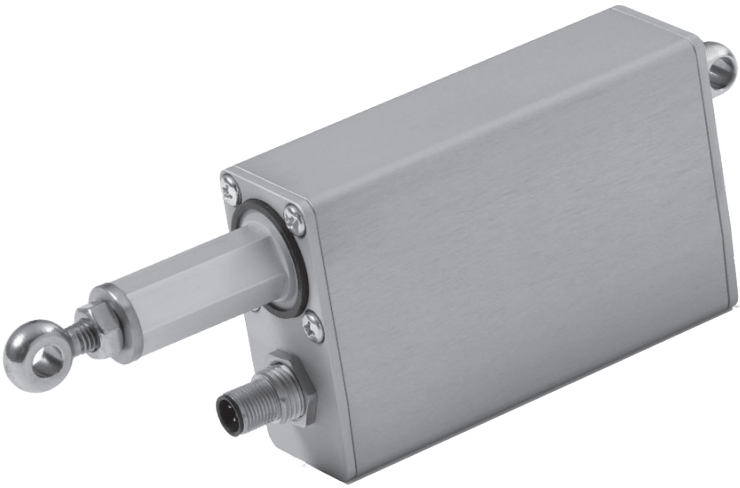
Junior 0E
Junior 1E-VA

Linear actuator



EN **Operating instructions**
Please take care of the operating instructions!

04/2016, TN: 2011241

EN

Translation from the original German version.

All other documents in different languages are translations of the original version.

Table of contents

1 General

1.1 Information relating to the installation instructions

The classification of the content is in accordance with the life phases of the linear drives
Junior 0E and Junior 1E-VA (referred to in the following text as the “device”).
The manufacturer reserves the right to make changes to the technical specifications stated in these installation instructions. In individual cases they may deviate from the respective device version without the information being fundamentally changed or losing its validity. The current status of the technical specifications can be requested from the manufacturer at any time. Any claims arising from this cannot 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 about any differing details relating to special versions by means of the sales documentation. Other specifications shall remain unaffected by this.

1.2 Standards and guidelines

During construction the fundamental health and safety requirements were applied and provision was made for the appropriate legislation, standards, directives and guidelines.
The safety element is confirmed by the Declaration of Incorporation (see section “Declaration of Incorporation”). All specifications relating to safety in these installation instructions refers to the laws and regulations currently valid in Germany. All specifications in these installation instructions must be complied with at all times and without limitation. In addition to the safety notices in these installation instructions, the regulations applicable at the place of installation with regard to accident prevention, environmental protection and occupational safety must be observed and adhered to. Regulations and standards for safety assessment can be found in the declaration of incorporation.

1.3 Intended use

The device is envisaged for use in the construction of machinery. Other possible areas 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 plant operator alone is liable for all damage arising from any use not in compliance with the 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 be operated only by instructed and authorized skilled personnel subject to compliance with all safety notices and directions.

Safe and error-free use and operating safety of the device can only be guaranteed subject to use in compliance the intended use in accordance with the specifications set out in these installation instructions.

Intended use includes observation of and adherence to all safety notices and directions specified in these installation instructions, as well as all applicable regulations of professional associations and the applicable laws relating to environmental protection. Use in compliance with the intended use also includes compliance with the operating regulations prescribed in these installation instructions.

1.4 Foreseeable misuse

Any installation into other equipment that deviates from the purpose cleared by the manufacture applies as being a foreseeable misuse.

1.5 Warranty and liability

The warranty terms defined in the general terms and conditions of sale and delivery of the manufacturer apply at all times. 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)
- Use not in compliance with the intended use of the device
- Improper installation, commissioning or operator control 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 these installation instructions
- Exceeding the limits of the specified technical specifications

1.6 Customer service of the 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 machine 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 and directions

These installation instructions contain all safety notices and directions 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 these installation instructions.

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 installation instructions, which are used for the graphic display of danger situations in connection with the symbol for the degree of risk.

Symbol	Meaning
	Danger due to an electrical voltage, electric shock: this symbol draws attention to dangers due to electric currents.
	Danger of crushing and fatal striking of personnel: this symbol draws attention to dangers due to which the entire body or individual parts of the body can be crushed or injured.

