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for Future Generations

ELC 100SR
ELC 250SR

Installation manual for ELC range linear electric actuators with spring reset device

CE

Contents

Read these operating instructions carefully particularly the following safety instructions prior to installation and operation.

CAUTION / NOTE / WARNING
as indicated in the manual.

1.1 Proper use

ELC 100SR, ELC 250SR linear actuators are controlled by three-point control or constant control. Linear actuators in the series described in these operating instructions are used for valve stroke adjustment.

Compliance of the above type designation with the linear actuator rating plate must be checked prior to starting any operations in order to guarantee utilisation in accordance with specification. The data on the rating plate specifies the actuator technical details and mains power supply requirements.

It is the users' responsibility to ensure that the equipment is operated safely and that all staff working with or on the equipment are properly trained for the work they are performing and aware of their liabilities in terms of health and safety in the workplace. It is extremely important that precautions are taken to avoid spark or static discharge in any areas of potentially explosive atmosphere.

The intended use also includes the compliance with accident preventions, DIN VDE regulations and safe working practices for all measures described in these operating instructions in due consideration of prevailing rules.

The intended use also includes the compliance with accident preventions, DIN VDE regulations and safe working practices for all measures described in these operating instructions in due consideration of prevailing rules.

1.2 Information for the operator

Always keep the operating instructions available at the linear actuator deployment site.

Observe the current health and safety, accident prevention and DIN VDE standards for installation, operation and maintenance.

Take into consideration any additional regional, local or in-house safety regulations.

Ensure that every person entrusted with one of the tasks specified in these operating instructions has read and understood these instructions.

1.3 Personnel

Only qualified personnel may work on these linear actuators or in their vicinity. Qualified persons are those persons entrusted with installation, assembly, commissioning and operation or maintenance of the linear actuators and possessing the appropriate qualifications for their activity. The necessary and prescribed qualifications include:

- Training / instruction or authorisation to turn on /off circuits and appliances / systems according to EN 60204 (DIN VDE 0100 / 0113) and the standards of safety technology
- Training or instruction according to the standards of the safety technology concerning care and use of adequate safety and work protection equipment
- First aid training

Work in a safe manner and refrain from any working practice which endangers the safety of persons or damages the linear actuator or other assets in any way whatsoever.

1.4 Prior to starting work

Prior to starting any work, check that the type designations specified here concur with the data on the linear actuator rating plate.

Linear actuators ELC 100SR, ELC 250SR.

1.5 During operation

Safe operation is only possible if transportation, storage, installation, operation and maintenance are carried out according to the instructions in this manual and the applicable national and international standards.

Transportation, installation and assembly

Observe the general set-up and safety regulations for heating, ventilation, airconditioning and pipework design. Use tools correctly. Wear the necessary personal protection safety equipment.

Repairs and maintenance

Ensure that qualified personnel switch off the linear actuator prior to maintenance or repair work in accordance with DIN VDE.

1.6 Working environment

Read the data concerning the working environment in the Technical Data.

2. Product specification

The linear actuator is used to actuate and adjust lift valves. The lifting movement is generated by means of a spindle actuator coupled to a valve spindle comprising a pivoted spindle and a spindle nut secured against skewing. The actuation of the ball bearing mounted spindle is achieved by means of a stepper motor with interconnected two-step planetary gear. The stepper motor receives the rotary field required for operation from a micro controller based electric control.

The linear actuator comprises a spring reset device with an electro-hydraulically blockable spring. On commissioning the spring is tensed inside the hydraulic unit by the spindle actuator and blocked electro-hydraulically when reaching the spring limit position. During a cut of supply voltage this spring will be unlocked and the clutch piece will move hydraulically dampened to the lower limit position – actuator spindle.

2.1 Component parts

2.1.1 Component parts ELC 100SR

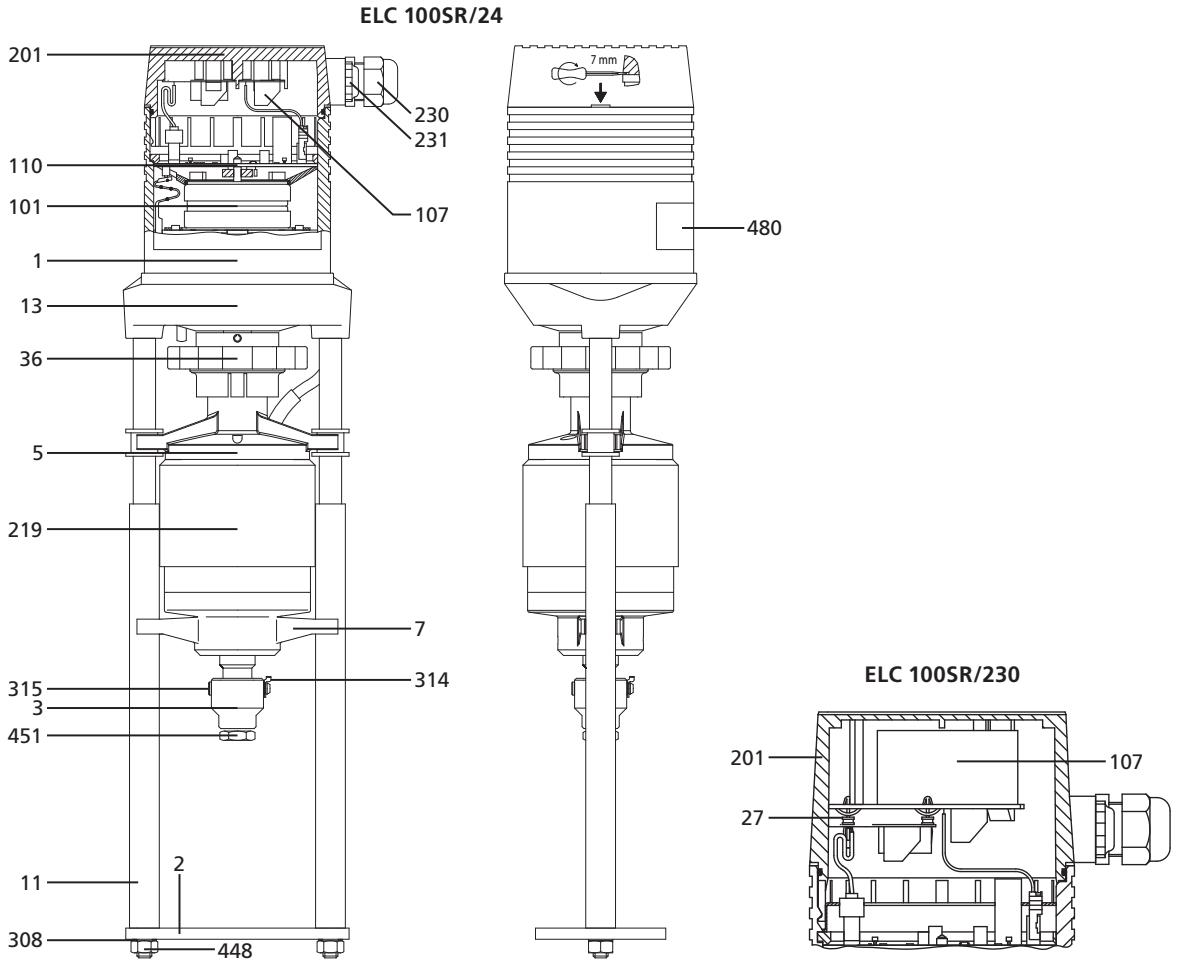


Fig 2.1 Component part denominations

ITEM	DESCRIPTION
1	Actuator housing
2	Crossbeam (optional)
3	Coupling piece*
5	Spindle nut
7	Anti-torsion locking device
11	Distance sleeve
13	Bridge
27	Spacer for 230 V*
36	Handwheel
60	Guiding sleeve
101	Engine/motor
107	Push-fit PCB for 24 V or 230 V

ITEM	DESCRIPTION
110	Main board
201	Cover for 24 V or 230 V*
219	Hydraulic unit
230	Cable lead-in M20 × 1.5*
231	Cable lead-in M16 × 1.5*
308	Safety disk*
314	Blank
315	Bolt
448	Hexagon nut M8*
451	Hexagon nut M10*
480	Type plate

* This component part is available as a spare part.