The following table describes the situations used in these installation instructions where damage may occur to the product or refers to important facts, statuses, tips and information.

Symbol	Key word	Meaning
	*CAUTION*	This symbol warns of possible material damage.
		This symbol refers to important facts and statuses, as well as to further information in these installation instructions. 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 these installation instructions, 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 these installation instructions. The device is designed for the application stated in the section “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 installation instructions 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 authorized 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 installation instructions, 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 authorized personnel who have received the appropriate safety instructions.
- ❏ Ultimately responsible for accident-free operation is the operator of the device or the personnel authorized 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 installation instructions 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 authorized 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. Please refer to the type plate Or the sales documents for the permissible type of voltage and operating voltage.
- ❏ 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.
- ❏ The erection and installation work may be performed fundamentally only by trained and instructed skilled 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 authorized electricians in accordance with the applicable regulations and provisions of the trade association, in particular the specifications in accordance with DIN VDE 0100.
- ❏ 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 drive. It performs linear movements.

Linear drive Junior 0E with an device plug

Abb. 1 Linear drive Junior 0E with an device plug

1 Appliance plug for motor and limit switch
2 Fastening on the piston face (eyebolt)
3 Fastening on the housing (articulated ring)

Linear drive Junior 0E with a connecting cable

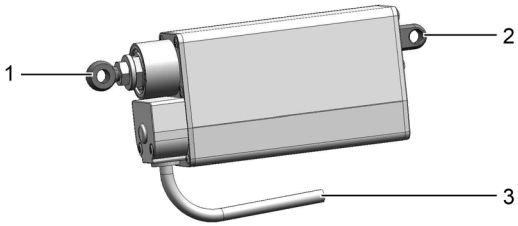


Abb. 2 Linear drive Junior 0E with a connecting cable

1 Fastening on the piston face (eyebolt)
2 Fastening on the housing (articulated ring)
3 Connecting cable

Linear drive Junior 1E-VA with a connecting cable

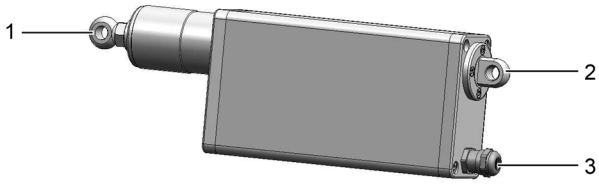


Abb. 3 Linear drive Junior 1E-VA with a connecting cable

1 Fastening on the piston face (eyebolt)
2 Fastening on the housing (articulated ring)
3 Connecting cable

3.2 Technical specifications

All information in this section relates to an ambient temperature of 20 C.

3.2.1 Summary of the technical parameters

Technical specifications	Junior 0E	Junior 1E-VA
Force, dynamic (N)	150 – 550	
Force, static (N)	150 – 550	
Stroke speed (mm/s)	1.6 – 30	
Stroke length (mm)	40[1)]; 50; 100; 150; 200	
Electronic limit switch	Set permanently to stroke length	
Housing	Aluminium/plastic	Stainless steel 1.4301
Protection class	IP54	IP65
Temperature range	-10 C to +50 C	
Connection	Plug contact/cable[2)]	Cable[2)]
Programmable positions	4 over the entire stroke length	
Undervoltage protection	Yes	
Overcurrent protection	Yes	

Tab. 1 Technical parameters

1) Only Junior 0E

2) At customer's option, possible between 1.5 m and 5.0 m

3.2.2 Electrical parameters

Parameter	Sym-bol	Min.	Nom.	Max.	Unit	Condition
Connection		Plug-in connector 8-pol., Binder series 713 or cable				
Programmable positions		4				
Rated voltage	U_B	20	24	28	V	Residual ripple ≤ 5%
Rise time of the supply voltage				50	ms	
Current consumption			up to 2		A	
Digital inputs:		High active				
High level		15	24	30	V	
Low level		-5	0	2	V	
Input current			0.5		mA	U_B = 24 V
Rise time				10	ms	
Fall time				10	ms	
Digital outputs:		Sinking Open collector outputs				
High level		21	22		V	U_B = 24 V; I_{OUT} = 5 mA
Low level			0	0.1	V	R_L < 100 kΩ
Output resistance	R_{OUT}		100		Ω	
Output current			5	20	mA	
Load resistance	R_L	0.82	4.7	100	kΩ	U_B = 24 V

Tab. 2 Electrical parameters

If the control unit has open collector outputs, it may be necessary to wire the resistances from the drive inputs to GND!

3.2.3 Information relating to the self-locking facility

WARNING

Danger of injury through loss of the self-locking facility.
Crushing and fatal injuries possible.

- Use the device with a brake.

CAUTION

Possible damage to the device or customer's machine through loss of the self-locking facility.

- Use the device with a brake.

There is a difference between dynamic and static self-locking on the devices. Dynamic self-locking arises from movement and static self-locking when the device is at a standstill. The self locking facility on the devices is dependent on various factors, e.g.:

- Angle of elevation of spindle and nut
- Surface roughness of flanks of spindle and nut
- Running speed
- Lubricant

The self locking facility can be negatively influenced by a multitude of factors, e.g. by:

- Shocks or vibrations
- Loads
- 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 minimize further risks.

4 Installation

WARNING

Danger of injury due to 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.

CAUTION

Destruction of the device due to insulation outdoors or in damp rooms.

- The drive must have protection class IP 65 for this purpose.
- The terminals of the connecting lead must be in compliance with IP 65.
- If the leads are laid in the open air, a drip loop must be laid on the cable.

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 the 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 delivery condition (factory setting) the connecting rod is fully retracted. Please refer to the order confirmation for the minimum and maximum dimensions.

4.1 Installation and connection

CAUTION

Damage to device through torsional forces.

- No torsional forces must impact on the device.

CAUTION

Destruction of the device, if the eyebolt is not screwed in far enough.

- The preset screw-in depth of the eyebolt is allowed to be altered by a maximum of only one turn outwards.

CAUTION

Damage to the electrical leads due to crushing or a tensile load.

- All electrical leads have to be laid so that they are not exposed to any crushing or tensile loads.

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1. Fasten the device only by the fastening elements provided for this purpose. These are located on the end of the housing and on the connecting rod (see e.g. Fig. “Components of a linear drive Junior 0E with an device plug”).
2. Connect the device's cable to the device or connect the connector to the device.

Prerequisite for connection:

- The device must be connected to a suitable control unit.
- Take heed of the contact assignment of the connector plug or cable.

4.2 Functions of the digital inputs and outputs

All digital inputs and outputs are high active on 24 V DC. The digital outputs are sinking open collector outputs.

Design.	Appliance plug		Connecting cable		Function	Button on the hand cable (optional)
	Conductor colour, plug cable	Plug assignment	Cable colour	Cable number		
IN 1	Gray	5	Gray	6	Enable	Gold button
IN 2	Yellow	4	Yellow	4	Direction -	Silver button
IN 3	White	1	Red	3	Direction +	Button + silver
IN 4	Pink	6	Pink	5	Programming	Switch
OUT 1	Blue	7	Blue	7[1)]	Position 2	
OUT 2	Green	3	Green	8[1)]	Run message	
+24 V	Brown	2	Brown	1	Supply voltage +24 V	
GND	Screening	8	White	2	Ground	

Tab. 3 Functions of the digital inputs and outputs

1) Optional or with pulse generator option OUT1 corresponds to channel A and OUT 2 to channel B, the signal is moved 90°.

2) Terminal assignment of the programming box also corresponds to this column.

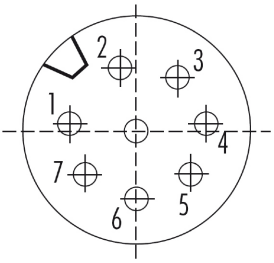


Abb. 4 Contact assignment of the connector plug (not screened)

4.3 Start of operation (commissioning)

The device has two non-adjustable electronic limit positions that limit the stroke length.
4 programmed positions within the stroke length have to be taught in.