2.1.2 Component parts ELC 250SR

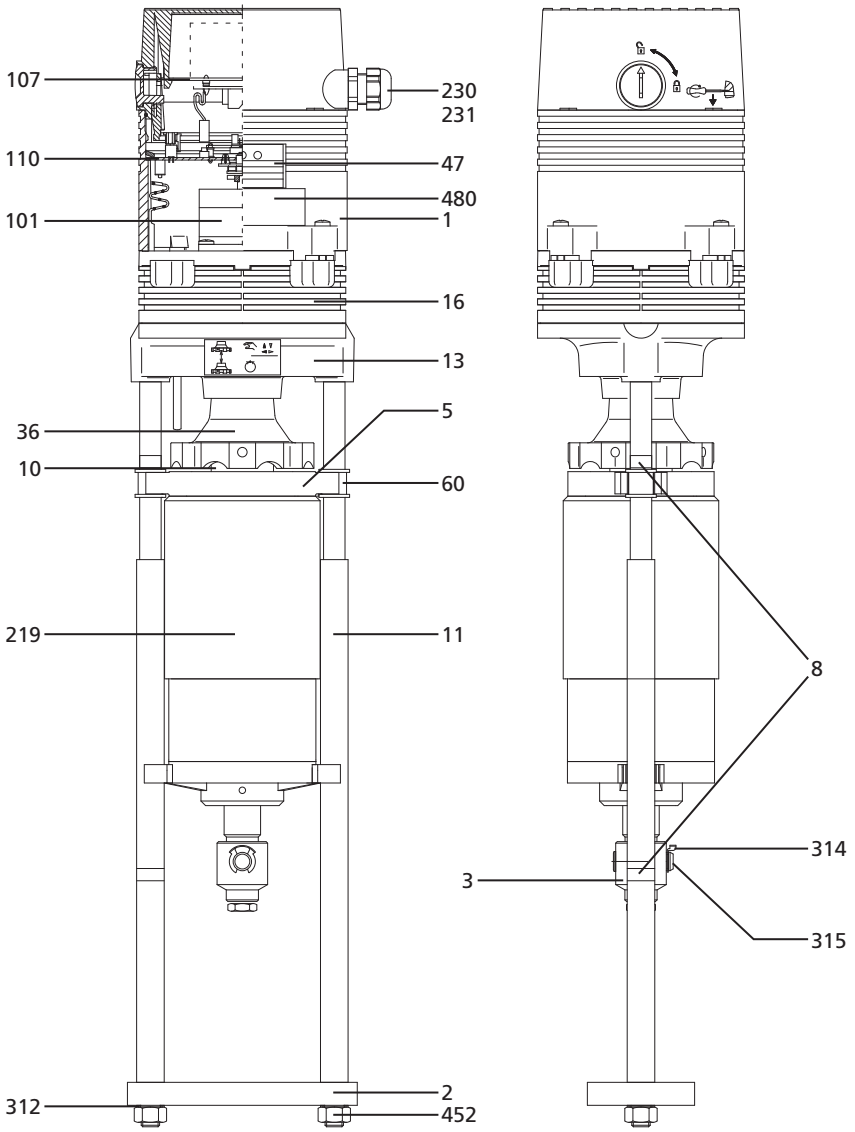


Fig 2.2 Component part denominations

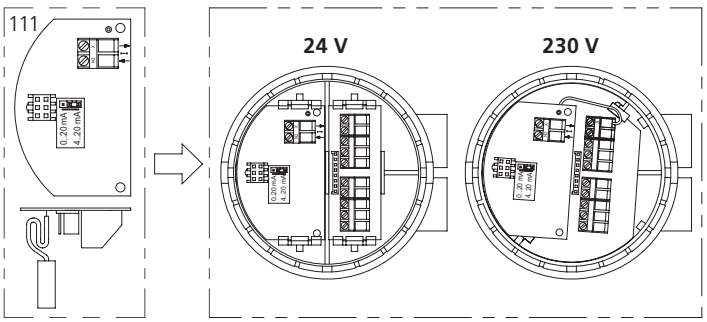
ITEM	DESCRIPTION
1	Actuator casing
2	Crossbeam (optional)
3	Coupling piece*
5	Spindle nut
8	Position display*
10	Protective tube
11	Spacer sleeve
13	Bridge
16	Gear casing
34	Knob
36	Handwheel
47	Viewing window
60	Guide bush

ITEM	DESCRIPTION
101	Engine/motor
107	Terminal board for 24 V or 230 V
110	Main board
201	Cover for 24 V or 230 V*
219	Hydraulic unit
230	Cable inlet M20 × 1.5*
231	Cable inlet M16 × 1.5*
312	Safety disk
314	Blank flange*
315	Bolt*
452	Hexagonal nut M10*
480	Type plate

* This component part is available as a spare part.

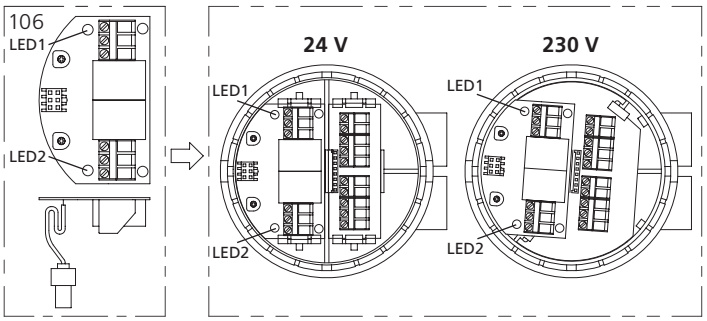
2.2 Accessories

2.2.1 ELC 100SR



111 PCB for output signal X = 0/4 to 20 mA

Fig 2.3 PCB for mA output signal in cover

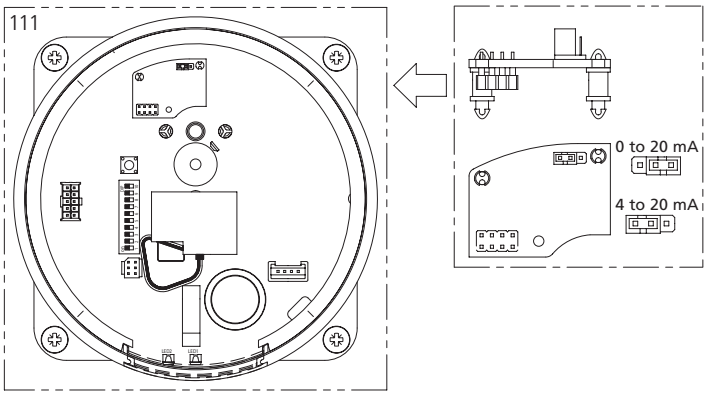


106 PCB for path switch

Fig 2.4 Position switch PCB in cover

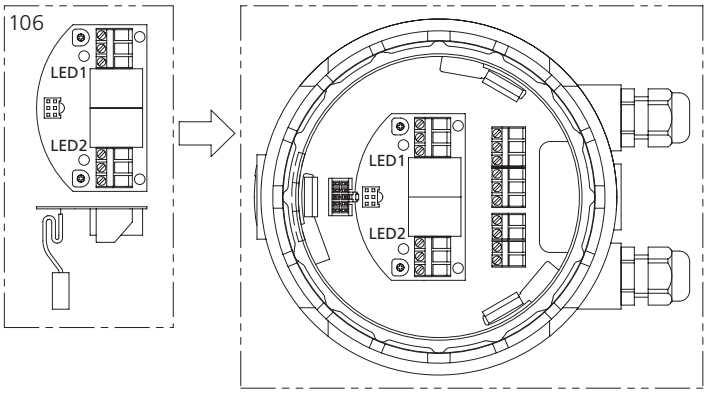
Optional operation with mA output signal or path switch possible.

2.2.2 ELC 250SR



111 PCB for output signal X = 0/4 to 20 mA

Fig 2.5 PCB for mA output signal in cover



106 PCB for path switch

Fig 2.6 Position switch PCB in cover

2.3 Operating modes

The linear actuator can be operated manually or automatically.

- In manual mode, stroke is adjusted via the handwheel
- In automatic mode, stroke is controlled electronically

2.3.1 Continuous mode

In continuous mode the system control presets the position of the linear actuator whilst inside the linear actuator the input signal (Y) of the system control is continuously compared with the output signal (X) of the linear actuator. In doing so, the output signal depends on the position of the linear actuator (travel).

The linear actuator keeps moving until the input signal and the output signal match.

Input signal (Y)

The input signal (Y) from the system control specifies the reference position for the linear actuator. It is an analogue signal on terminal Y.

The following input signals are possible:

- 0 to 10 VDC / 2 to 10 VDC
- 0 to 20 mA / 4 to 20 mA

Output signal (X)

The output signal (X) specifies the actual position of the linear actuator. It is an analogue signal on terminal X.

0% to 100% valve lift is output as:

- 0 to 10 VDC
- 0 to 20 mA or 4 to 20 mA
  (PCB for output signal as optional extra (**111**))
  When using the option "Output signal (X) as current output (0/4 to 20mA)", deviations of the output signal (X) up to max. 5% to the input signal (Y) may occur in the middle stroke range. This deviation is due to the design and does not represent a defect.

2.3.2 Three-point mode

The direction of movement is specified via a control voltage on terminal 2 and terminal 3 on the motherboard:

- If the control voltage on terminal 2 is on, the spindle nut extends
- If the control voltage on terminal 3 is on, the spindle nut retracts

2.4 Functions

2.4.1 Binary signal / frost protection function

Terminals B1 and B2 on the motherboard are bridged in normal mode. If the circuit between B1 and B2 is broken, the linear actuator stores the actual position and then moves automatically to its limit position.

All other control signals are ignored during this process.

The linear actuator remains in the limit position until the circuit between B1 and B2 is closed again.

- In three-point mode the linear actuator then returns automatically to the stored position
- In continuous mode the reference value of the input signal is again approached

2.4.2 Lock detection

If the linear actuator becomes mechanically locked, it returns briefly and tries again to reach the required position. If this does not happen after a total of 7 attempts, the linear actuator is switched off to avoid damage to linear actuator and actuator.

The lock detection is displayed via the green LED in the (60) viewing window.

See Table 8.

2.4.3 Internal temperature monitoring ELC 250SR

The actuator has internal temperature monitoring.

Overheating protection

If the temperature in the actuator casing exceeds a limit value, the motor will be switched off. Once the motor has cooled down, it is automatically switched on again.

Actuator heating

If the temperature in the actuator drops below 15 °C, the motor is switched to heating in the operating pauses. The actuator heating switches off automatically at a constant temperature of approx. 22 °C. The actuator heating does not affect the functions of the actuator.

Heating capacity:

- 12.5 W at temperatures from approx. 8 °C to approx.15 °C
- 18 W at temperatures below 8 °C

The heating prevents the build-up of water condensation in the actuator and at the same time guarantees the smooth running of the gears even at temperatures up to approx. -10 °C.

Heating operation and motor switch-off are displayed via the LED in the (60) viewing window.

See Table 9, Red LED display.

2.4.4 Open-circuit detection

Open-circuit detection is only available in continuous mode with an input signal 2 to 10 VDC and 4 to 20 mA.

If the input signal drops below 1 V or 2 mA in continuous mode, the linear actuator moves to the limit position set by coding switch S7.

Open-circuit detection is displayed via the green LED in the viewing window.

See Table 8, Green LED display.

2.4.5 Set time

The time the spindle nut takes to travel a defined path, is called actuating time. The actuating time is indicated in s/mm. The actuating time is set by coding switch S4 for ELC 100SR and S5 for ELC 250SR.

See Section 5.3, Set actuating time.

2.4.6 Hysteresis

The differential of the input signal (Y) required after a reversal of the signal direction so that the spindle nut is moved, is called hysteresis.

It is used to avoid permanent oscillation of the actuator motor around a specific lift position in the event of small input signal changes.

See Section 5.4, Set hysteresis.

2.4.7 Manual mode and feedback signal

The lift can be manually changed in manual mode without power supply.

- The electronic motor and control are switched off in manual mode so that lift movements by the control are not possible
- As soon as the linear actuator is switched to manual mode, the control switches a signal to Terminal R, if the power supply is on

See Section 6.1, Changing between manual and automatic mode.