Factory setting:
- Position 1: stroke fully retracted
- Positions 2, 3, 4: stroke fully extended

The following description relates to programming with the programming box.

The programming box can be ordered against part number 753492801 (for the connector plug) or 753618701 (for the cable).

Analogously to this the device can also be programmed by applying 24 V DC to the digital inputs. In this case “Switch ON” or “Button pressed” always means level H at the corresponding input.

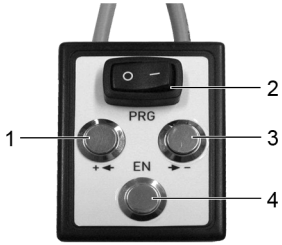


Abb. 5 Programming box

1 Direction button “+”
2 Programming switch
3 Direction button “-”
4 Enable “EN”

The linear drive has the operating modes described below:
- Teach-in mode
- Position correction
- Jogging mode

4.3.1 Teach-in mode

Setting of the positions takes place in teach-in mode.
Teach-in mode is for the purpose of changing the four programmed positions for normal mode. You reach teach-in mode by deleting the previous positions.

Proceed as follows to delete the positions:
1. Switch the programming switch on the programming box to position “ON”.
2. Keep the direction buttons pressed down simultaneously for at least 3 seconds. The device travels briefly in both directions.

   ✓ The positions are deleted.

Proceed as follows to program the 4 positions:

1. In jog mode (programming switch on the programming box in position “ON”) approach the first position with the corresponding direction button and stop in this position.
2. Save the position by pressing the enable button “EN” **once**.
3. Proceed analogously to program the positions 2, 3 and 4.

All 4 positions must be taught in. If only two are required, they can also lie on the same measurement.

✓ When all 4 positions have been programmed the device traverses briefly in both directions as an acknowledgement that all 4 positions have been successfully taught in.

4. Switch the programming switch on the programming box back to position “0”.

Es is imperative that all four positions are programmed in order to save these permanently. If this is not complied with, the positions originally stored in the processor will be used the next time the operating voltage is switched on.

Position correction:
As the exact approach of a position during teach-in is sometimes not possible, there is a possibility of shifting in small increments the positions that have already been taught in.

Proceed as follows for the exact positioning of the taught-in positions:

1. Traverse the device to the position to be changed (the programming switch on the programming box is in position “0”).
2. Switch the programming switch to position “ON”.
3. With the enable button pressed down the taught-in position is shifted by 0.2 mm (a maximum of eight times) with each press of the direction button.
4. The change is saved when the enable button is released.
5. Switch the programming switch to position “0”.
6. Approach the position again to check the correction.
7. You can repeat the exact positioning, if the correction is insufficient.

The position can always be approached from the same direction because of the reversing play in the drive.

A correction is possible by a maximum of 8 presses of the direction button.

Resetting to the factory setting:

Resetting is only necessary in very few exceptional cases and should only be performed in such cases.

Resetting can be necessary, if the device has lost its measuring system (e.g. using excessive force in de-energized condition due to a missing self-locking facility).

Proceed as follows to reset:

1. Switch the programming switch to position “ON”.
2. First of all press the enable button and hold down the enable button and both direction buttons for at least 15 s until the device starts to move.
3. When the device starts to move, release all the buttons.
4. To prepare for the reference run, the position of the connecting rod of the device has to be checked. The dimension must be at least 10 mm above dimension A_{MIN} (see order confirmation). If this is not the case, the connecting rod must be extended to the required and dimension with the direction button “+”.
5. The reference run can now be performed by pressing the enable button until the drive stops of its own accord.
6. Once the reference run has been performed, switch the programming switch to position “0”.
7. Check the taught-in positions and reprogram them as necessary.

4.3.2 Jogging mode (only for teaching in the positions)

In jogging mode the device can be moved freely within the traversing range at a reduced speed:

1. Switch the programming switch on the programming box to position “ON”.
2. Press the corresponding direction button “+” or “-”.

   ✓ The device traverses at a reduced speed.

The programmed positions are not active in jogging mode. The device can be traversed from limit position to limit position over the full stroke.

4.3.3 Positioning mode

In positioning mode the device approaches the preselected positions. The speed is reduced shortly before reaching the position.
The following input levels are selected for the 4 positions:

Positions	**Level of inputs IN 2 and IN 3** (L = 0 V; H = 24 V)	
	IN 2 (direction –)	**IN 3 (direction +)**
Positioning in position 1	L	L
Positioning in position 2	H	L
Positioning in position 3	L	H
Positioning in position 4	H	H

Tab. 4 Preselection of the positions

1. Define the positions.
2. Press the enable button.

   ✓ The device starts.

3. Removal of the enable signal stops the drive immediately.
4. However, if the position signal changes while the drive is running, despite this the position valid at the start is approached first of all and then the new position.

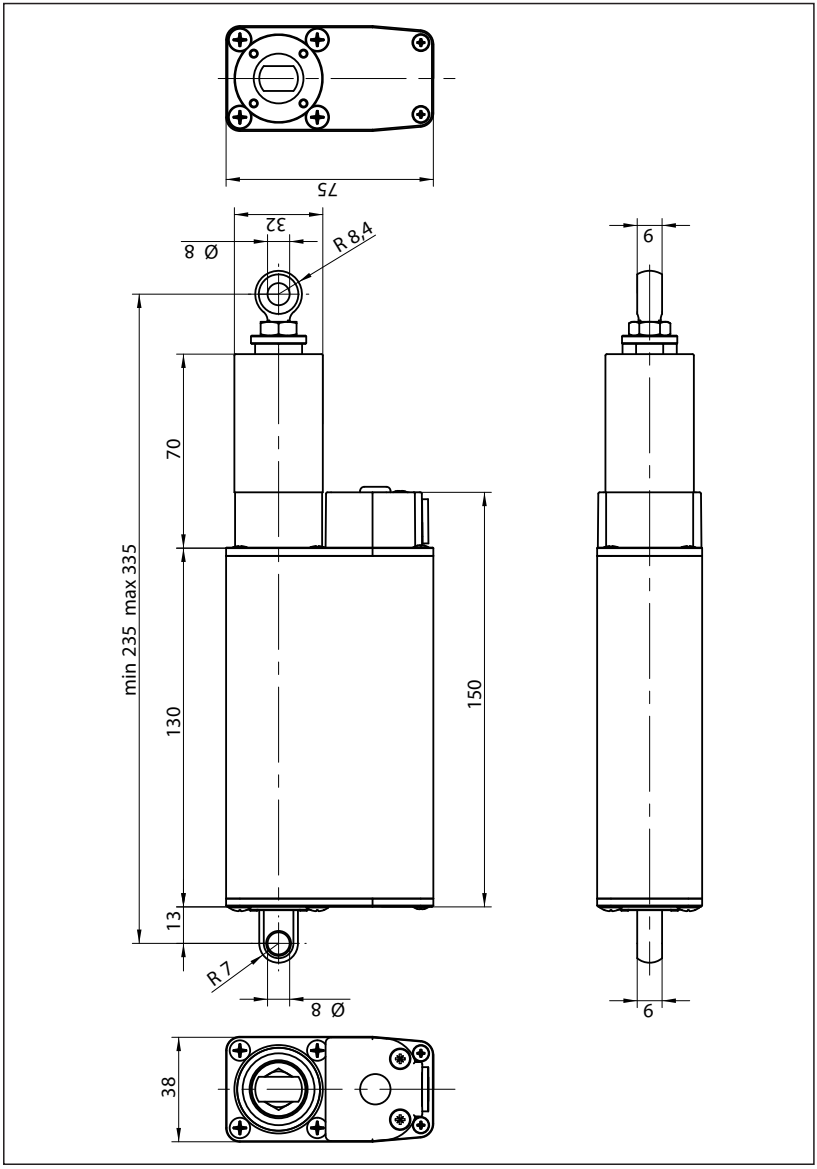
4.4 Protection devices

Internal limit positions
The internal limit position cut-off ensures traversing within the valid range and prevents overrunning of the mechanical stops. As position acquisition is performed electronically, movement of the device without a supply voltage by means of an excessively high external force has to be avoided because the measuring system will be shifted by doing so.