2.4.8 Autotest

If a valve is not actuated over a long period, the valve cone may seize. The Autotest function prevents this. If the Autotest function of the linear actuator is switched on, the linear actuator moves after approx.10 days without actuation automatically in rapid traverse to the limit position set by coding switch S7 and returns to the starting position.

See Section 5.6, Set Autotest and Autopause.

2.4.9 Autopause

The actuator uses this function to count the actuator commands which mean a change in direction. In the event of more than 20 different directional actuator commends per minute, a compulsory pause of 3 s is imposed.

See Section 5.6, Set Autotest and Autopause.

2.4.10 Potential-free limit switch (optional extra)

The optional limit switch PCB (106) can be used to set two lift positions at which a potential-free electrical contact is opened or closed.

See Section 5.8, Set potential-free limit switch.

2.5 Technical data

Type	ELC 100SR/24, ELC 250SR/24	ELC 100SR/230, ELC 250SR/230
Supply voltage	24 VAC ± 10%	115 VAC ± 10% 230 VAC ± 10%
Power consumption	ELC 100SR = max. 25 VA ELC 250SR = max. 50 VA	ELC 100SR = max. 20 VA ELC 250SR = max. 80 VA
Weight	ELC 100SR = 4.8 kg ELC 250SR = 12 kg	ELC 100SR = 5.1 kg ELC 250SR = 12.5 kg
Dimensions	See technical data sheets	
Stroke	ELC 100SR = max. 20 mm ELC 250SR = max. 40 mm	ELC 100SR = max. 20 mm ELC 250SR = max. 40 mm
Frequency	50/60 Hz ± 5%	50/60 Hz ± 5%
Ambient temperature	0 to +60°C	0 to +60°C
Enclosure protection	IP 54 Suitable for use in the usual enviroment	IP 54 Suitable for use in the usual enviroment
Operating mode	S3-50% ED	S3-50% ED
Actuating time	ELC 100SR = 4 or 6 s/mm ELC 250SR = 2.5 or 5 s/mm	ELC 100SR = 4 or 6 s/mm ELC 250SR = 2.5 or 5 s/mm
Emergency actuating time	0.1 s/mm	0.1 s/mm
Actuating force	ELC 100SR = 1.0 kN ELC 250SR = 2.5 kN	ELC 100SR = 1.0 kN ELC 250SR = 2.5 kN
Recommended external protection	ELC 100SR = T1, 6 A ELC 250SR = T4 A	ELC 100SR = T200 mA (115 V) ELC 100SR = T125 mA (230 V) ELC 250SR = T1 A (115 V) ELC 250SR = T800 mA (230 V)
Temperature limits transformer cover		T60 (EN60730 6.7; 14.5; 14.7; 17.3)
Surge voltage rating	Overvoltage category 2 (EN60730 20.1.12; 20.1)	
Ball pressure testing temperature	Ball pressure test 1 test temperature 140 °C (EN60730 21.2.5)	
Function	Control function according to EN 60730 = 1 Spring-return function according to EN 60730 = 2	

Table 1 Technical data

Input signal Y/Resistance of load	0 to 10 VDC / 77 kΩ 2 to 10 VDC / 77 kΩ 0 to 20 mA / 510 Ω 4 to 20 mA / 510 Ω
Output signal X/Load rating	0 to 10 VDC / resistance of load ≥ 1200 Ω, $I_{max.}$ 8 mA 0 to 20 mA / resistance of load ≤ 500 Ω - with accessory PCB for output signal (**111**) 4 to 20 mA / resistance of load ≤ 500 Ω - with accessory PCB for output signal (**111**)
Response signal R/Load rating	24 VDC / minimum impedance ≥ 480 Ω, $I_{max.}$ 35 mA
Cable impedance between B1 and B2	max. 10 Ω

Table 2 Technical data signals

2.6 Type plate

The type plate is attached to the housing of the linear actuator.

It bears the type denomination, serial number (s/no) and date of manufacture (last four digits).

See Section 2.1, Component parts.

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ELC220-0200-0

F.-Nr.: 07204142/01/0607

AC 50 Hz 24 V	6 VA	2.2 kN
Y=0 to 10 VDC	IP 54	3 s/mm
X=0 to 10 VDC	S3 50% ED	Stroke 14 mm

Fig 2.3 Example of type plate

3. Transportation and storage

⚠ **CAUTION**

Non-compliance with safety regulations may result in injury.

- **WEAR THE REQUIRED PERSONAL AND OTHER SAFETY EQUIPMENT**
- Avoid impacts, blows, vibrations etc. to the linear actuator
- Store the linear actuator (and, where appropriate, the entire controlling device) in a dry place
- Keep the specified transport and storage temperatures between -20 to +65 °C

4. Assembly

Prior to assembling the linear actuator:

See Section 4.1, Checking the scope of delivery.

See Section 4.2, Preparing assembly.

The following sequence of operations is part of the linear actuator assembly:

See Section 4.3, Mounting the linear actuator on the valve.

See Section 4.4, Assembling/disassembling the cover.

See Section 4.5, Electrical connection.

4.1 Checking the scope of delivery

1 Check the packaging for damage.

2 Dispose of packaging in an environmentally-friendly manner.

3 Check the delivered items against the delivery note in order to see whether the delivery is complete.

4 Report any missing or damaged products to the manufacturer.

4.2 Preparing assembly

⚠ NOTE

Malfunction due to exceeding the stroke range.

If the stroke range of the valve exceeds the stroke range of the linear actuator, the linear actuator will malfunction.

Ensure there is stroke limitation in the valve.

⚠ NOTE

A non-attached actuator causes damage.

If you operate the linear actuator without connection to a valve, the spindle nut may fall off due to the missing stroke.

1 Allow for about 140 mm space above the cover at the site of installation.

2 Check the working environment before assembling and commissioning the linear actuator.

3 Ensure that the valve is correctly fitted. For details please see assembly instructions for the valve.

4 Determine the assembly position of the linear actuator. Do not arrange linear actuators in a hanging position.

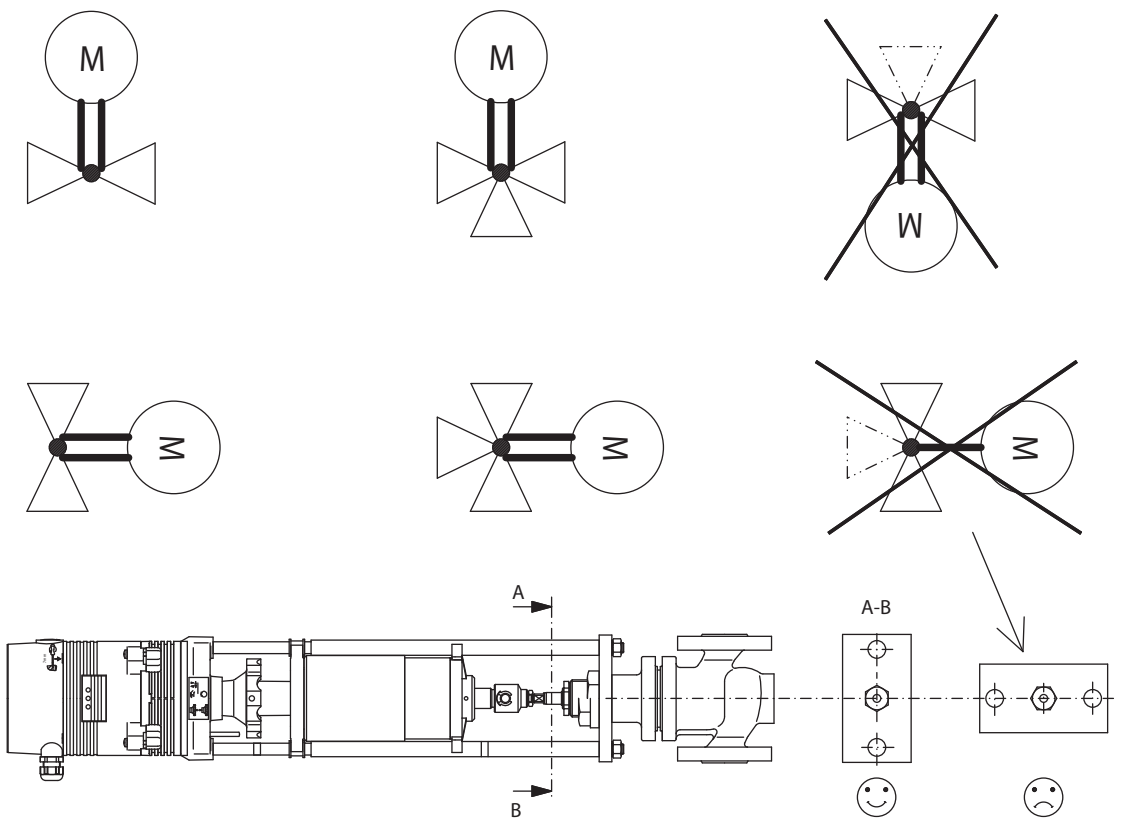


Fig 4.1 Assembly positions for linear actuator and valve

4.3 Mounting the linear actuator on the valve

If the linear actuator and the valve are supplied separately, you must mount the linear actuator on the valve.

4.3.1 Assembling ELC 100SR

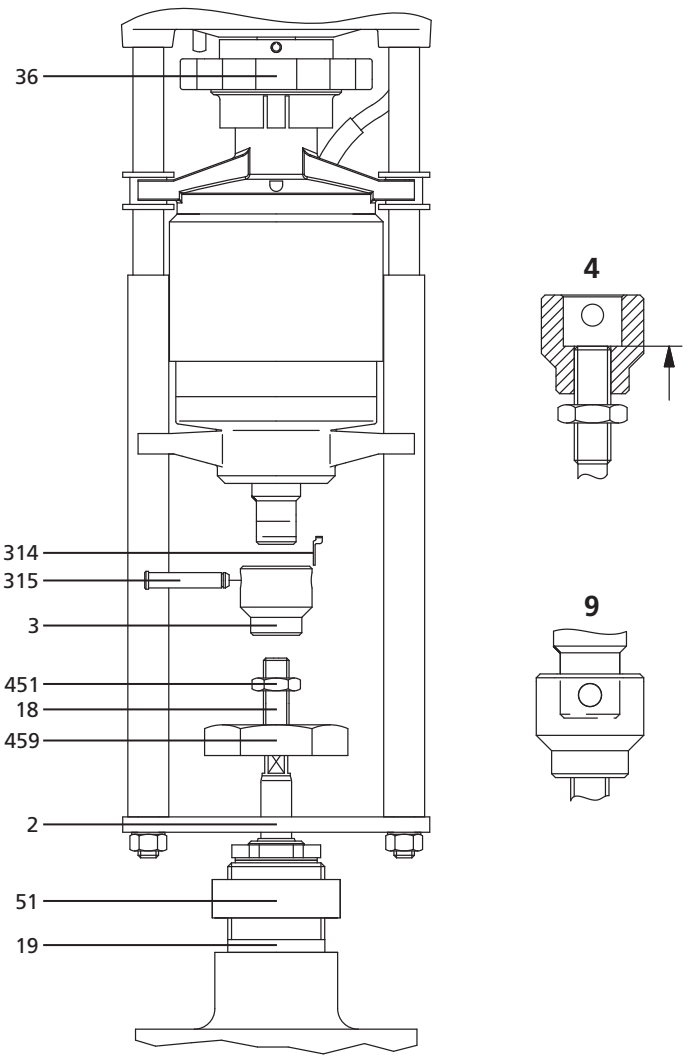


Fig 4.2 Mounting the linear actuator on the valve

ITEM	DESCRIPTION
2	Crossbeam (optional)
3	Coupling piece
18	Valve stem
19	Valve neck
36	Handwheel

ITEM	DESCRIPTION
51	Spacer ring
314	Blank
315	Bolt
451	Hexagon nut M10
459	Hexagonal nut

How to assemble linear actuator type ELC 100SR

1 Pull off the blank (314).

See Fig 4.2, Mounting the linear actuator on the valve.

2 Pull out the bolt (315) from the clutch piece (3) or drive it out.

3 Screw the hexagon locknut M10 (451) spanner width 17 onto the valve stem (18).

4 Screw the clutch piece (3) onto the valve spindle (18). The area of the valve stem (18) must be flush with the area of the clutch piece (3).

See Fig 4.2, Mounting the linear actuator on the valve (Detail 4).

5 Put the actuator into upper limit position by means of the hand wheel (36) and check whether it has reached the upper limit position.

6 Fit the spacer (51) on the valve neck (19).

7 Fit the actuator and crossbeam (2) and hexagon nut (459) on the valve neck (19). Make sure that the valve spindle is in bottom position.

8 Fix the crossbeam (2) using the hexagon nut (459) hand tight.

9 Turn the clutch piece (3) until both borings are congruent.

See Fig 4.2, Mounting the linear actuator on the valve (Detail 9).

10 Turn the clutch piece anti-clockwise by (3) one rotation (360°).

11 Loosen the hexagon nut (459) spanner width 50 and lift the actuator by c. 1.5 mm.

12 Insert the bolt (315) in the clutch piece (3) and secure it with a blank (314).

13 Tighten the hexagon nut (459) spanner width 50.

14 Fix the valve stem (18) by hexagon locknut M10 (451) spanner width 17 in order to secure it against skewing.

How to disassemble the linear actuator.

1 Move the linear actuator to the upper limit position (MAN / AUTO).

2 Turn the actuator by two rotations of the hand wheel away from the limit position.

3 Loosen the hexagon nut (459) spanner width 50.

4 Pull off the blank (314).

5 Pull out the bolt (315) from the clutch piece (3) or drive it out.

6 Remove the actuator.

4.3.2 Assembling ELC 250SR

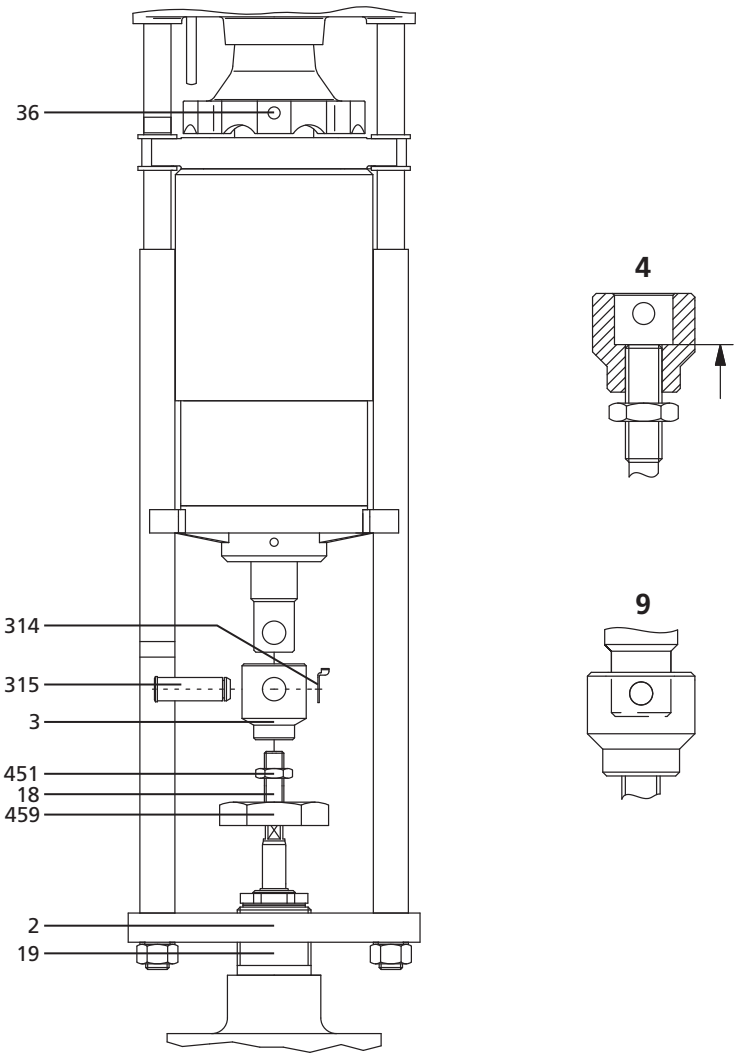


Fig 4.3 Mounting the linear actuator on the valve

ITEM	DESCRIPTION
2	Crossbeam
3	Coupling piece
18	Valve stem
19	Valve neck
36	Handwheel

ITEM	DESCRIPTION
314	Blank
315	Bolt
451	Hexagon nut M10
459	Hexagonal nut

How to assemble linear actuator type ELC 250SR

1 Pull off the blank (314).

See Fig 4.3, Mounting the linear actuator on the valve.

2 Pull out the bolt (315) from the clutch piece (3) or drive it out.

3 Screw the hexagon locknut M10 (451) spanner width 17 onto the valve stem (18).

4 Screw the clutch piece (3) onto the valve spindle (18). The area of the valve stem (18) must be flush with the area of the clutch piece (3).

See Fig 4.3, Mounting the linear actuator on the valve (Detail 4).

5 Put the actuator into upper limit position by means of the hand wheel (36) and check whether it has reached the upper limit position.

6 Fit the actuator and crossbeam (2) and hexagon nut (459) on the valve neck (19). Make sure that the valve spindle is in bottom position.

7 Fix the crossbeam (2) using the hexagon nut (459) hand tight.

8 Turn the clutch piece (3) until both borings are congruent.

See Fig 4.3, Mounting the linear actuator on the valve (Detail 9).

9 Turn the clutch piece anti-clockwise by (3) one rotation (360°).

10 Loosen the hexagon nut (459) spanner width 50 and lift the actuator by c. 1.5 mm.

11 Insert the bolt (315) in the clutch piece (3) and secure it with a blank (314).

12 Tighten the hexagon nut (459) spanner width 50.

13 Fix the valve stem (18) by hexagon locknut M10 (451) spanner width 17 in order to secure it against skewing.

How to disassemble the linear actuator

1 Move the linear actuator to the upper limit position (MAN / AUTO).

2 Turn the actuator by two rotations of the hand wheel away from the limit position.

3 Loosen the hexagon nut (459) spanner width 50.

4 Pull off the blank (314).

5 Pull out the bolt (315) from the clutch piece (3) or drive it out.

6 Remove the actuator.

4.4 Assembling/disassembling the cover

The cover contains the terminals for electric connection.

⚠ WARNING

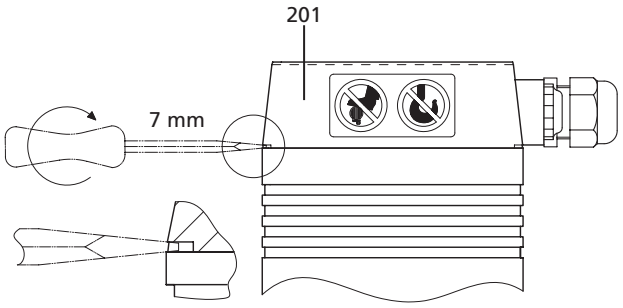
Risk of injury from electric shock by live parts.

When the power supply is on there is a danger of electric shock due to live parts.

- Prior to commencing any work, ensure that the actuator is safely disconnected from the power supply system
- Secure against unauthorised restarting
- Remove the cover only momentarily

How to remove the cover

1 Insert a screwdriver in the notch of the cover and lift the cover (201).



201 Cover

Fig 4.4 Removing the cover

⚠ NOTE

Damaged cables result in damage to devices.

When lifting the cover you may tear off or damage the cabling inside the cover. Carefully remove the cover.

2 Remove the cover (201) carefully.

3 Disconnect the plug-in connection between the main PCB (110 - see fig 2.1 on page 5) and the cover (201).

How to attach the cover

1 Plug the previously pulled off cables back into the main PCB (110 - see fig 2.1 on page 5). Pay attention to the notches on plug and socket.

You can mount the cover (201) in four, different, positions each of which is transposed by 90°. This allows the best possible laying of the connecting cable for different installations of the linear actuator.

2 Place the cover (201) on top and push it down to make it fit by applying moderate force.

3 Check the cover for correct fit to ensure air-tightness for the actuator housing.

4.5 Electrical connection

⚠ WARNING

Danger of life caused by unqualified staff.

Electrical connections carried out by unqualified staff may result in death, severe bodily injury or considerable material damage.

- Make sure that such all work is carried out by qualified staff

  See Section 1.3, Personnel.

⚠ WARNING

Risk of injury from electric shock by live parts.