Undervoltage protection
The undervoltage protection switches the device off at a supply voltage of less than 20 V DC.

Overload protection
The overload protection protects the device against excessive forces. If the overload is eliminated, the device can be restarted by a new traversing command.

4.5 General dimensions sheet for linear drive, Junior 0E, stroke 100



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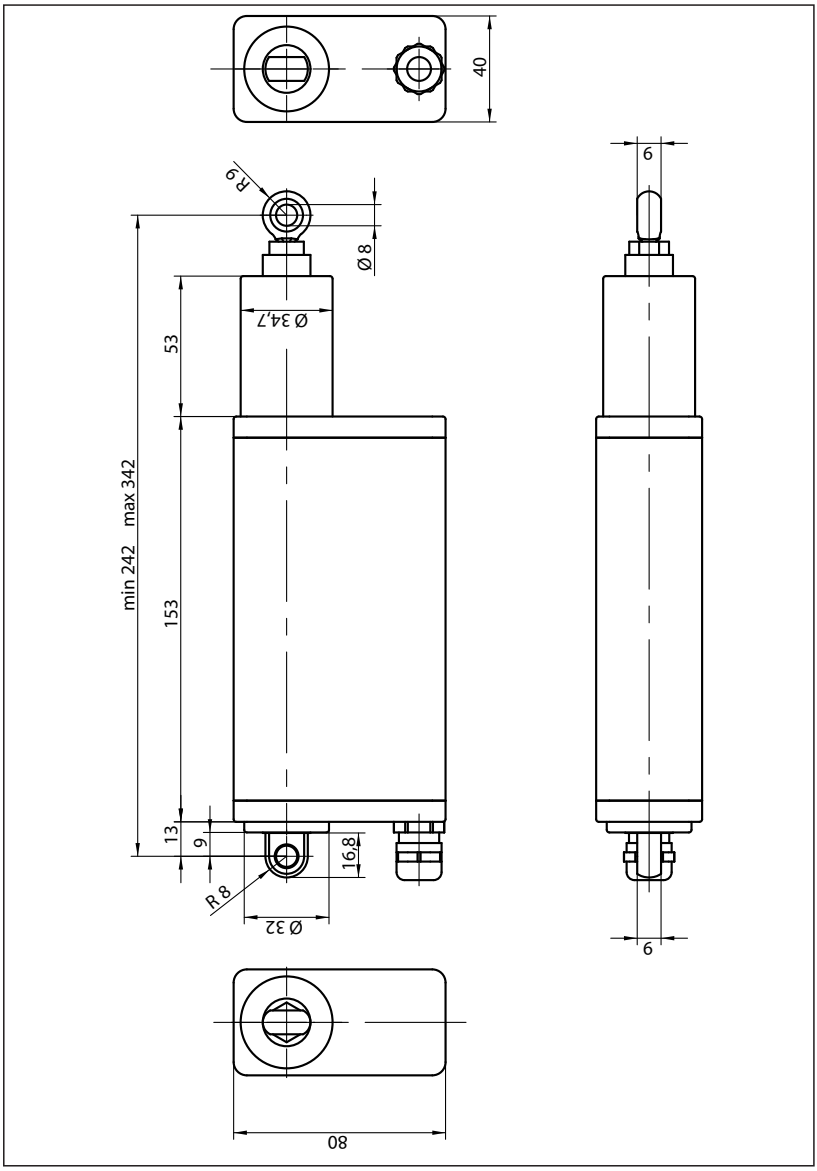
4.6 General dimensions sheet for linear drive, Junior 1E-VA, stroke 100



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 the recycling capability, dismantling capability and separation capability of the materials and subassemblies as well as the environmental and health dangers are all taken into consideration for recycling and waste disposal.

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

6.2 Disposal of electrical and electronic components

The waste disposal and recycling of electrical and electronic components must take place in compliance with the relevant laws and national regulations.

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