When the supply voltage is turned on there is a risk of electric shock from live parts.

- Prior to commencing any work, ensure that the actuator is safely disconnected from the power supply system
- Secure against unauthorised restarting

How to prepare the electric connection

1 Ensure that the supply voltage matches the specifications on the type plate of the linear actuator.

2 To avoid breakdown, construct the line diameter according to actuating performance and required line length.

3 Lay the mains for a supply voltage of > 48 V separate from the signal and control wires.

When laying cables in a joint cable duct, use shielded control wires.

4 Check the supply voltage.

If the required tolerance is not achieved by a power transformer you will have to use an AC voltage stabiliser.

See Section 2.5, Technical data.

5 Secure the power cables (e.g. with cable-binders) in order to prevent the cable sliding out from the connection terminal.

6 Ensure that there is fuse protection for the linear actuator.

See Section 2.5, Technical data.

How to establish electrical connection

1 Remove the cover (201).

See How to remove the cover.

2 Run the cable through the screw joint in the cover to the terminal.

3 Connect the power supply according to the wiring diagram.

See Fig 4.5.

⚠ NOTE

Malfunctions caused by incorrect zero potential.

If the electric power supply for the linear actuator is fed by transducing sensors with, varying zero potentials, this may result in incorrect automatic controller action.

- Ensure that the zero potential is properly applied

  See Table 3.

4 Tighten the screw joints.

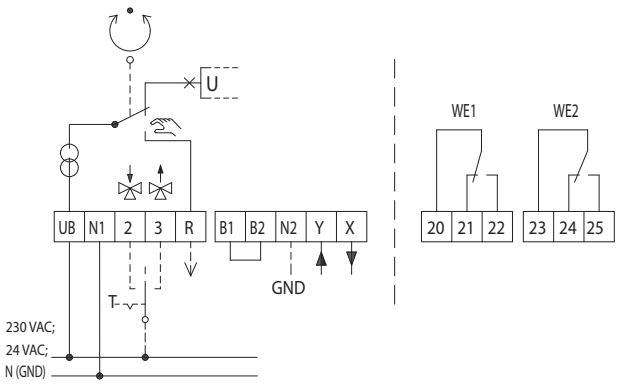


Fig 4.5 Circuit diagram

Terminal	Description
UB, N1	Supply voltage:
2	Control voltage for downward movement during three-point mode
3	Control voltage for upward movement during three-point mode
R	Response signal during "manual" mode • R= 24 VDC max. 35 mA
B1, B2	Binary input / frost protection function
N2	Zero potential of signals X, Y and R • When the zero potentials of signals X, Y and R are identical to the zero potential of the supply voltage it is possible to bridge terminals N1 and N2. • If you run the actuator in continuous mode at 230 V you will have to connect N2. • If you run the actuator in three-point mode at 230 V you will have to connect N2 if you wish to use X or R at the same time.
Y	Input signal continuous mode
X	Output signal continuous mode
20, 21, 22	Terminals path switch unit PS1
23, 24, 25	Terminals path switch unit PS2

Table 3 Key to wiring diagram

4.5.1 Controller independent circuit

When working with 24 V supply voltage and 0 to 10 VDC / 2 to 10 VDC input signal you can switch the actuator controller-independently via a three-step toggle switch in the control cabinet.

How to switch the actuator controller-independently

1 Run the supply voltage 24 VAC via a diode and a three-step toggle switch to terminal Y.

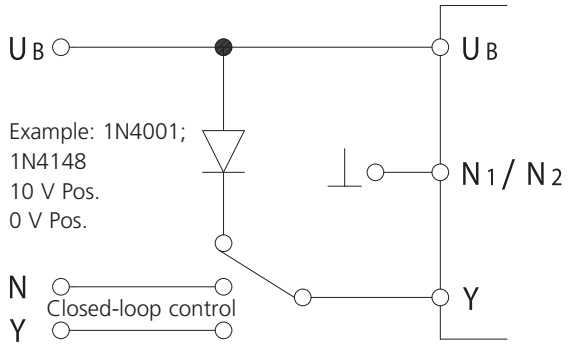


Fig 4.6 Controller independent circuit

2 Using the toggle you can move the linear actuator to the following positions:

- Closed-loop control by input signal Y (normal operation)
- 10 V-position
- 0 V-Position, the linear actuator can be moved to the position selected by encoding switch S7 at 2 to 10 VDC

See Section 5.1, Operating parameters and coding switch positions.

See Section 5.7, Set limit position.

4.6 Accessories installation ELC 100SR

Accessories are not part of the scope of delivery for the linear actuator unless expressly ordered. The linear actuators are prepared for retro-fitting with:

- PCB for path switch (106)
- PCB for output signal X=0/4 to 20 mA (111)

Optional operation with mA output signal or path switch possible.

See Section 2.2, Accessories.

4.6.1 Fitting a PCB for a path switch

⚠ WARNING

Risk of injury from electric shock by live parts.

When the power supply is on there is a danger of electric shock due to live parts.

- Prior to commencing any work, ensure that the actuator is safely disconnected from the power supply system
- Secure against unauthorised restarting

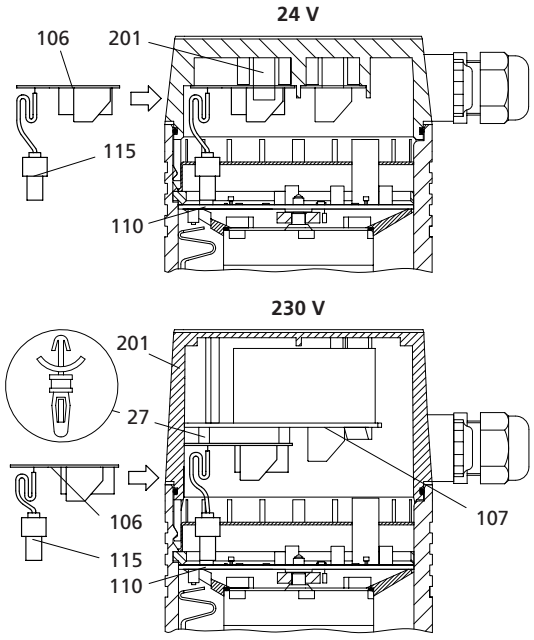
1 Open the cover (201) of the linear actuator.

See Section 4.4, Assembling/disassembling the cover.

2 **24 V:** Clipping the path switch PCB (106) to the safety catches on the cover (201).

See Fig 4.7.

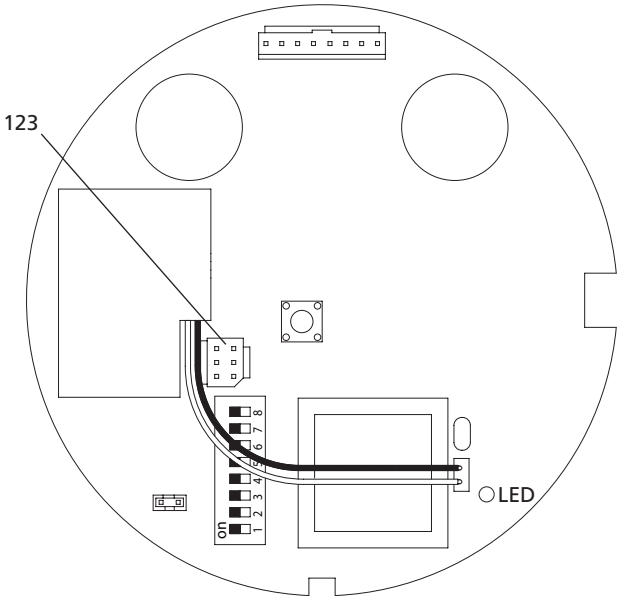
3 **230 V:** Push the path switch PCB (106) onto the three spacers (27) of the pushfit PCB (107).



27 Spacers
106 PCB for path switch
107 Push-fit PCB for 24 V or 230 V
115 Female plug
110 Main board
201 Cover for 24 V or 230 V*

Fig 4.7 Assembling the path switch PCB inside the cover

4 Plug the female plug into the (115) path switch PCB (106) on the socket board (123) of the main PCB (110). In the process pay attention to the notches on the socket board and female plug.



123 Socket board

Fig 4.8 Socket board for position switch PCB on main PCB

5 Set the position switches.

See Section 5.8, Set potential-free limit switch.

4.6.2 Fitting the PCB for the mA output signal

⚠ WARNING

Risk of injury from electric shock by live parts.

When the power supply is on there is a danger of electric shock due to live parts.

- Prior to commencing any work, ensure that the actuator is safely disconnected from the power supply system
- Secure against unauthorised restarting

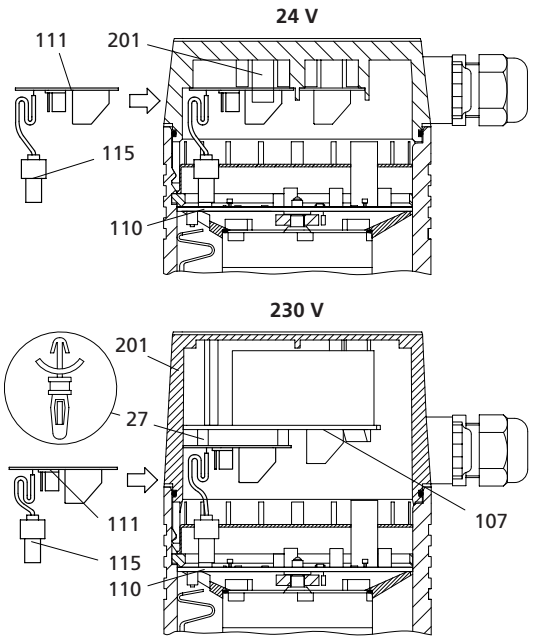
1 Open the cover (201) of the linear actuator.

See Section 4.4, Assembling/disassembling the cover.

2 **24 V:** Clip the PCB for the mA output signal to the safety catches inside the cover (201).

230 V: Push the PCB for the mA output signal onto the three spacers of the (27) push-fit PCB (107).

See Fig 4.10.



27 Spacers
111 PCB for mA output signal
107 Push-fit PCB for 24 V or 230 V
115 Female plug
110 Main board
201 Cover for 24 V or 230 V*

Fig 4.9 Fitting a PCB for the mA output signal

3 Push the female plug of the (115) PCB for the mA output signal onto the pin strip (123) of the main PCB (110). In the process pay attention to the notches on the socket board and female plug.

4 Attach the single cable from the PCB (111) for the mA output signal to terminal X of the push-fit PCB (107).

5 Use the jumper to select the signal range for the output signal:

- Jumper right: 4 to 20 mA
- Jumper left: 0 to 20 mA

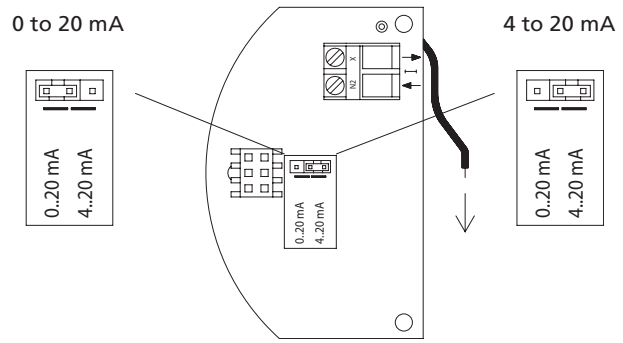


Fig 4.10 Setting the PCB for the mA output signal

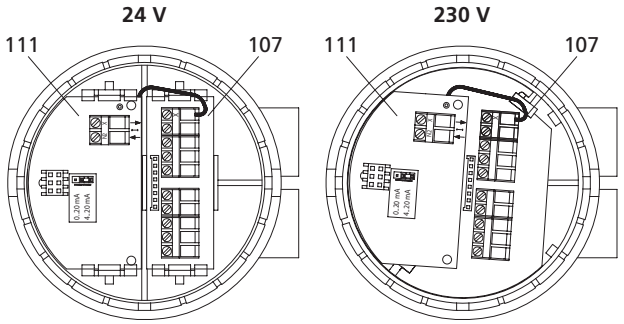


Fig 4.11 Connecting the PCB for the mA output signal to the push-fit PCB

4.7 Accessories installation ELC 250SR

Accessories are only part of the scope of supply of the linear actuator if expressly ordered. The linear actuators are prepared for retrofitting the following:

- Limit switch PCB (106)
- PCB for output signal X=0/4 to 20 mA (111)

See Section 2.2, Accessories.

4.7.1 Limit switch PCB installation

⚠ WARNING

Electric shock due to live components.

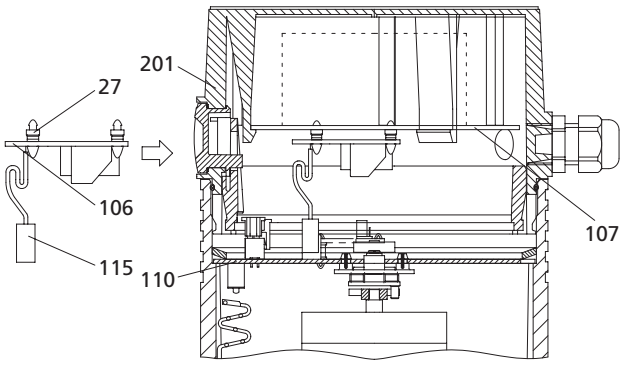
If the power supply is switched off, there is danger of electric shock due to live components.

- Prior to starting work ensure that the actuator is disconnected safely from the mains power supply
- Secure against unauthorised switching-on

1 Open the linear actuator (201) cover.

See Section 4.4, Assembling/disassembling the cover.

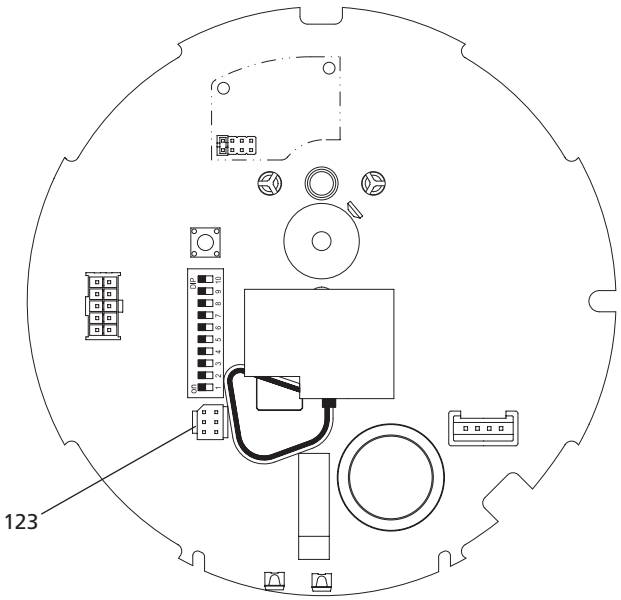
2 Press the limit switch PCB (106) onto the terminal board (27) using the (107) three spacers.



27 Spacers
106 Limit switch PCB
107 Terminal board for 24 V or 230 V
115 Plug connector bush
110 Main board
201 Cover for 24 V or 230 V*

Fig 4.12 Installation of the limit switch PCB in the cover

3 Place the plug connector bush (115) for the limit switch PCB (106) on the pin strip (123) on the (110) motherboard. Pay attention to the grooves in the pin strip and plug connector bush.



123 Pin strip

Fig 4.13 Pin strip for limit switch PCB on the motherboard

4 Adjust the limit switch.

See Section 5.8, Set potential-free limit switch.

4.7.2 Fit the PCB for mA output signal

⚠ WARNING

Electric shock due to live components.

If the power supply is switched off, there is danger of electric shock due to live components.

- Prior to starting work ensure that the actuator is disconnected safely from the mains power supply
- Secure against unauthorised switching-on

1 Open the cover (201) and remove the PCB cover (Type plate).

See Section 4.4, Assembling/disassembling the cover.

See Section 4.6, Accessories installation ELC 100SR.

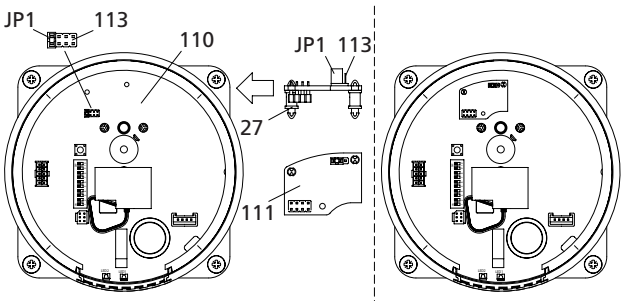
See Section 4.7, Acessories installation ELC 250SR.

2 Remove the jumper (JP1) from the motherboard (110).

3 Put the jumper (JP1) onto the plug-in bridge (113) for the PCB for mA output signal.

4 Plug the PCB for mA output signal (111) together with its pin strip into the plug-in bridge (113) on the motherboard (110).

5 Lock the spacers (27) into the holes in the motherboard.



JP1 Jumper
27 Spacers
110 Main board
111 PCB for mA output signal
113 Plug-in bridge

Fig 4.14 Installation of the PCB for mA output signal

6 Select the output signal range with the jumper (JP1):

- Jumper right: 0 to 20 mA
- Jumper left: 4 to 20 mA

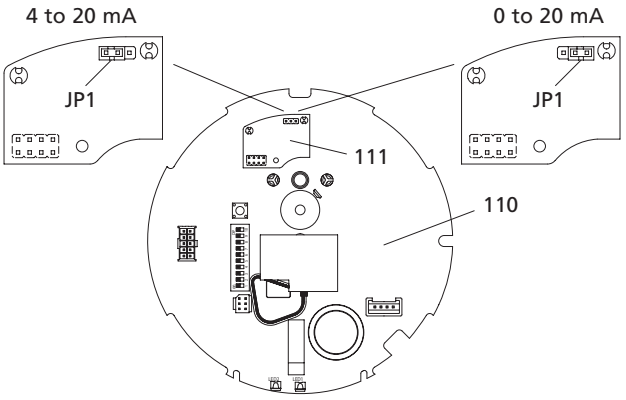


Fig 4.15 Set signal range for mA output signal X

⚠ WARNING

Risk of injury from electric shock by live parts.

When the power supply is on there is a danger of electric shock due to live parts.

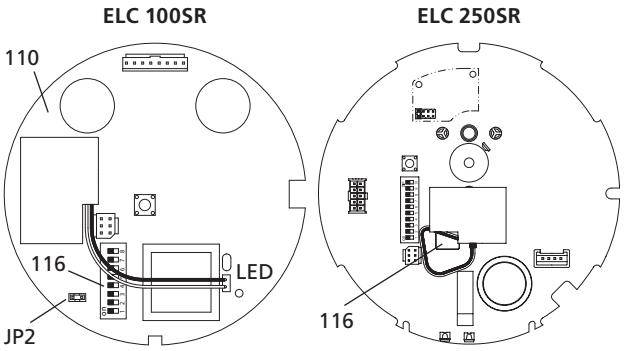
- Prior to commencing any work, ensure that the actuator is safely disconnected from the power supply system
- Secure against unauthorised restarting

The encoding switches (116) and the jumpers (JP2) are used to set the operating parameters. Encoding switches and jumpers are situated on the main PCB (JP2).

See Section 4.4, Assembling/disassembling the cover.

See Section 4.6, Accessories installation ELC 100SR.

See Section 4.7, Accessories installation ELC 250SR.



110 Main board

116 Coding switch
JP2 Jumper

Fig 5.1 Main PCB, encoding switches and jumpers

5.1 Operating parameters and coding switch positions

The operating parameters must be set with the coding switches and jumpers before the linear actuator can be operated.

5.1.1 ELC 100SR

Switch	On		Off	
S1	X characteristic line	Stroke X	X characteristic line	Stroke X
S2	Y characteristic line	Stroke Y	Y characteristic line	Stroke Y
S3	Input signal (Y) 0 to 10 VDC or 0 to 20 mA		Input signal (Y) 2 to 10 VDC or 4 to 20 mA	
S4	Actuating time 4 s/mm		Actuating time 6 s/mm	
S5	Auto test and auto pause on		Auto test and auto pause off	
S6	Limit position actuator spindle extended		Limit position actuator spindle retracted	
S7, S8	S7 and S8 are used to set the hysteresis (0.05 to 0.5 V)			
JP2	Input signal (Y) in mA		Input signal (Y) in V	

Table 4 Coding switch and jumper positions ELC 100SR

5.1.2 ELC 250SR

⚠ NOTE

Malfunctions due to incorrect switch position S1.

Switch S1 must always be at "on".

- Ensure that switch S1 is at "on"

Switch	On		Off	
S1	Ready for operation		-	
S2	X characteristic curve	Stroke 	X characteristic curve	Stroke 
S3	Y characteristic curve	Stroke 	Y characteristic curve	Stroke 
S4	Input signal (Y) 0 to 10 VDC or 0 to 20 mA		Input signal (Y) 2 to 10 VDC or 4 to 20 mA	
S5	Actuating time ELC 100SR 4 s/mm	Actuating time ELC 250SR 2.5 s/mm	Actuating time ELC 100SR 6 s/mm	Actuating time ELC 250SR 5 s/mm
S6	Auto test and auto pause on		Auto test and auto pause off	
S7	Limit position actuator spindle extended		Limit position actuator spindle retracted	
S8, S9	The hysteresis (0.05 to 0.5 V) is set using S8 and S9			
S10	Input signal (Y) in mA		Input signal (Y) in V	

Table 5 Coding switch positions ELC 250SR

5.2 Set the input signal

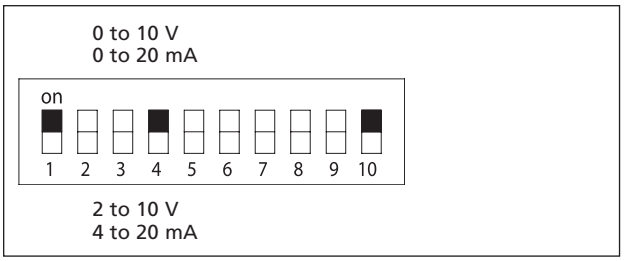


Fig 5.2 Set input signal

Additional information: Input signal (Y).

5.3 Set actuating time

Additional information: See Section 2.4.5, Set time.

5.3.1 ELC 100SR

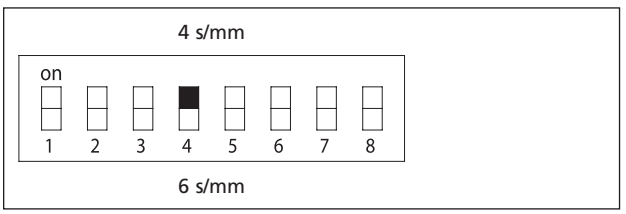


Fig 5.3 Set actuating time

5.3.2 ELC 250SR

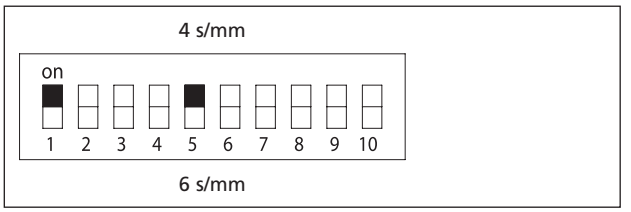


Fig 5.4 Set actuating time

5.4 Set hysteresis

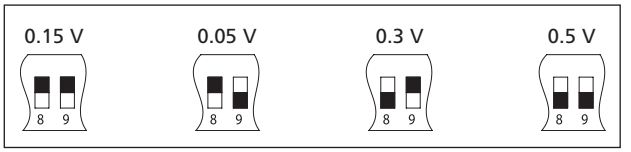


Fig 5.5 Set hysteresis

For further information see Section 2.4.6, Hysteresis.

5.5 Set actuating direction

The actuating direction of the linear actuator can be reversed at the coding switch (inverted operation).

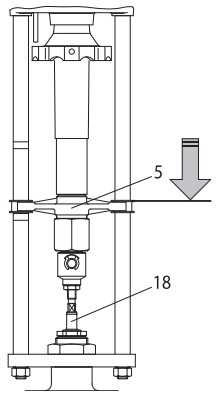
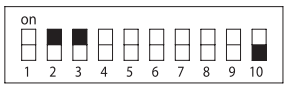
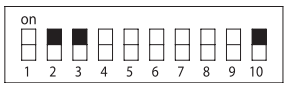
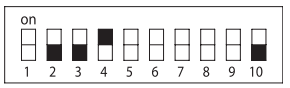
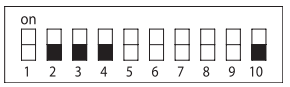
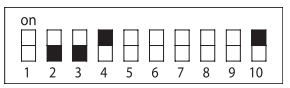
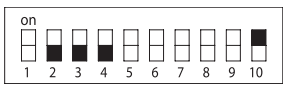
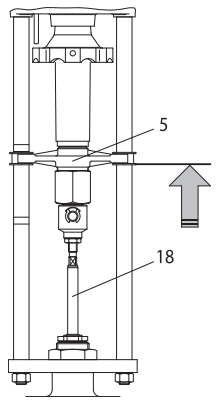
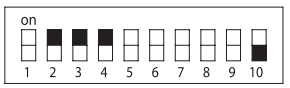
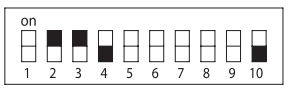
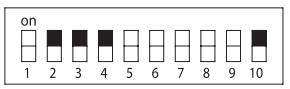
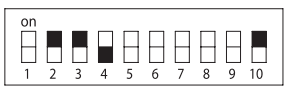
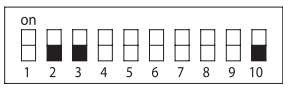
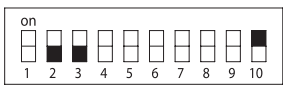
Actuator position	Normal operation	Inverted operation (X and Y inverted)
	 Y = 10 VDC  Y = 20 mA	 Y = 0 VDC  Y = 2 VDC  Y = 0 mA  Y = 4 mA
	 Y = 0 VDC  Y = 2 VDC  Y = 0 mA  Y = 4 mA	 Y = 10 VDC  Y = 20 mA
Coding switch S2: X (output signal), coding switch S3: Y (input signal)		

Table 6 Set actuating direction

5.6 Set autotest and autopause

If coding switch S6 is at ON, autotest and autopause are active.

Approaching the limit switch in rapid traverse is triggered approx. every 10 days in autotest. A new zero balance is carried out automatically.

A 3-second pause (2-minute measuring cycle) is carried out in autopause after more than 20 actuator commands in different directions per minute.

It is not possible to select these two functions separately.

5.7 Set limit position

Select the limit position for the linear actuator using coding switch S7:

- S7 ON: Limit position with extended spindle nut
- S7 OFF: Limit position with retracted spindle nut

The limit position is approached in the following situations:

- In the event of open-circuit detection by the Y signal (only for 2 to 10 VDC or 4 to 20 mA)
- In the event of a binary signal (circuit is broken between terminals B1 and B2)
- In autotest
- Upon disruption of the power supply (manual adjustment)

5.8 Set potential-free limit switch

Set the two limit switches via trimmer potentiometers P1/ P2 independently from one another. Carry out the specified working steps for each limit switch once.

Proceed as follows to set a limit switch

1 Ensure that the linear actuator has been started up and initialised.

See Section 5.10, Commissioning.

See Section 5.9, Initialising the path measuring system.

⚠ NOTE

Malfunction due to inaccurately set limit switch.

If the actuator has been set to manual mode (without power supply), the limit switch can only be set inaccurately (Centre position of the arm corresponds to the switching point for approx. 50% lift in this instance).

- Switch the actuator to automatic mode in order to set the limit switch accurately

2 Move the actuator into a position where a switching event should be triggered.

The following working steps must be carried out with the power supply switched on.

⚠ WARNING

Electric shock due to live components.

Once the power supply has been switched on, there is risk of electric shock due to live components.

- Take care not to touch any live components
- Take care not to cause a short circuit on a PCB with the tool

3 Open the cover (201).

See Section 4.4, Assembling/disassembling the cover.

The limit switch PCB is located in the cover (106).

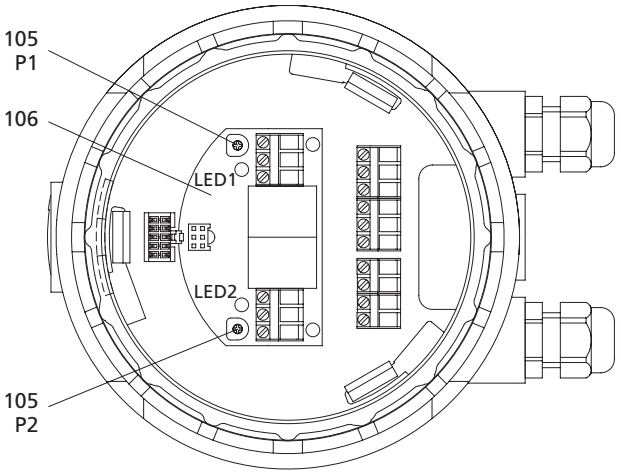
4 Use a screwdriver to turn the trimmer potentiometer until the limit switch switches. The associated LED goes on or off during this operation.

Use potentiometer P1 (105 P1) to set limit switch 1.

LED 1 indicates the switching status.

Use potentiometer P2 (105 P2) to set limit switch 2.

LED 2 indicates the switching status.



105 P1Trimmer potentiometer **105** P2Trimmer potentiometer

Fig 5.6 Limit switch PCB in cover

5 Observe the permitted limit switch contact load:

Nominal load	8 A, 250 VAC 8 A, 30 VDC
Switch voltage	max. 400 VAC max. 125 VDC

Table 7 Limit switch contact load

6 Switch off the power supply to the actuator and connect the limit switch contacts.

7 Close the linear actuator (201) cover.

See How to attach the cover.

5.9 Initialising the path measuring system

⚠ NOTE

Linear actuator starts automatically.

The linear actuator starts immediately after being connected to the supply voltage and automatically moves to a reference point of the path measuring system.

- Wait until this reference point has been reached and the linear actuator has stopped

The path measuring system has to be initialised after the following:

- At initial commissioning
- After repairs to the valve or actuator
- After a replacement of valve or actuator

Initialisation may be triggered in two different ways.

How to initialise via the initialising button

⚠ WARNING

Risk of injury from electric shock by live parts.

When the supply voltage is turned on there is a risk of electric shock from live parts.

- Take care not to touch any live parts
- Take care to apply the tool in a way that does not cause a short-circuit

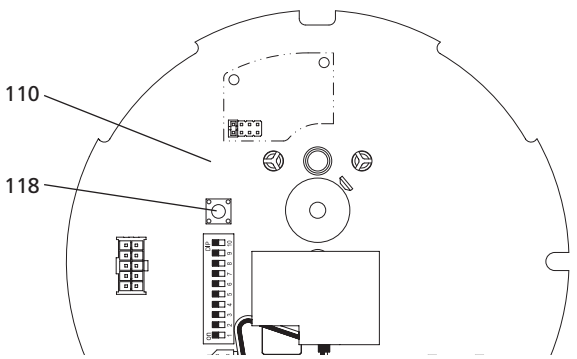
1 Open the cover (201).

See Section 4.4, Assembling/disassembling the cover.

2 Ensure that supply voltage is applied.

3 After applying the supply voltage the emergency actuating unit (NE) will automatically be tensed by the actuator. After tensing, the actuator will remain in bottom limit position.

4 After a waiting period of about 25 seconds, push and hold the initialising button (118) for at least 2 seconds (stopping time). After the initialising cycle the actuator will follow the actuating signal.



110 Main board **118** Initialising button

Fig 5.7 Initialising the path measuring system

Proceed as follows to initialise via the connecting terminals

1 Connect the power supply simultaneously to terminals 2 and 3. Ensure that the power supply remains on for at least 1 second.

See Fig 4.5.

5.10 Commissioning

1 Check that all installation and assembly tasks have been completed correctly.

See Section 4, Assembly.

2 Ensure that the electric actuation of the linear actuator is ensured without danger to persons or equipment or the system.

3 Ensure that the linear actuator is correctly fixed and the linear actuator cover is closed.

See Section 4.4 Assembling/disassembling the cover.

4 Ensure that the linear actuator is switched to automatic mode.

See Section 6.1, Changing between manual and automatic mode.

5 Ensure that the operating parameters have been correctly set.

See Section 5.1, Operating parameters and coding switch positions.

6 Ensure that the path-measuring system has been initialised.

See Section 5.9, Initialising the path measuring system.

7 Connect the power supply. Then the linear actuator moves to the reference point.

The linear actuator is ready for operation.

Prior to commissioning the linear actuator you will have to initialise it and select the operating mode.

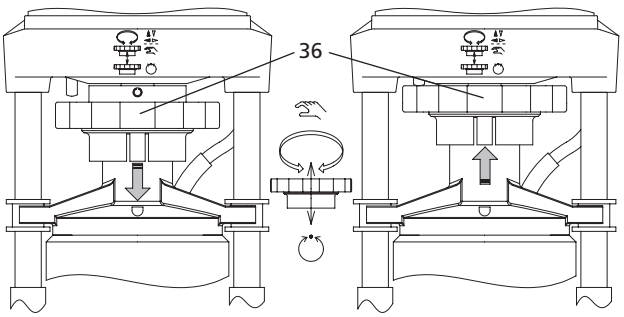
See Section 5, Commissioning.

See Section 5.9, Initialising the path measuring system.

6.1 Changing between manual and automatic mode

It is possible to run the linear actuator in automatic mode or manual mode (manual adjustment). During manual mode you will only be able to change the lift when voltage is applied and the spring of the response unit is in a tensed state.

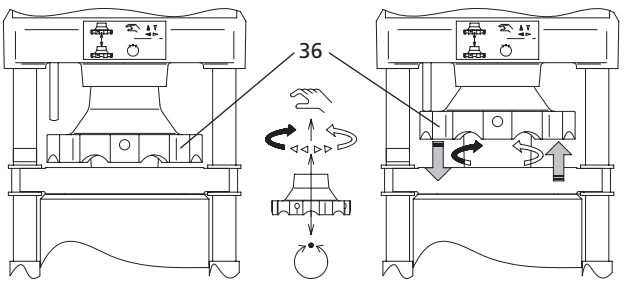
- In automatic mode the spindle nut moves to the position set by the controller
- In manual mode it is possible to set the spindle manually, e.g. for control purposes. Output signal (X) is not available in manual mode



Automatic operation **Manual operation**

36 Handwheel

Fig 6.1 Selecting automatic mode ELC 100SR



Automatic operation **Manual operation**

36 Handwheel

Fig 6.2 Selecting automatic mode ELC 250SR

Proceed as follows to switch to manual mode

1 Move the handwheel (36) into the manual mode position and rotate it until the handwheel locks.

⚠ NOTE

Risk of damage to valve and actuator in manual mode.

The valve can get damaged if it is pressed too firmly into its seat when closing in manual mode.

- Do not rotate the handwheel any further if the amount of effort needs to be increased
- Never use force

2 Use the handwheel to rotate the spindle nut into the required position. Rotate the handwheel until the rotational resistance increases. Do not use force.

Proceed as follows to switch to automatic mode

1 Move the handwheel (36) into the automatic mode position.

2 The linear actuator moves first of all into the position specified by coding switch S7 and then into the position specified by the control.

6.2 LED display

The LEDs in the viewing window (60) indicate operating states or faults.

See Section 10.2, Operating faults checklist

Green LED	Operating status / fault
☼ Duration	**Normal operation, standby** The LED illuminates continuously, actuator awaits drive command.
☼ ⊗ ☼ ⊗ 0.5s 0.5s 0.5s 0.5s	**Standard operation** Actuator carries out drive command.
☼ ⊗ ☼ ⊗ 0.2s 1.5s 0.2s 1.5s Short – long rhythm	**Open-circuit detection** In operating modes 2 to 10 VDC or 4 to 20 mA, the input signal has dropped below 1 V or below 2 mA. *See Section 2.4.4, Open-circuit detection.*
☼ ⊗ ☼ ⊗ 2.5s 2.5s 2.5s 2.5s Long – long rhythm	**Lock detection (only in continuous mode)** The linear actuator is mechanically locked. *See Section 2.4.2, Lock detection.*
☼ ⊗ ☼ ⊗ 1.5s 0.2s 1.5s 0.2s Long – short rhythm	**Continuous signal on terminal 2 and 3** An initialisation run starts in the event of simultaneous control signal on terminals 2 and 3 (max. 4 attempts). The linear actuator switches off automatically after 4 failed attempts.

Table 8 Green LED display

Red LED	Operating status / fault
⊗ OFF	**Temperature within normal range**
☼ Duration	**Heating operation** *See Actuator heating.*
☼ ⊗ ☼ ⊗ 0.25s 0.25s 0.25s 0.25s Flashes regularly	**Actuator overheats** *See Overheating protection.*

Table 9 Red LED display

7. Maintenance, care and repairs

The linear actuator requires only periodic maintenance.
To ensure that the spindle is greased, drive the actuator to its end position once per day.

8. Spare parts

When ordering accessories and spare parts please quote the specifications engraved on the type plate of your linear actuator. The specifications on the type plate are standard for the technical date of linear actuators as well as the requirements for the public power supply.

⚠ **NOTE**

Damage to device caused by faulty spare parts.

Spare parts must match the technical data specified by the manufacturer.

- Use genuine spare parts at all times

See Section 2.1, Component parts.

See Section 2.2, Accessories.

9. Shutdown and disposal

Dispose of the linear actuator in accordance with national regulations and legislation.

10. Troubleshooting

The path-measuring system needs to be re-initialised after troubleshooting.

See Section 5.9, Initialising the path measuring system.

10.1 Troubleshooting

If the linear actuator does not work perfectly, proceed as follows to eliminate the fault:

1 Check that the linear actuator was installed correctly.

2 Check the linear actuator settings and the rating plate data.

3 Eliminate the faults using the checklist.

See Section 10.2, Operating faults checklist.

4 If this fault still cannot be eliminated, contact the manufacturer.

5 Please quote the following for all queries and returning goods to the manufacturer:

- F-No. (Fabrication No. = Contract No.)
- Type designation
- Power supply and frequency
- Additional equipment
- Error report

6 If the fault cannot be eliminated by the inquiry, the equipment can be returned to the manufacturer.

10.2 Operating faults checklist

Fault	Cause/reason	Remedy
Linear actuator does not work.	Handwheel (36) is in manual mode position.	Switch handwheel to automatic mode position.
	Mains power failure.	Establish cause and eliminate.
	Fuse defective (in the electrical cabinet).	Establish cause and eliminate, change fuse.
	Linear actuator incorrectly connected.	Rectify connection in accordance with circuit diagram (on the cover).
	Short circuit due to humidity.	Establish cause, dry the linear actuator, change hood seal and screw connections if necessary and/or fit protective hood.
	Short circuit due to incorrect connection.	Rectify connection.
	Motor has coil damage (burnt-out) • e.g. due to too high voltage • Electronic system defective	Establish cause, measure current data. Compare with rating plate and table, Remove linear actuator and return to manufacturer for repair.
2. Linear actuator runs in an unstable manner, i.e. switches between clockwise and counter-clockwise rotation.	Voltage drop due to too long connecting cables and/or too small cross-section.	Measure linear actuator current data, recalculate and change connecting cables if necessary.
	Mains power fluctuations greater than permissible tolerance. *See Section 2.5, Technical data*.	Improve mains power ratios.
3. Linear actuator cuts out from time to time or initialises frequently.	Supply cable has loose contact.	Check and tighten connections (terminal strips).
4. Linear actuator does not move to limit position. Valve does not open/ close.	Valve jams.	Ensure smooth running valve.
	Too high system pressure.	Correct system pressure.
5. Linear actuator does not move or does not move correctly to the position specified by input signal Y.	Input signal Y is faulty: • Error signals • Signal fluctuations	Check input signal Y on linear actuator, eliminate cause of fault.
	Main PCB defective.	Change motherboard, remove linear actuator and return to manufacturer for repair if necessary.
6. Green LED flashes in long/long rhythm.	Lock detection has responded.	Press INIT and observe actuator during initialisation.
		Check valve for smooth running over entire lift range.
7. Green LED flashes in short/long rhythm	Open circuit detected.	Measure reference value voltage or current on linear actuator.
8. Green LED flashes in long/short rhythm	Relay contact adherence.	Check control.
9. Red LED flashes regularly.	Actuator overheats	Motor has switched off automatically. Automatic start-up after cooling down.

Table 10 Operating faults checklist

Notes

Notes

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